

**Atlantic States Marine  
Fisheries Commission**

1050 N. Highland Street, Suite 200A-N  
Arlington, VA 22201

*Robert E. Beal, Executive Director*



**Virginia Marine  
Resources Commission**

2600 Washington Avenue  
Newport News, VA 23607

*John M.R. Bull, Commissioner*

**MEMORANDUM**

October 4, 2017

**TO:** Commissioners; Proxies; American Eel Management Board; American Lobster Management Board; Atlantic Coastal Cooperative Statistics Program (ACCSP) Coordinating Council; Atlantic Coastal Fish Habitat Partnership Steering Committee; Atlantic Herring Section; Atlantic Striped Bass Management Board; Atlantic Sturgeon Management Board; Coastal Sharks Management Board; Executive Committee; Habitat Committee; Horseshoe Crab Management Board; ISFMP Policy Board; Law Enforcement Committee; Shad and River Herring Management Board; Spiny Dogfish Management Board; South Atlantic State/Federal Fisheries Management Board; Summer Flounder, Scup, and Black Sea Bass Management Board; Tautog Management Board

**FROM:** Robert E. Beal *REB*  
Executive Director

**RE:** **76<sup>th</sup> Annual Meeting of the Atlantic States Marine Fisheries Commission**  
October 16-19, 2017 (TA # 17-120)

The Atlantic States Marine Fisheries Commission's 76<sup>th</sup> Annual Meeting will be held October 16-19, 2017 at the Waterside Marriott Hotel (Telephone: 757.627.4200) located at 235 East Main Street, Norfolk, Virginia. Meeting materials are available on the Commission website at <http://www.asmfc.org/home/2017-annual-meeting>. Supplemental materials will be posted to the website on Wednesday, October 11<sup>th</sup>.

Board meeting proceedings will be broadcast daily via webinar beginning October 16<sup>th</sup> at 10:15 a.m. and continuing daily until the conclusion of the meeting (expected to be 3:00 p.m.) on Thursday, October 19<sup>th</sup>. The webinar will allow registrants to listen to board/section deliberations and view presentations and motions as they occur. No comments or questions will be accepted via the webinar. Should technical difficulties arise while streaming the broadcast the boards/sections will continue their deliberations without interruption. We will attempt to resume the broadcast as soon as possible. Please go to <https://attendee.gotowebinar.com/register/8911027556606824449> to register.

I look forward to seeing you at the Annual Meeting. If the staff or I can provide any further assistance to you, please call us at 703.842.0740.

Enclosures: Final Agenda, Hotel Directions, TA # 17-120, and Travel Reimbursement Guidelines



## Public Comment Guidelines

With the intent of developing policies in the Commission's procedures for public participation that result in a fair opportunity for public input, the ISFMP Policy Board has approved the following guidelines for use at management board meetings:

**For issues that are not on the agenda**, management boards will continue to provide opportunity to the public to bring matters of concern to the board's attention at the start of each board meeting. Board chairs will use a speaker sign-up list in deciding how to allocate the available time on the agenda (typically 10 minutes) to the number of people who want to speak.

**For topics that are on the agenda**, but have not gone out for public comment, board chairs will provide limited opportunity for comment, taking into account the time allotted on the agenda for the topic. Chairs will have flexibility in deciding how to allocate comment opportunities; this could include hearing one comment in favor and one in opposition until the chair is satisfied further comment will not provide additional insight to the board.

**For agenda action items that have already gone out for public comment**, it is the Policy Board's intent to end the occasional practice of allowing extensive and lengthy public comments. Currently, board chairs have the discretion to decide what public comment to allow in these circumstances.

In addition, the following timeline has been established for the **submission of written comment for issues for which the Commission has NOT established a specific public comment period** (i.e., in response to proposed management action).

1. Comments received 3 weeks prior to the start of a meeting week will be included in the briefing materials.
2. Comments received by 5:00 PM on the Tuesday immediately preceding the scheduled ASMFC Meeting (in this case, the Tuesday deadline will be **October 10, 2017**) will be distributed electronically to Commissioners/Board members prior to the meeting and a limited number of copies will be provided at the meeting.
3. Following the Tuesday, **October 10, 2017 5:00 PM deadline**, the commenter will be responsible for distributing the information to the management board prior to the board meeting or providing enough copies for the management board consideration at the meeting (a minimum of 50 copies).

The submitted comments must clearly indicate the commenter's expectation from the ASMFC staff regarding distribution. As with other public comment, it will be accepted via mail, fax, and email.



## Final Agenda

The agenda is subject to change. The agenda reflects the current estimate of time required for scheduled Board meetings. The Commission may adjust this agenda in accordance with the actual duration of Board meetings. Interested parties should anticipate Boards starting earlier or later than indicated herein.

### Sunday, October 15

2:00 – 7:00 p.m.                      **Registration**

### Monday, October 16

7:00 a.m. – 1:00 p.m.                **Registration**

8:30 – 10:00 a.m.                    **Plenary Session: Climate Change Impacts on the Habitat and Productivity of the Chesapeake Bay Region by Dr. Roger Mann, Virginia Institute of Marine Sciences**

10:00 a.m. – Noon                    **Welcome Tea for Spouses/Guests**

10:15 a.m. – 12:15 p.m.            **American Lobster Management Board**

*Member States:* Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia

*Other Members:* NEFMC, NMFS

*Chair:* Borden

*Other Participants:* Cloutier, Reardon

*Staff:* Ware

1. Welcome/Call to Order (*D. Borden*)
2. Board Consent
  - Approval of Agenda
  - Approval of Proceedings from August 2017
3. Public Comment
4. Southern New England Lobster Working Group **Possible Action**
  - Report on Future Management of the Stock (*M. Ware*)

5. Consider Lobster Draft Addendum XXVI and Jonah Crab Addendum III for Public Comment, if available **Possible Action**
  - Technical Committee Report on Harvester Reporting and Biological Sampling (*K. Reardon*)
  - Management Issues and Alternatives (*M. Ware*)
6. State and Federal Inconsistencies in LCMA 4 Season Closure (*M. Ware*) **Possible Action**
  - Consider Postponed Motion to Address Inconsistencies  
*Move to (1), allow LCMA 4 fishermen the ability to continue fishing fixed lobster gear for other legal species such as Jonah crab, during the closed period and (2), exempt closed seasons from the most restrictive rule; as currently defined by the feds*
7. Consider 2017 Fishery Management Plan Reviews and State Compliance Reports (*M. Ware*) **Action**
  - American Lobster
  - Jonah Crab
8. Other Business/Adjourn

1:00 – 5:00 p.m.

**Atlantic Coastal Fish Habitat Partnership (ACFHP) Steering Committee**

*Members:* Babb, Campfield, Carloni, Chiarella, Groskin, Johnson, Laney, Lorson, McMunigal, McReynolds, McTigue, Murray, Patterson, Powell, Rousseau, Schuler, Smith, Thomas-Blate, Topolski, Wilber

*Chair:* Smith

*Other Participants:* Beal

*Staff:* Havel

1. Welcome/Introductions (*K. Smith*)
2. Approval of Agenda
3. Review Lake Okeechobee Water Releases and St. Lucie Reef Coral Reef Stress Responses (*J. Beal*)
4. Review Comparison of Restored vs. Natural Oyster Reefs in the Indian River Lagoon (*J. Beal*)
5. Final Report on Jamestown Conservation Moorings Project (*C. Powell*)
6. Black Sea Bass Habitat Project Update (*L. Havel*)
7. Review Mapping Project Prioritization Status (*L. Havel*)
  - Review Variables and Metrics for Southeast Mapping
  - Discuss Future Plans to Relocate Mapping to the Mid-Atlantic
8. Recess

1:15 – 2:45 p.m.

**Tautog Management Board**

*Member States:* Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia

*Other Members:* NMFS, USFWS

*Other Participants:* McNamee, Snellbaker

*Chair:* Nowalsky

*Staff:* Kerns, Starks

1. Welcome/Call to Order (*A. Nowalsky*)
2. Board Consent
  - Approval of Agenda
  - Approval of Proceedings from August 2017

***Vision: Sustainably Managing Atlantic Coastal Fisheries***

3. Public Comment
4. Amendment 1 for Final Approval (*T. Kerns*) **Final Action**
  - Review Regional Proposals
  - Consider Remaining Issues in the Draft
  - Consider Final Approval of Amendment 1
5. Consider 2017 Tautog Fishery Management Plan Review (for the 2015 and 2016 Fishing Years) and State Compliance Reports (*C. Starks*) **Action**
6. Other Business/Adjourn

2:00 – 5:00 p.m.                    **Registration**

3:00 – 3:45 p.m.                    **Spiny Dogfish Management Board**

*Member States:* Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, North Carolina

*Other Members:* NMFS, USFWS

*Chair:* Borden

*Other Participants:* Moran, Newlin

*Staff:* Rootes-Murdy, Appelman

1. Welcome/Call to Order (*D. Borden*)
2. Board Consent
  - Approval of Agenda
  - Approval of Proceedings from October 2016
3. Public Comment
4. Set Fishery Specifications for the 2018/2019 Season **Final Action**
  - Review Mid-Atlantic Fishery Management Council’s Recommended 2018 Specifications (*M. Appelman*)
  - Set 2018/2019 Specifications (*D. Borden*)
5. Consider 2017 Spiny Dogfish Fishery Management Plan Review and State Compliance Reports (*M. Appelman*) **Action**
6. Other Business/Adjourn

4:00 – 5:00 p.m.                    **Atlantic Herring Section**

*Member States:* Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey

*Other Members:* NEFMC (Non-voting)

*Chair:* White

*Other Participants:* Eastman, Zobel

*Staff:* Kerns

1. Welcome/Call to Order (*R. White*)
2. Board Consent
  - Approval of Agenda
  - Approval of Proceedings from May 2017

***Vision: Sustainably Managing Atlantic Coastal Fisheries***

3. Public Comment
4. Set 2018 Atlantic Herring Specifications for Area 1A (*T. Kerns*) **Final Action**
5. Discuss Role of Section in Research Set Aside Process (*R. White*)
6. Discuss New England Fishery Management Council Participation in ASMFC Herring Management (*T. Kerns*) **Possible Action**
7. Other Business/Adjourn

**6:00 – 9:00 p.m. Welcome Reception at the Virginia Aquarium and Marine Science Center**

**Tuesday, October 17**

7:00 a.m. – 1:00 p.m. **Registration**

8:00 – 9:30 a.m. **Shad and River Herring Management Board**

*Member States:* Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida

*Other Members:* DC, PRFC, USFWS, NMFS

*Other Participants:* Chase, Furlong, Lyons-Gromen

*Chair:* Clark

*Staff:* Starks

1. Welcome/Call to Order (*J. Clark*)
2. Board Consent
  - Approval of Agenda
  - Approval of Proceedings from August 2017
3. Public Comment
4. Discuss Shad Stock Assessment Process Recommendations (*J. Kipp*)
5. Consider Approval of Shad and River Herring Sustainable Fishery Management Plans (SFMPs) **Final Action**
  - Review SFMPs and Technical Committee Memo (*B. Chase*)
    - Connecticut – Updated Shad SFMP
    - Potomac River Fisheries Commission – Updated Shad SFMP
    - North Carolina – Updated Shad SFMP
    - South Carolina – Updated Shad SFMP
    - Georgia – Updated Shad SFMP
    - Virginia – Bycatch Plan
6. Consider 2017 Shad and River Herring Fishery Management Plan Review and State Compliance Reports (*C. Starks*) **Action**
7. Other Business/Adjourn

8:30 a.m. – 4:00 p.m.      **ACFHP Steering Committee (continued)**

9. Recap and Introductions (*K. Smith*)
10. Summary of The Nature Conservancy/NOAA Seagrass and Salt Marsh Fishery Productivity Workshop (*K. Smith*)
11. National Fish Habitat Partnership, Coastal Fish Habitat Partnership, and Whitewater to Bluewater Update (*L. Havel*)
  - Whitewater to Bluewater Conservation Areas
  - 2018 Multistate Conservation Grant Update
  - USFWS and NFHP Reports
12. ACFHP Operations Update (*P. Campfield*)
13. Review FY2018 NFHP Project Rankings (*L. Havel*)
14. Lunch (not provided)
15. Discuss Ideas for New ACFHP Website (*L. Havel*)
16. 2017-2019 Action Plan Check-in (*K. Smith*)
17. Other Business/Adjourn

9:45 a.m. – 12:15 p.m.      **Horseshoe Crab Management Board**

*Member States:* Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida

*Other Members:* PRFC, NMFS, USFWS

*Chair:* Rhodes

*Other Participants:* Messeck, Sysak

*Staff:* Schmidtke

1. Welcome/Call to Order (*M. Rhodes*)
2. Board Consent
  - Approval of Agenda
  - Approval of Proceedings from October 2016
3. Public Comment
4. Review Results of Eel and Whelk Bait Practices Survey (*R. Sysak*)
5. Consider 2018 Benchmark Stock Assessment Terms of Reference (*K. Anstead*) **Action**
  - Review Assessment Timeline
  - Review Data Confidentiality Procedures for the Assessment
  - Advisory Panel Recommendations
6. Set 2018 Harvest Specifications **Final Action**
  - Review Horseshoe Crab and Red Knot Indices of Abundance for 2017 Adaptive Resource Management (ARM) Model Runs (*K. Anstead*)
  - Review Results of 2017 ARM Model Runs (*K. Anstead*)
  - Set 2018 Harvest Specifications (*M. Schmidtke*)
7. Review Results of ARM Model Runs Incorporating Biomedical Data and Recommendations from the ARM Subcommittee, Technical Committees, and Advisory Panel (*K. Anstead, M. Schmidtke*)
8. Consider 2017 Fishery Management Plan Review and State Compliance Reports (*M. Schmidtke*) **Action**

*Vision: Sustainably Managing Atlantic Coastal Fisheries*

9. Populate Advisory Panel with Non-traditional Stakeholders (*T. Berger*) **Possible Action**
10. Elect Vice-Chair **Action**
11. Other Business/Adjourn

1:00 – 5:00 p.m.

**Law Enforcement Committee**

***(A portion of this meeting will be a closed session for Law Enforcement Committee members only to discuss ongoing enforcement activities. Only members of the LEC, authorized law enforcement personnel and the LEC Coordinator may attend)***

*Members:* Anthony, Blanchard, Cloutier, Donovan, Eastman, Frampton, Furlong, Gadomski, Garner, Gordon, Green, Hettenbach, Hogan, Kersey, King, Lynn, Messeck, Moore, Moran, Overturf, Pearce, Santiago, Snellbaker

*Chair:* Eastman

*Staff:* Robson

1. Call to Order/Roll Call of the Law Enforcement Committee (LEC) Representatives (*M. Eastman*)
2. Approval of Agenda and May 2017 Minutes
3. Public Comment
4. Nomination of New Chair and Vice-Chair
5. Review 2017 Action Plan Results and Proposed 2018 Tasks
6. Review and Discuss American Lobster Management Issues
7. Review and Discuss Cobia Draft Fishery Management Plan
8. Review and Discuss Atlantic Menhaden Draft Amendment 3
9. Review Ongoing Enforcement Issues ***(Closed Session)***
10. Review and Discuss Other ASMFC Managed Species as Needed
11. Review and Discuss New Member Orientation Process
12. Recess

1:15 – 2:15 p.m.

**Coastal Sharks Management Board**

*Member States:* Maine, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida

*Other Members:* NMFS, USFWS

*Chair:* Miller

*Other Participants:* Brewster, Garner

*Staff:* Rootes-Murdy

1. Welcome/Call to Order (*R. Miller*)
2. Board Consent
  - Approval of Agenda
  - Approval of Proceedings from May 2017
3. Public Comment



4. Final Rule for Highly Migratory Species Amendment 5b (Dusky Sharks)
  - Review Final Rule & NOAA Fisheries Request for Complementary Measures (*K. Brewster-Geisz*)
  - Law Enforcement Committee Report (*M. Robson*)
  - Technical Committee Report (*K. Rootes-Murdy*)
  - Review State Feedback (*K. Rootes-Murdy*)
  - Consider Complementary Management Measures (*R. Miller*) **Possible Action**
5. Set 2018 Fishery Specifications (*K. Rootes-Murdy*) **Final Action**
6. Elect Vice-Chair **Action**
7. Other Business/Adjourn

2:00 – 5:00 p.m.                    **Registration**

2:30 – 4:30 p.m.                    **American Eel Management Board**  
*Member States:* Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, Pennsylvania, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida  
*Other Members:* DC, NMFS, PRFC, USFWS  
*Chair:* Clark  
*Other Participants:* Brust, Cloutier  
*Staff:* Rootes-Murdy

1. Welcome/Call to Order (*J. Clark*)
2. Board Consent
  - Approval of Agenda
  - Approval of Proceedings from August 2017
3. Public Comment
4. 2017 American Eel Stock Assessment Update
  - Presentation of Assessment Update (*J. Brust*)
  - Consider Management Response to Stock Assessment Update (*J. Clark*) **Possible Action**
5. Consider 2018 Glass Eel Quota for Maine (*J. Clark*) **Possible Final Action**
6. American Eel Allocation Working Group Report and Recommendations (*K. Rootes-Murdy*) **Possible Action**
7. Other Business/Adjourn

4:45 – 5:45 p.m.            **Atlantic Coastal Cooperative Statistics Program (ACCSP) Coordinating Council**  
*Members:* Alexander, Baum, Beal, Blazer, Boyles, Jr., Carmichael, Cimino, Clifford, Coit, Cyr, Detlor, Fegley, Gary, Geer, Gilmore, Grout, Keliher, King, McCawley, Michels, Moore, Nies, Perkins, Pierce, Ponwith, Risenhoover, Shiels, Stephen, White  
*Chair:* Boyles, Jr.  
*Staff:* Cahall

1. Welcome/Introductions (*R. Boyles, Jr.*)
2. Council Consent
  - Approval of Agenda
  - Approval of Proceedings from August 2017
3. Public Comment
4. ACCSP Status Report (*M. Cahall*)
  - Program Updates
  - Committee Updates
5. Social and Economic Data Standards Update (*R. Rhodes*)
6. Consider Recommendations of FY2018 Submitted Proposals (*P. Campfield, J. Morgan*) **Action**
7. Election of Chair and Vice-Chair **Action**
8. Other Business/Adjourn

6:30 – 9:00 p.m.            **Annual Dinner at the Nauticus, Peter G. Decker Jr. Half Moone Center**

**Wednesday, October 18**

8:00 – 10:00 a.m.            **Executive Committee**  
**Breakfast will be served**    ***(A portion of this meeting will be a closed session for Committee members when you arrive; you may arrive as early as 7:30 a.m. Members: Abbott, Allen, Blazer, Boyles, Jr., Bull, Clark, Davis, Estes, Gilmore, Grout, Keliher, McNamee, Miller, Miner, Pierce, Shiels, Woodward***  
**and Commissioners only)**  
*Chair:* Grout  
*Staff:* Leach

1. Welcome/Call to Order (*D. Grout*)
2. Committee Consent
  - Approval of Agenda
  - Approval of Meeting Summary from August 2017
3. Public Comment
4. Consider Approval of Fiscal Year 2017 Audit **Action**
5. Consider the Continued Need for Technical Meeting Weeks
  - Review Survey Results
  - Review Assessment Science Committee Recommendations
6. Discuss Quarterly Meeting Schedule
7. Discuss Process to Develop the 2019-2023 Strategic Plan
8. Discuss Officer Nomination Process
9. Discuss Secretarial Response to Request for Additional Information on Compliance Issue
10. Other Business/Adjourn

***Vision: Sustainably Managing Atlantic Coastal Fisheries***

8:30 a.m. – Noon            **Law Enforcement Committee (continued)**

12. Social
13. Reconvene/Review Agenda Adjustments or Change
14. Review and Discuss ASMFC Species as Needed
14. Review Changes to Enforceability Guidelines Matrix Table
15. Federal Agency Reports
16. State Agency Reports
17. Election of Chair and Vice-Chair
18. New Business/Adjourn

8:30 a.m. – 4:00 p.m.        **Habitat Committee**

*Members:* Ayvazian, Babb, Bachman, Carloni, Chiarella, Chintala, Coakley, Fay, Gill, Johnson, Laney, Lorson, McReynolds, McTigue, Murray, Odell, Patterson, Rousseau, Sanger, Schneider, Smith, Tinsman, Topolski, Watkinson, Wilber, Wilke

*Chair:* Murray

*Staff:* Havel

1. Welcome/Introductions (*J. Murray*)
2. Committee Consent
  - Approval of Agenda
  - Approval of Proceedings from May 2017
3. Atlantic Coastal Fish Habitat Partnership Update (*L. Havel*)
4. New England Fishery Management Council Habitat Impacts Modelling Work (*M. Bachman*)
5. Determine New Language for ASMFC Habitat Areas of Particular Concern (HAPC) Designations (*L. Havel*)
6. Review 2017 Action Plan (*L. Havel*)
  - Species Fact Sheets
  - *Habitat Hotline Atlantic*
  - Habitat Management Series: Submerged Aquatic Vegetation Policy Update
9. Review 2017 Action Plan (continued) (*L. Havel*)
  - Habitat Management Series: Aquaculture
  - Climate Change Document
10. Finalize 2018 Action Plan: Habitat Management Series Topic (*L. Havel*)
11. Communications Strategy Discussion (*T. Berger*)
12. Finalize 2018 Action Plan (continued): HAPC and Climate Change (*L. Havel*)
13. Other Business/Adjourn

10:15 – 11:45 a.m.

**Atlantic Sturgeon Management Board**

*Member States:* Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Pennsylvania, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida

*Other Members:* DC, PRFC, USFWS, NMFS

*Chair:* Nowalsky

*Other Participants:* Ballenger, Lankshear, Lee, Park, Snellbaker

*Staff:* Appelman

1. Welcome/Call to Order (*A. Nowalsky*)
2. Board Consent
  - Approval of Agenda
  - Approval of Proceedings from August 2016
3. Public Comment
4. 2017 Atlantic Sturgeon Benchmark Assessment
  - Presentation of Benchmark Assessment Report (*L. Lee*)
  - Presentation of Peer Review Panel Report (*J. Ballenger*)
  - Consider Acceptance of Benchmark Assessment Report for Management Use (*A. Nowalsky*) **Final Action**
  - Consider Management Response to Benchmark Stock Assessment and Peer Review Report (*A. Nowalsky*) **Possible Action**
5. Review Status of Incidental Take Permits for Atlantic Sturgeon (*M. Appelman*)
6. Update on the Progress of the Endangered Species Act 5-year Status Review and Development of Recovery Targets (*L. Lankshear*)
7. Other Business/Adjourn

Noon – 1:15 p.m.

**Captain David H. Hart Award Luncheon**

1:15 – 2:15 p.m.

**Business Session**

*Member States:* Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida

*Chair:* Grout

*Staff:* Beal

1. Welcome/Introductions (*D. Grout*)
2. Board Consent
  - Approval of Agenda
  - Approval of Proceedings from August 2017
3. Public Comment
4. Review and Consider Approval of the 2018 Action Plan **Action**
5. Elect Chair and Vice-Chair **Action**
6. Recess

2:30 – 4:00 p.m.      **Commissioner Workshop: ACCSP Data Collection and Management Efforts**

1. Welcome/Introductions (*R. Boyles, Jr.*)
2. Standardizing Regional Fisheries Data: An ACCSP Overview (*M. Cahall*)
3. Commercial Fisheries Data
  - Collecting Live Landings Data with SAFIS (*J. Defilippi Simpson*)
  - Integrating Datasets and Making Them Accessible – Data Warehouse (*J. Defilippi Simpson*)
  - Using Commercial Data in Science and Management
    - Stock Assessment Process (*K. Drew*)
    - In-season Management (*N. Lengyel*)
    - Solutions for Data Needs (*J. Defilippi Simpson*)
      - Herring Spawning Application
      - Traceability
    - Commercial Data Q & A
4. Recreational Fisheries Data (*G. White*)
  - Coordinating Regional Data Collection Efforts
  - Modernizing APAIS
  - Developing New Data Validation and Integration Methodologies
  - Recreational Q & A
5. Demonstrating Value: ACCSP Outreach Efforts Moving Forward (*M. Cahall*)

4:15 – 6:00 p.m.      **Summer Flounder, Scup, and Black Sea Bass Management Board**  
*Member States:* Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, North Carolina  
*Other Members:* NMFS, PRFC, USFWS  
*Other Participants:* Snellbaker, Wojcik  
*Chair:* Luisi  
*Staff:* Rootes-Murdy, Starks

1. Welcome/Call to Order (*M. Luisi*)
2. Board Consent
  - Approval of Agenda
  - Approval of Proceedings from August 2017
3. Public Comment
4. Consider Black Sea Bass Draft Addendum XXX for Board for Public Comment (*K. Rootes-Murdy*)  
**Possible Action**
5. Review Preliminary 2017 Recreational Harvest Estimates through Wave 4, if available (*K. Rootes-Murdy*)
6. Consider 2017 Fishery Management Plan Reviews and State Compliance Reports (*K. Rootes-Murdy, C. Starks*) **Action**
  - Summer Flounder
  - Scup
  - Black Sea Bass
7. Consider Potential 2018 Wave 1 Opening of the Black Sea Bass Recreational Fishery (*M. Luisi*)  
**Possible Action**
8. Other Business/Adjourn

*Vision: Sustainably Managing Atlantic Coastal Fisheries*

## Thursday, October 19

8:00 – 9:15 a.m.

### **Atlantic Striped Bass Management Board**

*Member States:* Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North Carolina

*Other Members:* DC, NMFS, PRFC, USFWS

*Chair:* Gilmore

*Other Participants:* Lengyel, Blanchard

*Staff:* Appelman

1. Welcome/Call to Order (*J. Gilmore*)
2. Board Consent
  - Approval of Agenda
  - Approval of Proceedings from May 2017
3. Public Comment
4. Consider 2017 Fishery Management Plan Review and State Compliance Reports (*M. Appelman*)  
**Action**
5. Consider Recommendations for the 2018 Benchmark Stock Assessment **Possible Action**
  - Technical Committee Report on Management Objectives of Different Biological Reference Points (*N. Lengyel*)
  - Provide Guidance on Reference Points
6. Elect Chair and Vice-Chair **Action**
7. Other Business/Adjourn

9:30 – 11:30 a.m.

### **Interstate Fisheries Management Program (ISFMP) Policy Board**

*Member States:* Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida

*Other Members:* DC, NMFS, PRFC, USFWS

*Chair:* Grout

*Staff:* Kerns

1. Welcome/Call to Order (*D. Grout*)
2. Board Consent
  - Approval of Agenda
  - Approval of Proceedings from August 2017
3. Public Comment
4. Update from the Executive Committee (*D. Grout*)
5. Update on Noncompliance Decision and Meeting with the Secretary of Commerce (*D. Grout*)
6. Review Risk and Uncertainty Workgroup Progress (*J. McNamee*)
7. Discuss Recommendation from Atlantic Herring Section on New England Fishery Management Council Participation in ASMFC Herring Management (*T. Kerns*) **Possible Action**
8. Discuss Noncompliance in the Charter and Party Boat Sector (*T. Kerns*)
9. Review White Paper from the Climate Change Working Group (*T. Kerns*)

10. Standing Committee Reports
  - Habitat (*L. Havel*)
  - Atlantic Coastal Fish Habitat Partnership (*L. Havel*)
  - Law Enforcement (*M. Robson*)
11. Discuss the Utility of Reporting Species Technical Committee Assignments (*S. Madsen*)
12. Review and Consider Committee on Economics and Social Sciences' (CESS) Recommendation on the ISFMP Charter Guidance for CESS Membership (*S. Madsen*) **Final Action**
13. Review and Consider Approval of Assessment Schedule (*T. Kerns*) **Action**
  - Review Changes to the Shad and Weakfish Assessment Timeline
14. Consider Noncompliance Recommendations (If Necessary)
15. Other Business/Adjourn

11:30 a.m. – Noon            **Business Session (continued)**

7. Consider Final Approval of Northern Shrimp and Tautog Amendments **Final Action**
8. Consider Noncompliance Recommendations (If Necessary) **Final Action**
9. Other Business/Adjourn

Noon – 12:30 p.m.            **Lunch Provided for Commissioners, Proxies and Board Members**

12:30 – 3:00 p.m.            **South Atlantic State/Federal Fisheries Management Board**  
*Member States:* New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida  
*Other Members:* DC, PRFC, NMFS, SAFMC, USFWS  
*Other Participants:* Jiorle, Lynn, McDonough, Powers, Rickabaugh  
*Chair:* Estes  
*Staff:* Schmidtke, Daniel

1. Welcome/Call to Order (*J. Estes*)
2. Board Consent
  - Approval of Agenda
  - Approval of Proceedings from August 2017
3. Public Comment
4. Consider Cobia Fishery Management Plan (FMP) for Final Approval (*L. Daniel*) **Final Action**
  - Review Options and Public Comment Summary
  - Review Committee Reports
  - Consider Final Approval of Cobia FMP
5. Review Maryland Proposal for Black Drum Commercial Harvest (*L. Fegley*) **Action**
  - Black Drum Technical Committee Memo on Maryland Proposal (*M. Schmidtke*)
6. Progress Report on Potential Adjustments to Atlantic Croaker and Spot Traffic Light Analyses (*J. Kipp*)

7. Consider 2017 Fishery Management Plan Reviews and State Compliance Reports  
(*M. Schmidtke*) **Action**
  - Red Drum
  - Black Drum
  - Spotted Seatrout
8. Discuss Removal of Spotted Seatrout from Commission Management (*M. Duval*) **Possible Action**
9. Other Business/Adjourn



# Atlantic States Marine Fisheries Commission

## American Lobster Management Board

October 16, 2017  
10:15 a.m. – 12:15 p.m.  
Norfolk, Virginia

### Draft Agenda

The times listed are approximate; the order in which these items will be taken is subject to change; other items may be added as necessary.

1. Welcome/Call to Order (*D. Borden*) 10:15 a.m.
2. Board Consent 10:15 a.m.
  - Approval of Agenda
  - Approval of Proceedings from August 2017
3. Public Comment 10:20 a.m.
4. Southern New England Lobster Working Group **Possible Action** 10:30 a.m.
  - Report on Future Management of the Stock (*M. Ware*)
5. Consider Lobster Draft Addendum XXVI/Jonah Crab Addendum III for Public Comment, if available **Possible Action** 11:10 a.m.
  - TC Report on Harvester Reporting and Biological Sampling (*K. Reardon*)
  - Management Issues and Alternatives (*M. Ware*)
6. State and Federal Inconsistencies in LCMA 4 Season Closure (*M. Ware*) 11:50 a.m.  
**Possible Action**
  - Consider Postponed Motion To Address Inconsistencies  
*Move to (1), allow LCMA 4 fishermen the ability to continue fishing fixed lobster gear for other legal species such as Jonah crab, during the closed period and (2), exempt closed seasons from the most restrictive rule; as currently defined by the feds*
7. Consider Approval of 2017 FMP Reviews and State Compliance Reports 12:05 p.m.  
(*M. Ware*) **Action**
  - American Lobster
  - Jonah Crab
8. Other Business/Adjourn 12:15 p.m.

The meeting will be held at the Waterside Marriott Hotel, 235 East Main Street, Norfolk VA; 757.627.4200

# MEETING OVERVIEW

**American Lobster Management Board Meeting**  
**Monday, October 16, 2017**  
**10:15 a.m. – 12:15 p.m.**  
**Norfolk, Virginia**

Chair: David Borden (RI) Assumed Chairmanship: 02/16	Technical Committee Chair: Kathleen Reardon (ME)	Law Enforcement Committee Representative: Rene Cloutier (ME)
Vice Chair: Stephen Train (ME)	Advisory Panel Chair: Grant Moore (MA)	Previous Board Meeting: August 1, 2017
Voting Members: ME, NH, MA, RI, CT, NY, NJ, DE, MD, VA, NMFS, NEFMC (12 votes)		

## 2. Board Consent

- Approval of Agenda
- Approval of Proceedings from August 2017

**3. Public Comment** – At the beginning of the meeting public comment will be taken on items not on the agenda. Individuals that wish to speak at this time must sign-in at the beginning of the meeting. For agenda items that have already gone out for public hearing and/or have had a public comment period that has closed, the Board Chair may determine that additional public comment will not provide additional information. In this circumstance the Chair will not allow additional public comment on an issue. For agenda items that the public has not had a chance to provide input, the Board Chair may allow limited opportunity for comment. The Board Chair has the discretion to limit the number of speakers and/or the length of each comment.

## 4. Southern New England Lobster Working Group (10:30-11:10 a.m.) Possible Action

### Background

- At the August meeting, the Board decided not to move forward with Draft Addendum XXV. Instead, the Board convened a SNE Lobster Working Group to discuss future management of the stock, particularly in light of changing environmental conditions.
- The Working Group met via conference call on September 15. The Group was comprised of Board members, federal partners, TC members, and fishermen.

### Presentations

- Report from the SNE Lobster Working Group by M. Ware (**Briefing Materials**)

### Board actions for consideration at this meeting

- Consider action regarding recommendations put forth by the Working Group.

## 5. Lobster Draft Addendum XXVI/Jonah Crab Addendum III (11:10-11:50 a.m.) Possible Action

### Background

- The Board initiated this addendum to improve harvester reporting and biological sampling in state and federal waters.

<ul style="list-style-type: none"> <li>The PDT and TC met via conference call throughout the spring and summer to draft the Addendum and complete associated analysis.</li> </ul>
<p><b>Presentations</b></p> <ul style="list-style-type: none"> <li>TC report on harvester reporting and biological sampling by K. Reardon (<b>Supplemental Materials</b>)</li> <li>Overview of draft Addendum XXVI for public comment by M. Ware (<b>Supplemental Materials</b>)</li> </ul>
<p><b>Board actions for consideration at this meeting</b></p> <ul style="list-style-type: none"> <li>Approve draft Addendum XXVI for public comment.</li> </ul>

<p><b>6. Inconsistencies in LCMA 4 Season Closure (11:50 a.m. – 12:05 p.m.) Possible Action</b></p>
<p><b>Background</b></p> <ul style="list-style-type: none"> <li>In April 2017, NY and NJ sent a letter to the Board, highlighting inconsistencies between state and federal regulations for the LCMA 4 spring season closure. Specifically, in federal waters traps must be removed from the water and the most restrictive rule does not apply, while the opposite is true in state waters. (<b>Briefing Materials</b>)</li> <li>In August, the Board postponed the following motion: <i>Move to (1), allow LCMA 4 fishermen the ability to continue fishing fixed lobster gear for other legal species such as Jonah crab, during the closed period and (2), exempt closed seasons from the most restrictive rule; as currently defined by the feds</i></li> </ul>
<p><b>Board actions for consideration at this meeting</b></p> <ul style="list-style-type: none"> <li>Align state and federal regulations for season closures.</li> </ul>

<p><b>7. Fishery Management Plan Review (12:05-12:15 p.m.) Action</b></p>
<p><b>Background</b></p> <ul style="list-style-type: none"> <li>State compliance reports for American lobster and Jonah crab are due on August 1<sup>st</sup></li> <li>The PRT reviewed each state report and compiled the annual FMP Reviews.</li> <li>Delaware, Maryland, and Virginia have requested and meet the requirements for <i>de minimis</i> in both fisheries.</li> </ul>
<p><b>Presentations</b></p> <ul style="list-style-type: none"> <li>Overview of the Jonah Crab (<b>Briefing Materials</b>) and American lobster (<b>Supplemental Materials</b>) FMP Reviews by M. Ware</li> </ul>
<p><b>Board actions for consideration at this meeting</b></p> <ul style="list-style-type: none"> <li>Accept 2017 FMP Review and State Compliance Reports for American lobster and Jonah Crab</li> <li>Approve <i>de minimis</i> requests</li> </ul>

**8. Other Business/Adjourn**

**DRAFT PROCEEDINGS OF THE  
ATLANTIC STATES MARINE FISHERIES COMMISSION  
AMERICAN LOBSTER MANAGEMENT BOARD**

**The Westin Alexandria**  
Alexandria, Virginia  
**August 1, 2017**

These minutes are draft and subject to approval by the American Lobster Management Board.  
The Board will review the minutes during its next meeting.

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## INDEX OF MOTIONS

1. **Approval of Agenda by Consent** (Page 1).
2. **Approval of Proceedings of May, 2017 by Consent** (Page 1).
3. **Move to approve LCMT 5 proposal as reported today** (Page 9). Motion by Mike Luisi; second by John Clark. Motion carried (Page 9).
4. **Move to approve the LCMT proposals for Areas 2, 3, 4 and Area 6 with Option 2** (Page 9). Motion by Eric Reid; second by Emerson Hasbrouck. Motion postponed (Page 16).
5. **Move to postpone indefinitely further action on Addendum XXV** (Page 16). Motion by Adam Nowalsky; second by Dennis Abbott. Motion failed (Page 18).
6. **Main Motion to approve the LCMT proposals for Areas 2, 3, 4 and Area 6 with Option 2.** Motion carried (Page 20).
7. **Move to approve Addendum XXV as approved at the May meeting and as amended today** (Page 20). Motion by Dan McKiernan; second by Mark Gibson. Motion failed (Page 23).
8. **Move to (1), allow LCMA 4 fishermen the ability to continue fishing fixed lobster gear for other legal species such as Jonah crab, during the closed period and (2), exempt closed seasons from the most restrictive rule; as currently defined by the feds** (Page 28). Motion by Jim Gilmore; second by Tom Baum. Motion postponed (Page 30).
9. **Move to postpone until the annual meeting** (Page 30). Motion by Dennis Abbott; second by Pat Keliher. Motion carried (Page 30).
10. **Move to initiate an addendum to consider standardized management measures in the Gulf of Maine/Georges Bank stock** (Page 32). Motion by Pat Keliher; second by Ritchie White. Motion carried (Page 32).
11. **Motion to adjourn** by Consent (Page 37).

**ATTENDANCE**

**Board Members**

Pat Keliher, ME (AA)	Jim Gilmore, NY (AA)
Douglas Grout, NH (AA)	Emerson Hasbrouck, NY (GA)
Dennis Abbott, NH, proxy for Sen. Watters (LA)	Adam Nowalsky, NJ, proxy for Asm. Andrzejczak (LA)
G. Ritchie White, NH (GA)	Tom Baum, NJ, proxy for L. Herrigty (AA)
Raymond Kane, MA (GA)	Tom Fote, NJ (GA)
Dan McKiernan, MA, proxy for D. Pierce (AA)	Roy Miller, DE (GA)
Sarah Ferrara, MA, proxy for Rep. Peake	Craig Pugh, DE, proxy for Rep. Carson (LA)
Mark Gibson, RI, proxy for J. Coit (AA)	John Clark, DE, proxy for D. Saveikis (AA)
David Borden, RI (GA)	Rachel Dean, MD (GA)
Eric Reid, RI, proxy for Sen. Sosnowski (LA)	Mike Luisi, MD, proxy for D. Blazer (AA)
Sen. Craig Miner, CT (LA)	Joe Cimino, VA, proxy for J. Bull (AA)
Lance Stewart, CT (GA)	Peter Burns, NMFS
Mark Alexander, CT (AA)	

**AA = Administrative Appointee; GA = Governor Appointee; LA = Legislative Appointee)**

**Ex-Officio Members**

Kathleen Reardon, Technical Committee Chair	Grant Moore, Advisory Panel Chair
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**Staff**

Robert Beal	Jeff Kipp
Toni Kerns	Megan Ware

**Guests**

Russ Allen, NJ DFW	Colleen Giannini, CT DEEP
Peter Burns, NOAA	Jennifer Goebel, NMFS
Kevin Chu, NMFS	Joseph Gordon, PEW
Heather Corbett, NJ DFW	Arnold Leo, E. Hampton, NY
Justin Davis, CT DEEP	Bart Mansi, Guilford, CT
Michelle Duval, NC DMF	Derek Orner, NOAA
Lindsey Fullenkamp, NOAA	Mike Thalarger, Maine Coastal Fisheries

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The Board will review the minutes during its next meeting.

The American Lobster Management Board of the Atlantic States Marine Fisheries Commission convened in the Edison Ballroom of the Westin Hotel, Alexandria, Virginia; August 1, 2017 and was called to order at 3:30 o'clock p.m. by Chairman Dave Borden.

#### **CALL TO ORDER**

CHAIRMAN DAVID V. D. BORDEN: Welcome. My name is David Borden; and I'm the Chairman of the Lobster Board.

#### **APPROVAL OF AGENDA**

We've got a full agenda that we intend to work through here. On the agenda itself are there any additions, deletions, or modifications to the agenda; any hands up? Yes, Jim.

MR. JAMES J. GILMORE JR.: I may have at the end just a brief thing on implementation of some of the Jonah crab measures.

CHAIRMAN BORDEN: Okay, anything else? We'll take that up under other business. With that addition, are there any objections to taking up the agenda in the order that it was published; no objections? We'll take it up in that order.

#### **APPROVAL OF PROCEEDINGS**

CHAIRMAN BORDEN: As far as the proceedings from May, 2017, any comments on the proceedings? No comments, any objections to approving the proceedings by unanimous consent? The proceedings stand approved.

#### **PUBLIC COMMENT**

CHAIRMAN BORDEN: Public comments, we had no one sign up. Is there anyone in the room that would like to speak on items that are not on the agenda; anyone? No hands up.

#### **AMERICAN LOBSTER DRAFT ADDENDUM XXV FOR FINAL APPROVAL**

CHAIRMAN BORDEN: We're going to start with the first major item on the agenda. This hopefully will be approval of Addendum XXV. I

would just like to remind everyone that in May the Board approved management measures for inclusion in the Addendum.

We were very specific, we included management measures for minimum size, maximum size, and trap cuts were included, and closed seasons. The objective was to increase egg production by 5 percent. Then in June, the states collectively, as is specified in the management plan, met with the LCMTs; and prepared proposals for consideration by the Technical Committee.

On June 28, the Technical Committee reviewed the various proposals; and we have a written report that we're going to take up. We're going to have recommendations on the LCMT reports from both Grant Moore, the Chair of the AP and also Megan. Then we're going to hear comments on the Technical report and review by Kathleen, and then we will be down to action.

I think once we get into the individual proposals, I think we'll discuss them individually. I had originally intended to vote on each one individually; but I've already had a number of suggestions here to possibly do a one vote on a range of different issues. We'll decide that when we get that far along. With that kind of as an introduction, we'll start off with the first series of reports.

#### **PRESENTATION OF PROPOSALS FROM LCMT'S 2 THROUGH 6**

MS. MEGAN WARE: We're going to start with the LCMT 2 proposal. On behalf of LCMT 2, they are proposing that they use the current trap reduction plan as specified in Addendum XVIII to achieve the 5 percent increase in egg production. As a reminder, Addendum XVIII specifies that in Year 1 there is a 25 percent trap reduction.

This is followed by 5 percent trap reductions. These started in 2016, so the 25 percent reduction and the first 5 percent reduction have

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been taken. The LCMT 2 proposal also noted unanimous support for the management measures chosen by the Board in May.

CHAIRMAN BORDEN: All right, questions? We're going to hear more reports, but any questions on that report? No questions, okay so Megan let's move on to the next one.

MS. WARE: Would you like to do the reports and then the TC reviews or the TC review all at once at the end?

CHAIRMAN BORDEN: Why don't we go through all the LCMT proposals; and then we'll get the Technical Committee report.

MS. WARE: Okay. At this point we'll do Area 3, so I invite Grant up to present that report.

MR. GRANT MOORE: The Area 3 LCMT met in New Bedford. On the Issue 1 of the Target Increase in the Egg Production, the LCMT strongly supported the Board's decision to pursue a 5 percent egg production increase. Under Issue 2, the Management Tools, the LCMT continues to support Option A; management tools to be used independently.

It allows for much needed management flexibility to craft area-specific plans that will meet the goals of this addendum. In Issue 3, the Recreational Fishery, we do not have a preference on this issue. Seasonal Closures, we support Option B, with Sub-option B, no possession of lobsters while fishing.

The most restrictive rule does not apply. With the addition of a bycatch allowance in the trap fisheries of 100 lobsters per day, 500 lobsters per trip by count. What this does, it will create an equitable fishery with the mobile gear fleet; which was very important to the fixed gear fishermen. Issue 5, Uniform Regulations, we continue to support Option A; that regulations are not uniform across all lobster management areas.

Issue 6, the Implementation of the Management Measures in LCMA 3. We support

Option A; which is to maintain Area 3 as a single area, in other words status quo. As far as the de minimis states, we do not have a preference on this issue. Thank you very much, Megan, Mr. Chairman. I would like the opportunity to speak later in the meeting, please.

CHAIRMAN BORDEN: This is on what?

MR. MOORE: This is going to be on the TC report.

CHAIRMAN BORDEN: Okay, we'll take that up when we get to that. Okay, questions for Grant; any questions? No questions, anyone in the audience, no questions. Okay Megan, next report.

MS. WARE: On behalf of LCMT 4, they are proposing a 10 percent trap allocation reduction for New York and New Jersey Area 4 permit holders. In their proposal they note that active lobstermen are fishing their full trap allocation; so a 10 percent decrease in allocation should decrease actively fished pots by a similar amount. They also note that a number of active lobstermen and traps fished have been fairly stable since 2012.

CHAIRMAN BORDEN: Questions on that proposal, anyone, no questions; we'll take up Area 5 next.

MS. WARE: On behalf of Area 5, they are proposing a 2 millimeter increase in their minimum gauge size. Their current gauge size is 86 through 133 millimeters, and they're proposing an 88 through 133 millimeters.

CHAIRMAN BORDEN: Any questions for Megan on that one? No, okay; Area 6.

MS. WARE: We're going to invite Bart to come up and present that proposal.

MR. BART MANZI: I would also like to thank Mark Alexander and Colleen for spending the time listening to the LCMT Committee's

proposal. We came up with a proposal of taking 9 Sundays off the month of July and August; to lower the maximum size on the lobsters from 5-1/4 to 4-17/32, which the Technical Committee gave us a 1 percent reward for.

The nine Sundays that we take off, they were going to give us 4.3 percent; which actually put us above the 5 percent that we were actually looking for. The guys wanted to stay status quo; but I believe that we should stay status quo, because we have so many other issues in Long Island Sound; whether it be water quality, and our biggest problem right now is predation.

We have sea bass that have inundated us, and every one of the sea bass is feeding on these baby lobsters. We feel that even with our proposal, we really don't feel it is going to do much until we define the problem with the sea bass; and all the other species that are targeting the infant lobsters. With that being said, I just hope that the Atlantic States Marine Fisheries Commission will look at our proposal and rule in our favor. Thank you.

#### **TECHNICAL COMMITTEE REPORT**

CHAIRMAN BORDEN: Thank you; any questions on the Area 6 proposal? Seeing no hands up; we'll move on to the Technical Committee report. Kathleen.

MS. KATHLEEN REARDON: In general the TC evaluated these proposals considering the likelihood of reduced exploitation; and therefore increased egg production as part of the goal. This would mean leaving more lobsters in the water. Starting with LCMT 2, consistent with the previous reports to the Board, the TC is concerned with the uncertainty within the relationship between trap allocations, exploitation, and the resulting potential egg production.

The analysis that produced the potential increases in egg production in the addendum, based on reductions in actively fished traps,

while Area 2s proposal is relying on reductions in total trap allocations. Trap transferability further reduces the potential effectiveness for egg production increases; because active traps may remain the same, due to high levels of latent effort that can be activated. Additionally, the TCs concerns were confirmed by a review of the Massachusetts LCMA 2 data from 2016; where the data showed an increase in trap hauls and landings; despite a 25 percent trap allocation reduction in that fishing year. This analysis illustrates that there is not a straightforward relationship between trap allocation and traps fished; or between traps fished and exploitation, which were part of the caveats in our previous reports. For these reasons the TC did not find the LCMT 2 proposal sufficient; and does not support the use of trap allocation reductions alone to achieve an increase in egg production.

CHAIRMAN BORDEN: Questions for Kathleen on that Area 2 proposal, any questions? Peter.

MR. PETER BURNS: I was just curious what the 5 percent reduction was based on from the Area 2 proposal. Was that explicit in the proposal?

MS. WARE: The 5 percent is what was chosen at the May meeting, and the Area 2 proposal is to use the ongoing trap reductions to achieve that 5 percent. Does that answer your question?

MR. BURNS: Yes, and maybe I should have asked this when we were going through the actual plans; but I guess my question is how did these trap reductions that are already in place now add up? How did the Area 2 LCMT come up with the math to show that those existing trap reductions add 5 percent in egg production?

MS. REARDON: I think that's part of the concern of the TC that the ongoing trap reductions are a trap allocation rather than active traps; and the original analysis that was

done by the TC was 25 percent reduction in active traps could at most give, I think 13.1 percent, at most. That was based on a relationship that we have a lot of uncertainty about. But I don't think that there was an argument within the proposal to solve the active traps versus trap allocation issue.

CHAIRMAN BORDEN: Other questions, Dan do you have your hand up? No.

MR. DAN McKIERNAN: I'll have a comment, but I don't have a question.

CHAIRMAN BORDEN: Any other comments or questions on the Area 2 proposal? All right then Kathleen, would you do Area 3 please?

MS. REARDON: For Area 3, similar to Area 2 the TC does not support the use of trap allocation reductions alone to achieve an increase in egg production. Understanding that Area 3 is different from Area 2, the TC recognizes Area 3 may have lower levels of latent effort. But it is unclear if ongoing trap reductions will impact that active effort.

It could also be more difficult to do a similar analysis of trap hauls in Area 3; as the Massachusetts LCMA 2 data review, because of the Jonah crab effort offshore. We do recognize that. But we also recognize that those traps also have the potential to be redirected back into the lobster fishery; therefore negating conservation benefit to the lobster. The TC does not find the LCMT 3 proposal sufficient.

CHAIRMAN BORDEN: Any comments or questions on Area 3? Grant, you wanted to address the Technical comments on Area 3, is that where you wanted to?

MR. MOORE: Yes it is.

CHAIRMAN BORDEN: Why don't you do it now, and then we'll take a minute. Eric Reid; did you have your hand up also?

MR. MOORE: With all due respect and I have the utmost respect for the TC and the work that they do, but industry begs to differ. Traps, actively fished traps are the numbers that I think the Board needs to look at and not a piece of paper that says I've got 1,000 traps in the door. The various addenda that have encouraged the industry to purchase trap allowances from other fishermen.

Basically all that is, is an industry funded buy out; which has enabled industry to buy up to the cap, which is governed by NMFS; with the understanding that that cap would be reducing every year by 5 percent. At the end of the five-year-reduction plan, instead of a cap of 1945, we would be looking at a cap of 1548; which drastically reduces potential and active fishing effort.

Industry is confident that after being told by the TC that a 25 percent reduction could achieve up to 13.1 percent that we would achieve at least 10 percent. There has been a huge amount of money invested by industry into setting up for the transferability plan; which was Addendum XXI and II if I remember correctly.

What we really need now is to move forward with this, and see the active trap reductions. Of greater importance, the analysis that the TC has done on trap hauls, the Jonah crab fishery in New England has exploded. You're looking at a crab that literally a year and a half ago was \$0.65. Dock price now is \$1.05 to \$1.15. You've got vessels that in New Bedford alone I think there are 12 vessels, and this is not including vessels that can carry less than 20,000 pounds; that are directly 100 percent hauling for nothing but Jonah crabs.

Lobster is a bycatch. Those trap hauls are counting against lobster hauls, so the data that the TC has to work with is incomplete. I don't fault them for that but it is a big hole that I think doesn't give them the proper picture of what's taking place in Area 3. With that being said that's all I have to say right now, Mr.

Chairman. Thank you very much for the opportunity.

CHAIRMAN BORDEN: Eric, no; anyone else on the Area 3 proposal? I would just add, and this is just for everyone's edification. Rhode Island does in a similar way that a lot of the other states do, we have pre-meetings. The industry gets to sit down with the Commissioners and discuss proposals.

One of the things that came up at the Rhode Island pre-meeting that actually I was not terribly well versed on is in the past year and a half; there has been a major expansion in the inshore areas in terms of sand crabs. The sand crabs are being exported live to the metropolitan markets. The price of sand crabs in Rhode Island now has gone from about \$0.50 up to \$0.95.

There is a lot of effort, and these are all exactly the same people that Grant is talking about. They are lobstermen with lobster pots that are basically fishing for the sand crabs; and all of that data gets co-mingled with that data that gets collected as part of the VTRs and the various data collection programs. Just factor that into your thinking, as we discuss this further. Okay, anything else on Area 3? Emerson.

MR. EMERSON C. HASBROUCK: I had two questions, one of which I think you just answered; so that the hauls for either Jonah crabs or sand crabs are viewed as hauls for lobsters. Am I understanding that correctly? That was the first question, and then I have a follow up.

CHAIRMAN BORDEN: I'll let the Technical people answer that. But my answer to it, last night I spent some time in anticipation of this very discussion going through the mill of VTRs. They have seven categories of pot fishing that you can write down. The difficulty is that every time you use a different category, so if you use pot fishing for crabs, and then pot fishing for

lobsters. You're supposed to do a whole new VTR; every single time you do that.

The fishery, at least to my knowledge in both the Mid-Atlantic area and New England area is very mixed. You have people using lobster pots that are catching sea bass, lobsters, and scup. I don't know of anybody that's doing five VTRs to report. I think the criticism that you're hearing about the lack of ability to kind of tease the information out of the VTRs is not a criticism of the Technical Committee; it's just an artifact of the system.

It's not being reported the way that would allow them to separate all that information. My hope is that at some point, when we get into the data collection addendum, we actually review that particular aspect of it. There has got to be some way that we can refine this so that the technical people get the information that they actually need on trap hauls. But I don't know, did I answer your question, Emerson? If I didn't I'll let somebody else give it a crack.

MR. HASBROUCK: Yes, you answered my question and thank you. I had a follow up, if possible.

CHAIRMAN BORDEN: Go ahead.

MR. HASBROUCK: The follow up was, we just heard that the trap cap is going to be reduced from 1945 to 1548; I think are the numbers that I just heard.

CHAIRMAN BORDEN: That was the cap that the Commission approved in Addendum XXII.

MR. HASBROUCK: My question is, as that cap reduces from 1945 down to 1548, do we know how that's going to change behavior relative to trap hauls and frequency of hauls and so forth?

CHAIRMAN BORDEN: No, I think there is an expectation that it will significantly change the behavior of the offshore industry; because what happens now, particularly up in the Gulf of

Maine, the northern New England offshore boats, will go out and they'll haul say three days or four days. Then they lay to, and then they'll haul again back through the gear.

As that cap comes down there is going to be less of a tendency to just lay to. I think they may come back to shore. But that is somewhat speculation on my part. If the traps are high and they can stay and consistently haul them for like four or five days, then the traps they haul on the first day have got five days of soak time on them; so the catch rates are high. But as that cap goes down that advantage kind of dissipates. Who else had their hand up, Mark?

MR. MARK ALEXANDER: I'm just curious. If the same traps are being used for sand crabs and Jonah crabs, are any different things done to the trap between one fishery and another or is it the same trap, same escape vent, same openings and everything? It's just possibly a different place it's fished. What's the difference?

CHAIRMAN BORDEN: Grant, do you want to answer that?

MR. MOORE: A trap that's set up exclusively to target Jonah crab or sand crab is set up with different vents. They go to a round vent versus the rectangular vent. We've seen a change in the entrance nozzle. Some guys are going with a rectangular aluminum nozzle now, both in the parlor and the back head. The traps are being set up quite differently.

Fishermen that are fishing both lobster and Jonah are setting the traps up with both vents in the trap, so that when they're targeting Jonah crab they plug off the lobster vent. These traps will basically or normally are built with a heavier twine, because the crabs are very destructive. But to answer your questions, crab trap, the physical size and everything is the same; but the makeup of the trap, the twine configuration and the vents are quite different.

CHAIRMAN BORDEN: A lot of times, Mark, what they do is when they do the conversion they've got two vents in the trap, a circular vent and a rectangular vent, they are both legal vents. When they want to fish for crabs they just take a zip tie and put it around the center of the rectangular vent; and it closes down the space, so it's a fairly small space. The trap is still legal, but it retains all the crabs; other questions on this, Roy.

MR. ROY W. MILLER: Mr. Chairman, what do you mean by a sand crab? When I Google sand crab a mole crab comes up. What is a sand crab?

CHAIRMAN BORDEN: Cancer irroratus. Doug.

MR. DOUGLAS E. GROUT: A question in clarification that I would like to ask. We're talking about the trap reduction in Area 3. Did NOAA Fisheries ever implement that trap reduction plan that was in Addendum XXII?

CHAIRMAN BORDEN: No, it's under consideration, I think is the way Peter described it to me earlier in the day; and Peter, correct me if I misstate that.

MR. BURNS: Not that you were wrong, Mr. Chairman, but I'll take the opportunity to address the question. Yes. We did get the recommendation from the Commission to look at Addenda XXI and XXII that includes the trap caps in Area 3 that Grant had mentioned. Then as soon as we got the last stock assessment in 2015, we were in the process of evaluating those trap caps within the context of the trap transfer program; and how that would fit in with southern New England in Area 2 and 3 trap reductions and trap transferability.

Then given the dire situation with the southern New England stock, and the fact that the Commission was going to move forward to look at another addenda that included some very potentially dire consequences for the fishery, we were asked to hold off on that and wait until

after Addendum XXV went into play; so that we could have a better idea of how things were going to look in the long run. I think that some of the things in Addendum XXI and XXII may still be relevant.

But we really don't know how those elements would play in, until we really know how Addendum XXV is going to play out. Then we can see what that holds; and we can evaluate these issues more comprehensively. But I think one thing to keep in mind is that I don't think that this LCMT proposal is based on the guarantee that this is going to go through.

I think right now we've asked the area management teams to come back with proposals to improve egg production by 5 percent; based on current situation, not necessarily what's in the plan, but what we have in place right now. Even if these trap cap reductions do go in place in the future that may be a good thing for the fishery and for the industry; but that doesn't necessarily play in to where we are right now in the process.

CHAIRMAN BORDEN: Any other either questions or comments on the Area 3 proposal? If not, we're going to move on to the Area 4 proposal. Kathleen.

MS. REARDON: Can I make a comment on some of the previous comments? Just to point out when we're talking about trap hauls and the mixing in of crab trap hauls. We also, looking at the Massachusetts data, it is not just the trap hauls that increased when they had a 25 percent trap allocation reduction; also the landings increased. The intent is to increase egg production, and more lobsters were taken out of the system. I just want to make that point.

Now on to LCMT 4, similar to Areas 2 and 3, TC does not support the use of trap allocation reductions alone to achieve an increase in egg production. While there is no trap transferability program in Area 4, trap allocation reductions still rely on the underlying

assumptions that the number of traps in the water correlate to the exploitation rate; a relationship that the TC believes has high uncertainty.

Furthermore, the LCMA 4 permit information for New York and New Jersey fishermen indicate roughly two-thirds of the trap allocations are not fished, so a very high level of latent effort. The TC does not find the LCMT 4 proposal sufficient.

CHAIRMAN BORDEN: Questions or comments on this. Are there any questions, any comments, none; Area 5 please.

MS. REARDON: For Area 5 the size analysis provided by the TC in the Addendum indicates that a 2 millimeter increase in the minimum gauge size will result in a 6 percent increase in egg production. The TC does note that the gauge size analysis presented in the Addendum was conducted on a stock-wide scale; and it would be ideal to have the length information for lobsters harvested in just the LCMA 5 area to validate this result.

That said, the TC does support the use of minimum gauge size change; as this measure is enforceable, keeps lobsters in the water longer, provides direct benefits in terms of fitness and egg production. The TC finds the LCMT 5 proposal is sufficient to achieve a 5 percent increase in egg production.

CHAIRMAN BORDEN: Comments or questions; none, all right Area 6.

MS. REARDON: For Area 6, break it into two components. As a component the TC does support the use of a max-gauge-size decrease to achieve a 1 percent increase in egg production. We support the gauge-size change; because the management tool is enforceable and provides permanent protection to larger lobsters. But similar to the Area 5 proposal, the gauge size analysis in the addendum was conducted on a stock-wide scale; and it would

be better to have the length information for lobsters harvested in just Area 6, in order to validate the result.

Nonetheless, the TC supports the use of the maximum gauge-size change. On the other hand the TC does not support the use of nine Sunday closures in July and August to achieve a 4 percent increase in egg production. While landing of lobsters may be prohibited on Sunday, traps still remain in the water and continue to fish for lobsters. Unless the traps are disabled so they cannot catch lobster, a Sunday closure is just a one-day delay in harvest.

We also note that with such a short closure it is easy for fishermen to recoup their losses by harvesting on different days of the week. The TC did support the analytical methods used in the proposal to estimate the LCMA specific egg production increases from a season closure; but noted the consecutive season closure days are more effective, or traps must be disabled in order to prevent them from fishing. With the components together, the TC does not find the LCMT 6 proposal sufficient to achieve a 5 percent increase in egg production.

CHAIRMAN BORDEN: Questions or comments? Yes, in the audience.

MR. BART MANSI: My name is Bart Mansi; I fish in Area 6. I've been fishing there for over 40 years. At one time we had over 700 license holders in Long Island Sound; we're down to 12 fishermen in Connecticut. We really don't feel what we're doing is really putting a burden on the lobstering. We're just trying to stay in business.

Any implementations that you put against us just about put us out of business. There is no new blood coming into this business. The average age of the fishermen that are here now are 60 years old; like myself. I would just hope that you will look at the real factors that are going on there. When we throw a lobster

overboard we don't know if it's going to make the bottom.

We have so many sea bass in Long Island Sound. We don't know where they came from, but they're there. From all the reports I get, when you open up these baby sea bass they are loaded with small lobster; one fish, 10, 12 lobsters, crickets, little ones. We don't even feel like that giving up the Sundays is really going to help anything, until we really get to the real issues.

As far as a trap reduction, there is a trap reduction. We lost all our fishermen. We had a handful of guys that are fishing half the gear just trying to survive. Now we're coming up with a 5 percent reduction. I mean really, does it really make sense to go after 12 guys that are trying to make a living?

CHAIRMAN BORDEN: Kathleen, thank you very much for the report. We're to the point where we can have a discussion, if anybody wants to discuss various aspects of this; or we can entertain motions, either individually or collectively. What is the preference of the Board? Eric Reid.

MR. ERIC REID: My preference would be to make a motion. It's up to the preference of the Board, but that would be my preference.

CHAIRMAN BORDEN: Any other comments on the way forward? Mike.

MR. MICHAEL LUISI: You had mentioned earlier, before the meeting started that we could take up these proposals one at a time or lumped together. I think given the nature of the report by the Technical Committee, and what they found in the proposals. It would be my preference to take up Area 5 alone; since it was the only proposal that was deemed to be sufficient in achieving egg production. Then we can get that off the table and then move on to the other proposals that the Technical

Committee obviously, as we just heard do not support at this time.

CHAIRMAN BORDEN: Anyone else on the way forward? Michael, do you want to make a motion on Area 5?

MR. LUISI: **Sure, I would move to approve LCMT 5 proposal as reported today.**

CHAIRMAN BORDEN: Seconded by John Clark; discussion, any discussion? **No discussion, any objections to approving the motion by unanimous consent. No objections, motion stands approved.** Eric, I'll go back to you. Would you like to make a motion?

MR. REID: Yes I would, Mr. Chairman. Megan, do you have it or do you want me to read it? **Okay, my motion would be move to approve Addendum XXV, including the LCMT proposals for Areas 2, 3, 4 and Area 6 with Option 2.**

CHAIRMAN BORDEN: Is there a second; seconded by Emerson, discussion on the proposal. Eric, do you want to comment on it?

MR. REID: Mr. Chairman, I think there have been enough comments today by not only you but Chairman Grant and a few others around the room. We did have a lengthy conversation about these issues in May. I don't think I need to add to that. I don't know if Emerson wants to speak to Area 6, but I don't have anything to add to the already long enough discussion.

CHAIRMAN BORDEN: Emerson, do you want to comment on the motion?

MR. HASBROUCK: Yes, I would support this motion. I mean if we don't approve these then I guess our option is to send these back to the LCMTs. From what I've heard from a couple of the different LCMTs is that the proposals they put forth are where they are on this issue, and if we send them back they are not likely to come up with anything different.

I think the analysis that was done by the states, in support of the different LCMTs, show a concerted effort in trying to increase and improve egg production. I also think that if we approve these we can move this forward and get these measures implemented. If we send this back then we're going to delay implementation of this addendum for another, I don't know how many months, three months, six months; however long it might take.

In terms of Long Island Sound, Area 6, I'll reiterate what I said in May; that landings in Area 6 have already been reduced by 97 percent. The number of active permits in Area 6 has been reduced by 90 percent. The active traps fished in Area 6 have been reduced by over 90 percent. The Cornell Marine Program has removed over 16,000 derelict pots from Long Island Sound from Area 6 that continued to fish; even though they were abandoned. To quote from the minutes of our May meeting, relative to Long Island Sound. The Chair said, "Let me ask this as a question, so that the record is clear. Does anyone around the table think that we have the ability to rebuild the Long Island stock? If a hand goes up, I'll recognize you and ask you to say why. Does anyone believe that we can rebuild the population of Long Island Sound? There are no hands up. Essentially we're dealing with a situation where we have a definition that is based on, I think a 20 year time period."

Back in May there wasn't anybody around this table who thought that there was a chance that we could rebuild the lobster population in Area 6. I don't see where requiring fishermen in Area 6 to do anything more than what they've offered is going to produce any more positive results. Thank you, Mr. Chairman.

CHAIRMAN BORDEN: Doug Grout, Dennis Abbott.

MR. DOUGLAS E. GROUT: I appreciate the efforts that the LCMTs have gone through to try and develop plans to try and comply with this 5



percent reduction. But let's face it folks, a 5 percent reduction, when we were looking at options between 10 and 60 percent, really isn't any kind of significant reduction.

When we decided to move forward with the 5 percent reduction, I actually if we were going to go down that line I would just say, let's not approve this plan. Let's go back and start looking at how to change our management of southern New England lobster. I was one that didn't raise my hand, Emerson, when we were saying did we expect it to be rebuilt.

I am concerned that we're putting out implementation of measures that really aren't going to do anything, and taking credit for it. I can't support any of these. I would even recommend that maybe we seriously consider taking a reconsideration of whether we're going to finally approve this measure.

I also would ask, now that the Service has seen at least the general direction that we're going to go through, whether it's 5 percent or nothing; that they start moving forward with the Area 3 reduction plan that the industry and this Commission supported several years ago. I think that will have some significant impacts in protecting the offshore fishery there.

At this point, I can't support moving forward with this in good conscience, especially given what our Technical Committee has provided. I would actually suggest that the Board, when we make final determination here, vote down implementation of this plan.

MR. DENNIS ABBOTT: On the one hand I'm willing to support this, only because I know that it really doesn't have any effect. I think it essentially maintains the status quo. But I'm really not willing to support it; because first of all it goes against the Technical Committee's recommendation. I think we're going down a bad road when we start making votes that are clearly against Technical Committee recommendation.

It only leads us to more trouble. There is no doubt in my mind that this is just a feel-good Addendum. Like Emerson said, we're not going to rebuild the Long Island Stock; that's clear. From last May's meeting, when we voted a 5 percent we were really essentially saying; we're not going to do anything again, because we haven't done anything in this area since about 1999. Again, I will vote against this; simply based on how I feel about the Technical Committee's recommendation, and us making votes against what the Technical Committee provides us, which we should be relying on the most in making our decisions.

CHAIRMAN BORDEN: I've got Ritchie White and then John Clark.

MR. G. RITCHIE WHITE: I might as well make it unanimous, so you know how New Hampshire is going to vote.

CHAIRMAN BORDEN: Keep us in suspense, Ritchie.

MR. WHITE: I think southern New England lobster has to follow northern shrimp, and I think that we have to admit we're not going to rebuild; which pretty clearly we've already admitted that. I think we have to change our management scheme because of climate change; and set a much lower standard that would allow some harvest to take place. What we're doing now I think is a joke for the Commission. We're pretending to rebuild but we're not, and we know we're not. Let's change how we manage it and be realistic.

CHAIRMAN BORDEN: Let me go back. I apologize to our Executive Director; he had his finger up there a couple of minutes ago. Bob, and then I've got John Clark and then Mark Gibson.

EXECUTIVE DIRECTOR ROBERT E. BEAL: I'm not commenting on the content of the motion at all, just procedurally I think we may need to modify it a little bit, since this says move to

approve Addendum XXV; and then goes into the other language. I think since the Board previously approved the Area 5 proposal and you took some actions back at the May meeting.

I think it's probably cleaner to modify this motion to say, move to approve these proposals from the LCMTs 2, 3, 4 and 6; and then have a subsequent motion to approve the addendum with all of the actions taken today and at the May meeting, and wrap it all into one. That will be your final motion with a roll call vote. Procedurally we can modify it here while you keep continuing with the discussion.

CHAIRMAN BORDEN: Eric and Emerson, would you have any objections to removing Addendum XXV, so basically move to approve the LCMT proposals, blah, blah, blah. Is that right? Emerson is that perfection okay?

MR. HASBROUCK: Yes that's acceptable.

CHAIRMAN BORDEN: We have a revised proposal, thank you, Bob, back on the list, John Clark, Mark Gibson, anyone else? Craig.

MR. JOHN CLARK: I just want to say I find it ironic that we in DelMarVa spent a lot of time trying to find ways to almost exclude LCMA 5 from this addendum; and yet now LCMA 5 is the only one that presented a plan that actually passed muster with the Technical Committee. My question would be in line with some of the comments made. Do we even go forward with this addendum at this point if we have proposals that are not going to meet, based on the Technical Committee analysis, the reductions that we put forward for Addendum XXV?

CHAIRMAN BORDEN: Okay, I've got Mark Gibson and then Craig and Pete Burns.

MR. MARK GIBSON: I know we're all weary with this southern New England lobster stock problem. I certainly appreciate concerns about

being in conflict with our Technical Committee advice. I think we should approve this motion. There has been a widespread recognition by this Board that rebuilding to the lofty levels that we've had in the past is not possible.

We've set a 5 percent increase in egg production as one of our objectives. That is pretty meager, and frankly it is within the statistical uncertainty of any stock assessment we'll get in the future. I think to not approve this motion, and I don't know what the next process would be after that; but certainly I don't support sending anything back to the LCMTs.

They've fought through this; they've given us rational and compelling arguments about why the trap reductions matter, and why they will be effective in the medium term. I would suggest that when we have an updated stock assessment, we're going to have several more years of estimates of estimates of exploitation rates under these trap reduction programs that will allow us to explore the uncertainty in this curve that the Technical Committee is having so much difficult with.

I for one believe we have cut through quite a bit of the, what we call hyper stability and saturation in the curve; and we're going to be on our way down, in terms of exploitation rate. I'm happy to approve this motion. Let the trap reduction proposals go into effect through the existing addenda we have, and take a look at this question again when the benchmark stock assessment comes down and we have additional years of information.

SENATOR CRAIG A. MINER: One of the reasons that I support the Amendment is that I remain concerned about Connecticut's ability to create any new data that would tell us whether we're headed in a different direction; positive direction, negative direction. Over the last couple of months I've asked the Agency whether they would appropriate any money for a ventless trap survey or onboard survey work.

The answer to both of those questions was initially no. Then it seemed there might be some money available and no one to do it. If not for the people who are out there fishing, having some eyes, providing some data, my concern is that we're never going to know. It doesn't seem to me to be extraordinarily scientific way to do this; but to oppose this, even though I do have some reservation about the Sunday proposal.

I think it's better than nothing. I don't think anything that we would come up with would have any more or less of an impact; to be quite honest with you. I think most of the fishermen are out of the water, because the lobsters aren't there. The reduction is already occurring; because the market's not there, because the stock's not there.

We can put in place some other kind of an artificial parameter, but I'm not sure it's going to have any greater impact on stock rebuilding than keeping the few people that we have out there out there. If we start to see landing numbers spike, then it seems to me that would be a time to go back and revisit it. But I don't see any spike.

CHAIRMAN BORDEN: Mark.

MR. ALEXANDER: Yes I just want to reiterate a little bit what Emerson said. Long Island Sound lobster fishery is a small fishery. It has declined in the number of participants; it's declined in the number of license holders. Connecticut implemented some changes in its licensing in 2016 that cut license holders from 453 down to 181.

It eliminated traps, reducing traps from 237,000 down to about 125,000. Admittedly a large number of those are latent traps, but it got them out of the fishery. It is an artisanal fishery, and it's a fishery challenged by lots of things; temperature, and as Bart pointed out black sea bass. I don't know if the next plan for

lobster is an ecosystem plan that looks at lobster and sea bass together.

But anyway, I had reservations about the nine Sundays, but the LCMT, we had two meetings, very well attended meetings; and they really thought hard about this. The staff in Connecticut and the staff in New York work hard to do the analysis that they did. I think they did a great job. I don't think the Area 6 proposal has any less efficacy than any of the others.

I can understand Ritchie's point when he says that we need to sit back and look at this, but we need to allow some amount of small harvest. That is basically what we're down to in Long Island Sound right now. The harvest that we've had has held pretty steady for the past few years. It increased slightly, so I think that's encouraging. The Millstone Entrainment Data shows an increase, consecutive increases over the past two years, so that's encouraging. I think that status quo is not a bad option for Long Island Sound.

CHAIRMAN BORDEN: Dan, Dennis next.

MR. McKIERNAN: I do agree with the TC that the data that I presented at the last meeting did reveal that after the first 25 percent cut there wasn't a cut in real effort. However, the ventless trap surveys in 2016 showed an increase in the abundance of lobsters; and fishermen responded to that accordingly. The CPUE went up as well as some of the effort; but I will guarantee, and you can see it in some of the data that when the next five years of cuts is completed, we will have cut into bone.

This fishery will be smaller. There will be fewer traps fished, fewer traps allocated; and that's going to be real, but it's going to take five years to get there. But we're on that trajectory now. I would support this motion, because the way this fishery has been arranged, it is an industry driven trajectory to scale this fishery down at a pace that is appropriate and reasonable.

I could have supported an acceleration of the trap cuts. But I don't think that's necessary; because I believe that the decrease in traps fished is going to be happening over the next five years, especially by Year 5, when all of the latent effort that we see today is going to be completely driven out of the system. You don't get 100 percent trap usage. We know that in the Outer Cape. There are always about 10 percent of the traps that go unused.

Therefore, we're going to be absolutely below that; and also the system that we've developed where a dual permit holder needs to get a federal trap and a state trap in order to remain whole; means we're going to be double eliminating traps doing some of these transfers. I'm quite confident that the fishery is going to see something in the realm of a 10 to 20 percent real trap reduction within a few years.  
CHAIRMAN BORDEN: Dennis Abbott, and then Pete Burns.

MR. ABBOTT: Sitting here thinking about this. Would you not agree that a vote against this motion would be supporting the Technical Committee, and it would also be supporting the fishermen who will be taking the reductions; whereas a vote for the motion really maintains the status quo, and probably creates work for each of the states in implementing these very minor provisions of the plan?

MR. BURNS: I think that is a good point that Dennis is making. I think maybe it's time to think a little bit differently about how we're managing lobster in southern New England. We talked about the vote back a year ago; whether we thought we could rebuild the stock. The science says that we can't; unless we have something along the lines of a 90 percent reduction in exploitation.

We came up with 20 to 60 percent, 0 to 60 percent, and we decided on 5 percent; and so that is the goal of the plan, not to rebuild the southern New England stock, but to take at least one step. We know that there are things

we can do from a management standpoint; because fishing mortality is still the top cause of mortality for the southern New England lobster stock.

We know there are things we can do. I don't want to walk away from this; but these proposals are status quo proposals; with the exception of our de minimis states in Area 5. I'll vote against this. But I think we need to move forward, either have the LCMTs come back maybe with the help of the Technical Committee, with something that actually meets the goal of this addendum that we've been working for a year and a half on, or to rethink how we're doing our southern New England management program.

Maybe it's more of a holistic approach when we start to look at some of the things that haven't been implemented yet in Area 3; maybe some of the data reporting requirements, other things that might come into play now that we have a better idea of what's happening.

CHAIRMAN BORDEN: Anyone else? Eric Reid, and then I am going to make a personal comment.

MR. REID: I don't like to go against the Technical Committee's advice either; but in this case the problem is the data is skewed. All you have to do is walk down the dock in New Bedford, or any other southern port; and the amount of traps that are going into the Jonah crab fishery is staggering. That is going to skew the data that we have here. I have to say that the data on trap hauls is not correct; because it is hauls for Jonahs, and that is skewing what we have here.

The industry is asking for this. There are more trap reductions coming. This isn't, "doing nothing" this is supporting the industry, and getting to a place where they could survive not only today, but tomorrow and for a while. We're not going against a well-informed TC, no offense to the TC; but the data has not been

filtered out enough to really figure out what we're doing here. I think we should approve this and move along.

CHAIRMAN BORDEN: Okay anyone else want to make a comment before I make mine? Dan.

MR. MCKIERNAN: Yes, I would just like to respond to Eric's comment. The number of traps going into the Jonah crab is not staggering, because it is the same traps that are being fished for lobster. The good news is, when we're all said and done, in Massachusetts there is only going to be 21,000 traps fished in Area 2, fished for either lobsters or Jonah crabs combined. While we're making these trap cuts on the lobster fishery, even though traps are being diverted or targeting Jonah crabs, they are still being cut; and so that's the good news.

CHAIRMAN BORDEN: On the motion itself I just want everyone to understand. If the motion passes, then we would move on to an overarching motion to approve the addendum as modified at this meeting and the last meeting. If the motion fails, then what's going to happen is we would remand the issue back to the LCMTs; and basically ask them to formulate new proposals. That's kind of, so that everybody understands, the path forward. Mike.

MR. LUISI: Just a question, Mr. Chairman. Please excuse my ignorance on the trap reduction programs; it is not something that we do in our state. But I've heard a lot of people say that trap reductions are coming. There is obviously something set forth into the future that is going to reduce lobster traps.

My question is what additional action that is being taken here accounts for that 5 percent? It seems to me like, and I've heard it mentioned that this is a status quo approach; because those trap reductions are already in front of us for the other areas. My understanding at this time is that these proposals are not actually

achieving anything more than what has already been put in front of lobster fishermen.

Therefore, for me to go home and to speak to our fishermen, who as John Clark mentioned wanted to be out of this whole thing altogether anyway; because there is only four or five fishermen in all of Area 5, down in DelMarVa. To go back and tell them that we were the only area that actually took action to keep more lobsters in the water is going to be incredibly difficult. With that said, I am not going to be able to support the motion moving forward.

CHAIRMAN BORDEN: Megan, do you want to comment on that point?

MS. WARE: Sure, and then I can talk a little bit about process here for the vote. The Area 2 and 3 trap reductions; those are ongoing; because they were a part of Addendum IVIII. Those are ongoing, so kind of regardless of the vote here those will continue. But the Board did specify in the Addendum XXV that any action from 2015 forward would be considered for this addendum.

That is how those two areas are using those trap reductions. The Area 4 trap reduction is not ongoing, so that would be something new; and then the Area 6 measures would be new as well. Just to speak to the order of the votes here. If we vote yes on this, then we would then move to the roll call vote on the Addendum.

That some people have mentioned voting up or down on the Addendum. That's when that vote would happen. If we vote no on this, as David mentioned, we go back to the LCMTs. I would recommend that we provide some guidance to the LCMTs as to what you're looking for if you vote no on this; so that we can have successful LCMT proposals at the next meeting.

CHAIRMAN BORDEN: Anyone else? Ritchie.

MR. WHITE: I guess I don't understand that we voted to have a 5 percent increase in egg production. We sent it to the LCMTs, and we're expecting a proposal back that meets 5 percent. We get proposals back and it's not 5 percent. Now it's arguments about why we should accept them; even though it's not 5 percent that we passed previously; and said that that was what we were going to do. I don't understand how we can argue for a proposal that doesn't accomplish what we said we needed to accomplish.

CHAIRMAN BORDEN: That actually is a good segue way to one of the comments that I wanted to make. I just remind everybody that when the Board approved this action back in May, we had a very lengthy discussion about trap cuts; whether or not we were going to include trap cuts.

The reality is that the analysis that the Technical Committee did on trap cuts, basically indicates that if you reduce active traps by 25 percent, you get a up to a 13 percent credit towards egg production. It's 25 percent traps up to 13 percent. The problem with that analysis is there is a lot of uncertainty in the analysis.

I think it sounds, I totally understand why Ritchie and other people are saying we're doing nothing. But if you were to go back and really scrutinize the Technical comments on this, what they are really saying to us; there is uncertainty in that analysis. They actually had a 95 percent confidence interval around the estimate.

I think Kathleen, correct me if I'm wrong, but I think it went from 2.5 percent to 16 percent. That was the range. Then before they did that analysis they did another analysis where they used a different timeframe; and they came up with a different range confidence interval. The second point I would emphasize is that this is such an evolving situation for the Board to try to wrestle with.

Grant Moore talked about, and I commented on it from Rhode Island perspective, but you can name dozens of boats, these are lobster boats with lobster permits, they use lobster gear; that aren't fishing for lobsters. All of that information goes into the system, and yet the Technical database can't tease out how much effort is going into actual lobster versus how much is going into Jonah crabs.

Now we have this new development where that same effort is now going into sand crabs; and it is all part of it. We can't expect, this is a personal opinion, we can't expect the Technical people to do an analysis when they don't have the data to do it. They are giving us good advice that there is uncertainty around these estimates.

That is what we're all struggling with. The other personal comment is and it goes back to something the Commission Chairman said. We need to get on with figuring out how to manage stocks like southern New England lobster. I would just point out to the assembly here that this is not the only stock that is suffering from exactly these types of consequences.

You could put together a list of at least a dozen stocks that are managed by the Commission, and or the New England Council, and or the Mid-Atlantic Council that fall into exactly this situation. Somehow all of us, I think, have to work together and figure out a way forward; so that when we have these stocks that are being buffeted by environmental change, we manage them differently. We set our expectations differently. I don't think we're going to do that today. I think that's something that we've got multiple chairmen here from the councils and commissions, and there is a way forward there. But that is something we've all got to collectively and collaboratively work on.

I know a lot of effort has already gone into it, but we're not going to do that today. I think the decision here is whether or not we take a step forward, take some action, and continue kind of

this path forward. There have been about 15 actions by the Commission on trap cuts, managing by traps.

I don't view this as status quo; I view this as continuing that. That whole exercise, as Mark Gibson I think correctly characterized. That whole exercise in terms of trap cuts, it is going to play out at some point. If you have no traps in the water you have no fishing mortality. At some point we're going down this hill, in terms of traps, and it's going to bite into the mortality. I don't think it is appropriate to expect the Technical people to tell us when.

They can give us estimates, but they can't tell us exactly when that's going to take place. For my two cents, I think we need to get on with this and decide we're either going to move this forward or we're not going to move it forward. If we don't, then we remand it back to the LCMTs. But I'll predict if we do that we're going to be right in the same position three months from now. I don't think we're going to advance. Is there any further discussion on this? Yes, Adam.

MR. ADAM NOWALSKY: To your desire to come to a determination whether we're going to move this forward or not. My sense is remanding something back to the LCMTs is not going to get us anywhere. **I'm going to make a motion to postpone indefinitely further action on Addendum XXV.**

CHAIRMAN BORDEN: Dennis, second?

MR. ABBOTT: I'll second that for discussion purposes.

CHAIRMAN BORDEN: Okay, Adam do you want to?

MR. NOWALSKY: I've listened very carefully to this discussion. The reality is we as a management body are faced with an impossible situation. We're being asked to do something that factors outside of our control here, i.e.

controlling fishing effort, aren't going to let us do. Sitting here and talking about advice from our Technical Committee and not listening to them.

It's not that we don't listen to them. We ask them to evaluate something; mathematically, scientifically, and they do a great job of coming back and giving us that information. But then ultimately, we have to make some decision that quite frankly goes beyond the factors we're asking them to evaluate; socioeconomic factors, other issues that aren't limited to what they're evaluating on.

They look at these proposals and say no, we can't mathematically give you a filled in Excel spreadsheet that says these proposals meet our reduction. To simply sit here and take a management action for the sake of saying we're doing something on paper, to pat ourselves on the back. We spent a lot of time on these ourselves. We've had a lot of individuals looking at this; TC, LCMTs, other managers, and we're spinning our wheels here. Let's stop the spinning the wheels, and let's move on to something else. Let the trap reductions take effect. Maybe we come up with some other idea. But let's stop spinning our wheels on this.

CHAIRMAN BORDEN: In terms of procedures here, motion to postpone is non-debatable. I'm going to call the question on this. Adam.

MR. NOWALSKY: As a point of order, Mr. Chairman, I would offer that a motion to table would not be debatable. I don't believe a motion to postpone is not debatable; but I'll defer to parliamentary procedure on that.

CHAIRMAN BORDEN: Bob.

EXECUTIVE DIRECTOR BEAL: My understanding is that you can debate the time at which you postpone it; but the rationale for postponing is not the debatable part. Are you postponing to the next meeting, indefinitely, three meetings from now or following a TC report or whatever.

That can be debated, but the rationale for the postponement cannot.

CHAIRMAN BORDEN: All right, does anyone care to debate the timeline in the motion to postpone; anyone, no hands up, Pete Burns?

MR. BURNS: Well, as the motion stands now I can't support it; because I think we still need to do something here. We made a commitment to do something, and that's why we've been working on this for so long. I know it's not easy; but I think there are things that we can do to help the stock until we can see how things play out, with respect to trap reductions and some of the other things that are in the pipeline right now.

My question on the timeline would be does this mean we're not going to take the issue up again; or does it mean we're going to take it up after some more behind the scenes discussion with our industry or our advisors, Plan Development Team et cetera?

CHAIRMAN BORDEN: The motion is to postpone indefinitely. Are there any other comments on the timing; Dennis, and then John Clark?

MR. ABBOTT: I have my little card from a great meeting. Reading it says Roberts Rules of Order, Item 12, bold; postpone indefinitely, and if it's in bold it says it's debatable.

CHAIRMAN BORDEN: I think what we're going to do is we're going to take a five-minute break.

(Whereupon a recess was taken.)

CHAIRMAN BORDEN: Bob, could you provide clarity on the way forward here?

EXECUTIVE DIRECTOR BEAL: There has been a debate about whether this is debatable or not. I think it's almost irrelevant. There has been a lot of conversation today about what should happen to this Addendum. Is 5 percent enough,

is the action being proposed by the LCMTs appropriate or not; and all those different things? I think the motion to postpone indefinitely, if that passes that makes all of Addendum XXV essentially go away. If the Board wants to do something it would start over with a new addendum from scratch, a new public comment period, new documents and everything else. That is up to the Board if that's the course they want to take.

If they want to do something within the framework of Addendum XXV, I think you go back to the motion that's on the Board, which is considering the LCMT proposals for 2, 3, 4, and 6; and decide whether the Board likes those or not. The other thing that the Board can do is at the May meeting the Board decided on the 5 percent number.

If there are folks around the table that don't like the 5 percent that can be revisited and start this LCMT process over as well. I'm not saying it's good or bad, but the Board can do anything you want within the structure of Addendum XXV; as long as you keep that Addendum viable. The motion to postpone sort of makes that Addendum no longer viable; and I'm not sure which course the Board wants, but that would be the outcome of those options.

CHAIRMAN BORDEN: Any questions for Bob on the process? John Clark.

MR. CLARK: I'm just confused. Bob, then for what you're talking about this motion would have to be defeated and then what would the next step be? The motion to postpone would be defeated, and then what would we do if we wanted to reconsider?

CHAIRMAN BEAL: If the motion to postpone fails, you have the other motion that's up on the board right now to deal with; the LCMT 2, 3, 4, and 6 options. You have to either decide what to do with that. You can table that one as well. You can vote that one down and you can then make a motion to revisit and reconsider



the percent increase in egg production under Addendum XXV, and that would take a two-thirds vote; because it's a previous action by the Board. If this motion fails, the next thing is to figure out what to do with the motion that's on top of the screen right now.

CHAIRMAN BORDEN: Emerson. This is on the process.

MR. HASBROUCK: Yes. I'm not clear. If the motion to postpone indefinitely is passed, we can no longer revisit or recall Addendum XXV; is that correct?

EXECUTIVE DIRECTOR BEAL: It essentially goes away. It means this is postponed indefinitely, no additional action by the Board on that Addendum.

CHAIRMAN BORDEN: Is everyone clear on the implications of what you're about to vote on? I'll allow everybody a one minute caucus; and then we're going to vote. Are you ready? I'm going to ask Megan to do a roll call vote on this. I think it's an issue of significant importance for the Commission; the record should be clear.

MS. WARE: Maine.

MR. PATRICK KELIHER: I would say null, but I would probably get in troubles. No.

MS. WARE: New Hampshire.

MR. ABBOTT: No.

MS. WARE: Massachusetts.

MR. McKIERNAN: No.

MS. WARE: Rhode Island.

MR. GIBSON: No.

MS. WARE: Connecticut.

MR. ALEXANDER: Yes.

MS. WARE: New York.

MR. GILMORE: Yes.

MS. WARE: New Jersey.

MR. TOM BAUM: Yes.

MS. WARE: Delaware.

MR. CRAIG D. PUGH: No.

MS. WARE: Maryland.

MR. LUISI: Yes.

MS. WARE: Virginia.

MR. JOE CIMINO: No.

MS. WARE: NOAA Fisheries.

MR. BURNS: No.

CHAIRMAN BORDEN: **A 4 to 7 vote; motion fails, so we're back on the main motion.** Is there any **further discussion on the main motion?** Joe.

MR. CIMINO: I speak reluctantly, but I'm the only one that hasn't. I appreciate a lot of the comments, and I think back to some of the stuff that Mark Gibson said. I think when we do get a new assessment; it's time for a second wave of actions more than likely. It may tell us something different; and I certainly hope it does.

Perhaps surprisingly, Virginia is out of this game. But I think I do support this motion. I want to give them a chance to move forward with something. I sat on a lot of TCs, perhaps half of them, not this one luckily. But there are times where you are not able to show everything that's taking place. I would like to give this a chance to move forward; especially knowing that the LCMTs probably won't be able to come up with anything else. Like I said, this

isn't the end. I think that moving forward either way, killing this, which luckily we didn't do; or accepting something that doesn't seem to be right, on paper. There is going to be more that needs to be done in the future, and I think maybe that's the way forward.

CHAIRMAN BORDEN: Does anyone have a point that has not been made yet? If they do I'll recognize you, if not I'm going to call the question. John.

MR. CLARK: Just to clarify what Bob was saying before. Is this the point where to table this motion would then allow us to reconsider this at a later date; or will we still have to vote on this and then make a motion to table?

CHAIRMAN BORDEN: You have a right to make a motion to table at any point.

MR. CLARK: I just meant in terms of the process that Bob was talking about earlier.

EXECUTIVE DIRECTOR BEAL: John, are you interested in going back and revisiting a previous decision that was made at the May meeting; but you want to sort of set this aside for a little while, while you do that?

MR. CLARK: Well, I think as we've already approved the LCMA 5 proposal, and now if this passes, you know as I say it is the only LCMA that has actually had a reduction that has passed muster here. I'm just curious as to what the process is; because you were just saying that if we tabled this we can revisit, pretty much all aspects of this Addendum; not that we want to do that. But it seems that if this passes then we have a finalized addendum at that point.

EXECUTIVE DIRECTOR BEAL: If this were to pass, we still need to make a motion that approves Addendum XXV as modified today and at the May Lobster Board meeting. There is still a next step that needs to happen between this motion and a finalized Addendum XXV.

CHAIRMAN BORDEN: With that guidance, I guess my advice is let's vote on this and see how the vote goes. Then if people want to do things differently there is nothing on the table at that point. Anybody is free to make a motion to do what they want to do at that point. Does that sound like a reasonable way forward here? All right, one minute caucus on this motion and then I'm going to call the question. We're going to do a roll call again, please. All right Megan, please call the roll.

MS. WARE: Maine.

MR. KELIHER: Abstain.

MS. WARE: New Hampshire.

MR. ABBOTT: No.

MS. WARE: Massachusetts.

MR. McKIERNAN: Yes.

MS. WARE: Rhode Island.

MR. GIBSON: Yes.

MS. WARE: Connecticut.

MR. ALEXANDER: Yes.

MS. WARE: New York.

MR. GILMORE: Yes.

MS. WARE: New Jersey.

MR. BAUM: Yes.

MS. WARE: Delaware.

MR. CLARK: No.

MS. WARE: Maryland.

MR. LUISI: No.

MS. WARE: Virginia

MR. CIMINO: Yes.

MS. WARE: NOAA Fisheries.

MR. BURNS: No.

CHAIRMAN BORDEN: **It's 6 to 4 to 1. Motion passes.** The floor is open; does anyone care to make a new motion on this? Otherwise, we need a motion to approve the Addendum as modified by the discussion at the May meeting and at this meeting; and that will finish the Addendum. If that type of motion passes, I am going to want to make a couple more comments. Dan McKiernan.

MR. McKIERNAN: **I'll make a motion, David to approve Addendum XXV as approved at the May meeting and as amended today.**

CHAIRMAN BORDEN: Is there a second; seconded by Mark Gibson, discussion on the motion, Doug?

MR. GROUT: I urge you not to move forward with this Addendum; and here are the reasons why. One, you just passed 4 of the 5 LCMT plans; that according to the best scientific information available does not meet the 5 percent cut. Number two, two of those LCMT plans will occur whether or not this plan gets passed. Those trap reductions are already part of existing plans. The only thing we have to count on now is that the National Marine Fisheries Service will begin to implement rules in Area 3; which we asked them to implement several years ago.

That is going to happen no matter what, and as a result, just as a piece of information, this is where the vast majority of the effort is going on. If we do nothing here, if we don't approve this that's going to happen, it's going to happen. We also have a plan for Area 6, which what did they say there are 12 lobstermen there?

Their plan includes a day off on Sunday that the TC says you can easily recoup that. That is what happens when a lobsterman takes his day off in a normal situation, he takes his day off and he goes and catches them the next day he's out. We also have the one area that had a plan that was approved by the Technical Committee is going to be implemented on four lobstermen.

This is going to be, I think, a difficult press release for Toni, I mean for Tina to put out; saying, we approved an Addendum for a 5 percent reduction, two of the plans are already going to occur anyway; and four of the plans don't meet Technical muster. We've got to take a different direction with southern New England lobster.

You've got to start thinking about a plan that's going to address what's happened, because of climate change. We all agree that we're not going to be rebuilding southern New England lobster. You had comments throughout this process from your constituents saying, our preference is not to have any changes; but if we have to we'll do this.

As your Chairman, I'm asking you to vote this down, because I'm concerned about the impression that the Commission is putting forward something that really isn't doing things that are actually going to occur anyways. Please consider this vote carefully.

CHAIRMAN BORDEN: Any other comments? Mike.

MR. LUISI: I will not be supporting Addendum XXV as it's been modified today. The reason for that is because I believe this to be just at the face of it all just a pure paper exercise. It's a contract, and the contract said we need to increase egg production by 5 percent. But when the proposals were prepared, Maryland, Delaware, and Virginia were the only states that signed the contract. I do not see the effort going forward from the other areas; and therefore it's a paper exercise. I will not be

supporting moving this Addendum forward today.

MR. THOMPAS P. FOTE: I've been sitting here pretty quiet for the last hour and a half, and listening to what's going on. Many years ago when I was proxy to Senator Lou Pisano, and he handed a proxy with Jack Dunnigan that said two things; I don't do lobsters and I don't do horseshoe crabs as his proxy; because it always seemed to be this hole we got into.

I cannot support this Addendum. I can't support singling out three states to do something that none of the rest of us is going to do. It's just not fair. I agree with everything New Hampshire says for a change, and basically going on forward there. I think we should just vote this down and try to figure out how we're going to address not only lobster; but all the species that are going to be effected by climate change, and that we have no control over; and all the problems we have with Chesapeake Bay and all the bays and estuaries up and down the coast that seem to be not producing and not serving as the nursery areas that they're supposed to serve as. I'm going to vote no on this.

CHAIRMAN BORDEN: Anyone else here? Peter.

MR. BURNS: I also can't support this now. Like it or not, the best science we have is the best science we have. Our Commission Chair said it more eloquently than I can. But I think that we need to be cognizant of sort of the road we're going down now; if we're going to be approving some of these things that don't meet the scientific standards that we're trying to do.

We came into this process with a 5 percent goal, and I think that is what we need to hold them to. I think if we're not going to do that then maybe Doug's right. Maybe we need to think about a different way of how we're going to manage this. I'm glad that it didn't get postponed. I think we need to take some kind of action.

But these are basically status quo proposals, with the exception of Area 5. When I get back now if this gets approved, I'm not sure if we can even support even implementing some of these measures from the areas, other than in Area 5; because I don't really even know what kind of basis we would even approve them on, so that puts us in a difficult spot.

CHAIRMAN BORDEN: Peter, just for my own edification. I want to make sure that the record is clear. Does the National Marine Fishery Service have the intent to adopt the trap cap as the Chairman said, if this motion fails? In other words, is something, is an action going to take place if this fails? I realize I'm putting you on the spot.

MR. BURNS: Yes, I think that that is something that's still on the table regardless of the vote. But I think it's something, we wanted to be able to see what the full slate of fishery management actions is going to be with respect to Addendum XXV and everything else.

Maybe that's another way that we can look at this more holistically; to see what types of benefits we can get from those Addendum XXI and XXII measures that come into play. I think that one doesn't negate the other. I think that we're considering those measures regardless; but depending on what happens here today, it's going to change how we evaluate them, certainly.

CHAIRMAN BORDEN: Okay, so are we ready for a vote on this? Emerson.

MR. HASBROUCK: I have a question on process. If this motion is defeated, then what happens with Addendum XXV? Is it dead and forever gone, or does it linger in limbo somewhere?

CHAIRMAN BORDEN: We're in the unenviable position that we've approved the LCMT proposals. We just did that. If this motion were to fail, then I'm not exactly sure where we are. Someone could make a different motion to

move forward, or go revisit some of the motions that we already made.

EXECUTIVE DIRECTOR BEAL: There are two courses forward if this were to fail. There are probably a lot more, but there are two primary ones. One is the Board can start an entirely different action, or the Board can go back and reconsider the series of motions that it's already made under the umbrella of Addendum XXV. You can reconsider the proposals that were approved. You can reconsider the 5 percent egg production increase and everything else. It's not dead, but it may not be the most efficient path forward; if the Board wants to do something entirely different on southern New England.

CHAIRMAN BORDEN: The thing that I'm struggling with is if the Board previously approved, and I read this intentionally, minimum size, max size, trap cuts in closed seasons. Those were the options. If we want to do something, and we also approved a 5 percent egg production target. Now if we want to change those, I think we need motions to do that and have a two-thirds majority to reconsider it. Frankly, given all the other items that we have on this agenda, I'm not sure it's time to argue that issue. Bob.

EXECUTIVE DIRECTOR BEAL: I agree with your last statement. There are a lot of other things the Board needs to try to tackle today. If this were to fail, maybe the Board has taken this as far as it can today; and they need to go back and think about it in between now and the annual meeting. I don't know; there seems to be a pretty big divide on how to move forward here.

Maybe some dialogue between the meetings would be more productive than trying to pick through this today and decide if it's better to go back and make a series of motions, with two-thirds votes and those sorts of things, or starting a new action. That may be hard to do

on the fly here, to decide what's the most efficient path forward.

CHAIRMAN BORDEN: At the risk of getting outside the Chair's prerogatives here. My suggestion would be to do just that. If this motion fails, then between now and the annual meeting we'll figure out a way forward; if that requires meetings or conference calls or maybe the staff putting together a document that gives us some alternatives that we can consider. I don't think we've got the time to deal with this. Mike.

MR. LUISI: Just a very quick question through you if it's okay to Peter. Is that okay? Peter, so you mentioned that if this was to pass and you would take this back and look to implement the proposals that we just approved. What happens if you don't support Area 2, 3, 4 and 6; and then you've got Area 5, which has been determined to actually meet the required reduction? Does it mean the Area 5 regulations change and nothing else happens; because that would be the worst kick in the craw that could happen as a result of all of this?

MR. BURNS: It's a good question, Mike. I think we'll do what we normally do in our process; which is we get a final addendum and a final recommendation from the Commission, and we go back and we analyze it through the NEPA process and the analysis that we normally do. We'll have to look to see.

We've got quite frankly the LCMTs with the exception of the Area 5 plan; don't even meet the goals and objectives of the Addendum. That's going to be a difficult thing for us to get around. I can't guarantee that we will or won't implement any of them. But I think we're going to have to look at what the implications are of some of these.

Most of it is status quo. There are additional trap reductions with Area 4. I don't know, I think we could probably think of that as maybe some additional conservation measure, or

maybe looking at it there is something consistent with what the states are doing. But I don't see it as something that meets the goals and objectives of this Addendum here.

CHAIRMAN BORDEN: All right, does anyone else have a new point? If not, Mark, excuse me.

MR. ALEXANDER: I'm just trying to wrap my head around this. I mean at the last meeting and in our previous motion, we just adopted motions to add certain elements to the total Addendum. Here at this point we're voting to either approve or not approve this Addendum. I don't think in the previous motions in this meeting and the other meeting, we said we were going to implement these things. We just said we were making them part of this action. You know if the action goes away all those elements go away, right?

CHAIRMAN BORDEN: All right another roll call vote please. Do you need a one-minute caucus, anyone here? Okay, so one-minute caucus and then Megan will take the roll. All right, are you ready for the question here? Megan, if you would please take the roll.

MS. WARE: Maine.

MR. KELIHER: Abstain.

MS. WARE: New Hampshire.

MR. GROUT: No.

MS. WARE: Massachusetts.

MR. McKIERNAN: Yes.

MS. WARE: Rhode Island.

MR. GIBSON: Yes.

MS. WARE: Connecticut.

MR. ALEXANDER: No.

MS. WARE: New York.

MR. GILMORE: No.

MS. WARE: New Jersey.

MR. BAUM: No.

MS. WARE: Delaware.

MR. CLARK: No.

MS. WARE: Maryland.

MR. LUISI: No.

MS. WARE: Virginia.

MR. CIMINO: No.

MS. WARE: NOAA Fisheries.

MR. BURNS: No.

CHAIRMAN BORDEN: **The vote is 2 to 10 to 1; so the motion fails.** Consistent with what I advised beforehand, between now and the annual meeting we're going to try to figure out a strategy for moving forward. Doug.

MR. GROUT: I'll defer to the process here and then the Chair and the Executive Director. But normally when we vote, we don't vote approval, it's done. Now if someone in this Board wants to reconsider some actions, and we want to take time to think about it, I think that's a place where we could continue our action to the following meeting. We could make a conscious decision we want to reconsider a particular part of the plan.

Then somebody makes a motion to postpone until the fall meeting. But if nobody says anything here, normally it's done. We've rejected addendums and amendments before; and if nobody brought up something at that meeting to continue discussion on it, I think it's done now. Again, I'll defer to the Executive

Director on that and to your ruling on this. But my understanding from past precedents, we need somebody here to say we want to reconsider something here.

CHAIRMAN BORDEN: What I'm wary of is having someone make a motion here for a specific action, and then that launching into another major debate. This is a very divided Board; as everyone recognizes. Let me ask. Do you want to proceed with a motion, which I'm basically advising you to not do that; or do we want to continue this dialogue and have the staff outline in a memo what they think the options are, and then consider those options in the future; primarily at the annual meeting? Dennis.

MR. ABBOTT: I agree with Doug that this issue is dead right now. But I think going back to the comments that Ritchie White made an hour or so ago; is we really have to look at the way we manage lobsters. That should become the question before us; not whether we fart around again with Addendum XXV or whatever number you want to put on it. We have got to consider how we are going to manage southern New England lobsters, plain and simple. I don't know how you're going to go about that. But I do think that is the issue that is now before you.

CHAIRMAN BORDEN: I don't disagree with you, but I would just remind everybody that the Commission went to enormous lengths to craft an addendum, specifically to recognize the southern New England stock problem. That addendum, Megan can remind me, I think it was XVIII; basically recognized that you had a reduced size of the resource in southern New England, and that the Commission wanted to right size the industry; downsize the industry to the available stock, so that the few participants that remain would be viable. That was a direction that this Commission took and put together a fairly elaborate addendum that then has over the course of a number of other addendums. We've gotten into trap transferability, with conservation taxes; the

whole idea is to shrink the size of the industry. That was the path forward; recognizing the reduced productivity of the resource.

Now I'm not saying that the Commission doesn't want to reconsider that. But that was the path that the Commission chose a number of years ago. I was not on the Commission when you chose that; but I actually worked on aspects of that for the state of Massachusetts.

But there was a conscious decision to downsize the industry, because the expectation was the resource was going to be smaller. If somebody wants to do something different than that we're going to have to sit down and articulate a position that we can all get behind; which I think is what Dennis is articulating. But that is going to take some doing. Doug.

EXECUTIVE DIRECTOR BEAL: I was raising Doug's hand. Back to Doug's point about when we make motions like this usually the action is dead and we move on. That is exactly right. I think if the Board wants to charge staff with going back and spelling out some options or looking at different ways of moving forward.

I think this Board needs to give staff clear direction on what's in bounds for that. In other words, is any further action under Addendum XXV inbounds for further consideration in this staff document; or are we considering Addendum XXV DOA right now and we're moving on to XXVI, XXVII or whatever it might be? I think we'll need that guidance from the Board, because that would be a little bit different tact but not an inappropriate tact than we've taken in the past.

CHAIRMAN BORDEN: Does someone have a motion they would like to make? Yes, Ray.

MR. RAYMOND W. KANE: Yes, some questions, David. When is our next stock assessment, or Megan?

CHAIRMAN BORDEN: It is 2019, I believe.

MS. WARE: Scheduled for a presentation August, 2020.

MR. KANE: How would this Commission favor we stay status quo, being how this was the feed of the Addendum XXV, until we get the next stock assessment; because from the conversation today, it sounds like the Technical Committee has a lot of numbers they're going to have to tease out between people who are lobstering, Jonah crabbing, sand crabbing.

I think the newer numbers when the assessment comes out, if the Technical Committee gets the data reported can give us a more qualified look at what's really going on; because two of the management plans are already in play. I know Area 2, we're taking reductions. We've taken 25, 5 percent more this year. How would the Commission feel about something like that?

CHAIRMAN BORDEN: Comments to that point? Tom Fote.

MR. FOTE: I'm sitting here with a couple of thoughts in my mind. One, we keep talking about the moving to sand crabs and Jonah crabs; and do we know how much we can harvest or how the effects of warmer water temperature will affect those two stocks, and how we're going to deal with those two stocks at the rate they're growing, because we haven't even really talked about that.

When it comes to lobsters and we started doing all this. We had something like 35, 40 permits working in New Jersey during the nineties; when the boom started, and we started dropping. We're down to about 15 permits actively fishing or a little less in New Jersey the last time I checked. The industry by itself has basically reduced itself down.

In New Jersey that was not a big problem, because we only had 32. It was part of our commercial fishery; it was a huge problem to those fishermen, but it wasn't to the overall economy of New Jersey or economy to the

commercial fishery in New Jersey. When I look at our northern brethren, and basically see that warm water moving up, and see black sea bass moving in; and sort of poor recruitment in the last four or five years.

I can understand, I would be very nervous up in Maine and New Hampshire at this time; and I think they are. We really need to think about how we do a gradual come down if those same thing happens up in New England, and how do we deal with it; because we're not talking about 30 permits.

I don't know how many permits you've got, 4 or 5,000 in Maine, Pat, something like that. That is going to be a huge economic impact that we haven't seen in any fishery since groundfish. I think that's what we should start thinking about. How do we deal with this situation; and that's what we basically have a group working on is what are the effects of climate change, how is it going to deal with fisheries.

Maybe that is the premiere one, because we know the effects. Like if it was the Council it would be surf clams, because that's the same thing that happened in New Jersey on surf clams, so I'm just trying to think ahead. I won't be here probably when we solve this problem, because that will probably be another 10 years down the road; but I see it coming.

CHAIRMAN BORDEN: I've got Jim Gilmore and then Peter Burns.

MR. GILMORE: I think waiting three years is probably not the best solution at this point, Ray; and we've been dealing with this for, well I've been here 10 years now. It's like its Groundhog Day; every time I come back to one of these meetings, it's like the same thing. We just don't seem to do anything.

Would it be, and this is just a question to you, David. Maybe between now and the next meeting put a working group together to essentially go explore what Doug was talking



about; because if we go back to try to fix XXVIII or start XXIX. We're just going to get to the same place again, where nobody can take reductions or whatever. We really need sort of an epiphany of like what we did; we said well if we put some good minds together between now and the annual meeting, maybe that's a way to start getting at this. That would be my suggestion. Thank you.

CHAIRMAN BORDEN: If you want my opinion, I would have no objection to that. I would just add a personal comment that there is an endless list of issues that this Board is going to have to deal with on southern New England lobster. I mean you've got the whole issue of the overfished definition; which needs to be revised.

It's going to be a Technical task. We've got all these data problems that we're trying to confront. I would go back to Doug Grout's point. I think we need a long-term vision. We need a long-term strategy on how to deal with stocks that fall into this type of circumstance. I just reiterate what I said before.

This is not just a lobster problem. The Commission has to deal with this. To Jim's suggestion, let me ask. Does anyone object to having a working group put together recommendations which will be reviewed at the fall meeting? Does anyone object to that? No objections. The question is, Eric.

MR. REID: Are we having a working group work on something for A XXV, or are we just going to let A XXV disappear and start all over? That's my question. I've got eight states saying they don't like XXV. I've got one person saying let's get a working group together. I mean normally when you say this is no good, I would like to hear what's better. I'm not hearing it right now, so I would like to hear it.

CHAIRMAN BORDEN: I think to answer your question, personal opinion. If we have a working group, I think they should have great

latitude to consider all these issues; and then bring recommendations back to the Board. I mean the big problem I'm having as a Chair is we've still got a lengthy agenda we've got to get through.

This is an important issue for us to deal with. If we start crafting motions at this point, we're going to be here at this meeting for a long period of time. I'm willing to do that. I don't want to discourage people from making motions. But it's difficult to do this type of stuff on the fly; Roy and Doug.

MR. MILLER: Question, Mr. Chairman. If this working group is formed are they working towards meeting the 5 percent egg increase target or is there no predetermined target for this working group?

CHAIRMAN BORDEN: I think, and Jim can correct me if I misunderstood. I think what he was suggesting is you have a working group, this has been a fairly elaborate discussion and it involved a lot of different pieces; including I would point out Addendum XXV.

You have a working group that looks at all the different points that are made here; and then brings recommendations back to the Board. My view of what he was suggesting is this does not mean that Addendum XXV is over. It means that you may revisit Addendum XXV at the annual meeting; and with other recommendations. Doug.

MR. GROUT: Well, I certainly would support the concept of a working group. If it's the desire of this Board to have it completely encompass not only potential for revisiting XXV, but I hope you would expand it to potentially considering a new addendum with different goals and objectives; and maybe even an amendment, to change your goals and objectives for southern New England lobster, and to think outside the box, because I don't think you're going to get a good management action by going back to XXV. That is my personal opinion. But maybe there is

some way that somebody could craft something; and I'm not going to hold it, but I certainly support the concept of a working group looking at any and all concepts. But let's look outside the box here folks, because we've been spinning our wheels on southern New England lobsters for a long time.

CHAIRMAN BORDEN: Let me ask this question. Does anyone object to the Commission forming a working group to work on the full range of options that have been discussed today? Does anyone object? Adam.

MR. NOWALSKY: I have no objection to forming a working group. I would just add that I consider, we took a roll call vote on what was on the agenda as a final action; and that was disapproved. From my perspective this Board would not be revisiting Addendum XXV; barring a motion to reconsider by the prevailing side from that motion moving forward. As long as we're clear on that way forward, then I have no objection to that.

CHAIRMAN BORDEN: Yes and that is consistent with the advice that we got from the Executive Director. You would need a two-thirds vote in order to do that.

EXECUTIVE DIRECTOR BEAL: The only difference is it does not have to be from the prevailing side; because it is at a subsequent meeting. The prevailing side only applies to the same meeting. The Commission specific rules say that reconsideration of a final action takes a two-thirds vote. We've got specific things that differ from Roberts Rules a little bit for subsequent meetings. But Adam's right. It would take a two-thirds vote to do that.

CHAIRMAN BORDEN: Okay, I think we've got a consensus around the table. We're going to move forward. What I would suggest is the staff writes a short memo that basically summarizes exactly what's going to take place as we move forward; what the process is going to be, and circulate it to everybody so that

everybody has the same understanding of how we're moving forward.

Is there any other business on this? If not, we're going to move on with the agenda.

#### **STATE AND FEDERAL INCONSISTENCIES IN LCMA 4 SEASON CLOSURE**

CHAIRMAN BORDEN: The next item on the agenda is Item 5, State and Federal Inconsistencies. This relates to concerns both New Jersey and New York have raised regarding the inconsistencies between state and federal regulations. Megan is going to describe this. It gets a little bit tricky, in terms of what action we can take and what process; and she's going to outline the different strategies. This potentially can be an action item at the end of discussion. Megan.

MS. WARE: ASMFC received a letter from New York and New Jersey asking the Commission to address inconsistencies in the Area 4 season closure, and for reference that season closure occurs April 30 through May 31st. There are two provisions I'm going to talk about. The first is the most restrictive rule, and the second is the requirement that traps come out of the water.

In state waters the most restrictive rule is applied to season closures; and traps can stay in the water if they are permitted for another species. In federal waters the most restrictive rule is not applied to season closures, and all lobster traps must come out of the water. A bit of background as to how these inconsistencies came to be; and I'll start with the most restrictive rule. At the February 2012 Board meeting, the Board made a motion that applied the most restrictive rule to all management measures in Addendum XVII. Addendum XVII is where that Area 4 season closure came from. In contrast, NOAA applied the most restrictive rule to everything except season closures.

There are a couple of ways the Board could move forward to address this inconsistency

with the most restrictive rule. If the Board does not want the most restrictive rule applied to season closures in state waters, then a two-thirds majority vote is needed to reverse that 2012 motion. If the Board wants the most restrictive rule to be applied to season closures in federal waters, then a letter needs to be sent to NOAA asking that the restrictive rule be applied to season closures.

Our second provision is the traps out of the water provision. During the February 2012 Board meeting, the Board passed a motion that requires lobster traps are removed from the water during a closed period. However, the Board does discuss at length that this applies to directed fishery lobster traps; and in contrast there are some traps which are used for multiple species.

Unfortunately this was not clearly reflected in the motion, nor is it reflected in the Addendum. As a result NOAA requires that all traps be removed from the water. Again there are a couple avenues here for the Board to try and resolve this inconsistency. If the Board would like traps that fish for multiple species to stay in the water, a letter needs to be sent to NOAA clarifying this point.

However, one of the confounding issues now is that we jointly manage Jonah crab with lobster. I think that begs the question if all traps are multispecies traps. If the Board would like all traps that fish for lobster to stay in the water during a season closure, a two-thirds majority vote is needed to reverse that previous motion.

However, the Board does need to consider the Atlantic large whale take reduction team 30 day wet storage provision; given that these season closures are longer than 30 days. To make things a bit more complicated, there are other implications for the season closures; depending on what the Board chooses today.

If the Board makes a motion that the most restrictive rule is not applied in state waters,

this may impact other season closures; specifically 4, 5 and 6, since they were all under the umbrella of Addendum XVII. Additionally, if the Board clarifies that traps do not have to be removed in federal waters, then this may impact federal waters of Area 5. Their season closure is February 1 through March 31.

CHAIRMAN BORDEN: All right, is everyone clear on the path forward, and if they are let me ask New York and New Jersey if they want to give us a recommendation on this. Jim.

MR. GILMORE: Sure. I can just do a motion and the second parts of this, maybe I'll do that. I'll just put a motion up; try to do this in one shot. Then I'm sure we'll have a lot of discussion, so if that's okay with you, Mr. Chairman. **Okay, I move to 1, allow LCMA 4 fishermen the ability to continue fishing fixed lobster gear for other legal species such as Jonah crab, during the closed period and 2, exempt closed seasons from the most restrictive rule; as currently defined by the feds.** Those are the options where we would have to notify NOAA Fisheries on these changes.

CHAIRMAN BORDEN: Is there a second, Tom wants to second it; so Tom, do you want to comment on the motion while we prepare it, and then I'll ask for questions from the Board? Tom.

MR. TOM BAUM: Just that our Technical Committee people worked with New York's and with our constituents and this has been an ongoing issue with a lot of confusion amongst the constituents. This would be extremely helpful in one, giving them work during the closed season.

The fishery would continue to fish for Jonah crab, and two, be a safety issue, as far as keeping the traps in the water. I believe they would say it would take them like 14 working days to take their hundreds of pots out of the water. That is including weather days and all

that. This would eliminate a lot of the confusion that exists already.

CHAIRMAN BORDEN: We still don't have the motion; does anyone want to offer a comment while we're crafting that? Oh, now we do have it. Okay, so questions on the motion; any questions or comments? Tom Fote. Other points here, does anyone want to comment on this? Mike.

MR. LUISI: Just a question Mr. Chairman to Megan. Megan, the last slide that you had up had some consequences to the other LCMAs, could you just clarify based on what this motion states whether or not there would be those impacts?

MS. WARE: Since the motion is specific to Area 4, it sounds like the intent is only to address the Area 4 inconsistencies. I think you would have to add Area 5 in if you were interested in making changes there. But from your shake it maybe sounds like you aren't.

CHAIRMAN BORDEN: Michael, are you suggesting that Area 5 be added?

MR. LUISI: No, sir. The last slide, I just wanted to make sure that there wasn't some trickledown effect of a change that would impact Area 5. I just wanted to be clear on that.

CHAIRMAN BORDEN: Other clarifications on the motion? Peter Burns.

MR. BURNS: I am just trying to think this through. If this was approved, this motion is approved by the Board; I'm assuming that the next step would be a recommendation for NMFS to look at this a little more closely. I think if that's the case, one of the things that still stands out is keep in mind that the closed season was put in place under Addendum XVII to address the 10 percent reduction in exploitation.

I don't necessarily see leaving the gear in the water as an even swap with taking the gear out. I certainly understand the other ancillary issues that are involved with the other fisheries and things like that. But if this goes forward and there is a recommendation for NMFS to take a harder look at this.

I think it would be helpful for us to have some type of analysis from the Technical Committee that shows what the level of conservation benefit is of leaving the traps in the water; as opposed to taking them out, and how this Area 4 closure adopted under Addendum XVII would or wouldn't need to be changed; in order to insure that the right level of conservation is achieved.

MS. TONI KERNS: Under Addendum XVII we approved conservation equivalency proposals; and this measure came from that conservation equivalency proposal, where they did the traps out of the water. That was a subsequent meeting. It was a part of what the Board approved previously.

CHAIRMAN BORDEN: What I'm not clear on, Toni. I think what Peter is suggesting is we would need some Technical analysis to back it up that it met the original standard; if we were going to change this rule.

MS. KERNS: It was already done when we approved the conservation equivalency proposal.

CHAIRMAN BORDEN: Okay, other points, there are no hands up. Are you ready to vote on this motion; or do we need a one-minute break here? Let's take a one-minute break. All right, I think I've got clarification. Since this motion has to pass by a two-thirds majority since it's actually constitutes reconsideration of a prior action by the Commission.

Are you ready for a vote on this; one minute caucus? Okay, so that was the longest pregnant one-minute break we've had to date. We have

a difference of opinion between the powers; which doesn't surprise me. It goes with the hour. But there is a legitimate difference of opinion. I think we need some time to sort this issue out.

The concept would be we need NOAA General Counsel to work with the Commission staff and do that. Then since NOAA is in the process of starting another regulatory action for federal waters; maybe we could address that as part of that effort. **I think the appropriate way to move forward here is a motion to table this action or postpone; motion to postpone the action. Would someone care to make that motion; Pat Keliher and Dennis Abbott?** Are you ready for the question? I'm going to call the question; all those in favor.

EXECUTIVE DIRECTOR BEAL: What time, to the next meeting?

CHAIRMAN BORDEN: Next meeting. Adam.

MR. NOWALSKY: I just want to toss up a word of caution about next meeting. We had gone through this with New Jersey's summer flounder appeal, and we happened to go through a conference call. I might suggest we specify the annual meeting or something here based on past precedent.

CHAIRMAN BORDEN: **Motion to postpone until the annual meeting?** We have a perfected motion then, Mr. Abbott and Keliher have perfected their motion; is that correct? They both nod yes, so the motion is to postpone until the annual meeting. **All in favor signify by saying aye. Opposed, motion carries any abstentions? No abstentions, motion carries.**

**AMERICAN LOBSTER  
GULF OF MAINE/GEORGES BANK  
SUBCOMMITTEE REPORT**

CHAIRMAN BORDEN: Okay, so we're going to move on to another really easy issue to address; which is the Gulf of Maine/Georges Bank. As the Board knows a number of months ago there

was a lot of concern that was voiced by a number of individuals; Pat Keliher being one of them, about the status of the Gulf of Maine/Georges Bank stock. The settlement indices up there have basically been declining since 2012; which is a real concern when you consider that there are about 8,000 fishermen involved in that fishery, and the fishery is worth \$500,000,000.00 to the coastal communities in that area.

The Board, with some prompting from the northern New England portion of the Board, formed a Subcommittee to meet and discuss this. Megan is going to report on the status of those deliberations; and then I think there is going to be a motion at the end of that. Megan.

MS. WARE: The Subcommittee met in New Hampshire on July 13. This was the second meeting of the Subcommittee and it expanded upon the recommendations that were presented to the Board in May. As a reminder, the Subcommittee includes Board members, industry, organization leaders, TC members and fishermen; and it was established to discuss future management of the stock given changing conditions.

One of the topics of conversation for this Subcommittee meeting was proactive versus reactive management action. Overall there was a consensus that there is a need for a proactive management. American lobster is one of the largest and most valuable fisheries along the Atlantic coast.

In 2016 over 158 million pounds were landed, totaling over \$666,000,000.00 in ex-vessel value. The vast majority of this is landed from the Gulf of Maine/ Georges Bank stock with 87 percent of landings in Maine and New Hampshire alone. This concentration highlights the economic importance of the lobster fishery to coastal communities; particularly in Maine or the total economic value is estimated at over one billion dollars.

These minutes are draft and subject to approval by the American Lobster Management Board.  
The Board will review the minutes during its next meeting.

As the Chairman alluded to, the concern that has prompted this discussion is the settlement surveys. This here is the Maine settlement survey. Since about 2012 on, we've seen a consistent decline in those surveys for all three statistical areas in Maine. The settlement surveys for other states mirror this.

The overall goal of the Subcommittee is to increase the resiliency of the Gulf of Maine/Georges Bank stock. As a result they are recommending a multi-phase approach; which includes a proactive management response. This is in response to signs of reduced settlement, and the combination of the Gulf of Maine and Georges Bank stocks following the 2015 stock assessment.

Phase 1 is a recommendation that the Board initiate an addendum to consider uniform management measures in the Gulf of Maine/Georges Bank stock. This would include things such as gauge size changes and V-notch requirements and other measures. This is a proactive response, and the intent is to build an additional biological buffer; through the protection of spawning stock biomass across LCMA's.

Currently we have disparate measures that allow lobsters protected in one area to potentially be harvested in another. Standardized regulations will also address enforcement concerns; particularly rules regarding the lobster chain of custody, where lobsters are moved across state lines. As a reminder, initiating an addendum charges the Plan Development Team with developing management alternative; and starts the Commission's public process. Phase 2 seeks to address the fact that substantial economic effects will be felt before reference points trigger management action. Right now we trigger management action at the 25th percentile of abundance; which is 66 million lobsters from the 2015 stock assessment. At the end of that stock assessment we were at

248 million lobsters. That's a fairly large decline before management action is initiated.

The Subcommittee is recommending that triggers be developed; which require management action at a higher abundance. We still need to identify the nature of these triggers and the management response. However, the Subcommittee is encouraging the Board members to initiate conversations with industry; to field potential goals and gain consensus that the current reference points will lead to economic consequences.

In addition we have the 2020 stock assessment that is scheduled to be presented in August of 2020; and that provides an opportunity for the Board to consider reference points that more appropriately reflect current stock conditions. With that I'll take any questions.

CHAIRMAN BORDEN: Questions for Megan. If not; let me just say, since I chaired these meetings. I thought the dialogue at the Subcommittee was really excellent. I think this is a good opportunity for the Commission to try to get a little bit ahead of an issue. This is a really important issue for all of the states from Rhode Island north.

It will be a difficult process. I don't think any of us should delude ourselves. Some of the decisions we're going to face on this will be extraordinarily difficult. I want to say as part of the record, this issue of standardizing regulations is in the context of discussing standardizing regulations. It does not mean every regulation will be standardized.

I don't want anyone in the industry to assume that that is going to be the case; you know have the state of Maine adopt the Rhode Island minimum size of 10.2 inches. This I think is a really worthwhile endeavor. Nothing is going to happen extremely fast on this, but we're going to just start the process, start the dialogue; and see if we can get ahead of an issue, instead of trying to react to an issue. Pat Keliher, you

indicated to me that you wanted to make a motion.

MR. KELIHER: That's correct, Mr. Chairman. I would be happy to do that now. **I would move to initiate an addendum to consider standardized management measures in the Gulf of Maine/Georges Bank stock. This addendum is intended to be a proactive management response to increase the resiliency of the stock.** If I get a second, I'll be happy to give some justification.

CHAIRMAN BORDEN: Seconded by Ritchie White.

MR. KELIHER: In 2016 landings of lobster totaled more than 158 million pounds, 130 million pounds of that nearly 600 million in landed value, came from the state of Maine alone. This represents one billion in economic activities within the state of Maine. While the economic picture is sound, there are troubling signs that would suggest action may be warranted.

Along with changing environments within the Gulf of Maine, coupled with a shift in the geographic distribution of the stock; we now have survey information showing that last four of the five years we have seen poor settlement. After the last stock assessment this Board concluded that the Gulf of Maine and Georges Bank were indeed one stock; and it would seem that this would be the next logical action, if done appropriately it could have the added benefit of building biological buffer to protect spawning stock biomass. With that Mr. Chairman I'll conclude my remarks.

CHAIRMAN BORDEN: Ritchie, do you want to comment on this? Anyone else on the motion, are there any objections to the motion? **No objections; the motion is adopted by unanimous consent.** There will be a tasking. We'll put this on the staff list and start to work on it; but one comment that I just wanted to make is that from a southern New England

lobster perspective, there are scary parallels that are going on.

The spawning stock biomass in the Gulf of Maine stock is at record high levels at this point; and yet you have some of the same symptoms that we saw in southern New England, where you get decoupling between Stage 1 larvae and Stage 4 larvae in the spawning stock biomass. This is an issue that we really have to focus on and figure out ways to try to move forward on. Is there anything else on this issue?

If not we're going to move on to the Law Enforcement report, Mark, you're going to talk to us about chain of custody, I think. I jumped ahead of myself.

#### **UPDATE ON DEVELOPMENT OF DRAFT ADDENDUM XXVI**

CHAIRMAN BORDEN: Okay, so we're working on the Data Collection Addenda. We have so many addendums going on in lobster that it is difficult for the Chairman to keep track of them. Megan, do you want to give us a status report on the data collection addendum?

MS. WARE: Given the time of the evening I'm just going to verbally talk about it; and give you guys a brief update. We're still working on harvester reporting and biological data collection addendum. Right now we have three issues in that. We have the percent of harvester reporting, we have the elements that are collected from harvesters, and then our third issue is a potential pilot program for electronic tracking.

I would just ask that if the Board has any feedback on the direction that the PDT is taking thus far, to let me know that after the Board meeting. A draft copy of the addendum was included in supplemental materials. It is not finalized, but I just wanted to give the Board a flavor of where we're going. In terms of timing, we have some TC analysis that's going on.

We hope to have that complete by the annual meeting. But I am unsure if we're going to be able to complete the addendum by annual meeting. We're certainly going to try; but there is another document called Menhaden Amendment 3 also going on, so I don't want to try and over commit. But we'll do our best and I just want to let you guys know it's still on our radar.

CHAIRMAN BORDEN: Any comments, Emerson.

MR. HASBROUCK: The vessel tracking that you refer to, is that a VMS system? Is that essentially what you're referring to?

MS. WARE: It's the same idea, but we're not looking at VMS technology. We're trying to look at other devices that are a bit more cost effective and have a faster ping rate. Those were some of the suggestions of the Law Enforcement Committee; so we're looking at other technologies to test. One of the ideas of the pilot program is that the lobster fishery spans a large geographic range; we have inshore versus offshore, different vessel capabilities. We might need to identify multiple technologies to fit the fishery; should the Board even want to pursue electronic tracking.

CHAIRMAN BORDEN: Anyone else? I would offer a personal comment. At some point I would like the Technical people to look at this issue of trap hauls; in terms of the data collection system. If you just look at the points that Kathleen made and the Technical Committee made, they're really struggling trying to differentiate trap hauls and lobster versus some of these other fisheries.

Maybe if there's some kind of alternative that we could put into this to try to clarify that that would be a useful addition to the list. Are there any objections to that; any other action on this? If not we'll move on with the Law Enforcement. No? No report. The next item is the JEA Agreement. We had asked for a discussion of this issue.

## **NOAA OFFICE OF LAW ENFORCEMENT DRAFT PRIORITIES FOR 2018-2022**

CHAIRMAN BORDEN: I just remind everybody we submitted a letter some time ago, basically recommending that NOAA OLE raise the priority of lobster enforcement. Pat Keliher in particular kind of championed that issue. Megan is going to talk about the priorities, and then if we want to formalize another recommendation we can do that at that time. Megan.

MS. WARE: The NOAA OLE draft priorities for 2018-2022 have been released, and it's now open for public comment. Kind of the question before the Board is if you guys would like to again comment on these priorities. Geoff, if you just want to flip through those slides, those are a couple of the priorities. I'm not going to read them all.

But some of the things you'll notice is that they tend to be a bit more broad this year, they aren't species specific; and they don't have a high versus low priority ranking, they're just all kind of on the same level. We did have an LEC call and there was a member from NOAA OLE who kind of talked to those changes, and the intent is to provide greater flexibility. But it is up to the Board if you would like to send another letter commenting on that.

CHAIRMAN BORDEN: Comments, Pat.

MR. KELIHER: Frankly I was very disappointed at how watered down these priorities were. They made them extremely broad. We talked at length in Maine about the fact that how we operate our enforcement arm within the department. It doesn't give guidance and it doesn't really help us in any way, shape or form; understanding that these priorities are such high level.

Frankly I think the most appropriate thing is for the Law Enforcement Committee to continue to interact with NOAA OLE on really digging down into these issues; so they have a better



understanding of what the priorities are, because each state is going to be in a situation of having to work on their own JEA agreement.

We think we could be much more effective in the state of Maine with our agreement if it was laid out properly. While we're doing lobster enforcement we can still be doing ground fishing enforcement and herring enforcement, and all of the other issues associated with protected species. I'm kind of at a loss with how they've brought these forward. Yes, it gives them more flexibility, but it gives me kind of a sense of pause; because I'm not sure how you kind of really drill down into them. I think our own LEC Committee could really do a better job engaging OLE.

CHAIRMAN BORDEN: Pat, wasn't one of the concerns you had when this came up originally the idea that there were inadequate fiscal resources available to have better platforms for trap enforcement offshore? To what extent does this address that concern? I mean this is an issue that Mark and the Enforcement Committee have been working on for the Board.

How do you improve that? One of the issues is we need at least one offshore platform someplace that can actually engage in trap hauls. A 45-foot boat is not going to do it. To what extent has that concern been addressed as part of this?

MR. KELIHER: I don't think it's been addressed at all the way they've put this at such a high level. They've really said that these specific areas, protected resources, sustainable fisheries are priorities; without getting into any detail. You're exactly right. We have no ability to haul gear in offshore Area 1 and in particular Area 3.

The state of Maine has five large vessels ranging from 38 to 45 feet. We're not going to haul gear in Area 3. I don't believe any other state has the ability to do that. If we're going to be serious about lobster enforcement in Area 3,

we need to have those capabilities; because nobody else does.

CHAIRMAN BORDEN: I don't want anyone to misinterpret this, because I'm not picking on NOAA; but this is a real issue. As Pat Keliher knows, over a year ago I went to the Enforcement Committee meeting and basically flagged this as a real concern. We're relying on trap limits in federal waters, and yet there is no ability by any of the agencies involved to haul traps, or to monitor traps, or to target traps.

When they get a complaint, and I'm sure they get valid complaints all the time about some fisherman violating the trap limits or fishing illegal gear. No one has the ability to do anything about it. I mean it's a system that's designed to fail. Somehow we have to get on with figuring out how to at least get one vessel.

The concept was that I think the Enforcement Committee was working on. You get one vessel that has that capability, and utilizing the JEA mechanism, other states could then say we need that vessel for two weeks to do offshore enforcement in X area. Then you could charge the JEA Agreement for some of the time to do that.

Somehow we have to figure out how to get on with this; it's too important an issue. No enforcement will lead to rampant cheating in the offshore areas, and I think to some extent it's already going on. I don't know whether Mark has any comments on this; but it doesn't appear there is any action at this point. Mark.

MR. MARK ROBSON: Well, we just heard the review of the STRAP, Strategic Plan at the conference call on the 25th. There were a number of different comments about; I don't believe the Maine representative had had any interaction yet with NOAA OLE. There were a couple of representatives from Law Enforcement Committee from other states that had acknowledged that they were in fact communicating with NOAA OLE. To the extent

that the more general description of priorities allowed the states to possibly do more multispecies enforcement, and still be able to get reimbursed through the federal process. They were actually pleased with that change; because previous ranking processes were pointing towards having a very specific list of tasks, and the states would have to address very specific enforcement for each of those species or tasks in order to get reimbursed.

I don't know enough about where this is going to end up, as far as specific states being able to get the kind of resources they need; and the lobster issue is one we've been discussing obviously. As you described, even in the case of the U.S. Coast Guard, which has offshore vessels, they do not have and will not have the capability to do any trap hauling and checking.

This is why the Law Enforcement Committee was pressing on that issue. I think what we would have to do is go back to the LEC and the NOAA OLE representatives on the Committee; and we did have three members from NOAA OLE on the call on the 25th, and really tried to nail down what the process can be for each state working through this ranking process or prioritization process; to make sure that the joint enforcement agreements and the cooperative agreements are set up to address those states priority needs.

CHAIRMAN BORDEN: Other comments here? Ritchie.

MR. WHITE: I would think that it's something that all the New England states would be asking for; as opposed to each state attacking this individually. I would think the process would be for all the New England states to be asking JEA to somehow come up with the money for a boat that all the New England states would use.

CHAIRMAN BORDEN: I agree with that personally. I think that's an appropriate strategy. I mean having been involved in certain aspects of reviewing Pat's program up

there. He has very competent individuals that are very knowledgeable about how to do this; they just don't have the equipment to do it.

I think this is a problem that can be resolved; we just have to figure out how to get the right focus on it. I have no objections if the Enforcement Committee continues to work with the appropriate states to try to insert this as a priority; as we recommended for the northern New England states. Dan.

MR. MCKIERNAN: The second level of advice I would give to the Enforcement Committee is looking at the penalties for this, or have them give feedback on the penalties; because we have some small scale pot fisheries in state waters, and sometimes our law enforcement officers will board the boat while they're hauling, and see an untagged trap or more.

I'm not sure they understand the gravity of that. Most lobstermen who feel that someone has been detected fishing any amount of untagged gear, they would like to see the ultimate punishment. But that message hasn't always been relayed very well. I think the action that comes about from an observation or a finding of an untagged trap needs to be really significant. That has to be part of this solution as well.

CHAIRMAN BORDEN: Other comments on this; Pat.

MR. KELIHER: I'll build on Dan's comment. Just briefly, Mr. Chairman, the state of Maine just went through a very exhaustive legislative session dealing with just this particular issue. I would be happy to present any findings to the Board if they would like. In a nutshell, trap molesting, trap cutting, hauling of other individuals gear, fishing sunken trawls, fishing over the trap limit, fishing over the allowable trap limit within the neighboring zones, burning and sinking of vessels and scrubbing; all very intentional illegal activities.

We just put very severe penalties in place, which includes minimums for most of them at three years instead of a year or less, which is where they use to be. They also have on second offenses up to ten year provisions for penalties; and on third offense they have permanent revocation, with the exception of scrub lobster, which is permanent revocation on the first offense and sinking and burning of vessels, which is permanent revocation on the first offense. We modeled these after what we did with elvers. We're two strikes and you're out. It is the most aggressive penalty provisions that I know on the east coast with the state fisheries.

CHAIRMAN BORDEN: All right so we're going to continue to work on this issue. I think the primary focus will have to be the northern New England states to work with the LEC; and see if we can get the appropriate recommendations made. Is there any other action on this? If not we're down to other business. Jim.

MR. GILMORE: I'll make this quick. I raise it because it's a potential compliance issue. With Jonah crab, when we started the process we got legal counsel from a former attorney, who told us we had our regulatory authority for all the measures that were being formed. As we got into it, it turns out we only have half of the regulatory authority.

What we're going to be able to do is first the size limits. We can do that through our current regulatory process. However, licensing and effort restrictions we have to get legislative authority to do that. What we're going to do is first we can do it through a departmental bill; which is our budget cycle, which starts now actually; so the timing's good.

But that would mean an April 1st date by the time, because it goes with the state budget before we would have the authority. We're also going to try to get a local legislator to give us that authority on a quicker timeframe, because it's a pretty straightforward set of

legislation. Essentially the piece of it that's looking at licensing and effort restrictions we can't implement until we get the authority to do that. But we'll work as diligently as we can to get it done quickly.

## **OTHER BUSINESS**

### **UPDATE ON THE STATUS OF THE JONAH CRAB FISHERY**

CHAIRMAN BORDEN: Any questions for Jim? If not; Megan, when are we going to get an update on the status of the crab fishery? At what point will we get that?

MS. WARE: Compliance reports are due today. Annual meeting I'll do the first Jonah crab FMP review.

CHAIRMAN BORDEN: Given all the discussion about what's happening in terms of the focus of the fishery; I think if everything that everybody's been saying all day long about the focus on crabs, I think it will be an eye-opening review in terms of what's actually happening with the landings. Dan.

MR. MCKIERNAN: What about a Jonah crab stock assessment?

CHAIRMAN BORDEN: I am not sure exactly where we stand with that. The last time we discussed this we didn't have the available tools, biological tools. Toni.

MS. KERNS: In my discussions with, I think your staff, Dan. I don't think we're quite ready there yet; maybe a couple years. A lot of those folks that would have good knowledge of that will be reviewing the compliance reports. I know that there is some update of the work that Mass has been doing; but I don't think it's enough to get us to an assessment yet.

CHAIRMAN BORDEN: I would just note the compliance report is going to include research recommendations. Hopefully we'll move on with that. That needs to be done. If much effort is going into that fishery as we all suspect,

we need to get on with a stock assessment there.

**ADJOURNMENT**

CHAIRMAN BORDEN: Is there any other business? If not the meeting is adjourned. Thank you.

(Whereupon the meeting was adjourned at 6:30 o'clock p.m. on August 1, 2017)



# Atlantic States Marine Fisheries Commission

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## MEMORANDUM

**TO:** American Lobster Management Board  
**FROM:** SNE Lobster Working Group  
**DATE:** September 29, 2017  
**SUBJECT:** Recommendations Regarding Future Management of SNE Stock

At the August meeting, the Lobster Board decided not to move forward with Addendum XXV for management use. After reviewing the proposals put forth by the Lobster Conservation Management Teams (LCMTs) and the report by the Technical Committee (TC), some Board members expressed concern that not all proposals will meet the required 5% increase in egg production. Other commented that the 5% increase in egg production is too low to protect the stock while others disagreed that further reductions in fishing effort are needed. Given the wide variety of perspectives, the Board decided to convene a Southern New England (SNE) Working Group to discuss future management of the stock, particularly in light of the role that climate change is having on the population.

The SNE Working Group met via conference call on September 15<sup>th</sup>. The Working Group consisted of Lobster Board members, TC representatives, federal partners, and industry representatives. The Working Group discussed five potential paths forward regarding management of the SNE stock. These included: 1) reconsidering provisions of Draft Addendum XXV; 2) reconsidering the goals and objectives by which the Board manages the SNE stock; 3) engaging with the Commission's Climate Change Work Group; 4) reducing latent effort in LCMA 4, 5, and 6; and 5) considering additional management changes following the 2020 Stock Assessment (see Appendix 1). Based on this discussion, the Working Group put together a series of recommendations to the Board regarding future management of the SNE stock.

### **Working Group Members:**

David Borden (Board Chair)

Dan McKiernan (MA Board Member)

Mark Alexander (CT Board Member)

Peter Burns (GARFO Board Member)

Chip Lynch (GARFO)

Kim McKown (TC Member, SASC Chair)

Jay McNamee (2015 SASC Member)

Grant Moore (AP Chair)

Lanny Dellinger (AP Member, LCMT 2 Chair)

Michael Grimshaw (LCMT 6 Fishermen)

One key aspect of the Working Group's deliberations relates to workload. The Board currently has two addenda in progress and there is a threshold to the amount of time staff (Commission staff, PDT members, TC members) can devote to each issue. Draft Addendum XXVI should make much needed improvements in the data collection program, and directly address some of the noted deficiencies in the last assessment. Draft Addendum XXVII is intended to provide an

additional buffer for the Gulf of Maine/Georges Bank stock during a period when some indices of abundance are demonstrating warning signals for the future status of the resource. Moving forward, it is important for the Board to prioritize these tasks so staff can allocate time appropriately. The SNE Working Group did note that less than 10% of coastwide landings come from the SNE stock and issues such as harvester reporting and resiliency of the GOM/GBK stock are extremely important.

***Recommendations for Future Management of Stock:***

The following are recommendations from the SNE Working Group for Board consideration.

1. Do Not Reconsider Addendum XXV – Given the disparate views of the Commissioners, the Working Group does not recommend that the Board reconsider the provisions of Draft Addendum XXV. Following a series of extensive votes at the August Board meeting, it became clear that the Board does not have a unified goal for Draft Addendum XXV, including the percent increase in egg production or the management tools under consideration. Given a motion from the prevailing side along with a two-thirds majority vote is needed to reconsider Draft Addendum XXV, the SNE Working Group does not see this as a viable option for the Board.
2. Review the Goals and Objectives under Which the SNE Stock is Managed – Given concern that the SNE stock may not be able to be rebuilt to historic levels, the SNE Working Group does support a review of the goals and objectives under which the SNE stock is managed. It is clear that the SNE stock is influenced by changing environmental conditions, including warming waters and changes in the distribution of predator species. As a result, the goals and objectives originally established under Amendment 3 (1997) may no longer be applicable. Should the Board desire, the SNE Working Group can compile and review the goals and objectives of Amendment 3, as well as subsequent addenda, and report back to the Board at the Winter Meeting. Staff notes that changes to the goals and objectives used to manage the stock will require an Amendment.
3. Engage with the Climate Change Working Group – The SNE Working Group also recommends that the Board engage with the Commission’s Climate Change Working Group to gain insight on how to manage a stock which is impacted by changing environmental conditions. The Commission’s Climate Change Work Group is currently developing recommendations on ways to manage stocks which have either been negatively or positively impacted by climate change, a discussion pertinent to the management of the SNE lobster stock. Depending on the direction and timeline of the Climate Change Working Group, there may be an opportunity to consider SNE Lobster as a case study, similar to how the Risk and Uncertainty Work Group is using striped bass as a case study for their work.
4. Develop TORs for the 2020 Stock Assessment Which Address Changes in the Stock – The Stock Assessment Subcommittee (SASC) is beginning work on the 2020 Stock Assessment and it is expected that draft Terms of Reference will be presented to the Board at the Winter Meeting. This stock assessment provides an opportunity for the Board to consider

new reference points which more accurately reflect the condition of the stock as well as environmental covariates in the model (i.e. climate drivers, predation, shell disease). The SNE Working Group recommends the Board incorporate TORs which address reference points and environmental drivers into the 2020 Stock Assessment, thereby tasking the SASC to review these issues.

5. Explore Ways to Reduce Latent Effort in LCMAs 4, 5, and 6: Under Addendum XVIII, LCMAs 2 and 3 are going through a series of trap reductions to scale the size of the fishery to the size of the resource. Similar actions have not taken place in LCMAs 4, 5, and 6 resulting in large amounts of latent effort. This is a concern as improvements in the stock could re-activate this effort and negate improvements in the stock's condition. As a result, the SNE Working Group recommends that the Board task LCMTs 4, 5, and 6 with developing strategies to reduce latent effort in their respective regions. When ready, LCMTs can present their proposals to the Board, at which point the Board may consider the initiation of an addendum. This process not only engages the LCMTs but also provides an opportunity for ASMFC staff and PDT members to work on Draft Addenda XXVI and XXVII before another addendum is initiated. It should be noted that this option increases the workload of TC members from states with fishermen in LCMAs 4, 5, and 6 as additional LCMT meetings will be needed to develop proposals. The Board should consider this workload and its implications, given the TC is beginning to engage on the development of the 2020 Stock Assessment.

## Appendix 1

**TO:** SNE Lobster Working Group  
**FROM:** Megan Ware, FMP Coordinator  
**DATE:** August 30, 2017  
**SUBJECT:** Potential Paths Forward in SNE Lobster

At the August meeting, the Lobster Board decided not to move forward with Addendum XXV for management use at the current time. After reviewing the proposals put forth by the Lobster Conservation Management Teams (LCMTs) and the report by the Technical Committee (TC), some Board members expressed concern that not all proposals will meet the required 5% increase in egg production. Other commented that the 5% increase in egg production is too low to protect the stock while others disagreed that further reductions in fishing effort are needed. Given the wide variety of perspectives, the Board decided to convene a Southern New England (SNE) Working Group to discuss future management of the stock, particularly in light of the role that climate change is having on the population. The purpose of this Subcommittee is to provide direction and guidance to the Board regarding the SNE stock.

Moving forward, there are several paths for the Subcommittee to consider. Staff has outlined five approaches for discussion by the Subcommittee; however, the Subcommittee may consider other options and there may be combinations of these ideas that work together too.

1. Engage With the Climate Change Work Group and Wait for Recommendations – Draft Addendum XXV notes the effect of climate change on the lobster stock and several Board members have expressed concern that the SNE stock cannot be rebuilt to historic levels. The Commission has a Climate Change Working Group which is currently evaluating management practices for affected stocks. As a result, the Board could engage in these discussions and/or wait for recommendations from this Working Group before proceeding with management changes for SNE.

2. Take Action to Reduce Latent Effort in LCMA 4, 5, and/or 6 – Addendum XVIII (2012) required all states within SNE to work with LCMTs to draft proposals to scale the size of the fishery to the size of the resource. Since that time, only LCMTs 2 and 3 have developed and implemented proposals to reduce their trap allocations. LCMTs 4, 5, and 6 have yet to address this Board task and, as a result, there is a significant number of latent traps in those management areas. This is a concern given this latent effort could be reactivated on a depleted stock. In their Addendum XXV proposal to the Board, LCMT 6 noted the large amount of latent effort in Long Island Sound and the desire to develop and implement measures to reduce the number of unused traps. As a result, the Board could task this LCMT, as well as LCMTs 4 and 5, to scale the size of their fishery to the size of the resource. This action would require an addendum.



3. Consider Future Management Action after the 2020 Stock Assessment – The next benchmark stock assessment is scheduled for 2020 and will provide the best available science on the SNE stock. The Board could wait until this information becomes available to consider further action in SNE.

4. Initiate an Amendment to Reconsider the Goals and Objectives for the SNE Stock – Under Amendment 3, the management objectives for the SNE stock include: 1) protecting, increasing, or maintaining the brood stock abundance at levels which would minimized risk of stock depletion and recruitment failure; 2) developing flexible regional programs to control fishing efforts; and 3) optimizing yield from the fishery while maintaining harvest at a sustainable level. If there is interest in adjusting the goals and objectives set forth in Amendment 3, particularly in light of climate change, an Amendment must be initiated. Typically, an Amendment takes at least two years to complete and is not implemented in the states until the 3<sup>rd</sup> year. The Amendment may also consider changes outside of the goals and objectives of the fishery, such as the simplification of the management program. The Board should consider the timing of an Amendment in relation to the 2020 Benchmark Stock Assessment.

5. Reconsider Draft Addendum XXV – A two-thirds majority vote is needed to reconsider action on Draft Addendum XXV. In reconsidering this addendum, the Board can re-evaluate the percent increase in egg production, the management tools which can be used to achieve the percent increase in egg production, or any of the other management issues and alternatives included in the public comment document. Given the divergent views on the Board, this may be the most difficult approach on which to gain a consensus. Management alternatives outside of the scope of the Draft Addendum can be considered; however, the document would have to be taken out for a second round of public hearings.

6. Other strategies/Combination of Strategies

As the Subcommittee considers the future direction of management in SNE, it may be important to consider the management priorities of the Lobster Board. Currently, the Board currently has two additional Addenda in progress: Addendum XXVI (harvester reporting and biological data collection) and Addendum XXVII (Gulf of Maine/Georges Bank stock). Addendum XXVI should make much needed improvements in the data collection program, and directly address some of the noted deficiencies in the last assessment. The Gulf of Maine/Georges Bank Addendum is intended to provide an additional buffer for the stock during a period when settlement indices are demonstrating warning signals for the future status of the resource. Should the Subcommittee and Board pursue further action in SNE, it will be important to prioritize tasks so that Commission staff focus on the most pertinent needs of the fishery.



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James Gilmore, Director

## Memorandum

April 3, 2017

**TO:** ASMFC American Lobster Management Board

**FROM:** Peter Clarke (NJDEP) and Kim McKown (NYDEC)

**SUBJECT:** LCMA 4 Proposal State and Federal Regulatory Consistency for Closed Seasons

This memo addresses two state – federal consistency concerns that have developed through the implementation of the 10% reduction requirement of Addendum XVII. These items relate to trap removal and implementation of the most restrictive rule during the closed season. These concerns are discussed below.

### **Trap Removal:**

#### **Background**

In order to accomplish a required 10% reduction in harvest as outlined by ASMFC Addendum XVII, Lobster Conservation Management Area (LCMA) 4 implemented rules requiring v-notch all egg bearing females coupled with a seasonal closure from February 1 to March 31. During the Winter 2012 American Lobster Board (Board) meeting, the Board decided that all directed fishery lobster traps must be removed from the water. The Board also decided that if a closed season extended four weeks or longer, a two-week grace period for removal of lobster traps and a one-week grace period for setting un-baited lobster traps would be allowed. In accordance with these determinations, NJ Division of Fish and Wildlife (DFW) and NY Department of Environmental Conservation (DEC) developed closed regulations that required trap removal with the appropriate grace period, but also allowed for the traps to remain in the water if they were being legally fished for other species (non-lobster directed traps). NY DEC and CT Department of Environment and Energy (DEEP) adopted similar rules for LCMA 6 (see Appendix 1).

Upon evaluation in 2014, the ASMFC Lobster Management Board determined that LCMA 4 did not reach the required 10% reduction in landings for fishing year 2013. Due to the reduction not being met with the combined v-notching and seasonal closure a seasonal closure from April 30-May 31 was applied alone for the 2015 fishing year as approved by the Board. The NJ DFW and NY DEC closed season rules were revised to

implement the new closure dates and new removal grace period, but the allowance for traps to remain in the water to allow fishermen to continue to legally fish for other species remained (see below).

In December 2014, the NJ DFW and NY DEC applied the seasonal closure with the following regulatory language:

**For NJ;** “A person fishing in ASMFC Lobster Management Area (LMA) 4 and/or 5 or that has designated LMA 4 and/or 5 for fishing on their Federal Fisheries or State Lobster Pot Permit shall not take or attempt to take, land, have in his or her possession, sell, or offer to sell any American lobster during the closed season of April 30 through May 31, inclusive. During the closed season, no dealer shall accept, have in his or her possession, buy or offer to buy, sell, or offer to sell any American lobster harvested from LMA 4 and/or 5. During the closed season, all lobster traps in LMA 4 and/or 5 must be removed from the water. However, a licensee shall have a two-week period from when the season closes to accomplish removal of all lobster traps. In addition, unbaited lobster traps may be set one week prior to the season reopening. *If the license holder is harvesting other species with lobster trap gear, the lobster trap gear does not need to be removed; however, it shall be tended at least every 30 days.*”

**For NY;** “The harvest and landing of lobsters from LMA 4 is prohibited from April 30th through May 31st. *During the April 30th through May 31st closure, lobster permit holders who use lobster traps or pots may set un-baited lobster traps or pots one week prior to the end of the closed season. No lobster trap or pot may be in the water from April 30th to May 24th, unless the lobster permit holder also holds appropriate license(s) to harvest other species from his or her traps or pots.*”

The key wording for both statutory regulations is the ability of lobster pot fishermen to continue harvesting other species, particularly Jonah crabs during the closed period.

### **Current Issue**

In 2015, a Federal Registry Notice was released stating that all lobster gear needed to be removed from the water for extent of the closed period. This places an unfair burden on fishermen to remove gear for a 32 day closure. It takes a fisherman with a 1200 trap allocation in LCMA 4 approximately 12 days to remove all his gear. Coupled with poor weather during April, the removal of gear could take up to 4 weeks to accomplish effectively phasing in the seasonal closure over the course of a month instead of the required 32 days.

For the last 45 years, the Area 4 lobster grounds which are soft bottom have been protected from mobile gear (scallop dredge and otter trawl) creating an effective sanctuary for lobsters and other marine fish. With the opening of this ground, the mobile fleet will move in and fish heavily upon the resources there. Lobster mortality will increase by up to 15 percent and the mobile gear will cause significant damage to previously protected habitat.

Because of these reasons, we urge the ASMFC Lobster Management Board to adopt one of the following options for trap removal for Area 4 fishermen in both State and Federal waters

Option 1 (preferred):

Allow LCMA 4 fishermen the ability to continue fishing fixed lobster gear for other legal species (Jonah crab) during the closed period.

Option 2:

Allow LCMA 4 fishermen to keep traps in the water that have been disabled by removing the escape panel or permanently opening the top of the trap so that any animal that entered the trap could escape.

If approved, we ask the ASMFC to forward the Board findings to NMFS for an immediate retraction to the current Registry to allow these changes to take place for the 2017 fishing season.

### **Most Restrictive Rule:**

#### **Background:**

LCMA's 4 and 6 both implemented closed seasons to accomplish the required 10% reduction in harvest of Addendum XVII, but during different times of the year. The LCMA 6 closed season is from September 8 through November 28, while the LCMA 4 closed season was originally from February 1 through March 31 and was revised to April 30 through May 31. Since there are NY lobstermen with joint LCMA 4 and 6 trap allocations, the question of whether the most restrictive rule applied to closed seasons was discussed at the Winter 2012 Board meeting. Due to concerns of potential shifting of effort, the Board determined that LCMT measures required the most restrictive rule apply to participants with multiple LCMA permits.

Due to the Board's determination, NY DEC adopted regulations that required permit holders with multiple area designations to abide by the most restrictive rule. The following is NY's most restrictive rule: *"Permittees who designate more than one LMA in their lobster permit application shall abide by the closed seasons rules in all designated LMAs, regardless of where they are fishing. Any person who possesses more than one commercial lobster permit shall abide by the closed season rules of the LMAs designated on all of their permits, regardless of where they are fishing. Any permittee who fails to designate an LMA on their application shall abide by all the closed season rules of the LMAs 1, 2, 3, 4, 5, 6, and Outer Cape Cod (OCC). The department shall provide license holders written notice of the current closed season rules of LMAs 1, 2, 3, 4, 5, 6 and OCC annually."*

#### **Current Issue:**

The 2015 Federal Registry Notice was silent about the most restrictive rule. NOAA Fisheries Lobster Information Sheet, (<https://www.greateratlantic.fisheries.noaa.gov/regs/infodocs/lobsterinfosheet.pdf>), has a section on the most restrictive rule, specifically mentioning trap allocations, lobster

size, v-notch rules, trap and vent size; but doesn't include season closures. Currently NOAA fisheries is not requiring lobster permit holder with joint LCMA 4 and 5 trap tag allocations to abide by the most restrictive rule as was required in NY.

NY's waters include 2 Lobster Management Areas (LCMA) 6 and 4. In addition, the south fork of Long Island is at the confluence of LCMA 6, 4, and 2. Many of NY's south shore lobster permit holders, in particular those on the south fork near Montauk, have traditionally fished in areas that now are part of multiple LMAs. These permit holders used to regularly move their pots throughout the year following the lobsters. Due to the implementation of the most restrictive rule, these lobstermen have had to remove one of the LCMA's that they historically fished in from their permit. This has caused significant financial hardship. Federal permit holders with joint LCMA 4 and 5 permits are not required to do this and are not impacted by this hardship.

Because of these reasons, we urge the ASMFC Lobster Management Board to adopt one of the following options for the most restrictive rule as it applies to closed seasons for permit holders with multi-area trap tag allocations in both State and Federal waters.

Option 1 (preferred):

Exempt closed seasons from the most restrictive rule (as currently done for federal permits).

Option 2:

Mandate that both federal and state multi-area permit holders abide by the most restrictive rule, which means they must abide by all season closures implemented in the areas listed on their permits.

If option 1 is approved, NY will remove the most restrictive language as it applies to closed seasons from NY state regulations. If option 2 is approved we ask the ASMFC to forward the Board findings to NMFS and request that they implement the most restrictive rule for closed seasons for federal permit holders.

Thank you for your consideration.

## **Appendix 1**

### **LCMA 6 rules:**

#### **NY DEC:**

“No lobster may be taken from Atlantic States Marine Fisheries Commission Area Six from September eighth through November twenty-eighth pursuant to the recommendations of the Area’s Lobster Conservation Management Team as required by the Interstate Fishery Plan for Lobsters adopted by the Atlantic States Marine Fisheries Commission.

b. During the September eighth through November twenty-eighth closure, lobster permit holders who use lobster traps or pots shall remove lobster traps and pots from the water by September twenty-second.

c. No lobster trap or pot may be in the water from September twenty-second until November fourteenth unless the lobster permit holder also holds a permit or license that authorizes them to harvest other species from their lobster traps or pots.

d. Lobster permit holders may set unabated lobster traps or pots beginning November fourteenth.

e. Lobster permit holders may set baited lobster traps or pots beginning November twenty-first.”

#### **CT DEEP:**

##### **“Season**

1. The closed season for Lobster Management Area (LMA) 6 (Long Island Sound and western Block Island Sound) is September 8 through November 28, inclusive, and applies to both recreational and commercial fisheries and all gears. Between those dates possession of lobsters taken from LMA 6 or from traps with LMA 6 trap tags is prohibited.
2. All lobster gear must be removed from the water during the closure, except that the ASMFC plan allows fishermen two weeks at the beginning of the closure period (September 8 through September 21) to remove gear and two weeks prior to the late fall reopening (November 15 through November 28) to redeploy the gear. Traps cannot be baited until one week prior to reopening (November 22).
3. An exception to the gear removal requirement is provided for fishermen who hold a conch (whelk) license for those lobster pots being actively fished for whelk. The take and landing of lobsters during these exception periods is prohibited.”

2017 REVIEW OF THE  
ATLANTIC STATES MARINE FISHERIES COMMISSION  
FISHERY MANAGEMENT PLAN

**FOR Jonah Crab  
(*Cancer borealis*)**

**2016 FISHING YEAR**



*Prepared by the Plan Review Team*

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**2017 REVIEW OF THE ATLANTIC STATES MARINE FISHERIES COMMISSION FISHERY  
MANAGEMENT PLAN FOR JONAH CRAB (*Cancer borealis*)**

**2016 FISHING YEAR**

**1.0 Status of the Fishery Management Plan**

<u>Year of ASMFC Plan's Adoption:</u>	FMP (2015)
<u>Framework Adjustments:</u>	Addendum I (2016) Addendum II (2017)
<u>Management Unit:</u>	Maine through North Carolina
<u>States with a Declared Interest:</u>	Maine through Virginia (Excluding Pennsylvania and DC)
<u>Active Committees:</u>	American Lobster Management Board, Technical Committee, Plan Development Team, Plan Review Team, Advisory Panel

**2.0 Status of the Fishery**

**2.1 Commercial Fishery**

Historically, Jonah crab was taken as bycatch in the lobster fishery; however, in recent years a directed fishery has emerged causing landings to rapidly increase. Throughout the 1990's, landings fluctuated between approximately 2 and 3 million pounds and the overall value of the fishery was low. In the early 2000's landings began to increase with over 7 million pounds landed in 2005. By 2014, landings had almost tripled to 17 million pounds and a value of nearly \$13 million dollars. This rapid increase in landings can be attributed to an increase in the price of other crab (such as Dungeness), creating a substitute market for Jonah crab, as well as a decrease in the abundance of lobsters in Southern New England, causing fishermen to supplement their income with Jonah crab.

Today, Jonah crab and lobster are considered a mixed crustacean fishery in which fishermen can target lobster or crab at different times of the year based on slight gear modifications and small shifts in the areas in which the traps are fished. While the majority of Jonah crab is harvested as whole crabs, fishermen from several states, including New York, Maryland and Virginia, land claws. Jonah crab claws are relatively large and can be an inexpensive substitute for stone crab claws. As a result, they can provide an important source of income for fishermen. A historic claw fishery takes place along the Delmarva Peninsula where small boat fishermen harvest Jonah crab claws because they do not have a seawater storage tank on board to store whole crabs.

In 2016, 15.0 million pounds of Jonah crab were landed along the Atlantic Coast, representing \$11.9 million in ex-vessel value. The states of Massachusetts (68%) and Rhode Island (24%) are

the largest contributors to landings in the fishery. Landings in descending order, also occurred in Maine, New Jersey, New York, New Hampshire, Maryland, Virginia, Connecticut, and Delaware. Over 545 individuals participate in the commercial Jonah crab fishery coastwide.

## **2.2 Recreational Fishery**

The magnitude of the Jonah crab recreational fishery is unknown at this time; however, it is believed to be quite small as compared to the size of the commercial fishery.

## **3.0 Status of the Stock**

Jonah crab are distributed in the waters of the Northwest Atlantic Ocean primarily from Newfoundland, Canada to Florida. The life cycle of Jonah crab is poorly described, and what is known is largely compiled from a patchwork of studies that have both targeted and incidentally documented the species. Female crab (and likely some males) are documented moving inshore during the late spring and summer. Motivations for this migration are unknown, but maturation, spawning, and molting have all been postulated. It is also generally accepted that these migrating crab move back offshore in the fall and winter. Due to the lack of a widespread and well-developed aging method for crustaceans, the age, growth, and maturity of Jonah crab is poorly described.

The status of the Jonah crab resource is relatively unknown and no range wide stock assessment has been conducted. Massachusetts, Rhode Island, Maine, and New Hampshire conduct inshore state water trawl surveys and NOAA Fisheries conducts a trawl survey in federal waters which collects data on Jonah crab abundance and distribution. Several studies are on-going (Section 7.0) to elucidate information on the species.

## **4.0 Status of Management Measures**

### **Interstate Fishery Management Plan for Jonah Crab**

Jonah crab is managed under the Interstate Fishery Management Plan (FMP) which was approved by the American Lobster Management Board in August 2015. The goal of the FMP is to promote conservation, reduce the possibility of recruitment failure, and allow for the full utilization of the resource by the industry. The plan lays out specific management measures in the commercial fishery. These include a 4.75" minimum size with zero tolerance and a prohibition on the retention of egg-bearing females. To prevent the fishery from being open access, the FMP states that participation in the directed trap fishery is limited to lobster permit holders or those who can prove a history of crab-only pot fishing. All others must obtain an incidental permit. In the recreational fishery, the FMP sets a possession limit of 50 whole crabs per person per day and prohibits the retention of egg-bearing females. Due to the lack of data on the Jonah crab fishery, the FMP implements a fishery-dependent data collection program. The Plan also requires harvester and dealer reporting along with port and sea sampling.

### **Addendum I**

Addendum I establishes a bycatch limit of 1,000 pounds of crab/trip for non-trap gear (e.g., otter trawls, gillnets) and non-lobster trap gear (e.g., fish, crab, and whelk pots) effective January 1, 2017. In doing so, the Addendum caps incidental landings of Jonah crab across all

non-directed gear types with a uniform bycatch allowance. While the gear types in Addendum I make minimal contributions to total landings in the fishery, the 1,000 crab limit provides a cap to potential increases in effort and trap proliferation.

### Addendum II

Addendum II establishes a coastwide standard for claw harvest. Specifically, it permits Jonah crab fishermen to detach and harvest claws at sea, with a required minimum claw length of 2.75" if the volume of claws landed is greater than five gallons. Claw landings less than five gallons do not have to meet the minimum claw length standard. The Addendum also establishes a definition of bycatch in the Jonah crab fishery, whereby the total pounds of Jonah crab caught as bycatch must weigh less than the total amount of the targeted species at all times during a fishing trip. The intent of this definition is to address concerns regarding the expansion of a small-scale fishery under the bycatch limit. *The implementation deadline for Addendum II is January 1, 2018.*

## **5.0 Fishery Monitoring**

The Interstate Fishery Management Plan for Jonah Crab states that *"at a minimum, state and federal agencies shall conduct port/sea sampling to collect the following types of information on landings, where possible: carapace width, sex, discards, egg-bearing status, cull status, shell hardness, and whether the landings are whole crabs or parts."* The Plan also establishes coastwide mandatory reporting and fishery dependent sampling with 100% dealer and harvester reporting. Jurisdictions that currently require less than 100% harvester reporting in the lobster fishery are required to maintain, at a minimum, their current programs and extend them to Jonah crab. De minimis states are not required to conduct fishery-independent sampling or port/sea sampling.

Overviews of the states' port and sea sampling are as follows:

- Maine: A sea sampling protocol for Jonah crab has been established to collect data on shell width, sex, egg bearing status, cull status, and shell hardness. No Jonah crab were sampled during lobster sea sampling trips in 2016. Maine's lobster port sampling program was suspended in 2011.
- New Hampshire: Staff sampled 183 Jonah crabs on 7 sea sampling trips and collected information on sex, presence of eggs, cull condition, molt stage, and carapace length. NH initiated a quarterly port sampling program in late 2016. Sampling took place at shellfish dealers, where an interview with the captain occurred and a biological sample was taken. A total of 172 Jonah crab were sampled through this new program.
- Massachusetts: Staff conducted 6 sea sampling trips and sampled 6,213 Jonah crab. Types of information collected include shell width, sex, egg bearing status, cull status, shell hardness, and whole crabs vs. parts. 14 port sampling trips from 11 vessels were also conducted, with a total of 9,449 Jonah crab sampled. Catch was 99.9% male.
- Rhode Island: Through a collaboration with URI-GSO and the state, 8 sea sampling trips measuring 5,788 Jonah crab were conducted as part of a Masters student's thesis project. Due to staff and budget constraints, RI DFW did not conduct its own sea or port sampling.

- Connecticut: No sea sampling or port sampling trips were conducted for Jonah crab.
- New York: Staff made 13 attempts to obtain trips with Jonah crab fishermen but no trips were conducted. Staff conducted 1 port sampling trip and sampled 10 Jonah crab.
- New Jersey: No sea or port sampling trips were conducted for Jonah crab.
- Delaware: No sea or port sampling trips were conducted for Jonah crab.
- Maryland: No sea or port sampling trips were conducted for Jonah crab.
- Virginia: No sea or port sampling trips were conducted for Jonah crab.

## **6.0 Status of Surveys**

The Interstate Fishery Management Plan for Jonah crab encourages states to expand current lobster surveys (i.e. trawl surveys, ventless trap surveys, settlement surveys) to collection biological information on Jonah crabs. The following outlines the fishery-independent surveys conducted by each state. Figures 11-13 also show the results of the NMFS Bottom Trawl survey for the Gulf of Maine, Georges Bank, and Southern New England.

### ***Maine***

#### **A. Settlement Survey**

The Maine settlement survey was primarily designed to quantify lobster young-of-year (YOY), but has also collected Jonah crab data from the sites throughout the survey. Jonah crab information collected includes carapace width, sex (when large enough), ovigerous condition, claw status, shell hardness, and location. The density of YOY Jonah crab has increased over the past two decades with high values in 2013 and 2016 (Figure 1). Similarly, the density of all Jonah crabs noticeably increased in the early 2000's and has remained high since (Figure 1).

#### **B. State Trawl Survey**

The ME/NH Inshore Trawl Survey began in 2000 and is conducted biannually (spring and fall) through a random stratified sampling scheme. Jonah crab data has been collected throughout the history of this survey. The 2016 spring survey completed 122 tows and sampled a total of 1,378 Jonah crabs. The spring abundance indices for Jonah crab have significantly increased since 2013 (Figure 2). The 2016 fall survey completed 83 tows and sampled 996 Jonah crab. Abundance indices for Jonah crab were slightly less than 2015 but were still well above the time-series average (Figure 2).

#### **C. Ventless Trap Survey**

Maine began its Juvenile Lobster Ventless Trap Survey in 2006. Since the beginning of the survey, Jonah crab counts were recorded by the contracted fishermen, but the confidence in this data in the early years is low because of the confusion between the two *Cancer* crabs and similar common names. In 2016, the survey began collecting biological data for Jonah crab including carapace width, sex, ovigerous condition, claw status, shell hardness, and location. Figure 3 shows the catch of Jonah crabs per trap in 2016. The majority of traps caught less than 5 crabs; however, a handful of traps had upwards of 50 crabs.

## **D. Sea Urchin Survey**

Maine DMR conducts an annual dive survey of the sea urchin stock within state waters. Beginning in May and working through June, divers evaluated approximately 60 1-meter square quadrats at each site they visited. Beginning in 2004, the data collected on crabs was expanded to include carapace width and sex. A total of 117,337 quadrats have been evaluated for Jonah crab through 2016. Counts of Jonah crab from this survey show a marked increase from 2005-2008 (Figure 4).

## ***New Hampshire***

### **A. Settlement Survey**

Since 2009, species information has been collected on Jonah crabs in the New Hampshire Fish and Game portion of the American Lobster Settlement Index. Figure 5 depicts the CPUE (#/m<sup>2</sup>) of Jonah crabs for all NH sites combined, from 2009 through 2016. This time series shows an upward trend to a time series high in 2012, followed by relatively high levels from 2014 through 2016.

### **B. Ventless Trap Survey**

Since 2009, NHF&G has been conducting the coastwide Random Stratified Ventless Trap Survey in state waters (statistical area 513). A total of six sites were surveyed twice a month from June through September in 2016. Beginning in 2016 all Jonah crabs were evaluated for sex and carapace length. A total of 39 Jonah crabs over 8 trips were measured during the 2016 sampling season.

## ***Massachusetts***

### **A. Settlement Survey**

The MA DMF Lobster Settlement Survey began measuring Jonah crabs and making a greater effort to identify small *Cancer* crabs to species in 2016. Appropriate analyses are being developed to properly explore these data as numerous stations have been added and/or removed and the level of identification of *Cancer* crabs has varied since the survey began in 1995. Figure 6 is a length frequency plot of all crabs caught during the 2016 survey. Most crabs are below 25 mm CW. Though Jonah crab size-at-age is not very well known, these are likely age-0 crabs.

### **B. Ventless Trap Survey**

The MA DMF Ventless Trap Survey collects information on the distribution of Jonah crabs. Figure 7 shows the distribution of Jonah crab in 2016. The largest catches of crabs are caught in the deep survey stratum (41-60 m) in the federal waters portion of the survey, southwest of Buzzards Bay. MA DMF began collecting Jonah crab carapace width data in the ventless trap survey in 2015. The size structure of the catch was similar in 2015 and 2016 (Figure 8).

### **C. Trawl Survey**

The MA DMF spring and fall trawl surveys collect biological information on Jonah crab. There is an upward trend in relative abundance in both seasons, particularly in the Spring survey, since 2010 (Figure 9).

## ***Rhode Island***

### **A. Ventless Trap Survey**

Since its inception in 2006, the RI Ventless Trap Survey (VTS) has recorded counts of Jonah crabs in each pot. In 2014, carapace width and sex were also recorded for all individuals. In 2016, the VTS was conducted during the months of June-August and over 18 sampling trips. A total of 1,302 Jonah crabs were sampled. All sampling was conducted in LMA 2, NMFS Statistical Area 539. The stratified mean catch per trap on a six pot (three ventless, three vented) trawl was 0.55 Jonah crabs, the highest of the time series (Figure 10).

### **B. Trawl Survey**

RIDEM has conducted Spring and Fall trawl surveys since 1979, and a monthly trawl survey since 1990. However, invertebrates (other than lobsters) have not been counted for much of these time series. In 2015, the survey began counting Jonah crabs specifically. Given the short time series of Jonah crab data available and few Jonah crab observations by the surveys, the information is not available at this time. As the datasets for Jonah crab from these trawl surveys grow, these data will be provided as abundance indices.

## ***Connecticut***

### **A. Trawl Survey**

Jonah crab abundance is monitored through the Long Island Sound Trawl Survey (LISTS) during the spring (April, May, June) and fall (September and October) cruises, all within NMFS statistical area 611. The survey documents the number of individuals caught and total weight per haul by survey site in Long Island Sound. The Long Island Sound Trawl Survey caught one Jonah crab in the fall 2007 survey and two in the fall 2008 survey. Both observations occurred in October at the same trawl site in eastern Long Island Sound. No Jonah crabs have been observed in the survey since 2008.

## **7.0 On-Going Research Projects**

### **A. Maturity Study**

MA DMF, in collaboration with CFRF, is finishing a Jonah crab maturity study. The study suggests that females mature at a smaller size than males (~88mm carapace width vs. ~117mm carapace width in Southern New England); however, the gonadal maturity of small male crabs still needs to be determined. A graduate student from UMES is also conducting a thesis on Jonah crab maturity and fecundity and it is expected that this work will be completed within the year.

### **B. Tagging Study**

MA DMF, in collaboration with AOLA, NH F&G, and ME DMR, is conducting a Jonah crab tagging study. Preliminary data suggests that Jonah crab are not migrating far; however, this could mask seasonal migrations to and from the same location. Through the project, 20,000 t-bar tags and 20,000 zip-tie tags will be deployed. It is expected that the project will finish in 2018.

### **C. Declawing Study**

NH F&G has conducted an in-lab study to investigate the mortality associated with declawing of Jonah crabs. To date, 5 trials have been completed over 3 seasons. Results indicate a 15% mortality rate for control crabs, a 56% mortality rate for crabs with one claw removed, and a 75% mortality rate for crabs with both claws removed. The next step is to replicate this study in the ocean to see if results are similar.

### **D. Growth and Fishery Dependent Data**

A graduate student at URI is completing a Master's Thesis on Jonah crab, focusing on growth data and biological sea sampling in statistical areas 537 and 529. To complete the growth study, morphometric analysis as well as calculation of growth per molt are being conducted. Preliminary results suggest that the growth rates between males and females are statistically different.

### **E. CFRF Research Fleet**

The Commercial Fisheries Research Foundation (CFRF) has expanded their lobster commercial research fleet to sample Jonah crab. Biological data collected include carapace width, sex, shell hardness, egg status, and disposition. Currently, 17 vessels participate in the Jonah crab sampling program.

## **8.0 State Compliance**

- New York has not yet implemented the full suite of management measures required under the Jonah Crab FMP or Addendum I. New York crab legislation currently prohibits the harvest of female crabs with eggs and recreational harvest is limited to 50 crabs. The 4.75" minimum carapace width, the 1000 crab bycatch limit, and commercial rules regarding crab part retention have not been implemented but are included in a current regulatory proposal and are expected to be adopted in early 2018.
- Delaware has not yet implemented the management measures required under the Jonah Crab FMP or Addendum I. Delaware delayed implementation of the regulations anticipating a change in the lobster regulations due to Addendum XXV. Given the regulatory process is costly and the lobster/Jonah crab fishery is quite small in Delaware, the state hoped to do these regulatory actions together. Given that lobster regulatory changes are not required at this time, the state is moving forward with implementation of the Jonah crab regulations and they are expected to be completed by early 2018.

## **9.0 De Minimis Requests.**

The states of Virginia, Maryland, and Delaware have requested *de minimis* status. According to the Interstate Fishery Management Plan for Jonah crab, states may qualify for *de minimis* status if, for the preceding three years for which data are available, their average commercial landings (by weight) constitute less than 1% of the average coastwide commercial catch. Delaware, Maryland, and Virginia meet the *de minimis* requirement.

## 10.0 Regulatory Changes

- Maine DMR adopted regulations to expand the existing lobster and crab harvesting closure in the Penobscot River in order to protect public health due to the risk of mercury contamination.

## 11.0 Research Recommendations

The following research questions were compiled by the Jonah Crab TC and need to be answered in order to complete a coastwide stock assessment.

- **Growth Rates** – While there has been some research on Jonah crab growth rates, more studies are needed to determine growth rates along the entire coast. In particular, it is necessary to determine the molt frequency, molt increment, and if there is a terminal molt.
- **Maturity and Reproduction** – Studies are needed to determine the size at maturity of crabs in different regions, the size ratio of mating crabs, and sperm limitations.
- **Mortality Rates in the Claw Fishery** – An in-lab study investigating mortality associated with the claw fishery has been conducted; however, this mortality study should be replicated in the field and in different regions along the coast. It is also unclear how long it takes to regenerate a claw.
- **Migration** – There are several tagging studies on-going in the Jonah crab fishery. Hopefully these studies will elucidate the migrations of Jonah crab as well as seasonal habitat preferences.
- **Natural Mortality** – An estimate of natural mortality must be developed for Jonah crab in order to carry out a stock assessment. In particular, it will be critical to determine the natural mortality of the adult size crabs.

## 12.0 Plan Review Team Recommendations

The following are recommendations from the Plan Review Team:

- The PRT recommends the Board approve the *de minimis* requests of DE, MD, and VA.
- The PRT recommends the Jonah Crab TC evaluate the sea sampling needs of the fishery, particularly given some states did not conduct sea/port sampling in 2016 and a large portion of landings occur in two states.
- The PRT also recommends that the Jonah Crab TC discuss standard methods for reporting survey data in compliance reports. This includes a common unit of measure as well as a standard definition for young-of-year.
- The PRT highlights the importance of all states implementing the 4.75” minimum carapace width in the Jonah crab fishery, especially in regards to issues of interstate commerce.
- As states implement Addendum 2, which addresses claw landings in the Jonah crab fishery, the PRT highlights the importance of disposition reporting.
- The PRT recommends continued research of the Jonah crab species so that a coastwide stock assessment can be completed in the near future.

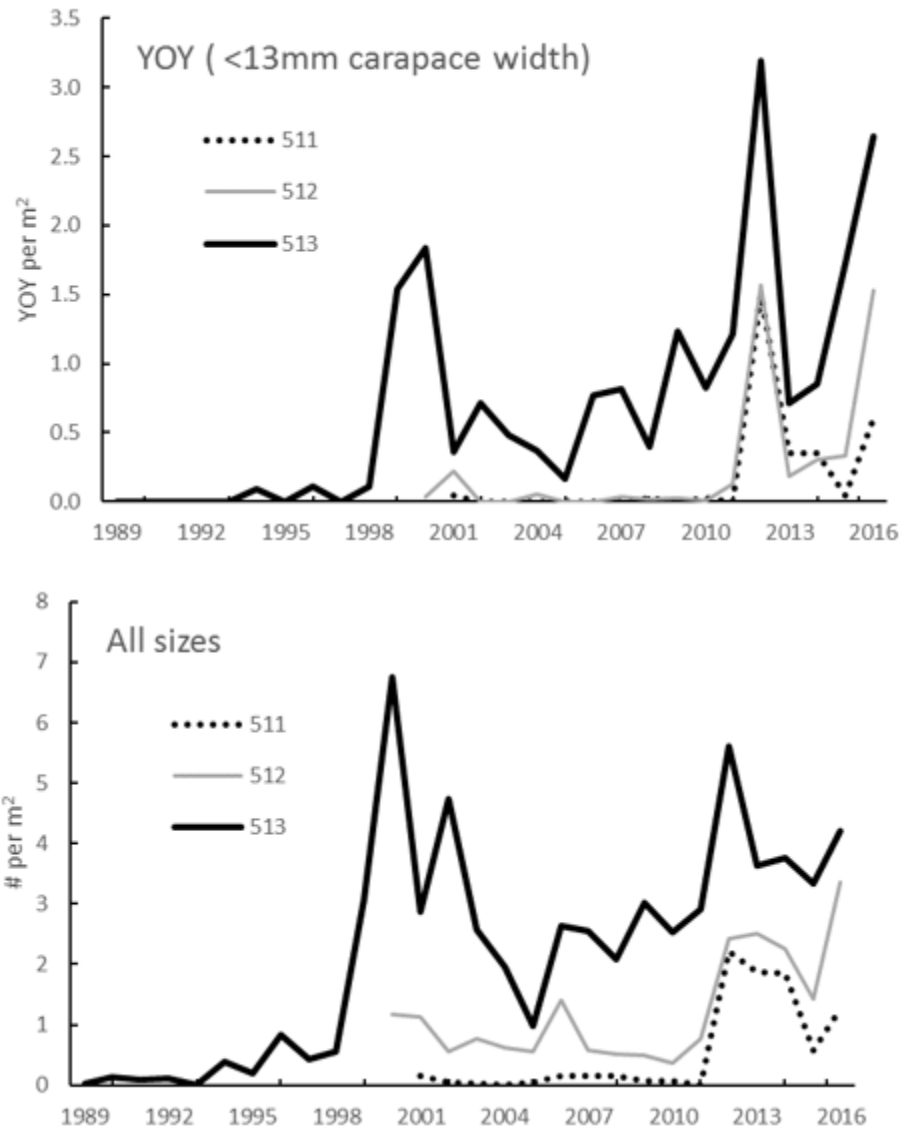


## 12.0 Tables

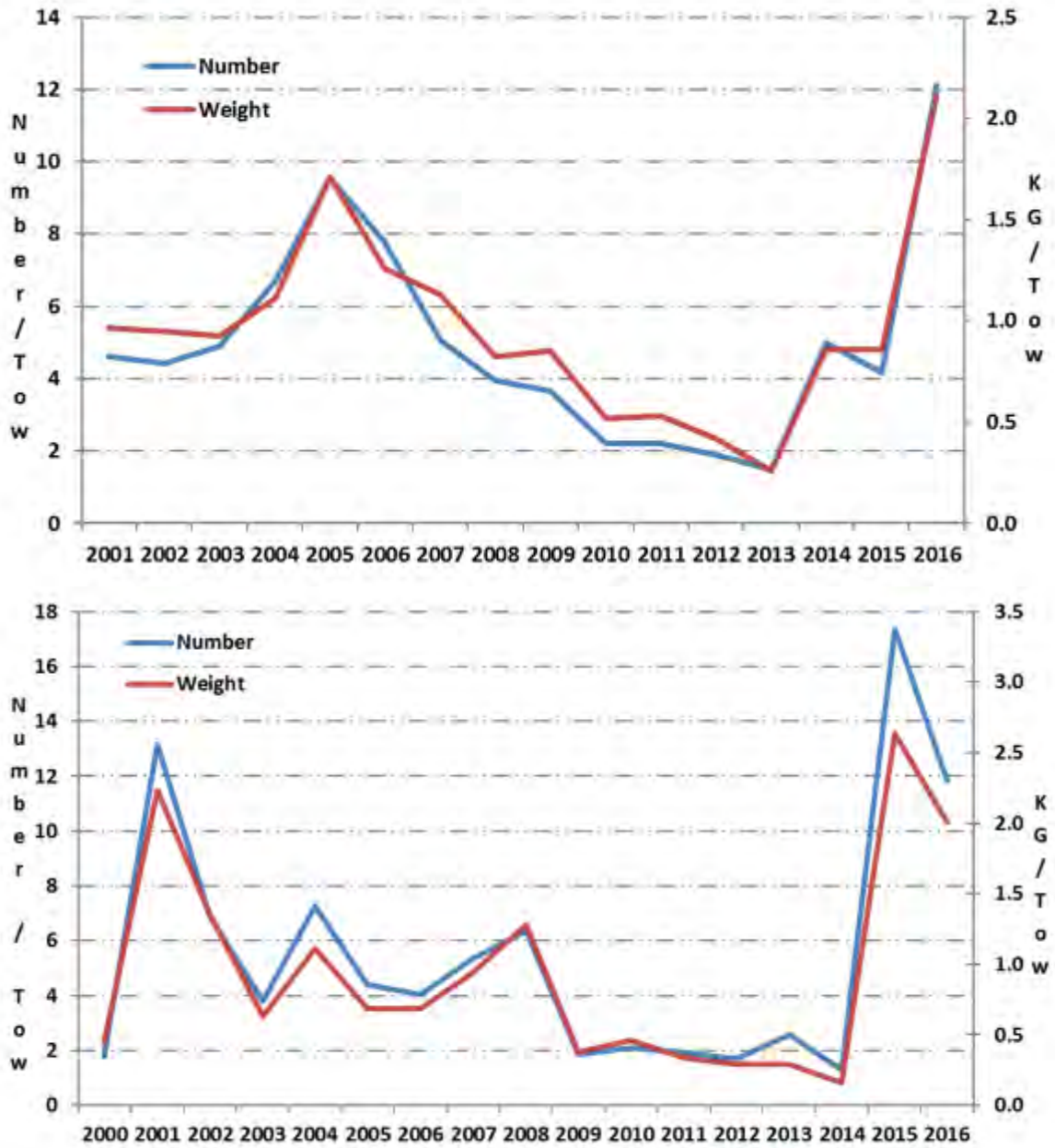
**Table 1.** Landings (in pounds) of Jonah crab by the states of Maine through Virginia. 2010-2015 landings were provided by ACCSP. 2016 landings were submitted by the states as a part of the compliance reports. *C= confidential data*

	ME	NH	MA	RI	CT	NY	NJ	DE	MD	VA	Total
<b>2010</b>	1,093,962	C	5,689,431	2,922,404	C	968,122	28,400		18,045	C	10,890,910
<b>2011</b>	1,096,592	C	5,379,792	2,540,337	C	69,440	26,286		92,401	C	9,273,622
<b>2012</b>	556,675	C	7,540,510	3,286,569	C	609	68,252		C	C	11,662,713
<b>2013</b>	379,073	340,751	10,087,443	4,397,734	51,462	C	7,803		C	C	15,474,240
<b>2014</b>	344,290	404,703	11,858,702	4,123,040	50,070	C	33,104	C	153,714	C	16,974,364
<b>2015</b>	309,715	C	9,096,374	3,861,260	7,989	C	68,116	C	30,244	C	13,565,974
<b>2016</b>	620,950	150,342	10,130,257	3,650,760	C	170,996	246,090	C	C	C	14,990,066

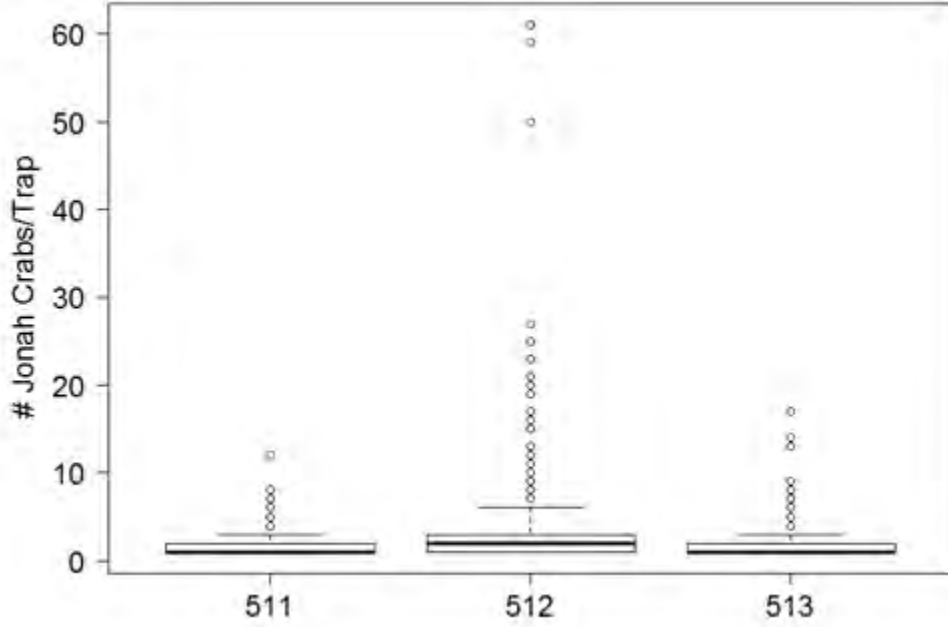
### 13.0 Figures



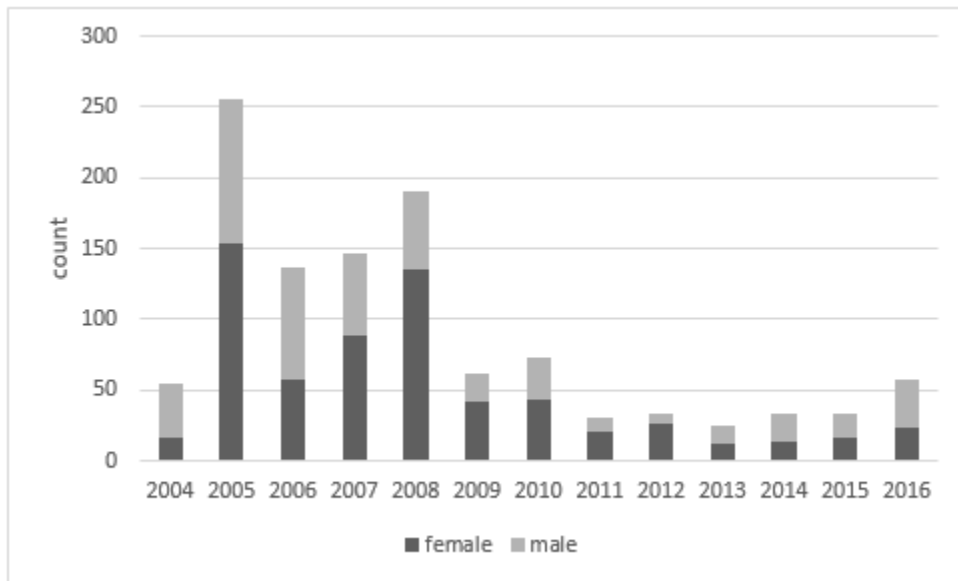
**Figure 1:** The density of Jonah crabs measured over time in the Maine Settlement Survey by statistical area. The top graph shows the density of young of year Jonah crab and the bottom graph shows the density of all Jonah crabs.



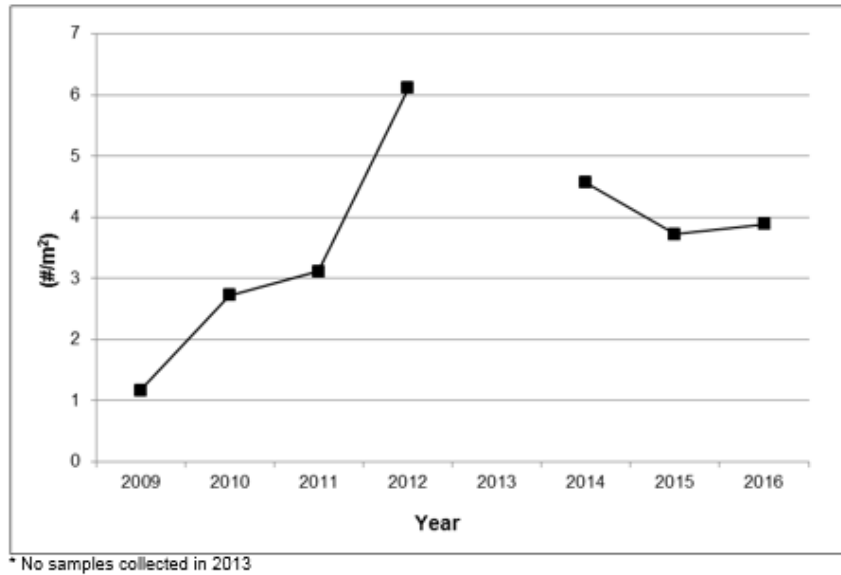
**Figure 2:** Maine-New Hampshire survey abundance indices for Jonah crab, 2001-2016. Results of the spring survey are on the top and results from the fall survey are on the bottom.



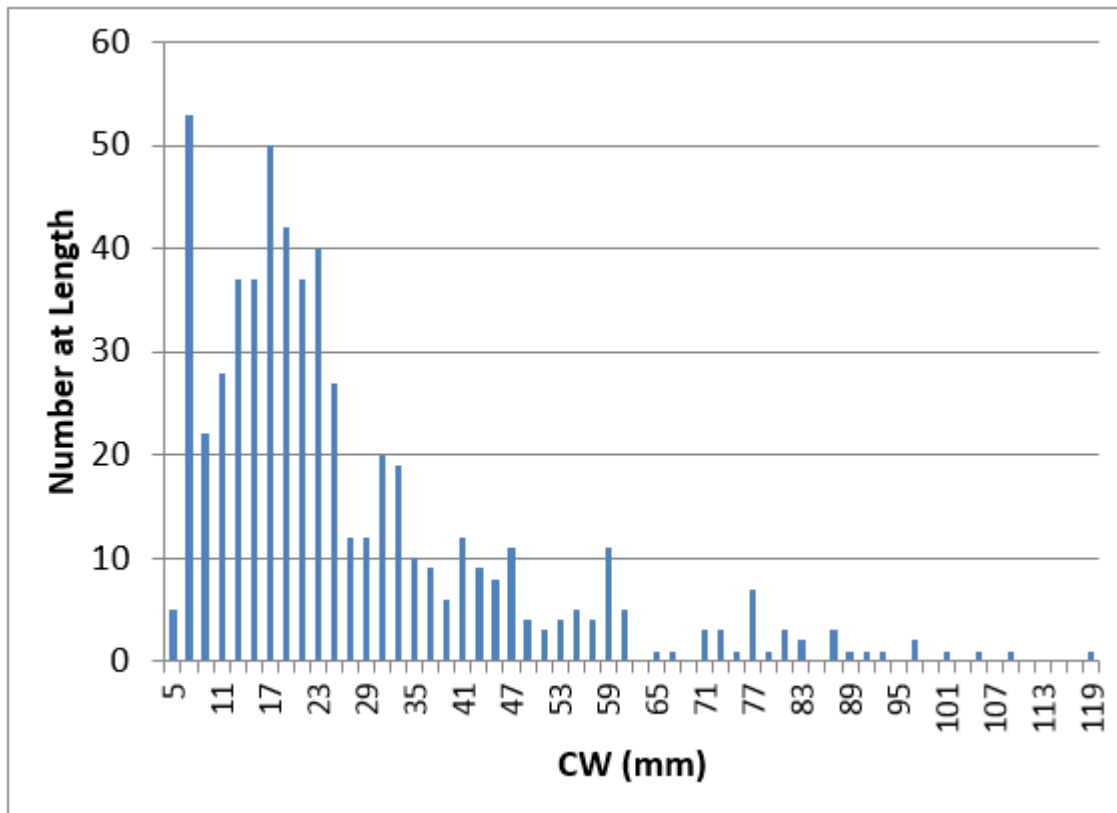
**Figure 3:** Catch per trap of Jonah crabs in the 2016 Maine Ventless Trap Survey by statistical area.



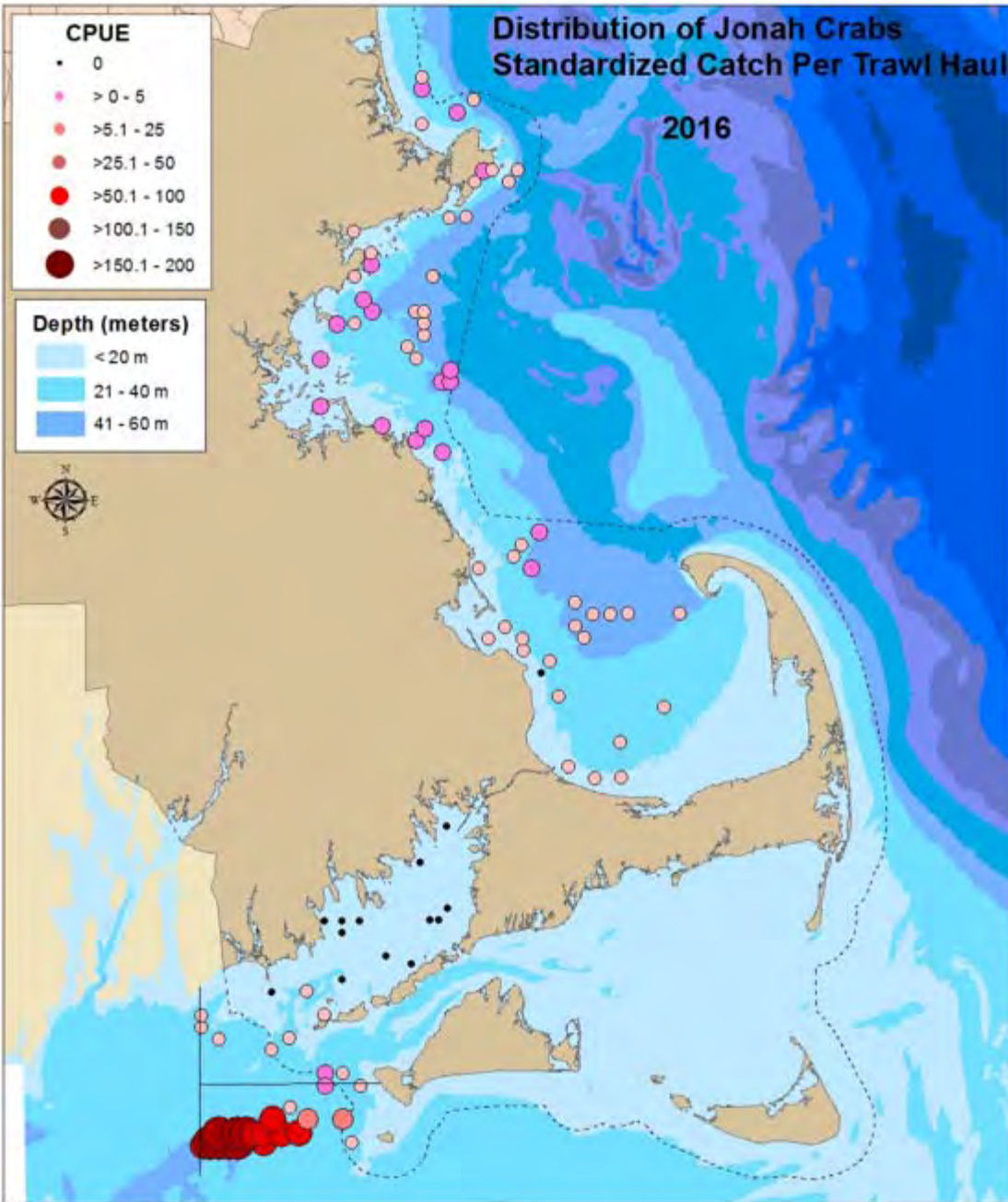
**Figure 4:** Observed crabs from the Maine Sea Urchin Survey (statistical area 511).



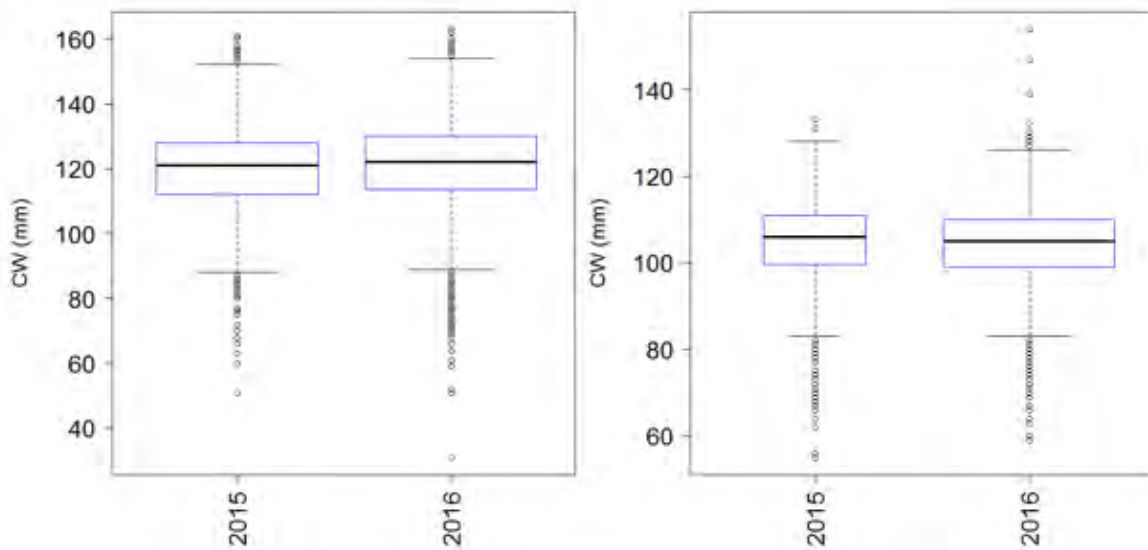
**Figure 5:** Catch per unit effort (#/m<sup>2</sup>) of Jonah crabs during the American Lobster Settlement Index Survey, in New Hampshire, from 2009 through 2016.



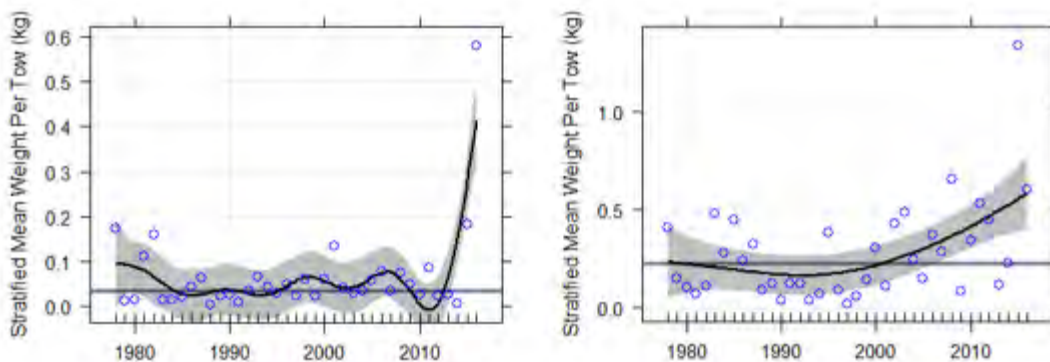
**Figure 6:** Size frequency of all Jonah crabs caught in the 2016 MA DMF Lobster Settlement Survey.



**Figure 7.** 2016 Catch per unit of effort (CPUE) from MA DMF Ventless Trap Survey. Catch is standardized to a six pot trawl consisting of three vented traps and three ventless traps.



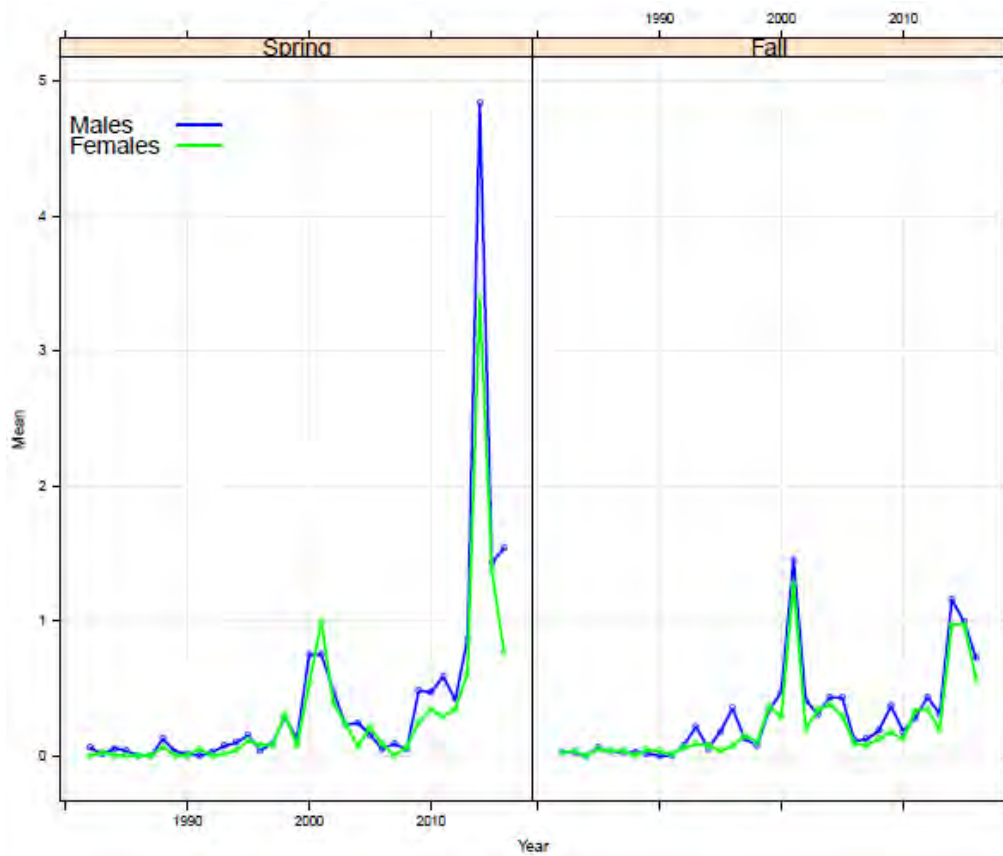
**Figure 8.** Male (left) and female (right) size distribution from MA DMF Ventless Trap Survey. The survey started measuring Jonah crabs in 2015. Black line is monthly median, top of the blue box is the 75th quartile, the bottom of the blue box is the 25th quartile, dashed lines are 1.5 times the interquartile range, circles are outliers, and box width is representative of sample size.



**Figure 9.** Jonah crab (sexes combined) stratified mean weight per tow from all regions of the MA DMF Spring (left) and Fall (right) Trawl Survey. Black line is the generalized additive model fit, grey line is the time series median, shaded area is  $\pm$  two times the standard error of the predicted value.

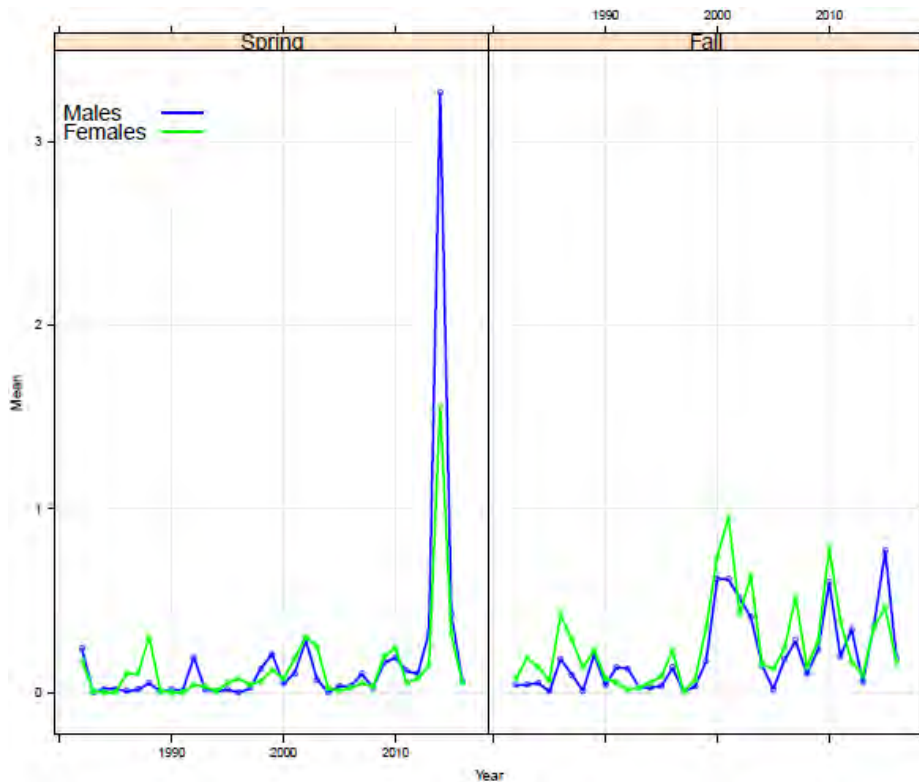


**Figure 10:** Stratified mean catch (#) per trap in a VTS haul for Jonah crabs (Source: RI DEM).

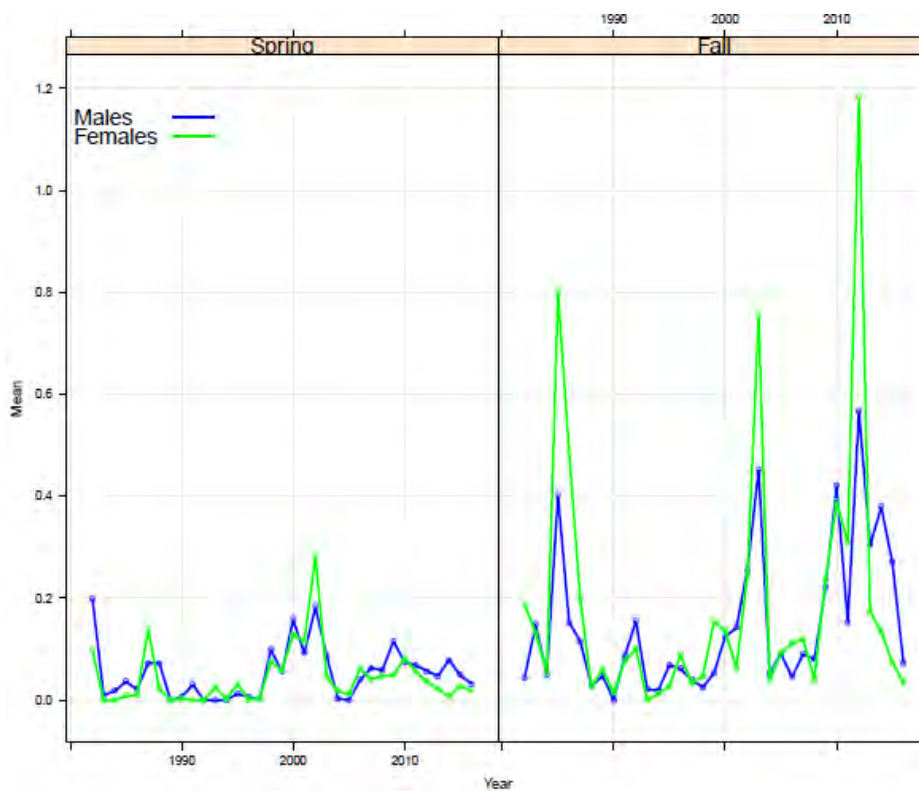


**Figure 11:** NMFS Jonah crab index from the bottom trawl survey in the Gulf of Maine.





**Figure 12:** NMFS Jonah crab index from the bottom trawl survey in Georges Bank.



**Figure 13:** NMFS Jonah crab bottom trawl survey index for Southern New England.



UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
NATIONAL MARINE FISHERIES SERVICE  
1315 East-West Highway  
Silver Spring, Maryland 20910  
THE DIRECTOR

Mr. Robert E. Beal  
Executive Director  
Atlantic States Marine Fisheries Commission  
1050 N. Highland Street, Suite 200A-N  
Arlington, VA 22201

SEP 07 2017

Dear Mr. Beal:

Thank you for your letter recommending that NOAA's National Marine Fisheries Service fully implement regulations in the Exclusive Economic Zone consistent with the measures approved by the Atlantic States Marine Fisheries Commission in Addenda XXI and XXII to Amendment 3 of the Interstate Fishery Management Plan for American Lobster (FMP).

We were actively evaluating the measures in Addenda XXI and XXII when the Commission reported the results of the 2015 lobster stock assessment in October 2015 and began the development of draft Addendum XXV. At its October 2016 meeting, the Commission's Lobster Board decided to wait and reassess Addenda XXI and XXII after the finalization of Addendum XXV, when it would have a better understanding of how and if the measures are still relevant to the lobster management program. We agreed with the Board's approach and informed them that we would postpone our rulemaking action based on the two addenda.

At the August 2017 meeting, the Board took final action on draft Addendum XXV, disapproving it because many of the management plans submitted by the fishing industry were technically inadequate to achieve the egg production goals set forth there. Now that the Board has made its decision to take no further action to address recruitment failure in the Southern New England lobster stock, we can more clearly assess the utility of the measures in Addenda XXI and XXII in a rulemaking action as they relate to the current state of the fishery and the lobster management program.

I appreciate your interest in this matter. Should you have any further questions or concerns, please contact Peter Burns, Greater Atlantic Regional Fisheries Office, at (978) 281-9144.

Sincerely,



Chris Oliver



# Atlantic States Marine Fisheries Commission

## Tautog Management Board

*October 16, 2017*

*1:15 – 2:45 p.m.*

*Norfolk, Virginia*

### Draft Agenda

The times listed are approximate; the order in which these items will be taken is subject to change; other items may be added as necessary.

1. Welcome/Call to Order (*A. Nowalsky*) 1:15 p.m.
2. Board Consent 1:15 p.m.
  - Approval of Agenda
  - Approval of Proceedings from August 2017
3. Public Comment 1:20 p.m.
4. Amendment 1 for Final Approval (*T. Kerns*) **Final Action** 1:30 p.m.
  - Review Regional Proposals
  - Consider Remaining Issues in the Draft
  - Consider Final Approval of Amendment 1
5. Consider Approval of 2016 and 2017 FMP Review and State Compliance Reports (*C. Starks*) **Action** 2:35 p.m.
6. Other Business/Adjourn 2:45 p.m.

The meeting will be held at the Waterside Marriott Hotel, 235 East Main Street, Norfolk VA; 757.627.4200

*Vision: Sustainably Managing Atlantic Coastal Fisheries*

# MEETING OVERVIEW

**Tautog Management Board Meeting**  
**August 3, 2017**  
**1:15-2:45 p.m.**  
**Alexandria, Virginia**

Chair: Adam Nowalsky (NJ) <i>Assumed Chairmanship:</i> <i>05/15</i>	Technical Committee Chair: Jason McNamee (RI)	Law Enforcement Committee Representative: Jason Snellbaker
Vice Chair: Dan McKiernan	Advisory Panel Chair: VACANT	Previous Board Meeting: August 3 , 2017
Voting Members: MA, RI, CT, NY, NJ, DE, MD, VA, NMFS, USFWS (10 votes)		

**2. Board Consent**

- Approval of Agenda
- Approval of Proceedings from August 2017

**3. Public Comment** – At the beginning of the meeting public comment will be taken on items not on the Agenda. Individuals that wish to speak at this time must sign in at the beginning of the meeting. For agenda items that have already gone out for public hearing and/or have had a public comment period that has closed, the Board Chair may determine that additional public comment will not provide additional information. In this circumstance the Chair will not allow additional public comment on an issue. For agenda items that the public has not had a chance to provide input, the Board Chair may allow limited opportunity for comment. The Board Chair has the discretion to limit the number of speakers and/or the length of each comment.

<b>4. Consider Amendment 1 for Final Approval (1:30-2:35 p.m.) Final Action</b>
<p><b>Background</b></p> <ul style="list-style-type: none"> <li>• The Board approved Draft Amendment 1 for public comment in May 2017. <b>(Briefing Materials)</b></li> <li>• Draft Amendment I includes multiple management options to update the 1996 FMP and proposes a four-region management scenario. Additionally a commercial harvest tagging program was proposed in the document to combat illegal harvest and trade.</li> <li>• Public Hearings were held in June 2017 and public comments were gathered through July 14, 2017. <b>(Briefing Materials)</b></li> <li>• In August, the Board approved several options in the Draft Amendment but delayed the management measures for each region until the states could develop additional proposals.</li> <li>• States developed alternative proposals <b>(Briefing Materials)</b> and the Technical Committee reviewed the proposals on October 10.</li> </ul>

**Presentations**

- Review public comment, management options, and additional state proposals by T. Kerns
- Advisory Panel Report
- Law Enforcement by J. Snellbaker

**Board Actions for Consideration**

- Select management options
- Approve final document

**5. Fishery Management Plan Review (2:35-2:45 p.m.) Action****Background**

- State Compliance Reports are due annually
- The Plan Review Team reviewed each state report and compiled the 2016 and 2017 FMP Review.
- Delaware and Maryland have requested and meet the requirements for *de minimis*.

**Presentations**

- Overview of the FMP Review Report by C. Starks. **(Supplemental Materials)**

**Board actions for consideration at this meeting**

- Accept 2016 and 2017 FMP Review and State Compliance Report.
- Approve *de minimis* requests for *Delaware and Maryland*

**6. Other Business/Adjourn**

**DRAFT PROCEEDINGS OF THE  
ATLANTIC STATES MARINE FISHERIES COMMISSION  
TAUTOG MANAGEMENT BOARD**

**The Westin Alexandria**  
Alexandria, Virginia  
**August 3, 2017**

These minutes are draft and subject to approval by the Tautog Management Board  
The Board will review the minutes during its next meeting

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    Review Public Comment and Management Options ..... 1

    Law Enforcement Report..... 5

    Board Discussion..... 7

    Regional Updates..... 15

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Adjournment..... 22

**INDEX OF MOTIONS**

1. **Approval of Agenda by Consent** (Page 1).
2. **Approval of Proceedings of May 2017 by Consent** (Page 1).
3. **Move to approve option B: Revised Goal Statement in section 2.2** (Page 7). Motion by John Clark; second by Mike Luisi. Motion carried unanimously (Page 8).
4. **Move to approve option H: accept options B through G into section 2.3 Objectives** (Page 8). Motion by John Clark; second by Eric Reid. Motion carried (Page 8).
5. **Move to approve option B in section 2.5 Biological Reference points** (Page 9). Motion by Roy Miller; second by Emerson Hasbrouck. Motion carried (Page 9).
6. **Main Motion**  
**Move to approve option B Managing to the Regional Target F, with Sub-Option B2 Board Action within one Year, in section 2.7.1 Fishing Mortality Target** (Page 9). Motion by John Clark; second by Bob Ballou. Motion tabled until discussion on section 4.1 (Page 11).
7. **Motion to Table**  
**Move to table action on this specific issue until the Board decides on regional management, section 4.1** (Page 11). Motion by Emerson Hasbrouck; second by Bob Ballou. Motion carried (Page 12).
8. **Main Motion**  
**Move to approve option B in section 2.7.4 Stock Rebuilding Schedule** (Page 12). Motion by John Clark; second by Dan McKiernan. Motion tabled until discussion on section 4.1 (Page 13).
9. **Motion to Table**  
**Motion to table action on this specific issue until the Board decides on regional management, section 4.1** (Page 13). Motion by Emerson Hasbrouck; second by Bob Ballou. Motion carried (Page 13).
10. **Move to approve option B Regional Management in section 4.1 Regional Boundaries** (Page 13). Motion by John Clark; second by Joe Cimino. Motion carried (Page 15).
11. **Move to approve option B Managing to the Regional Target F, with Sub-Option B2 Board Action within One Year, in section 2.7.1 Fishing Mortality Target** (Page 15). Motion by John Clark; second by Bob Ballou. Motion carried (Page 15).
12. **Move to approve option B in section 2.7.4 Stock Rebuilding Schedule** (Page 15). Motion by John Clark; second by Dan McKiernan. Motion carried (Page 15).
13. **Move to approve option B Commercial Quota Procedures in section 4.3 Commercial Quota** (Page 18). Motion by John Clark; second by Bob Ballou. Motion carried (Page 19).



14. **Move to approve option B in section 4.4 Commercial Harvest Tagging Program** (Page 20). Motion by John Clark; second by Russ Allen. Motion carried (Page 20).
15. **Move to approve option A in section 4.4.3 Tag Application** (Page 21). Motion by John Clark; second by Ray Kane. Motion carried (Page 21).
16. **Move to approve Dan McKiernan as vice chair of the Tautog Management Board** (Page 22). Motion by Russ Allen; second by John Clark. Motion carried (Page 22).
17. **Move to adjourn by Consent** (Page 22).

**ATTENDANCE**

**Board Members**

Dan McKiernan, MA, proxy for D. Pierce (AA)	Roy Miller, DE (GA)
Raymond Kane, MA (GA)	John Clark, DE, proxy for D. Saveikis (AA)
Sarah Ferrara, MA, proxy for Rep. Peake (LA)	Craig Pugh, DE, proxy for Rep. Carson (LA)
Bob Ballou, RI, proxy for J. Coit (AA)	Rachel Dean, MD (GA)
Eric Reid, RI, proxy for Sen. Sosnowski (LA)	Michael Luisi, MD, proxy for D. Blazer (AA)
Mark Alexander, CT (AA)	Joe Cimino, VA, proxy for J. Bull (AA)
John Maniscalco, NY, proxy for J. Gilmore (AA)	Cathy Davenport, VA (GA)
Emerson Hasbrouck, NY (GA)	Kyle Schick, VA, proxy for Sen. Stuart (LA)
Russ Allen, NJ, proxy for L. Herrighty (AA)	Lindsay Fullenkamp, NMFS
Adam Nowalsky, NJ, proxy for Asm. Andrzejczak (LA)	Mike Millard, USFWS

**(AA = Administrative Appointee; GA = Governor Appointee; LA = Legislative Appointee)**

**Ex-Officio Members**

Jason McNamee, Technical Committee Chair

Mark Robson, Law Enforcement Representative

**Staff**

Bob Beal  
Toni Kerns  
Mike Schmidtke

Megan Ware  
Katie Drew

**Guests**

Mike Armstrong, MA DMF  
Matt Gates, CT DEEP  
Arnold Leo, E. Hampton, NY  
Jason McNamee, RI DEM

Derek Orner, NOAA  
Jack Travelstead, CCA  
Sherry White, USFWS

The Tautog Management Board of the Atlantic States Marine Fisheries Commission convened in the Edison Ballroom of the Westin Hotel, Alexandria, Virginia, August 3, 2017, and was called to order at 2:00 o'clock p.m. by Chairman Adam Nowalsky.

#### **CALL TO ORDER**

CHAIRMAN ADAM NOWALSKY: Good afternoon. I would like to convene the Tautog Management Board. Let me begin by thanking everyone that stuck around here. I'm not sure if we drew the ultimate short straw or the absolute vote of confidence here to get the last agenda item of the meeting.

#### **APPROVAL OF AGENDA**

CHAIRMAN NOWALSKY: We'll begin with going ahead and taking an approval of the agenda as presented. Are there any changes to the agenda that has been presented? I'll simply offer that it is my hope to bump these times up a little bit. We'll do the best we can. Seeing no changes to the agenda, is there any objection to accepting the agenda as presented? Seeing none; the agenda is accepted.

#### **APPROVAL OF PROCEEDINGS**

CHAIRMAN NOWALSKY: Our next order of business is to approve the proceedings from the May, 2017 Board meeting. Is there any objection to accepting those minutes? Seeing none; the previous proceedings stand accepted. The next order of business is public comment for any items that are not on the agenda. We have no one signed up, we have no hands up. We'll move along.

#### **CONSIDER AMENDMENT 1 FOR FINAL APPROVAL**

CHAIRMAN NOWALSKY: Just like that we're 14 minutes ahead of schedule. That brings us to Agenda Item Number 4, Consider Amendment 1 for Final Approval. Before we go ahead and get started with presentations, I'll first offer a word of thanks to Ashton Harp for her efforts in

helping get us to this point. Apparently we scared her all the way across the country.

But we have Toni Kerns standing in today; thank you, Toni for your help in the last couple weeks and seeing this item through. I'll note that there has been some communication that has been sent out this week to members of the Board; regarding our plans. We do have this item here for final action today; so that is an option.

However, as per the memo that was sent out through a combination of summer schedules and response to public comment, there have been requests from just about every state involved in this amendment process for a little bit more time to develop some options. What our goal here today is going to be, to go through the presentations as we have them.

We'll review the presentation for the amendment, review the public comment presentations, AP report, Law Enforcement report, and then we'll go through the document. We had sent around a set of the items we would definitely like to see action taken on here today. We'll have discussion about those items that we think could wait until the annual meeting; with potentially not taking final action until then, but it will ultimately be up to the Board. Are there any questions about what we hope to do here today? All right, seeing none; I'll go ahead and turn the microphone over to Toni to present the presentation on the amendment, followed by public comment.

#### **REVIEW PUBLIC COMMENT AND MANAGEMENT OPTIONS**

MS. TONI KERNS: What I have done is I have actually combined the presentation of the options and the public comment into one; to be most efficient. I did pull, as Adam mentioned there were some items that we've had some requests from states to do delays on, basically most of Section 4.2, which is all of the regional management measures.

I pulled the public comment slides from those here. If you want me to go over them today I can, or I can wait to go over them at the next meeting when we actually are considering those options. For now I am not going to go through what the public comment was on those; unless I'm asked to, so moving on.

Even though it says we had a hundred and something comments in my summary, I apologize for the bad math. We really only had 36 written comments; 21 of those were from individuals, 8 were from groups, and 2 were form letters. Those form letters totaled 7 comments. We also had one petition with 317 signatures on it.

The document is a full amendment. It has revised goals and objectives, biological reference points, options for fishing mortality targets, probabilities of achieving the F target, F reduction schedules, and stock rebuilding schedules all in Section 2. First the management document, the goal is to sustainably manage tautog over the long term; using regional differences and biology and fishery characteristics as the basis for the management.

Additionally the amendment seeks to promote conservation of enhanced and structured habitat; to meet the need of all life stages of the tautog. That is what the revised goal is. There are two options; either to maintain the 1996 goal or to approve the revised goal. There were five written comments in favor of the 1996 goal, and two comments in favor of the revised.

In general the state of Rhode Island and Maryland were in favor of the revised goals, and the state of Massachusetts was in favor of the status quo goals. I was not at the public hearing, so I had to take the notes from the summaries to try to figure out counts and numbers. If I couldn't figure out exact counts from those hearings I just put exes where I thought there was general favorability for something. I apologize in advance if I misinterpreted what

happened at your hearings; but it was hard for me, since I was not there.

MR. NOWALSKY: Did you want to stop for a question?

MS. KERNS: I'll go through the whole thing.

CHAIRMAN NOWALSKY: Give me just a minute. Dan, did you have –

MR. DAN McKIERNAN: Just a point of clarification. Toni, you said that the state had a position. But I think what you meant is people at a hearing in that state had a position, right?

MS. KERNS: Correct; the people at the hearings in those states. For objectives, the objectives options were to either maintain the 1996 objectives. Options B through G were specific modifications to objectives; and Option H would insert all of the modifications to the identified options in B through G. There were five written comments in favor of maintaining the 1996 objectives; as well as five individuals that had a range of favoring any of the options of B through G. One individual that favored changing all of the objectives and the state of Maryland's hearing attendees were in favor of changing all of the objectives, Option H.

For biological reference point, the document had two options. One is to stay status quo. The reference points can be modified via management document, and the second option was reference points can be modified via Board action. The TC or SAS could make a recommendation to alternative reference points; as long as the modification to the status determination criteria and their associated values were the result of a peer reviewed stock assessment.

In response to that the Board could take action to set new reference points based on that peer reviewed results. For the comments, we had nine comments in favor of maintaining that reference points had to be modified via

management document, and two commenter's in favor of making changes via Board action.

For the mortality targets, Option A is status quo. We would have a coastwide fishing mortality target; and Option B is to manage the regional target based on F. If the current F exceeds the regional threshold the Board would have to take corrective action via management document within a certain time period.

There are three sub-options here for the B option, one being no time requirement, two being action within a year, and three being action within two years. Based on the request from the states to delay some actions, it was staff's recommendation to not take action on the actual sub-options here today; but you could make a determination of whether or not you wanted to manage based on a coastwide F or a regional F, just as an FYI.

Public comment here; we had eight commenter's in favor of Option A, a coastwide target. We had ten people in favor of regional F targets. One person thought we should not have a timeframe, and then three people plus the folks at the Virginia hearing were in favor of the one year, and seven people were in favor of action within two years.

Next is looking at the probability of achieving the F target. There are two options; status quo and a 50 percent probability of achieving an F target. Currently under status quo there would be no probability associated. We had ten people in favor of remaining status quo, and five people in favor of the 50 percent probability; as well as the folks at the Rhode Island hearing were in favor of the 50 percent probability.

Next is looking at the F reduction schedule. This sets a timeframe for which the Board initiates a harvest reduction or the management response. Option A is looking at status quo; there is no timeframe. Option B is three years, and Option C is five years. For the commenter's we had three people in favor of three years, plus the

folks at the Mass hearing, and eight people in favor of five years.

For how the stock rebuilding schedule is developed, we have Option A status quo, there is no required management response if SSB is below the threshold. Option B is a stock rebuilding schedule can be developed to be an addendum and Option C similar, it would be developed via an addendum; but it would not exceed ten years. There is no timeframe associated with Option B. We had seven folks in favor of Option A, status quo, no management response required. For B we had five people in favor plus the individuals at the Mass hearing, and Option C the addendum with the timeframe of ten years with three individuals.

Moving on to Section 4, which are the management measures, for today I think there are just a couple of things we're looking at here. First the concept of whether or not we would manage via a coastwide management, which is status quo Option A; or whether the Board would move to regional management based on the stock assessments, and it would be the four regions, the Mass/Rhode Island and then Long Island Sound, then New York/New Jersey Bight, and the DelMarVa area.

For Option A, status quo coastwide management, all of the participants at the New York hearing, which was roughly 80 individuals, were in favor; plus then the seven other commenters' as well as the individuals at the Connecticut hearing. Then for regional management, those individuals at the Mass and Rhode Island hearings expressed interest as well.

Then, sorry I didn't total these up so I'm counting in my head as I speak. It is 23 individuals were in favor of regional management. Then, if regional management is chosen, then looking at Long Island Sound and determining where we would want to break the boundaries for that Long Island Sound management over on the edges.

In both the Connecticut and New York hearings they were not in favor with regional management; or in the New York and New Jersey hearings they were not in favor of regional management, so they did not comment on which option they favored on where the split should occur. One of the folks at the Connecticut hearing they said either would work; as well as the AP members were also concurring with that exact sentiment that happened at the hearings as well.

Looking at commercial quota, Option A is status quo. We would not have any specified procedures to do commercial quotas. Option B puts forward commercial quota procedures. A state or region could implement an annual commercial quota following the procedures that are identified in the document and Board approval is granted.

The decision making to include a quota could be within that regional group, and then they would also have to make decisions about quota rollover, transfers and how to deal with overages; if a quota is utilized. For what we heard from the commenter's, and there were six people in favor of status quo; do not establish quota procedures.

Then there were four people in favor of establishment of quota procedures, and the folks at the Maryland hearing were generally in favor of this. Then next is looking at a possible commercial harvest tagging program and whether or not we would implement one or not. Status quo would be no tagging program, and Option B would be to implement a harvest tagging program.

The individuals at the New York hearing were not in favor of a tagging program; and there were eight commenter's not in favor of. Then for Option B, individuals at the Rhode Island, New Jersey, Delaware, and Maryland, hearings were generally in favor. Then we had 12 individuals that wrote in or commented specifically in favor. Then lastly is looking at how those tags would get

applied. The tags could be applied either with the harvester application or either at harvest or prior to offloading. Either would suffice under this option, or under Option B the application would be done by the dealer. The majority of the commenter's were in favor of either harvester application at harvest, or prior to offloading.

Those individuals at the Mass hearings were the only ones that commented in favor of application by the dealer. Also in general, some of the comments that were heard were that folks were in favor of recreational and commercial spawning closures. Pot restrictions are needed, as well for the pots that fished for tautog constantly all the time, as well as there should be artificial reef programs funded that would help support tautog habitat; and help to rebuild the stock.

Then because we had the request to delay specifically the regional management measures, in order to have some additional time to either develop additional options, try to come to consistency, or to spread out the timeframe in which some of the reductions need to be occurring; particular in the Long Island Sound area.

Today what we're looking to do is approve some of the options; and then come back in October, look at the remaining options, and make choices and then do a final approval of the document in October. Mark would have the Law Enforcement Committee report if there are no questions on the actual public comments.

CHAIRMAN NOWALSKY: Okay, so thank you for that Toni. Before we go forward with the next report, let me ask if there is any objection to ending that presentation there and not covering those items that we don't expect to have final action on until the annual meeting; which would be the individual, regional measures.

Does anybody feel the need to see those presentations today, or those can wait until planned decision making on that? Okay, I'm not

seeing any objection to continuing as we are. Let me stop there for a moment. Are there any questions for Toni about the information presented about the contents of the Amendment sections as presented, or about the public comment? Raymond Kane.

MR. RAYMOND W. KANE: Toni, can you go back to that slide where we're talking about the tagging program, please?

MS. KERNS: Do you want the application or the actual tagging program?

MR. KANE: The application. Yes, so I see we're the lone state. Can the other states give us a suggestion at this table right now how they would plan on distributing tags to individual harvester's, so that might be something I could take back to our harvesters?

CHAIRMAN NOWALSKY: Well, I think that would be a question for the Board if there is anybody wants to chime in on that right now; or when we get to the section and decision making on that and we get a motion up. We would expect further discussion at that point, right; any additional questions right now? Dan.

MR. McKIERNAN: Not to rush ahead on this, but when would Toni like the states to submit the proposals for the biological measures?

MS. KERNS: The revised proposals?

MR. McKIERNAN: Yes.

CHAIRMAN NOWALSKY: It's probably me more than Toni. What my intention is; once we go through these items that we can hopefully come to decisions on today, will be to just go back to each of those sections and just generally bring the Board up to speed on what each of those regions is discussing.

I think the goal we would need by the middle of September, to answer your question directly, and I'll reiterate that again. Whatever revised

proposals that would be a timeline we would be looking at. Again, my intent is to come back to each of those sections and just see if there are any general questions, and make sure everybody is onboard with how each region is hoping to proceed. Joe.

MR. JOE CIMINIO: With that timeline is the idea that once they're received the Technical Committee will have a chance to review; but the first time the Board will see them is at the November meeting?

CHAIRMAN NOWALSKY: The intent would be for TC to review them. Now whether these proposals are developed with TC membership as part of that decision making process, and get a general sense from the TC that that is acceptable review, or whether we submit the entire proposals for a formal TC review. I think is going to depend on the scope of what we get back at that point.

We can certainly go ahead and distribute those items for review prior to the Board meeting; which would be one of the goals of getting those ironed out, with substantial time left prior to the annual meeting. Are there any other questions before we go to Mark? Okay Mark, Law Enforcement report.

#### **LAW ENFORCEMENT REPORT**

MR. MARK ROBSON: We have provided a written memo for you; it should have been in the briefing package, summarizing Law Enforcement Committee comments. The date of the memo is July 11, but it actually covers a series of opportunities for the LEC to review this issue; in regards to defining a boundary line for the eastern end of Long Island Sound, which was first brought to us by Ashton back in March in a teleconference call.

Then at our May meeting we had an opportunity to actually look at some maps and discuss it at the LEC meeting in more detail. Then once again, in follow up on a June 29 teleconference call. At

that last teleconference call, we basically reiterated the position that we had taken previously, expressing some precautionary comments regarding how do you establish a line across open water that is clearly definable and clear to the fishermen and also supportable in court cases?

Once we looked at the two options for drawing that line on the east end of Long Island Sound, we suggested that both were acceptable; but it would be preferable, at the time we called it Option 6. I believe now in the document it's Option B2, Sub-Option B2, because that line has a few more island or land-based references that you can use for line of sight; making it a little bit clearer when you're trying to define where somebody is fishing, either on one side of the line or the other, which is important in making court cases. Again, some of the concern for this line in general was that you are looking at potentially different regulations in Long Island Sound; the ocean side of Long Island, and perhaps even in Rhode Island waters.

LEC members familiar with those waters report that vessels both recreational and commercial are regularly moving back and forth among those three areas. Depending on what kind of differences in regulations occur, that could have a bearing on how many resources are going to be required to maintain coverage for that boundary line at the east end of Long Island Sound.

It kind of segue ways into the other option that we did comment on; and that's regarding the commercial tagging program.

Of course we've been working with the Law Enforcement Subcommittee on the tagging issue. We still continue to support commercial tagging for tautog; and with this particular document we also wanted to reiterate that particularly in the case, where you have this eastern end of Long Island Sound and you have vessels moving back and forth in different zones.

Once again, it reinforces the point that we were making that the sooner that those fish are

tagged from the point of harvest the better. Our recommendation would continue to be that you adopt a provision to have those fish tagged as close to the point of harvest as possible; recognizing that that may in the end not be possible.

There were a lot of concerns expressed by the LEC members with any dealer tagging as really reducing your ability to monitor compliance with those tag requirements. All of that is again summarized in the July 11 memo. That concludes my report, Mr. Chairman.

CHAIRMAN NOWALSKY: Thank you very much for that report. Are there any questions on the Law Enforcement report? Eric Reid.

MR. ERIC REID: Just one question. If you look at Page 69 you have Long Island Sound Option 5 and Long Island Sound Option 6, and you prefer Option 6. Is that what I'm getting out of that? Then if you look at New Jersey/New York Bight Option 5, it is different from Long Island Option 6; they are two different things.

MR. ROBSON: Well, at the May meeting we looked at two maps identified as Option 5 and Option 6. I just noticed in the presentation today that it looked like they were identified as Sub-options B1 and B2. Sub-option B2, where the line for the Long Island Sound boundary is drawn using those points of land and the islands there. That's the one that Law Enforcement would prefer. Both of them are acceptable; they are going to create some enforcement challenges.

CHAIRMAN NOWALSKY: In the document itself, Eric, Long Island Sound Option 5 is Sub-option B1. The graphic labeled Long Island Sound option 5 is text Sub-option B1, and graphic labeled Long Island Sound Option 6 is labeled as Sub-option 2, and I believe Law Enforcement has expressed a preference, or at least has offered some advantages for what's text labeled Sub-option 2, and graphically labeled Long Island Sound Option 6.



MR. REID: Okay Mr. Chairman, I appreciate that. Basically, New Jersey/New York Bight Option 5, is not what Law Enforcement prefers at this time.

CHAIRMAN NOWALSKY: When you're looking at the New York/New Jersey Bight Option 5, you would only be looking at the purple area there.

MR. REID: Yes, but it is not the same as what they prefer.

CHAIRMAN NOWALSKY: Toni.

MR. REID: The one they prefer has basically the range of islands. They're different.

MS. KERNS: I will help, Eric. I think that when, I can't remember who actually created these charts for us, but when they were originally created we had only had the first Long Island Sound Option 5. They just automatically created the New York/New Jersey Bight based off of how we split Long Island Sound.

Whatever we decide to do with Long Island Sound, the New York/New Jersey Bight map will be altered appropriately to account either for that extra water body within the Bight or not. We didn't have the person recreate another map for us; since they had already done a lot of work for us.

CHAIRMAN NOWALSKY: Mark.

MR. ROBSON: Again, the reason they like what is Sub-option B2 there better than 1, is because it does have that chain of islands, so you have more line of sight on a line. Plus I believe that is the option that is essentially the colregs line; which is something a little easier to manage.

CHAIRMAN NOWALSKY: I can certainly understand your confusion, Eric, and the reality is that there is essentially two options from New York/New Jersey Bight based on what would be selected for Long Island Sound; we good?

MR. REID: Yes, we're good.

## BOARD DISCUSSION

CHAIRMAN NOWALSKY: Okay, thanks for that; any additional questions? Okay. Seeing none; I believe that will take us into discussion about the document. Again, Toni was kind enough to send an e-mail around that basically itemized what sections, which apples we're going to take bites at here today. We'll go through each section. We'll get that slide back up on the screen. We will need a motion for each item.

Each of these individual items will simply require, I'll ask for whether or not there is any objections on those or not; and we'll see what progress we can make. The first item we would like to tackle would be reflected in Pages 48 and 49 of the Amendment itself; which if I jump over to the meeting materials, again keep in mind the page and the PDF may be different.

But these will actually be 48 and 49 in the amendment itself. We'll start out with the goals. We've got two options here, Option A for status quo; which would be to maintain the '96 goals, Option B, the revised goal statement as written in the amendment. Discussion and/or a motion on how to proceed with this section, I'll turn to John Clark.

**MR. JOHN CLARK: Move to approve Option B; revise goal statement in Section 2.2.**

CHAIRMAN NOWALSKY: Do we have a second to that; seconded by Mike Luisi? We'll get that up on the board here in just a moment.

MS. KERNS: While he's getting that up on the board, on the back table there is a cheat sheet of all of the items in the document; if anybody needs that staff could run over and grab those and get them, or you could run over and grab them. It doesn't matter, if anybody needs one. There are also copies of the draft, just the short version of the draft document; so you only have the stuff that we're actually taking up to vote, if you want that to cheat on as well.

CHAIRMAN NOWALSKY: Thirty seconds to grab cheat sheets. While we're grabbing cheat sheets, I'll turn for discussion on this motion. Emerson.

MR. EMERSON C. HASBROUCK: Does Option B lock us into regional management? I mean Option B says that we will use regional differences in biology and fishery characteristics; or whatever the exact language is, as a basis for management. Does that lock us into regional management?

CHAIRMAN NOWALSKY: It is my understanding that while it does in fact use those terms, it does not. We still have to select or have the option to select regional options moving forward. I would just offer that should we do something when we get to the regional management section, which we do intend to tackle today.

That may cause reconsideration on this topic. But it doesn't specifically lock us into it. Again, it's a goal. A goal doesn't necessarily mean it's what we do immediately. But something this Board has talked about striving for. Additional questions about this motion. Okay I'll read the motion; move to approve Option B, revise goal statement in Section 2.2, motion by Mr. Clark, seconded by Mr. Luisi. I'll give us five second to caucus.

Let me ask; is there any objection to this motion? We're going to give this 30 more seconds. Here is the route I'm going to take, given the discussion I see going on around the room. **We're going to do this with a show of hands. All those in favor of the motion please raise your hand. Put your hands down, please; anyone opposed to the motion raise your right hand, any null votes, and any abstentions? Okay motion carries.** Thank you very much.

Next section will be 2.3 Objectives; here we have one course of action would be Option A, status quo, maintain the 1996 objectives. Then we have a series of other options; which are Options B through H, B through G take individual actions

with the objectives. Option H incorporates all of the changes that are incorporated in B through G.

Our options for action on this item would be Option A, status quo, Option H, which incorporates everything, or some combination of B through G. Those would be our three courses of action in this section; discussion and/or a motion on this section. I'll turn to John Clark.

**MR. CLARK: Move to approve Option H; accept Options B through G into Section 2.3 objectives.**

CHAIRMAN NOWALSKY: Okay motion by Mr. Clark, seconded by Eric Reid; discussion on the motion to accept Option H, which would accept Options B through G for the objectives. Seeing no hands; I'll read the entirety again. Move to approve Option H; accept Options B through G into Section 2.3 Objectives, motion by Mr. Clark, seconded by Mr. Reid. **Is there any further discussion on the motion? Seeing none; is there any objection to this motion? Seeing no objection the motion is approved by consent.** Thank you very much.

All right, our next section will be Section 2.5; Biological Reference Points. Just for clarities sake, we're not actually selecting biological reference points here. What we're specifying is how biological reference points can be modified moving forward. We've got two options here. Reference points would be required to go through a management document, which would be an addendum or an amendment; Option B, which would allow reference points to be modified via Board action.

Pages 53 to 54 basically spell out what that process might be; including how we would review scientific advice, peer review, et cetera. I would also like to point out that by selecting Option B this would not preclude the Board from initiating a management document; an addendum or an amendment, should they feel the need that that change in reference point is

significant enough that we need to go through some public process. Do I have any discussion on this section or a motion on these options? First hand up I saw was Roy Miller.

**MR. ROY W. MILLER: I move to accept Option B; reference points can be modified via Board action.**

CHAIRMAN NOWALSKY: Okay I have a motion for Option B, do I have a second for that; seconded by Emerson Hasbrouck? I'll give staff a moment to get that up on the board, also offer Delaware a word of thanks for taking the initiative on moving this along. Okay so we have a motion; move to approve Option B in Section 2.5 Biological Reference Points, motion by Mr. Miller, seconded by Mr. Hasbrouck; discussion on the motion.

**Okay seeing no hands up are there any objections to the motion? Seeing none; the motion stands approved by consent.** All right, our next item will be Section 2.7.1 Fishing Mortality Target. Again, this is not an item where we're selecting a specific F. But what we're selecting here would be how the Board would respond to scientific advice that we get that would call for a change to F.

We've got Option A, Status Quo; coastwide fishing mortality cannot exceed the F target of 0.15. That would be the first option. Option B would be managing to a regional F target, and selection of Option B would require selection of a time requirement, either no time requirement in B1, B2, Board action within one year, and Board action within two years.

I would just like to turn to staff for a moment to get clarification where these items state the Board must initiate corrective action via management document within either one year or two years. That would not call for that management action necessarily being completed in that time, nor would it call for that management action having those impacts go into effect. Typically we go through an

addendum process takes multiple meetings, and then has an implementation date. Just to be clear, it is my understanding that both of these options would allow for the completion of those documents and the implementation date to go beyond these timeframes; but these specifically call for when those documents would be initiated.

MS. KERNS: You are correct, Adam.

CHAIRMAN NOWALSKY: Okay, hope that's clear; discussion or a motion on this section. I looked left, but I'm pulled back right. John Clark.

**MR. CLARK: I've got the motion sheet in front of me; so I would like to move to approve Option B, managing to the regional target F. Oh, am I in the right one? Yes, okay, and Sub-option B2, Board action within one year in Section 2.7.1 Fishing Mortality Target.**

CHAIRMAN NOWALSKY: Okay, motion by Mr. Clark for Option B, managing to regional target F with Sub-option B2, Board action within one year. I have a second from Bob Ballou. We'll get that up on the board; while that's going up, discussion, Mike Luisi.

MR. MICHAEL LUISI: Just a question, because we're not going to know F each and every year, if three years go by and we look back in retrospect to an assessment update, and we notice that a year prior to the terminal year F exceeded the threshold. However, the terminal year of the assessment F is maybe between the target and the threshold, or even below the target.

Are we going to be inclined to go forward with some type of action? Would a trigger be set in the event that the terminal year F is not above the threshold, yet a prior year is? Just having dealt with this with striped bass and the ongoing saga about where we stand regarding fishing mortality. For my own edification I would like to understand how assessments would be applied to this option.

CHAIRMAN NOWALSKY: I'm going to first say that the document specifies current F. But for clarity on what current F is, I'll turn to Toni.

MS. KERNS: I'm going to let Katie give me a head nod. But I believe what the TC has been doing is using the average of the last three years to give you your current F. Your current F would be the average of the last three years. Joe is giving me a head nod.

CHAIRMAN NOWALSKY: Katie is coming to a microphone.

MS. KERNS: I told her I wouldn't need her, but I guess I was wrong.

DR. KATIE DREW: Yes, it is the average of the last three years; so if the assessment ended in 2015, it would be the average of '15, '14 and '13 would be the value that you would compare, and need to bring down.

CHAIRMAN NOWALSKY: My interpretation of that is if the F in one of those years that would not be enough to trigger this management action. We would need the average of those three years, which we would call the current F, which is what the document refers to.

DR. DREW: Yes that is correct.

CHAIRMAN NOWALSKY: That's the most current information we can give you. Dan McKiernan.

MR. MCKIERNAN: That is a great explanation, but is it necessary for folks who are going to read this document months and years from now to somehow have that in the document that F is going to be calculated on a three-year-moving average?

MS. KERNS: I can add it in.

CHAIRMAN NOWALSKY: I guess the question would be, since we're not planning to take final action today to either add that in, or do we leave that out should there be some future review of

how the TC calculates current F, i.e. average of a longer period or a shorter period or something else?

I think that would be the question is that yes, we could put it in here so we clearly know or perhaps we could reflect it as of this document, current F the TC uses average of the last three years; but that may be subject to change in the future. Is there a preference from the Board on how we outline that right now? Again, we got an answer today, and I think that is very good to have that written in Microsoft Word or Adobe PDF. But that may change in the future. Katie.

DR. DREW: I think to that point, part of the reason that we are able to or allowed to is that three-year average was approved by the peer review process. If we go through another benchmark process and the definition of what the F should be changes based on peer review advice, and then maybe we would not want to include it; and just understand that current F is the reflection of the best available advice coming out of the stock assessment, whatever that is.

CHAIRMAN NOWALSKY: Okay, so what's the pleasure of the Board? A couple options I see here are one, to add nothing additional and just leave it as current F, another option would be to include information that that refers specifically to the three-year average. Then the question beyond that would be whether or not we're going to include in the document that that is just currently how it's done, and it may change in the future. I saw Emerson's hand.

MR. HASBROUCK: My hand was up for another issue, so why don't you resolve this first and then come back to me.

CHAIRMAN NOWALSKY: John, I saw your hand on this.

MR. CLARK: Same thing. I just realized the motion didn't include one part of this part of the document. Whether this is status quo, or we're going to put a 50 percent probability of achieving

F. Without having that in there I assume it falls to status quo.

CHAIRMAN NOWALSKY: Our goal is to make a decision on that at the annual meeting, because that will impact the projections. Eric Reid.

MR. REID: That being said, why don't we just leave it the way it is, because we can always fix it at the annual meeting.

CHAIRMAN NOWALSKY: Okay, so I've got a recommendation to just leave the document as is; referencing current F, and we've got a matter of record the discussion here today. Okay not seeing any desire to change that. Is there any further discussion on the motion; Emerson Hasbrouck?

MR. HASBROUCK: I have a question and then I have a motion. My question is, for both the status quo option and Option B. Where does that leave us if F is between the threshold and the target; because they're both managing to the target? Right, we can't exceed F target. But the F value can be higher, can exceed the F target value, but still be below the threshold.

CHAIRMAN NOWALSKY: The document offers that if current F exceeds the regional threshold, the Board will take steps to reduce F to the regional target level; with the timeline that we have in the motion. If the current F exceeds the target but is below the threshold, which is I think the area to which you're referring.

The Board should consider steps to reduce F; should not shall, not required to, and no specific timeline. That is what we have currently is if it is in that area that I think you're referring to, the advice that the Board should take action; but no further specific direction.

MR. HASBROUCK: Right thank you for clarifying that. I understand that for Option B. Under Option A, which is status quo, what happens if F is between the target and the threshold; because it says it shall not exceed F target? But we can

be below the threshold, but the value is still going to be above the target.

CHAIRMAN NOWALSKY: Toni.

MS. KERNS: There is no threshold in the old amendment. It's just a target. That is all there was. There is only a coastwide target, and if you went above then you had to take action. Remember this plan has not been modified since 1996.

CHAIRMAN NOWALSKY: We had a single F. When we would get a new benchmark the Board would consider taking action; based on that benchmark. That is what we've been doing, well not me; that is what the Board has been doing for the last 20 years. I'm working on getting there.

MR. HASBROUCK: Then my motion then is to whatever the proper wording is, delay. I don't want to say table this motion, but to delay action on this motion.

CHAIRMAN NOWALSKY: I'm getting the sense you actually want to postpone it.

**MR. HASBROUCK: Postpone, thank you. To postpone action on this amendment, or this issue rather, on this specific issue until we've decided what we're doing with regional management.** I think in a way we're putting the cart before the horse a little bit here. Right, because this says that we're going to manage to the regional target F; and we haven't had any discussion about regionality yet, other than the question I asked before.

CHAIRMAN NOWALSKY: Okay, so motion to postpone action on this issue until the Board decides on whether we're managing this regionally. Is that what you're looking for? In that case, I would actually recommend a motion to table; since we plan to decide on regions today. We're going to have that discussion, so if you would like to do so I would entertain a motion to table this; and we've got one other

section to get through and we would then come back to this if you would like to do that.

MR. HASBROUCK: Yes, whatever is proper under Robert's Rules.

CHAIRMAN NOWALSKY: What Emerson is proposing is that we table action on this motion until we get through Section 4.1; which we hope to get through today, which would be the regional boundaries decision. We've got a motion to table. We would need a second, and just a reminder that that would not be debatable. We would immediately vote on that.

**Motion to table action on this issue until Board decides on regional management, Section 4.1; motion by Mr. Hasbrouck, seconded by Mr. Ballou. Okay again there will be no discussion on this. I'll ask is there any objection to doing so? All right, seeing none; the motion to table passes, and we will temporarily move on from Mr. Clark's motion.**

The next item going through here sequentially again was Probability of Achieving F Target; which again as per the discussion we had just a moment ago, the plan is to not tackle that today, unless there is anyone who wishes to do otherwise. Okay I'm not seeing any inclination to do so. The next section in the document would be 2.7.2, the F reduction schedule.

This is another area that we felt was best left to the annual meeting; which would provide some opportunity to develop those other options we've mentioned. Unless there is any objection, we're going to hold off on 2.7.2 until the annual meeting. Seeing no objection; that will bring us to 2.7.4 on Page 56 of the amendment, Stock Rebuilding Schedule. Again, the stock rebuilding schedule here, this section seeks primarily to define how the management action would be to achieve that rebuilding.

The first option is status quo, no management responses if SSB is below the threshold. Option B is a stock rebuilding schedule could be

developed via addendum, and then Option C would say the rebuilding schedule can be developed via addendum. But that rebuilding schedule could not exceed ten years; discussion or a motion on this section. John Clark.

**MR. CLARK: I'll try to get it right this time. I move to approve Option B in Section 2.74 Stock Rebuilding Schedule.**

CHAIRMAN NOWALSKY: Motion from Mr. Clark in 2.74 Option B, a stock rebuilding schedule can be developed via an addendum; and that would not have a timeline on that rebuilding schedule. Do I have a second for that motion? Dan McKiernan. Is there discussion on the motion, Bob Ballou?

MR. ROBERT BALLOU: I would just ask the maker of the motion why you would not opt for Option C, and that would provide for a rebuilding schedule that would not exceed ten years. I'm just curious as to your reasoning for not favoring that approach.

MR. CLARK: Well, just personally when I looked at these. I mean we have made a decision with this amendment not to manage to rebuild SSB, but to manage F; at least my understanding of it is. I mean granted ten years is not really putting us in any type of straight jacket at all. But I just figure it's optional no matter what; but at least this gets us beyond the status quo of not having to do anything about SSB. This gives us the option to do something about SSB. But if the Board decides that they would rather go with Option C that is fine with me also.

CHAIRMAN NOWALSKY: Mark Alexander.

MR. MARK ALEXANDER: I support this option. I think even ten years for a fish with the life history of tautog could challenge us at times. I think this would be an appropriate option.

CHAIRMAN NOWALSKY: Emerson Hasbrouck.

**MR. HASBROUCK:** I would also like to move to table action on this motion until we've decided what we're going to do with regional management. This option specifically says; the Management Board will evaluate the current estimates of SSB with respect to the regional reference points.

CHAIRMAN NOWALSKY: Okay so that would be the next topic. I've got a motion from Mr. Hasbrouck to table this motion until we decide on regional management Section 4.1. Is there a second to the motion to table? Bob Ballou. **Okay this motion is non debatable. Is there any objection to the motion to table?**

**Okay seeing none we're queuing things up like arrows in a quiver here.** Hopefully we can get them all to come out as quick as we did the earlier ones. Okay, well that brings us to the regional boundaries, 4.1. That will be 65 and 66 in the document. Our first option here is status quo; to stay with coastwide management.

Option B would be regional management, the four region approach. Again I'll remind the Board that we had an awful lot of discussion about three versus four regions. The four-region approach was what has already been decided on as going forward in the document. There is pretty much no going back on that in this document at this point. That is what we would be deciding on. We'll take those two options up first; and then once that decision has been made, if Option B is selected we would then go ahead and decide on B1 or B2.

I understand that votes on the first part may be contingent upon that. I would entertain a motion that specifies both selecting whether you want status quo or regional management. If you select Option B, I would encourage inclusion of the selection of the sub-option at the same time, since I think that's going to help inform that decision for people; discussion or a motion? John Maniscalco, welcome!

MR. JOHN MANISCALCO: I move to make a motion to adopt Option A; status quo Coastwide Management.

CHAIRMAN NOWALSKY: Move to adopt Option A; status quo. Do I have a second to that motion? All right I'll ask one more time; is there a second to the motion? Okay seeing none; that motion fails for lack of a second. The floor is open; John Clark.

**MR. CLARK: Move to approve Option B; Regional Management, and Sub-option B2 in Section 4.1 Regional Boundaries.**

CHAIRMAN NOWALSKY: Okay, I have a motion from Mr. Clark to approve Option B; Regional Management, and Sub-option B2, which would set the Long Island Sound boundary from Orient to Watch Hill. Do I have a second for that motion? Joe Cimino. Sorry Russ, we'll get you for one of these; discussion on the motion. Mark Alexander.

MR. ALEXANDER: Connecticut and New York hope to, in their deliberations on a proposal that we will bring forth in October, may want to have some discussions about the boundary and how that may ease our transition into a 47 percent reduction. I would not like to take action on what the boundary is at this meeting. I would like to make a motion to amend; to remove the words "and Sub-option B2" from this motion.

CHAIRMAN NOWALSKY: Okay, I have a motion from Mr. Alexander to remove Sub-option B2. Again, if I understand your intent right now would be to remove that now with a pending discussion on that and decision at the annual meeting.

MR. ALEXANDER: Yes, Mr. Chair that is correct.

CHAIRMAN NOWALSKY: Do I have a second to that motion? Eric Reid. Let me ask the Board; given that we've had some discussion and that original motion is the property of the Board. Is there any objection from the original maker or

anyone else from the Board about making that modification?

MR. CLARK: No objection, I just had a question for Mark. Is Option B1 what the New York and Connecticut are considering, or is there something different from that also?

MR. ALEXANDER: This is based on a discussion I had with Jim right before he had to leave, so I don't have a lot of answers to that. Perhaps John does. But Jim, as I understood it, did indicate to me that we would like to at least maintain the possibility of the boundary line consideration during our discussions.

CHAIRMAN NOWALSKY: Mark, let me ask you this. Did he leave it with there is discussion that you would like to have or were there specific points offered? I would ask that question, because from my perspective we basically have a range right now of Orient in the west and Montauk in the east. Is it your understanding that some other point is to be discussed; or is it your belief that that point for discussion would be between those two points?

MR. ALEXANDER: There were no specific alternatives indicated to me, so my understanding is that we just don't want this solidified at this moment; and that it would be helpful if it remains an option to be considered during our discussions.

CHAIRMAN NOWALSKY: We would certainly have the opportunity to go back, reconsider, and the goal is to take action on these items and hopefully not have to reconsider any of them at the annual meeting. That would certainly be the goal; but none of these are final actions here today. It would be my belief, and I'll let staff chime in if they feel somehow differently; that given that we took this document out to public comment with an east and a west range that that would be the range of the boundary that we would need to consider. If we were moving that line further west of Orient to Watch Hill that would not be within the bounds of something

we've taken out for public comment. I'll turn to staff if they have some other feeling about it.

MS. KERNS: I think you are correct. I think the path of last resistance, in terms of how we choose an option for this would be to just delay action on this particular one until annual meeting. If it is a friendly amendment, we could remove that from the original motion that John made.

We could just take action on regional boundaries or not, and then determine the Long Island Sound boundary at the next meeting, once Mark has more information from what Jim said. But there is a narrow window of where that boundary would be as informed in this document. If we need to take another document out for public comment we'll have to face that down at annual meeting.

CHAIRMAN NOWALSKY: Let me get back to procedure here. Mark had asked for a motion to amend. We went around and looked. Let me first get back to what we have to deal with. Is there any objection from the Board about striking the sub-option from Mr. Clark's original motion? Okay seeing none, we don't have a need for Mr. Alexander's motion, and we're going to modify the original motion to remove "and Sub-Option B2."

That brings us back to the motion before the Board; move to approve Option B, Regional Management in Section 4.1 Regional Boundaries. That is the option presently before the Board; discussion on the motion, Eric Reid.

MR. REID: It's my understanding that the only boundary that would be in question, if this were to be voted favorably, is that line. All the other boundaries are set. It's only a question of how we're going to define that west end of Long Island going forward. Is that correct?

CHAIRMAN NOWALSKY: West or east end, depending on how you're looking at it. That is my understanding, correct.



MR. REID: One end of the rainbow or the other, or something in between. It's up to Connecticut and New York to come up with a proposal that would be acceptable to the Board. Is that how this is going to have to go?

CHAIRMAN NOWALSKY: That's our goal. Further discussion on the motion, okay seeing none; is there any objection to the motion? Okay, so we'll go ahead and we'll take a vote on the motion. Did you have anything else to add? John, go ahead.

MR. MANISCALCO: Yes, I would just like to explain New York's reason for objecting to the motion; while we're largely in favor of regional management under species like tautog, where 90 percent of the harvest, at least in Long Island Sound region is recreational. The resolution, which means we're highly relying upon MRFSS or MRIP data, and the resolution of approximately 1.5 states to base an assessment on and a 47 percent reduction on is inappropriate.

CHAIRMAN NOWALSKY: Again, the goal is, well we'll have more discussion about what the goal is under Long Island Sound management. All right, any further discussion on this motion? Seeing none; we'll provide 30 seconds to caucus. **Okay, motion to approve Option B; Regional Management in Section 4.1 Regional Boundaries. Motion by Mr. Clark, seconded by Mr. Cimino, all those in favor of the motion please raise your right hand, looking for right hands. Well I saw a left, a right, then none, then the other person. Okay, you can put your hands down please. All those opposed to the motion raise your right hand; abstentions, null votes. The motion carries; 7 in favor, 1 opposed, 2 abstentions, 0 null votes.**

**Okay, so this now brings us back to two previously tabled motions. We'll take the first motion that was tabled first. Okay, move to approve Option B; managing to the Regional Target F, with Sub-option B2, Board action within one year in Section 2.7.1 Fishing**

**Mortality Target, motion by Mr. Clark, seconded by Mr. Ballou.**

**Discussion on the motion, seeing no discussion is there any objection to the motion? Okay seeing none; that motion carries.** We'll give staff a moment to bring up the next tabled motion. **Move to approve Option B in Section 2.7.4 The Stock Rebuilding Schedule. That would allow for the stock rebuilding schedule to be developed via an addendum without a timeline.** Discussion on the motion, okay no discussion on the motion, here we go, Joe.

MR. CIMINO: I think as John mentioned, you know it is not much of a box necessarily, but it is a long timeframe if we had a ten year tie in here. I would also assume that during that time we might see one or two new assessments coming through from when we started. I'm not sure how, we might be playing an entirely different ballgame if we were shooting for a ten year timeframe and then got a new benchmark assessment. I would rather leave it without.

CHAIRMAN NOWALSKY: **Further discussion on the motion? Okay seeing none; is there any objection to the motion? Okay seeing none; the motion carries by consent.**

#### REGIONAL UPDATES

CHAIRMAN NOWALSKY: Next up that brings us to the balance of Section 4. What I'm going to do is I'm going to go to each region that we have. I'm going to turn to Toni briefly to give an update on where we are and what we hope to accomplish with each of those regions; between now and September 15, to then pass information around to the Board ahead of the annual meeting.

Also I would like the individual states within that region to chime in with any comments that would be helpful to the Board. Again, the intent is not to make motions on these today, but if there is some action the Board wishes to take it is certainly within the purview of the members

here today. With that Toni, I'll turn to you 4.2.2 Mass and Rhode Island recreational measures.

MS. KERNS: The states of Massachusetts and Rhode Island are interested in exploring possible consistent regulations between the two states fisheries. There was some conflicting advice that came out during the public comment period on how to accomplish this; and the two states want additional time to craft possible measures and analyze those measures, as well as discuss those possible measures with their advisory councils/advisory bodies within the two states.

CHAIRMAN NOWASKY: I'll look to Mass and Rhode Island for further comments. Dan McKiernan.

MR. MCKIERNAN: Yes, when we first saw this brought forward it made sense; and I credit Jay and the other folks who put it together for having done the calculations. But upon further reflection, we would really like to test the potential of allowing a single fish during the popular summer fishing months; since the stock we have up our way is not overfished, and overfishing is not occurring. It seemed overly harsh to go from three fish during our prime fishing months to zero, so we would like to see if we can't retain a single fish during those months. We don't expect this to amount to a lot of harvest.

But I think in terms of accommodating the lower end casual anglers, the families, kids, and those who aren't as familiar with the rules, it's a better public policy in terms of maintaining access to a resource. That's our goal. What we want to do is work with Ray, our Chairman, and talk to Rhode Island and their council; and see if we can't craft a better set of rules that still would be the same.

Having the identical rules is really going to be valuable for the fishermen who fish the upper part of Narragansett Bay. In Massachusetts we have the Fall River, Mount Hope Bay area, which are state waters; that's part of Narragansett Bay.

We have problems with enforcement and compliance when the rules are different. It also will help MRIP, because you'll have more consistent rules between the two states and less confusion and less what would appear to be poaching, but is just ignorance of the rules.

CHAIRMAN NOWASKY: Any further discussion, any questions from the rest of the Board? Next up we have Long Island Sound; again, as a result of the regional assessment assuming a 50 percent probability of achieving the F target, which will remain a decision point in the document that would call for a 47.2 percent reduction in harvest. Not surprisingly the public hearings certainly were adventurous to say the least.

I wish to thank staff for doing the best they could, as well as staff from New York. I'm sure it wasn't easy for them there as well. But I think that that certainly was a cause, from my conversations with New York and Connecticut, to have some further discussion and see what could be done to ameliorate that type of reduction; specifically when some of the recent assessment information gave us some hope for some good news there.

Based on discussions with staff as well as the states, there were a couple of different ideas that came forward for how to work through that. Again, I'll turn to Toni and then to the states of New York and Connecticut to further discuss it.

MS. KERNS: As Adam said it is a 47 percent reduction. This would be a severe social and economic impact on the fisheries and the communities in New York and Connecticut along Long Island Sound. They are looking for some flexibility in achieving the reduction. The states are requesting that a more modest harvest reduction on the scale of 20 to 30 percent be explored.

The states would work with the TC to determine what impacts such of a lessened reduction would have on the probability of achieving an F target

in a reasonable amount of time. Their rationale for lowering the 47 percent reduction includes that the assessment indicates a strong 2013 and 2015 year class.

Biomass has been increasing since Addendum VI measures were implemented in 2012. The three-year-average harvest has an 18.3 percent, percent standard error in the recreational data; which is somewhat large for a three-year average. They are also looking to moderate what would be otherwise an extremely disjointed interregional management measure. How they plan to approach this is looking at an alternative probability of achieving the target. This would likely be a lower probability; and as well as extending the period in which the F reduction would be achieved from three years to five to ten years.

They also would like to examine the sensitivity of the Long Island Sound assessment; specifically in the context of the ACCSP facilitated percent standard error workshop and modeling efforts that have recently been held, as well as setting a required reduction considering both the three-year average of harvest as well as the percent standard errors informing a lower bound relative to the harvest target.

They would then bring back revised management options that would include, but aren't limited to, measures that might look at a three to four fish bag limit, and consideration of a broader slot limit. They'll work with the TC and the SAS to do this.

CHAIRMAN NOWALSKY: Thanks for that, Toni. That gives some information on a region for skipping over the probability of achieving F target; as well as the reduction schedule, because both of those variables could impact the reductions. I'll turn to New York or Connecticut to provide any other information they want to at this time.

MR. ALEXANDER: I'll say a few words. I just want to express my gratitude to the Chairman and his

initiative in working with Toni to reach out to us with an opportunity to try to mitigate the impacts that we're going to feel in trying to achieve this 47 percent reduction. As Adam indicated, our hearings were interesting.

I think New York's probably more so than Connecticut. This will cause some pretty severe social and economic impacts in Connecticut. I think it is not an understatement to say that our party charter industry is traumatized by the prospects of this. Tautog makes up an important or a key part of their fall fishery, and they stand to lose quite a bit of business with regard to this.

Also our bait and tackle shops enjoy a robust business based from tautog in the fall fishery. It brings people into their stores at a time when there is not much else going on. Anything we can do, or anything that the Board could accommodate for us to ease our transition into this period of rebuilding, would be greatly appreciated.

CHAIRMAN NOWALSKY: Okay, any other questions, discussion about Long Island Sound and how we plan to move forward? Again that is probably the heaviest lift that we've got here right now. I'll certainly be encouraging staff to encourage the states, again to move forward as expeditiously as we can, so we can get information out to the entirety of the Board in advance of the annual meeting; and make sure the appropriate reviews are done to inform that decision, New Jersey/New York Bight, Toni.

MS. KERNS: Not much there, because three of the four regions decided to delay, we thought we would just delay all of these measures.

CHAIRMAN NOWALSKY: Any comments, discussion on New York/New Jersey Bight. Okay, Delaware, Maryland, Virginia.

MS. KERNS: I hope I get this straight. These guys will correct me if I'm wrong. But out of the, I think it was the Maryland Charterboat Association had suggested a revision to some of

the regulations, and then the other areas might be interested in taking on those regulations as well; or having somewhat consistent regulations amongst all of the states. We needed time to go back and evaluate what that change in those regulations would mean and see if there is the possibility to have those consistent regulations.

CHAIRMAN NOWALSKY: Comments from those states, Mike Luisi.

MR. LUISI: I'll just add an explanation to where we stand. At our public hearings the options presented before us that would put Maryland, Delaware, and Virginia into a region had a seasonal closure for two months beginning on May 1, and ending at the end of June. The public hearing that we had in Maryland, fishermen were quite upset at the fact that because black sea bass does not open until May 15, that there would be a two week period of time when they could not fish for anything.

Our transition in our state is from a tog fishery to a black sea bass fishery. Delaware and Virginia and Maryland I think, plan to put forth some alternative options to present; which close that gap of a closure period for the charter fleet, and not just the charter fleet, but recreational anglers as well. It does not liberalize our fishing effort from where we currently are. There would still be a slight reduction; even though we would open up those two-weeks time. We'll follow up with staff on a proposal to include in the next round of discussions.

MR. CIMINO: Virginia has a different situation with the commercial fishery, so I think I will be putting forward something. I may reach out to the TC right from the very beginning; to figure out the best way forward with that.

CHAIRMAN NOWALSKY: Any further discussion on Delaware, Maryland and Virginia's development of their measures? Okay, seeing none; we'll move along to the next Section 4.3 Commercial Quota. In Section 4.3 Commercial Quota; that contemplates two options. A would

be status quo; no specific commercial quota procedures.

Option B would be commercial quota procedures; which include 4.3.1, 2, 3, 4, and 5. I'll turn to staff for further clarification; but as I understand this section, if Option B is selected that doesn't immediately implement quotas. But it would allow for the regions to come together, form a working group; basically a representative from each of the state in the regions to then design the quota proposal program, which would be reviewed by the TC, and then approved by the Board.

MS. KERNS: That is correct, Adam. It also actually allows for an individual state within a region to develop a quota themselves. They would just need to bring it to their region to get approval by their region; and then it would come to the Board and the TC. That individual state would need to follow the procedures that are outlined in the document.

CHAIRMAN NOWALSKY: With regards to the other options here, rollover would be an option that would be offered in a given proposal; and ultimately approved or disapproved by the Board in consideration of that proposal. Transfers would be allowed, and overages would have deductions.

MS. KERNS: Correct.

CHAIRMAN NOWALSKY: Okay, John Clark.

**MR. CLARK: Move to approve Option B; Commercial Quota Procedures in Section 4.3 Commercial Quota.**

CHAIRMAN NOWALSKY: Motion from Mr. Clark, do I have a second to that motion? Bob Ballou. Move to approve Option B, Commercial Quota Procedures in Section 4.3 Commercial Quota. Motion by Mr. Clark, and seconded by Mr. Ballou. Thanks to staff for getting these up so promptly; discussion on the motion, Mark Alexander.

MR. ALEXANDER: I would just like to get some clarification on this. Under Option B, you said that would not immediately mean that a state would have to implement quotas, it would mean that within a region the regional partners would decide what they're going to do, right, whether or not that includes a quota.

CHAIRMAN NOWALSKY: Or not, or an individual state could put forward that commercial quota program proposal for Board approval. **Further discussion on the motion; is there any objection to the motion? Seeing none; the motion is approved by consent.** Next Section 4.4 Commercial Harvest Tagging Program on Pages 84 through 86.

Option A; status quo, no commercial harvest tagging program. Option B; implement a commercial harvest tagging program. Then depending on how we proceed here, we may have Section 4.4.3; which would discuss tag application, discussion on this section, Commercial Harvest Tagging Program. Eric Reid.

MR. REID: We've heard a lot of discussion in the past about the black market for tautog, and I think we would be foolish to go down this road without a tagging program.

CHAIRMAN NOWALSKY: Did you want to beat Delaware?

MR. REID: I like Delaware. They were good to me. I don't need to beat anybody, I suppose. He's doing such a fine job; I'll let him finish it off. Go on.

MR. CLARK: Well, if you insist Eric.

CHAIRMAN NOWALSKY: Hang on; I've got John Maniscalco first.

MR. MANISCALCO: Don't worry; I'm not going to make a motion. My question is does having a tagging program mandate a quota?

MS. KERNS: No. You don't have to. But if you do implement a quota, and you do the tagging program, then you don't have to do the size limits et cetera to do any reductions if those were required. But you don't have to; all fishermen would still have to use the tags though.

CHAIRMAN NOWALSKY: Dan McKiernan.

MR. MCKIERNAN: A question for Toni. There are other species within the ASMFC list that have tagging, and those tags have to be accounted for. Would we envision a requirement that tags would have to be returned that weren't used?

MS. KERNS: I think if we moved forward with the tagging program, we will have to do some additional work in order to make sure that the tagging program does not have any loopholes, such as accounting for those tags that are not used. I think there might be some additional work that we'll have to do; in terms of the implementation plans for the tagging programs.

MR. MCKIERNAN: Would that be a future addendum?

CHAIRMAN NOWALSKY: There are some specifics outlined here with regards to tag allowance, tag accounting. The document specifically says unused tags would be returned by February 15. There is that element. There is also the annual commercial tag report here that would be part of the compliance report.

Then there are some specifics about what the tag would be, same single use tag inscribed with year of issue, state of issue, unique number. Those items would be here. In terms of how the program was further developed, I think management action via an addendum or something is certainly an option moving forward. Does staff have any other thoughts about it?

MS. KERNS: No, I don't think I have any other thoughts. I think that when the state's put

together their state implementation plan for the tagging program that we can, if there are issues that come up that are not specified in the document that would provide for loopholes. Then we may have to go forward with another document. But if we've covered it all here then we should be okay. But I think the crux of it will be in how the states implement the tagging program themselves.

CHAIRMAN NOWALSKY: Spoiler alert, I think I know why Dan is questioning that; but we'll get to that in the next agenda item. Further discussion on the tagging program, and we still don't have a motion on it. But I know how to fix that. John Clark.

**MR. CLARK: This is motions, yes okay, move to approve Option B in Section 4.4 Commercial Harvest Tagging Program.**

CHAIRMAN NOWALSKY: Do I have a second to the motion? Russ, thank you. Move to approve Option B in Section 4.4 Commercial Harvest Tagging Program; motion by Mr. Clark, seconded by Mr. Allen, discussion on the motion? Mike Luisi.

MR. LUISI: I'll be very brief. I just want to go on the record by saying that we absolutely support the need for this program. But I just want to be clear that it just adds another small but, it's one of those little pains that kind of sticks in your ribs. The burden to the agency again, we've probably have five people that harvest tog in Maryland commercially; and they can only bring in a recreational limit. At some points in the year they can bring two fish back to the dock.

That guy is going to have to go find this little special gun, wherever it might be, and grab a tag or two and apply it, keep track of it all throughout the year and return everything to the agency after the year is over. It's not a big deal. It's just a little stick in the ribs. It's just one more thing. We're going to support it. Our fishermen actually support it, but on our end it's just one

more thing to account for each year. I just want to go on record by saying that.

CHAIRMAN NOWALSKY: Further comments, Mark Alexander.

MR. ALEXANDER: In Connecticut we're kind of facing the inverse of what Mike was just describing. You know we have a few more than five fishermen. But according to the amendment our commercial harvest target is, I don't know two thousand something hundred pounds, which equates to about 7 to 900 fish.

Implementing the infrastructure within our department to administer these tags for such a small number of fish, and figuring out how we're going to equitably distribute them to the available fishermen, is just going to be a challenge for us. It's a lot to do for what we see as such a small commercial harvest potential. It's just too much for us to try to administer for what we see getting out of it.

CHAIRMAN NOWALSKY: Further discussion on the motion? Okay seeing no further hands; I'll just go ahead and ask for, well first I'll say take a couple seconds to caucus, and then I'm going to ask for a show of hands on this one. If you're done caucusing you can check traffic maps. Okay, I'll go ahead.

**Move to approve Option B in Section 4.4 Commercial Harvest Tagging Program. Motion by Mr. Clark; seconded by Mr. Allen, all those in favor of the motion please raise your right hand. Thank you, you can put your hands down. All those opposed please raise your right hand. Thank you put your hand down, abstentions, null votes. Motion carries; 9 to 1.**

With that that would then open the floor for Section 4.4.3 Tag Application. Option A would be Harvester Application, at harvest or upon landing. Option B would be Application by Dealer; discussion on this section and/or motions. Start with Eric Reid.

MR. REID: In my day job I'm a fish dealer. In Rhode Island we tag striped bass, and the dealer does the tagging and the dealer does its own paperwork. Then we do the accounting for the tags at the end of the year; or at any period where we have to re up tags. There is some pretty good accountability there.

I'm pretty sure New York does something different with striped bass tags, where the fishermen actually get the tags. That's the only other fishery I have any experience with that the fishermen actually get the tags. I'll qualify my remarks with that I buy dead fish. I don't buy live fish, and tautog is a live fish.

Whether or not the harvester has to apply the tag, because you get the trauma out of the way, and then you know the fish survives better. I can't even begin to speak to that; but as far as the accountability of the tags, unless there is some enforcement issue with the location of the fishermen; although it says at the time of harvest or prior to unloading, so that kind of throws that argument out of the way.

I guess all that being said from my standpoint in what I do, and I've tried to qualify that. I would just as soon that the dealer applied the tag. I think at the end of the year when you've got a fisherman who is trying to find his tags that he can't find, and however they're going to be attached. I think it's problematic. I would prefer that the dealer does the tagging. That would be my preference.

MR. McKIERNAN: I'm going to argue counter to Eric. The model for tagging fish is the striped bass system that was developed by the state of Maryland; and if you recall one of the findings is that there was a lot of poaching and interstate shipping of fish, and the tagging system was identified as being really weak.

Most states have a fishermen applied tag. Massachusetts has a dealer applied tag, and we're fairly confident about that. But I think with the small number of fishermen that we have. I

think with the propensity for storing up live fish, which often is done in this fishery. A lot of the times these fish are card in the water. I just think that this fishery needs some serious accountability, and so I would prefer it go to a fisherman applied tag.

CHAIRMAN NOWALSKY: Thanks Dan, John Clark.

MR. CLARK: I agree with Dan. In a state like Delaware, we don't really even have dealers that buy the live tog. I mean it's going to be a very small harvest anyhow. But we would prefer that the tag be applied at the time of harvest by the fishermen.

CHAIRMAN NOWALSKY: Something else you would like to add, John?

**MR. CLARK: It's that time again, huh? Okay, move to approve Option B, oh excuse me Option A. Move to approve Option A in Section 4.4.3 Tag Application.**

CHAIRMAN NOWALSKY: Is there a second to the motion; Ray Kane. Move to approve Option A in Section 4.4.3 Tag Application. Motion by Mr. Clark, and seconded by Mr. Kane, further discussion on the motion? Okay we'll give it 30 seconds to caucus. All right, we'll go ahead and take a vote on the motion.

**Move to approve Option A, in Section 4.4.3 Tag Application, motion by Mr. Clark, seconded by Mr. Kane; that might have been the third time I've read that. All those in favor please raise your right hand. Okay you can put those down, thank you. All those opposed raise your right hand, thank you, abstentions, and null votes. The motion carries 9 to 1.** Okay thank you very much. That completes all of the discussion items and options in the draft amendment.

I want to thank everybody for getting through them as well as we did. I think we had good discussion on a lot of them. Again, for those region-specific options, I'll be encouraging staff on a regular basis to make sure we get those on

a timely basis. Again, I ask all the states to respond to those requests in a timely manner as well, so we can get things out to the Board.

#### **ELECTION OF VICE CHAIR**

CHAIRMAN NOWALSKY: Is there any further discussion on any of the Amendment 1 topics? Okay seeing none; that will complete that agenda item and take us to Agenda Item 5, **Motion to approve Dan McKiernan as vice chair of the Tautog Management Board.** Motion made by Mr. Allen and seconded by Mr. Clark. Motion carries unanimously.

The Vice Chair is currently vacant. We had Dave Simpson, who has since retired from his position, so that is vacant. I'm going to turn to Russ Allen for a motion.

MR. RUSS ALLEN: **It would be my pleasure to nominate Dan McKiernan Vice-Chair of this Board.**

CHAIRMAN NOWALSKY: Do I have a second to that; John Clark; thank you Russ, thank you, John. Dan, do you have anything you would like to add?

MR. MCKIERNAN: Thank you, I think. This plan was amended once in 21 years; sounds good.

CHAIRMAN NOWALSKY: It hasn't been amended yet, Dan. We're getting there. All right thank you very much. Is there any objection to that motion? Okay seeing none; congratulate Dan on Vice-Chair, and thank you very much.

CHAIRMAN NOWALSKY: Is there any other business to come before the Board today? We never had that on the board.

**Motion to approve Dan McKiernan Vice-Chair of the Tautog Management Board, motion made by Mr. Allen, seconded by Mr. Clark; motion carried without objection by consent.**

#### **ADJOURNMENT**

CHAIRMAN NOWALSKY: All right, having completed the business of the Board we stand adjourned. Thank you very much, safe travels home.

(Whereupon the meeting adjourned at 3:50 p.m. on August 3, 2017.)



# ***Atlantic States Marine Fisheries Commission***

## **DRAFT AMENDMENT 1 TO THE INTERSTATE FISHERY MANAGEMENT PLAN FOR TAUTOG FOR PUBLIC COMMENT**



*ASMFC Vision: Sustainably Managing Atlantic Coastal Fisheries*

## Draft Amendment 1 for Public Comment

### Atlantic States Marine Fisheries Commission Seeks Your Input on Tautog Management

The public is encouraged to submit comments regarding this document during the public comment period. Comments will be accepted until **July 14, 2017**. Regardless of when they were sent, comments received after that time will not be included in the official record.

You may submit public comment in one or more of the following ways:

1. Attend public hearings held in your state or jurisdiction.
2. Refer comments to your state's members on the Tautog Management Board or Tautog Advisory Panel, if applicable.
3. Mail, fax, or email written comments to the following address:

Ashton Harp  
1050 North Highland St., Suite 200 A-N  
Arlington, VA 22201  
Fax: (703) 842-0741  
aharp@asmfc.org (subject line: Tautog Draft Amendment I)

If you have any questions please call Ashton Harp at 703.842.0740.

#### Draft Amendment 1 Timeline

Winter 2015	Board Reviews the 2015 Benchmark Stock Assessment that Evaluates Stock Status Across Three Regions
Fall 2015	Board Solicits Public Comment on a Public Information Document (PID)
November 2015	Board Reviews PID Comments and Tasks Plan Development Team (PDT) to Develop Draft Amendment I
Spring 2016	Board Tasks Technical Committee to Develop a Regional Assessment to Evaluate Stock Status Across Two Additional Regions
August 2016	Board Reviews Regional Assessment and Tasks TC to Develop a Four-Region 2016 Stock Assessment Update that Includes Data through 2015
Winter 2016/17	Board Tasks TC and PDT to Develop Management Measures for Each Region Respective to Regional Stock Status
May 2017	Board Reviews Draft Amendment 1 and Considers Approval for Public Comment
June/July 2017	Board Solicits Public Comment on Draft Amendment 1 and States Conduct Public Hearings
<b>August 2017</b>	<b>Board Reviews Public Comment, Selects Management Options and the Commission Considers Final Approval of Amendment I</b>

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## Draft Amendment 1 for Public Comment

### 1.0 INTRODUCTION

The Atlantic States Marine Fisheries Commission (ASMFC) is responsible for managing Tautog (*Tautoga onitis*), under the authority of the Atlantic Coastal Fisheries Cooperative Management Act (ACFMA). The management unit consists of the coastal states from Massachusetts through Virginia. ASMFC has coordinated interstate management of tautog in state waters (0-3 miles) since 1996. Responsibility for compatible management action in the Exclusive Economic Zone (EEZ) from 3-200 miles from shore lies with the Secretary of Commerce through ACFMA in the absence of a federal fishery management plan. If approved, Amendment 1 would consolidate the fishery management plan (FMP), subsequent addenda (Addendum I-VI) and new management measures into a single document.

#### 1.1 STATEMENT OF THE PROBLEM

Since the Tautog FMP was implemented, in 1996, the resource has experienced changes in stock status, as well as management measures used to control harvest. Based on the 2015 Benchmark Stock Assessment and Peer Review Report (2015 assessment), tautog is overfished and overfishing is occurring on a coastwide scale.

The 2015 assessment suggested the delineation of separate, regional stock units as management areas to reduce the risk of overfishing and account for tautog's very limited coastwide movement. It explored multiple regional definitions for management purposes, including a three-region delineation of Massachusetts-Rhode Island-Connecticut, New York-New Jersey, and Delaware-Maryland-Virginia. The Tautog Management Board (Board) accepted the 2015 assessment for management use, but expressed concern with the proposed three-region stock delineation that would split Long Island Sound (LIS) into two assessment and management areas. This was seen as an issue because recent landings indicate a concentration of the effort in the LIS and fishermen from Connecticut and New York routinely cross states lines when fishing.

Therefore the Board requested a new regional assessment that would examine the population dynamics in Connecticut-New York-New Jersey in more detail. This regional assessment proposed two additional stock unit boundaries for consideration at a finer regional scale: Long Island Sound (LIS), which consists of Connecticut and New York waters north of Long Island, and New Jersey-New York Bight (NJ-NYB), which consists of New Jersey and New York waters south of Long Island. The Board approved the regional assessment for management use and selected a four-region management approach (Table 13) for inclusion in Draft Amendment 1.

Draft Amendment 1 updates the 1996 FMP with new fishery management principles and consolidates associated addenda into a single document. The document proposes regional management for tautog to address overfishing and overfished stock status present in some regions. In addition, a commercial harvest tagging program is proposed to address an illegal, unreported and undocumented fishery that has persisted for more than a decade. If approved,

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Draft Amendment 1 would be the comprehensive management document for tautog management in state waters.

### 1.2 BENEFITS OF IMPLEMENTATION

Unlike previous assessments, which assessed the stock on a coastwide basis, the 2015 benchmark stock assessment and 2016 regional assessment evaluated stock status regionally to reflect differences in life history characteristics and harvest patterns. Regional management of the species has been suggested since the onset of management, however the tools and data to run a regional stock assessment to determine regional stock status were not available until recently. The 2015 benchmark stock assessment peer review panel, 2016 regional assessment peer review panel and tautog technical committee consider the regional assessments to be a significant advancement from prior assessments.

The regional stock unit definitions are based on localized biological and socioeconomic trends, which allow managers to better address the management needs of each region. Evaluating stock status by regions allows managers to develop targeted management measures that restrict effort only where necessary. Whereas a coastwide assessment and management measures, required the entire coastwide fishery to take reductions regardless of where fishing effort was highest. Regional management is expected to have a positive impact on the resource and fishery.

### 1.2 DESCRIPTION OF THE RESOURCE

Tautog, a member of the wrasse (*Labridae*) family, is a stout fish with an arched head, large lips broad tail and a lack of scales on the gill covers. They are regionally referred to as blackfish, in reference to its common overall coloration. Juveniles and females more often exhibit a mottled and brown toned appearance, while males are most often grayish in color. Adults can live more than thirty years and stay close to a preferred home site moving only short distances longitudinally, if at all, during seasonal migrations. A sedentary life history and aggregation around structure makes tautog relatively easy to catch, even when biomass levels are low. Catchability and slow growth rate make tautog highly susceptible to overfishing and slow to rebuild.

#### 1.2.1 Species Life History

##### *1.2.1.1 Distribution*

Tautog are distributed along the northeast Atlantic coast of North America (Figure 1) from the outer coast of Nova Scotia to Georgia (Collette and Klein-MacPhee 2002, Parker et al. 1994); although, most abundant from Cape Cod to Cape Hatteras (Bigelow and Schroeder 1953). They inhabit coastal and estuarine waters throughout this range. North of Cape Cod, they are usually found within 4 miles of shore in waters less than 60 feet deep (Bigelow and Schroeder 1953). South of Cape Cod, they can be found up to 40 miles offshore and at depths up to 120 feet (Hostetter and Munroe 1993).

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**Figure 1. Tautog Distribution**

### *1.2.1.2 Life History Stages*

Eggs and larvae have been collected on the inner continental shelf and within estuaries from May through August (Berrien et al. 1978, Colton et al. 1979, Ferraro 1980, Bourne and Govoni 1988, Monteleone 1992, Able and Fahay 1998, Witting et al. 1999). Viable eggs are 1 millimeter (mm) in diameter, buoyant and are found in the greatest numbers at the water surface. Hatching occurs in 81 hours at 15°C and 42 hours at 20°C (Auster 1989, Perry 1994). The larvae (2 mm at hatching) stay near the surface during the day and may go deeper at night (Malchoff 1993). After approximately 3 weeks, larvae undergo metamorphosis and settle out of the water column as juveniles (Sogard et al. 1992, Dorf 1994).

As juveniles, tautog begin a bottom dwelling (demersal) existence that continues for the remainder of their lives. Newly settled juveniles look similar to miniature adults and assume the color (green to mottled or striped brown) of the habitat they occupy. It is unknown if tautog

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larvae settle out of the water column in offshore locations or if small juvenile tautog are found in offshore habitats.

Tautog are attracted to some type of structure in all post larval stages of their life cycle. These habitats include both natural and man-made structures, such as submerged vegetation, shellfish beds, rocks, pilings, jetties, shipwrecks and artificial reefs (Olla et al. 1974, Briggs 1975, Briggs and O'Connor 1971, Orth and Heck 1980, Sogard and Able 1991, Dorf and Powell 1997, Steimle and Shaheen 1999). Juvenile tautog are found in estuaries and bays where newly settled individuals are reported to prefer areas less than 1 meter (m) deep (Sogard et al. 1992, Dorf and Powell 1997), and vegetated areas to unvegetated regions. Vegetation can include sea grass and various types of macroalgae (Briggs and O'Connor 1971, Sogard et al. 1992). With growth, these young-of-the-year move to deeper waters but are not usually found deeper than around 25 feet (Cooper 1964).

Larger juveniles become associated with various reef-like habitats and hard surfaces as long as the main habitat requirement of shelter is met. Young tautog may establish home sites, ranging within a few feet during the day and returning at night when they become dormant (Olla et al. 1979). Dixon (1994) found juvenile tautog showed a size-specific preference when choosing a shelter. Juvenile tautog remain inshore during the winter (Cooper 1964, Stolgitis 1970, Olla et al. 1974). When water temperatures drop below 4.5°C some large juveniles may move to deeper, more protected locations. Juveniles remaining inshore in shallow water can be found in a variety of shelters including grass and macroalgal beds, shells, discarded soda cans and bottles, fish pots, crevices and bottom depressions covered with silt (Cooper 1964, Olla et al. 1978, Olla et al. 1980). By the end of their first year juveniles reach a length of around 60 mm in Rhode Island waters (Cooper 1967) and 140 mm in Virginia waters (Hostetter and Munroe 1993).

During summer months, adult tautog are found in both inshore embayments and coastal waters in habitats similar to those of large juveniles (Cooper 1966, Briggs 1969, Briggs 1977, Steimle and Shaheen 1999, Arendt et al. 2001). They can be found in a variety of complex, structured locations including vegetation, rocks, natural and artificial reefs, pilings, jetties and groins, mussel and oyster beds, shipwrecks, submerged trees, logs and timbers (Steimle and Shaheen, 1999). Tautog exhibit diurnal activity and enter a torpid state at night during which they seek refuge in some type of structure. Adults stay relatively close to their preferred home site and, while moving away during the day to feed, they return to the same general location at night where they become dormant (Olla et al. 1974).

The mouths of estuaries as well as other inlets and artificial reefs may be extremely important habitats for tautog (Zawacki 1969, Briggs 1975), particularly south of Long Island where there are fewer natural rocky outcrops to provide shelter than in the more northern portion of the range. Localized populations form during the summer, in co-existence with large juveniles (Olla et al. 1974).

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### *1.2.1.3 Age and Growth*

Larval growth rates have been estimated to be between 0.25 - 0.76 mm per day (Malchoff 1993, Dorf 1994). During summer, young-of-the-year juveniles grow around 0.5 mm per day (Sogard et al. 1992, Dorf 1994). The size attained at the end of the first year increases along the coast from north to south. Since juvenile daily growth rates appear to be similar in all areas during the summer, size differences may be due to the longer duration of warmer water temperatures in southern portions of the species range (Sogard et al. 1992, Dorf 1994). Juvenile growth rates have been observed to be higher in vegetated than in unvegetated habitats. Among vegetated habitats, juvenile growth was higher in sea lettuce beds than in eelgrass beds in New Jersey (Sogard et al 1992).

Adult male tautog grow faster in length than adult females (Cooper 1967, Simpson 1989, Hostetter and Munroe 1993). In Rhode Island waters (Cooper 1967), the mean length of a seven year old male was 358 mm (14.1 inches), while a female was 335 mm (13.2 inches). Faster adult male growth has also been documented in Long Island Sound (Simpson 1989) and Virginia waters (Hostetter and Munroe 1993). Adult growth is relatively slow and varies with the season. Slowest body growth rates occur during maturation of the gonads in the spring prior to spawning. Maximum body growth occurs after spawning during the summer and fall followed by a period of slow or no winter growth associated with reduced water temperatures and feeding activity during the torpid period (Hostetter and Munroe 1993).

Mean adult growth rates are similar for tautog in northern and southern waters until the age of 13. After that age, growth rates decrease more rapidly in the northern part of the species range, with growth rates in Virginia being almost double those of tautog in Rhode Island waters (Hostetter and Munroe 1993). In Rhode Island, male annual growth rates were reduced to less than 12 mm (0.5 inches) per year after age 12 and to 2–4 mm per year after age 20. For females, annual growth decreased to less than 10 mm per year after age 13 and to 3–4 mm per year after age 17 (Cooper 1967) Tautog are long-lived fish with males living longer than 30 years and females around 25 years (Cooper 1966, Hostetter and Munroe 1993). Fish as old as 30 years have been caught in Rhode Island, Connecticut, and Virginia, but the majority of fish caught are four to eight years old.

As stated above, many variables may affect the observed length of an individual tautog at a given age. Age-length keys show significant overlap of age groups by length. On average, Table 1 provides a reasonably accurate guide.

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**Table 1. Tautog length-at-age relationship**

Length (Inches)	Age (Years)
3	1
5.5	2
9	3
10.5	4
12.5	5
14	6
15.5	7
17	8
18	9
19	10
21	15
22	20

### *1.2.1.4 Spawning*

Adult tautog generally migrate inshore in the spring from offshore wintering locations to spawn in April through July (Chenoweth 1963, Cooper 1966, Stolgitis 1970, Olla et al. 1974, Hostetter and Munroe 1993, White et al. 2003). Spawning usually occurs within estuaries or in nearshore marine waters (Chenoweth 1963, Sogard et al. 1992, Hostetter and Munroe 1993, White et al. 2003).

Surveys and tagging data suggest tautog spawn seasonally at specific locations. In Rhode Island, tagging studies showed that adults returned to the same spawning locations over a period of several years (Cooper 1966, Lynch 1991) and spawn in discrete groups in May and June (Cooper 1964, 1967). Studies in New York waters suggest adults from different populations may mix at specific spawning locations from year to year (Olla et al. 1980). Tautog collected from offshore hard bottom sites in Maryland and Virginia were found to be in spawning condition seasonally (Eklund and Targett 1990, Hostetter and Munroe 1993).

Some adults remain offshore throughout the year, particularly in the southern part of the range (Olla and Samet 1977, Eklund and Targett 1990, Adams 1993, Hostetter and Munroe 1993). Eggs and larvae collected in continental shelf waters from Georges Bank to North Carolina, with especially high concentrations off of southern New England and New York, suggest tautog spawn offshore as well as inshore locations (Ferraro 1980, Sogard et al. 1992, Hostetter and Munroe 1993, White et al. 2003). Tautog have been found in spawning condition 12 miles off the coast of Virginia in 60 feet of water (White et al. 2003).

### *1.2.1.5 Reproduction*

Tautog normally reach sexual maturity at 3 to 4 years of age and 177 to 304 mm in length (7 to 12 inches), although there are some sexually mature 2 year old fish (Chenoweth 1963, Olla and Samet 1977, Hostetter and Munroe 1993). Tautog in Rhode Island waters reach sexual maturity



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at a smaller size of 190 to 200 mm (7.5 - 7.9 inches, Cooper 1966) than in New York at 215 to 241 mm (8.5 - 9.5 inches, Briggs 1977) or Chesapeake Bay waters at 271 to 289 mm (10.7 - 11.4 inches, Hostetter and Munroe 1993). The difference in size is likely related to the length of time which the water remains warm and growth occurs (Hostetter and Munroe 1993).

Spawning occurs in heterosexual pairs or in groups of a single female with several males. In laboratory studies, the type of spawning depends on the number of mates available for the female, the male dominance hierarchy, and the availability of shelter and food. Pair spawning is usually the dominant process (Olla and Samet 1977).

Spawning begins in the spring when water temperatures reach at least 9° C. Peak spawning varies annually with temperature. Generally spawning reaches peak in June, and continues throughout the summer (Bigelow and Schroeder 1953, Cooper 1964, Colton et al. 1979, Eklund and Targett 1990, Sogard et al 1992, Hostetter and Munroe 1993). Chenoweth (1963) reported peak spawning in Narragansett Bay during the first two weeks of June 1961 and the last two weeks of May 1962, when average water temperatures were 13-14°C. Malchoff (1993) reported peak spawning in the New York Bight during July 1988. In Maryland and Virginia, reported peak spawning is between April and June (Eklund and Targett 1990, Hostetter and Munroe 1993, White et al. 2003). GSI off the south shore of New York has been found to peak in mid-June to mid-July when temperatures reached 11-12°C (Dumais 2005).

Tautog are batch spawners with a prolonged spawning season (White et al. 2003, Dumais 2005, LaPlante and Schultz 2007). Batch fecundity varies with female size (Chenoweth 1963, White et al 2003, Dumais 2005, LaPlante and Schultz 2007). In Rhode Island waters, estimates of batch fecundity for tautog between 200-685 mm were 5,000 to 637,500 mature eggs. (Chenoweth 1963). Similar results were found in Long Island Sound with batch fecundity for females 250 – 600 mm estimated between 8,000 and 600,000 eggs (LaPlante and Schultz 2007). Off the south shore of Long Island, batch fecundity for females 213 – 455 mm was estimated as 778 to 69,500 eggs (Dumais 2005). Batch fecundity in Virginia was estimated to be between 2,800 and 181,200 eggs for females 259 - 516 mm.

Larger females were found to spawn more frequently than smaller females and have a longer spawning season (LaPlante and Schultz 2007). During the peak part of the season, larger females were found to spawn almost daily (White et al. 2003, LaPlante and Schultz 2007).

Total annual fecundity has been found to vary yearly as well as with fish size (LaPlante and Schultz 2007, White et al 2003). Estimates of annual fecundity were higher in Long Island Sound (LaPlante and Schultz 2007) than those reported for Virginia waters (White et al. 2003). In Long Island Sound, female tautog in the 500 mm size range produced around 26 to 55 million eggs where as a female in the 250 mm size range produced 0.6 to 1 million eggs. In Virginia, annual fecundity ranged from 160,000 eggs to 10 million eggs for females 259 mm and 511 mm respectively.

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### 1.2.1.6 Migration

Tautog typically migrate offshore when water temperatures drop below approximately 50°F in the late fall. Migration behavior includes schooling to rugged bottom topography 80-150 feet deep. Tautog do not appear to make extensive long-shore migrations, although some fish from Long Island bays have been reported to overwinter in New Jersey coastal waters (Briggs 1977).

Seasonal migration is not uniformly exhibited. Some adults remain inshore and active throughout the year, particularly in the southern portion of the range (Auster 1989, Eklund and Targett 1991, Adams 1993, Hostetter and Munroe 1993, Arendt et al. 2001). Juvenile tautog have been collected in Maryland's Coastal Bays submerged aquatic vegetation (SAV) in September (Doctor et al 2015), and spawning tautog have been collected on artificial reefs near Ocean City in May. In Maryland and Virginia, populations of adults have been observed 12 - 40 miles offshore in 30 - 225 feet of water throughout the year (Eklund and Targett 1990, Hostetter and Munroe 1993). Offshore distributions decline toward the northern part of the species range (Chesapeake Bay Program 1994).

When water temperatures are very low, adults become torpid (Cooper 1966, Briggs 1977). This may allow tautog, a member of a mostly tropical family, to survive cold winter conditions in northern regions (Curran 1992). Suboptimal conditions (i.e., high water temperature, decline in mussel abundance) will cause adult and large juvenile tautog to leave an area (Olla et al. 1979, Adams 1993, Steimle and Shaheen 1999).

### 1.2.1.7 Feeding

Juvenile tautog feed primarily on small benthic and pelagic invertebrates including copepods, amphipods, isopods, ostracods, polychaetes, crabs and mussels (Olla et al. 1975, Festa 1979, Grover 1982, Sogard et al. 1992, Dorf 1994). The composition of the juvenile diet changes with fish size. In Narragansett Bay, Rhode Island, small young-of-the-year (20 - 50 mm total length) primarily consumed amphipods and copepods. Juveniles 50 - 68 mm in length consumed a variety of invertebrates. The largest young-of-the-year (68 - 99 mm) ate mainly small shrimp and crabs (Dorf 1994). Similar diets were reported in New Jersey (Festa 1979, Sogard et al. 1992), Chesapeake Bay (Orth and Heck 1980) and Connecticut waters (Clark et al. 2006). In New York waters, juveniles 104 - 205 mm in length fed primarily on blue mussels (*Mytilus edulis*) throughout the year (Olla et al. 1975). Larger juveniles (200 - 320 mm) in New Jersey were observed to feed on xanthid crabs (Festa 1979).

Adult tautog feed primarily on the blue mussel and other shellfish throughout the year. The diet can be extremely varied depending on location and availability. The following items have been found in the diets of adult tautog: hydroids, barnacles, various crabs, sand dollars, amphipods, isopods, polychaete worms, shrimp, lobster, periwinkles, jingle shells, scallops, soft shell clams and razor clams (Bigelow and Schroeder 1953, Olla et al. 1974, Steimle and Ogren 1982, Auster 1989, Dumais 2005).

Tautog have been found to select a limited size range of blue mussels as prey (Lankford 1999) which is 45-50% smaller than the size mussel the fish is capable of ingesting. Adults grasp

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mussels using their large canine teeth, tearing them from the surrounding surface by shaking their heads. Small mussels are swallowed whole, while larger, hard-shelled ones are crushed by the pharyngeal teeth prior to swallowing. The canine teeth are not used for crushing shells (Olla et al. 1974).

Tautog are visual predators and therefore, do not feed at night (Olla et al. 1974, Deacutis 1982). Tautog leave their home sites and begin actively searching for food at dawn (Briggs 1969, Olla et al. 1974, 1975). Generally venturing up to 1,500 feet away, although there have been reports of tautog traveling as far away as 10 kilometers from their home site (Olla et al. 1974, Arendt et al. 2001). Tautog have been observed to follow an incoming tide above low water levels to feed on concentrations of mussels in the intertidal, returning to deep water as the tide ebbs (Bigelow and Schroeder 1953). Most fish move to areas with large concentrations of mussels during the day and return to their home site at evening twilight (Olla et al. 1974). Food intake may be reduced due to high water temperatures (Olla et al. 1978), low winter temperatures (Cooper 1966), and during spawning (Bridges and Fahay 1968).

Tautog's high dependence on blue mussels creates an important trophic link influencing distribution, behavior, and perhaps, growth and survival. Periodic recruitment failure of mussels in tautog habitat can cause tautog to move to other feeding areas (Steimle and Shaheen, 1999). If they do not move, or the failure is widespread, tautog inhabiting the area may suffer some effects of an inadequate diet. Heavy consumption of mussels can cause a depletion of this food source before new prey recruitment occurs, especially if tautog are concentrated in an area for some climatological, water quality, or behavioral reason.

### 1.2.2 Stock Assessment Summary

The first tautog stock assessment was performed in 1995 using the ADAPT virtual population analysis (VPA) model (available through NMFS NEFSC toolbox, <http://nft.nefsc.noaa.gov/>). In order to incorporate perceived regional differences in biology and fishery characteristics throughout the range of the species, the Technical Committee (TC) attempted separate regional models for northern (Massachusetts to New York) and southern (New Jersey to Virginia) states. The assessment underwent peer review through the NMFS NEFSC Stock Assessment Workshop/Stock Assessment Review Committee (SAW/SARC) process. Although the assessment was not accepted by the peer review panel, the resulting fishing mortality estimate from the assessment was incorporated into the initial FMP (ASMFC 1996).

The next benchmark stock assessment, performed in 1999, was also conducted using the ADAPT VPA. The regional approach was used for data consolidation, application of age keys, and preliminary VPA runs of the model. Unfortunately, results for the southern region were unreliable. The preferred run, therefore, was based on catch at age (CAA) developed separately for north (MA-NY) and south (NJ-VA) regions and combined for a total coastwide CAA. The assessment derived coastwide estimates of F, spawning stock biomass, and recruitment. In addition, tag based survival estimates were included in the assessment as corroborative

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evidence. A peer review of the model through the SAW/SARC process determined the model was suitable for management purposes. That assessment indicated the terminal F rate had dropped to 0.29, which was attributed to increases in minimum size required in the original FMP. This terminal F was close to the interim FMP target of 0.24, but well above the final plan target of  $F = 0.15$ .

A stock assessment update conducted in 2002 using the methods from the 1999 assessment found that recreational catch rates had returned to levels observed prior to the minimum size limit increase, and F had increased to  $F = 0.41$ . The Board responded by implementing reductions in recreational harvest in 2003, in an attempt to return F to the FMP target value. The target was revised to  $F_{SSB_{40\%}} = 0.29$  by Addendum III (ASMFC 2002), based upon updated recruitment and weight at age parameters and a desire to adopt a target with more management flexibility.

A benchmark stock assessment conducted and peer-reviewed in 2005 (ASMFC 2006) continued the use of the coastwide ADAPT VPA model based on separate regional (north/south) CAA. The assessment indicated the coastwide population of tautog had declined about four-fold from 1982 to 1996 and had then remained relatively stable through the terminal year. The stock was considered overfished and overfishing was occurring with a 2003 coastwide fishing mortality estimate of  $F=0.299$ . In response to concerns from the Management Board and TC regarding the utility of a coastwide model on a mostly sedentary species, the 2006 assessment also presented results of state-specific assessments (primarily catch curves) of local tautog populations. The peer review panel generally agreed local or regional methods were more appropriate given the life history of the species, but expressed reservations about the paucity of data available at small regional scales and the use of catch curves for management purposes. The panel approved the coastwide model for use in management, encouraging further development and refinement of more localized models for future use (ASMFC 2006).

A “turn of the crank” update assessment was completed in 2011 using the same methodology as the 2006 assessment, with data through 2009. Fishing mortality was estimated as  $F = 0.23$  in 2009, with the three-year average  $F = 0.31$ . Both estimates were above the Addendum IV target of  $F_{\text{target}} = 0.20$ . SSB was estimated to be 10,663 MT in 2009, well below Addendum IV’s target of 26,800 MT and threshold of 20,100 MT. Therefore, the 2011 stock assessment update concluded tautog was overfished and experiencing overfishing.

A benchmark stock assessment was completed and peer-reviewed in 2014 (ASMFC 2015). The assessment was conducted at a regional level. The TC used life history information, tagging data, fishery characteristics, and data availability considerations to split the coastwide population into three regions. Each region was assessed independently using the statistical catch-at-age model ASAP. All three regions were found to be overfished, with overfishing occurring in two regions (Massachusetts-Rhode Island and Connecticut-New York-New Jersey).

While the three-region approach in the benchmark stock assessment was applicable, there was interest in assessing and managing the Long Island Sound as a discrete area. A regional stock

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assessment was completed and peer-reviewed in 2016 (ASMFC 2016a). This regional assessment analyzed two additional regions (Long Island Sound and New Jersey-New York Bight) to comprise a four-region management scenario. The Long Island Sound (LIS) region includes harvest in Connecticut and New York LIS. The New Jersey-New York Bight (NJ-NYB) region includes harvest in New York's south shore and New Jersey. The two regions were found to be overfished and overfishing was occurring.

In 2016, the Board reviewed stock status across the three and four region management scenarios, ultimately electing to separate management into four regions. A four region stock assessment update was conducted using data through 2015 (ASMFC 2016b). The assessment estimated the maximum level of harvest (per region) in order to achieve the F target for each region by 2021 (Table 2). Spawning potential ratio (SPR) based reference points were utilized for all regions, except LIS, which used maximum sustainable yield (MSY) based reference points (See Section 2.5).

**Table 2. 2013-2015 Average Landings Compared to the Proposed Maximum Removals by Region when Applying a 50% Probability of Achieving F Target in 2021. Parenthesis indicates the necessary harvest reduction to achieve the associated level of harvest. (ASMFC 2016b)**

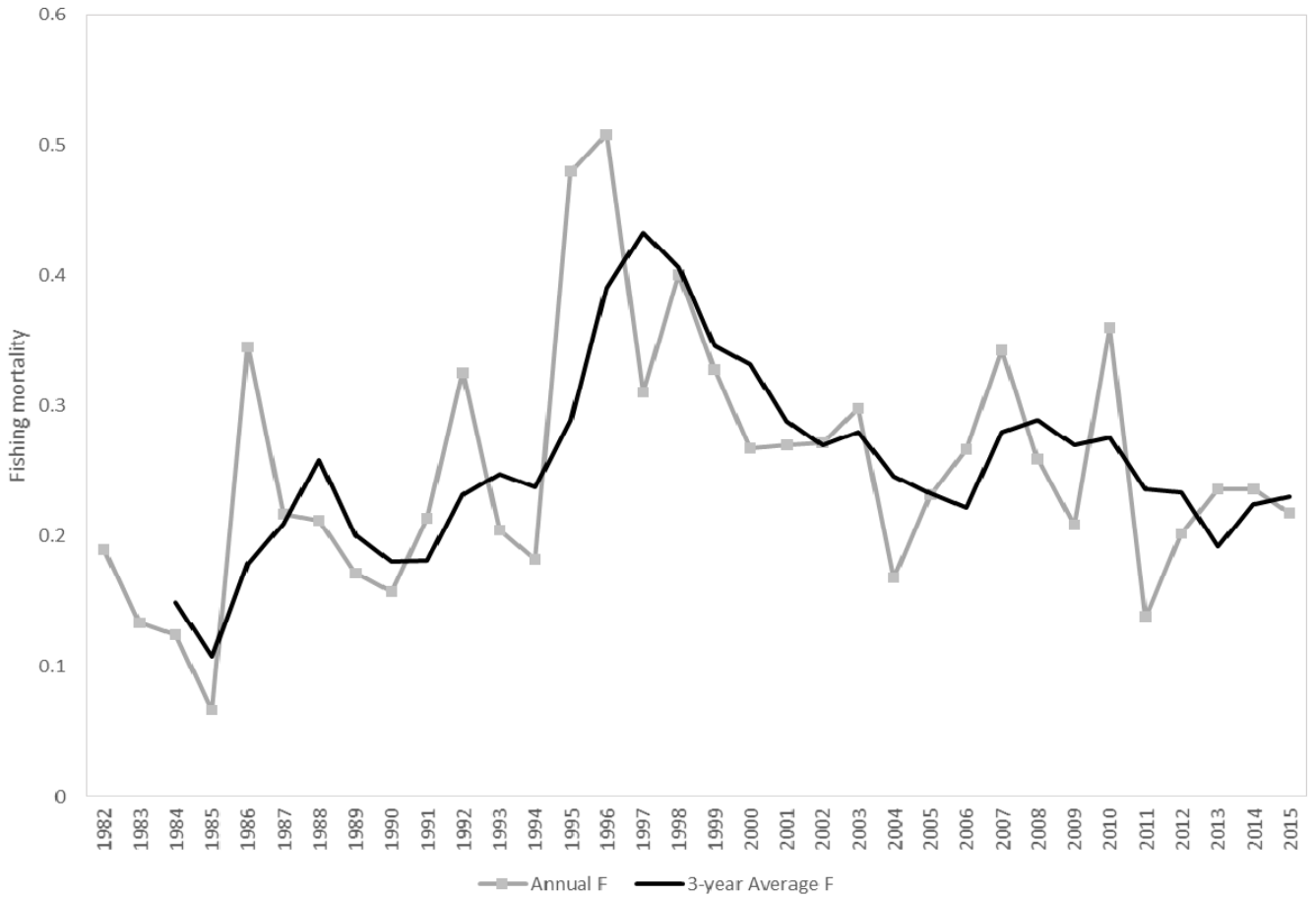
Region	Status quo (mt) 3 yr avg: 2013-2015	50% Probability of Achieving F Target (mt)
Massachusetts-Rhode Island	390	-
Long Island Sound	500	264 (-47%)
New Jersey-New York Bight	461	450 (-2)
Delaware-Maryland-Virginia	77	-

### *1.2.2.1 Massachusetts-Rhode Island*

The 2016 stock assessment update indicates the Massachusetts – Rhode Island (MARI) stock is not overfished and overfishing is not occurring.

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**Fishing Mortality:** For SPR estimates, the 3-year average value of  $F_{3yr} = 0.23$  was below both  $F_{Target} = 0.28$  and  $F_{threshold} = 0.49$ , this stock is not experiencing overfishing and the fishing mortality rate is below the target.

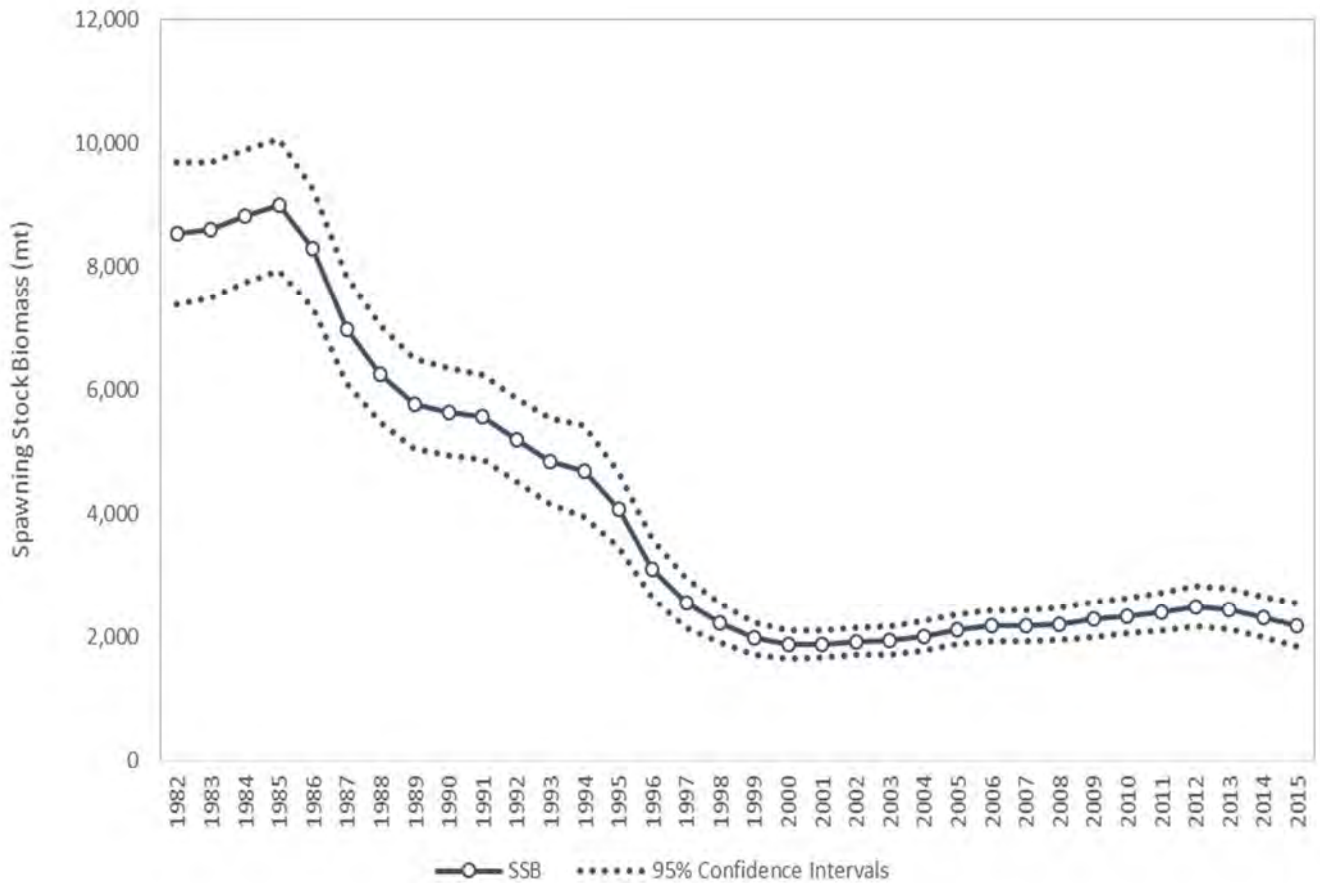


**Figure 2. Fishing mortality estimates for the MARI region.**

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Spawning Stock Biomass: For SPR estimates, the point estimate of  $SSB_{2015} = 2,196$  mt is below the  $SSB_{Target} = 2,684$  mt but is above the  $SSB_{threshold} = 2,004$  mt, indicating the stock is not overfished but is not yet rebuilt to the SSB target. Total abundance and spawning stock biomass declined rapidly from 1982 until 2000. Spawning stock biomass decreased from 8,994 mt in 1985 to the current estimate of 2,196 mt in 2015.

**Figure 3. Spawning stock biomass estimates for the MARI region.**



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Recruitment: Recruitment was generally highest in the early years of the time-series, with a couple of average recruitment years in the mid-2000s. Observed recruitment has increased from time series lows during the 2013 – 2015 period, but remain below average in general.

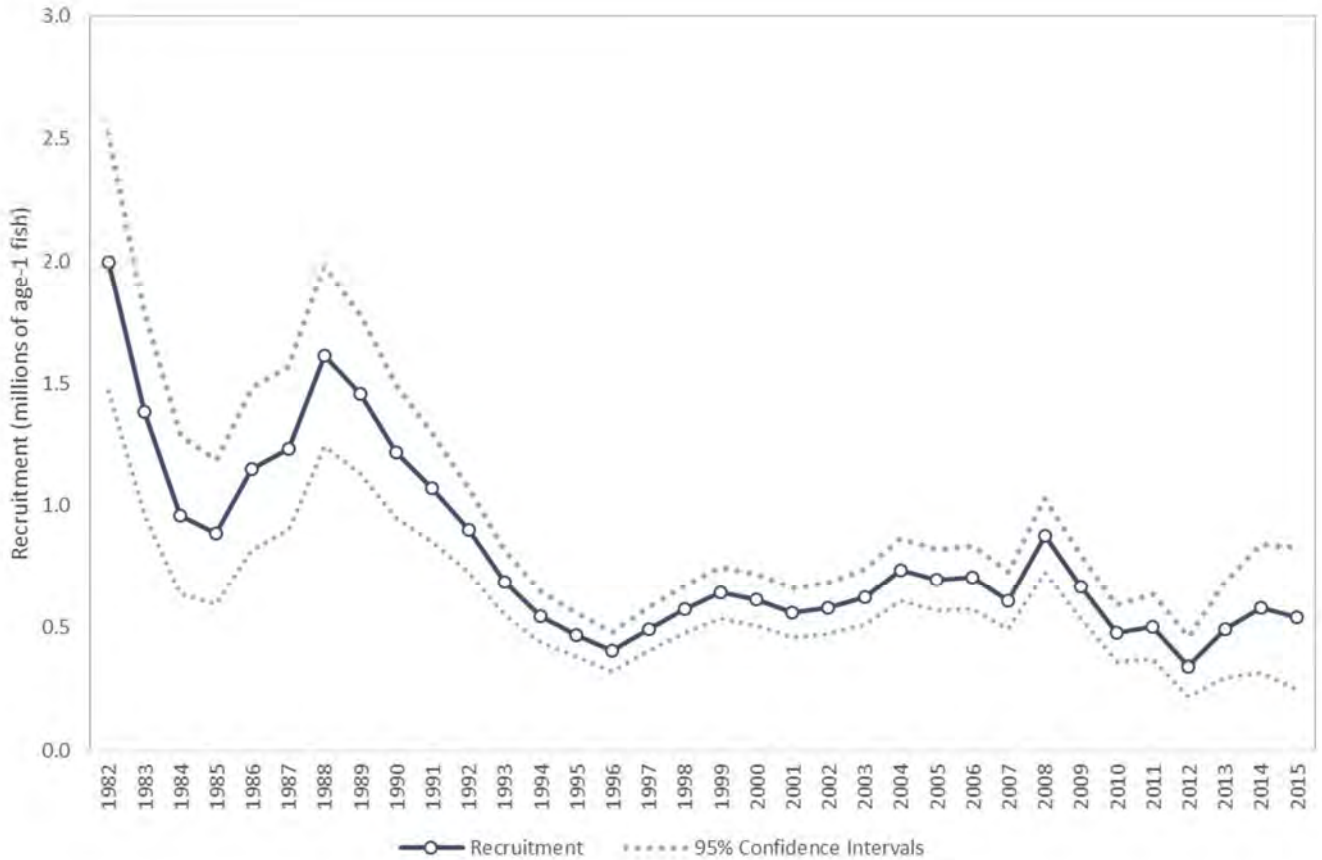
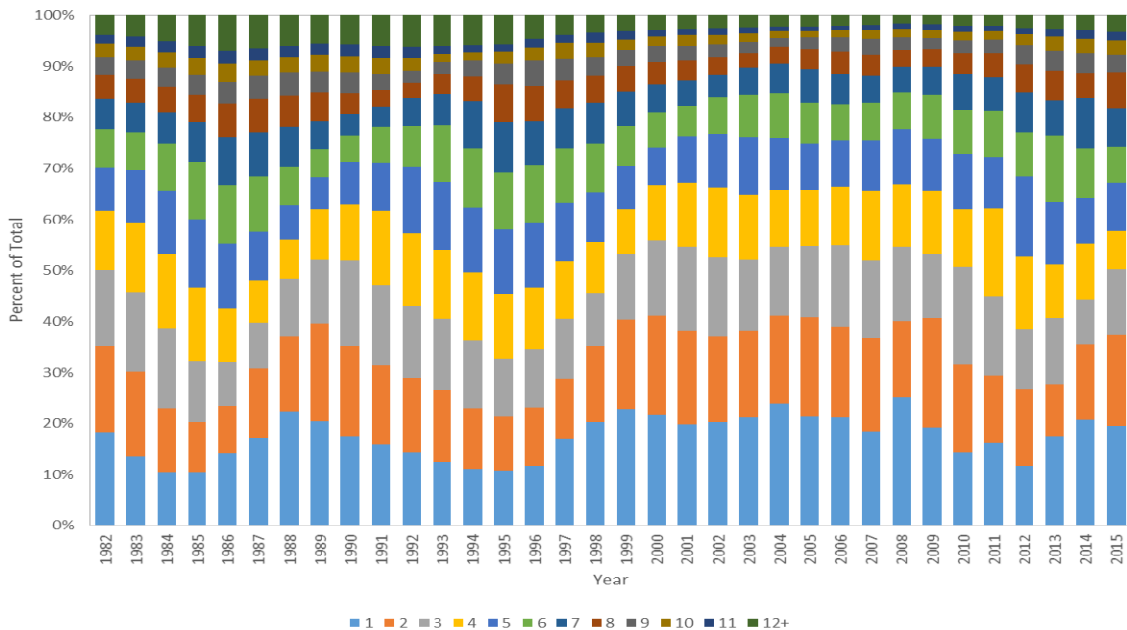
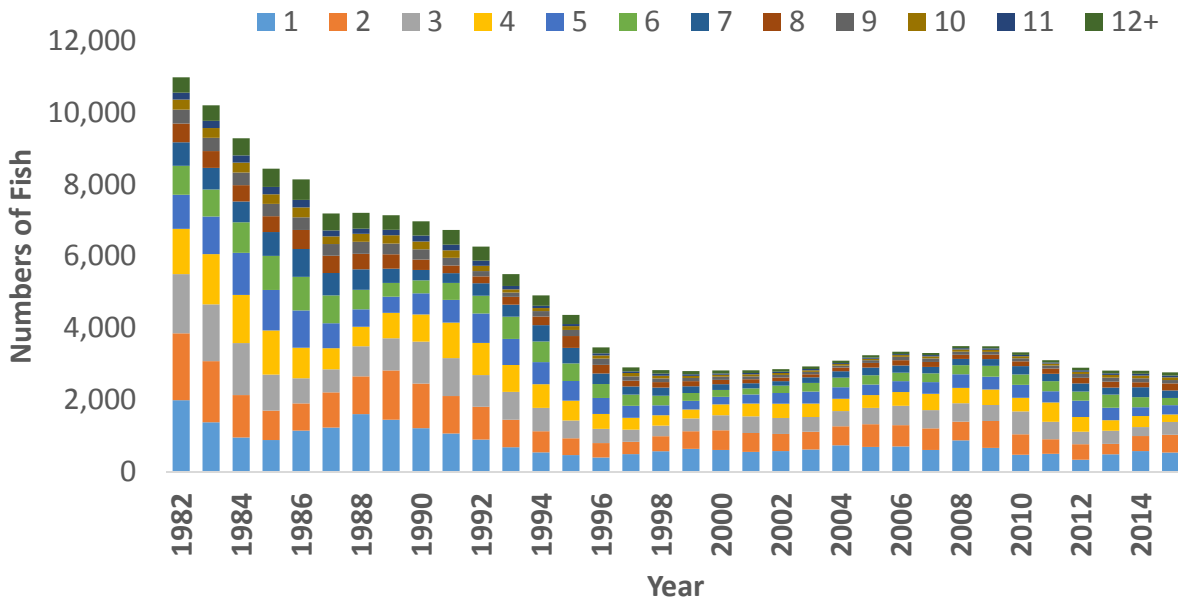


Figure 4. Recruitment estimates for the MARI region.



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Abundance: Total abundance and spawning stock biomass declined rapidly from 1982 until 2000. Despite a period of slightly increased abundance in the early to mid-2000s, the overall trend has been flat from 2000 until 2015. Total abundance declined from a high of 10.9 million fish to the current estimate of 2.8 million fish in 2015.



**Figure 5.** The top graph is the abundance at age for the MARI region in total numbers of fish. The bottom graph illustrates the data in terms of the overall percentage of fish at age within each year.

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### 1.2.2.2 Long Island Sound

The 2016 stock assessment update indicates the LIS stock is overfished and overfishing is occurring.

**Fishing Mortality:**  $F_{\text{target}}$  is defined as  $F_{\text{MSY}}$  and  $F_{\text{threshold}}$  is defined as the  $F$  rate that would maintain the population at  $75\%SSB_{\text{MSY}}$ .  $F_{\text{target}}$  for LIS was 0.28 and  $F_{\text{threshold}}$  was 0.49. In 2013-2015,  $F$  ranged from 0.35 to 0.59. The 3 year-average estimates of  $F$  ( $F_{3\text{yr}} = 0.51$ ) exceeded the MSY target and threshold.

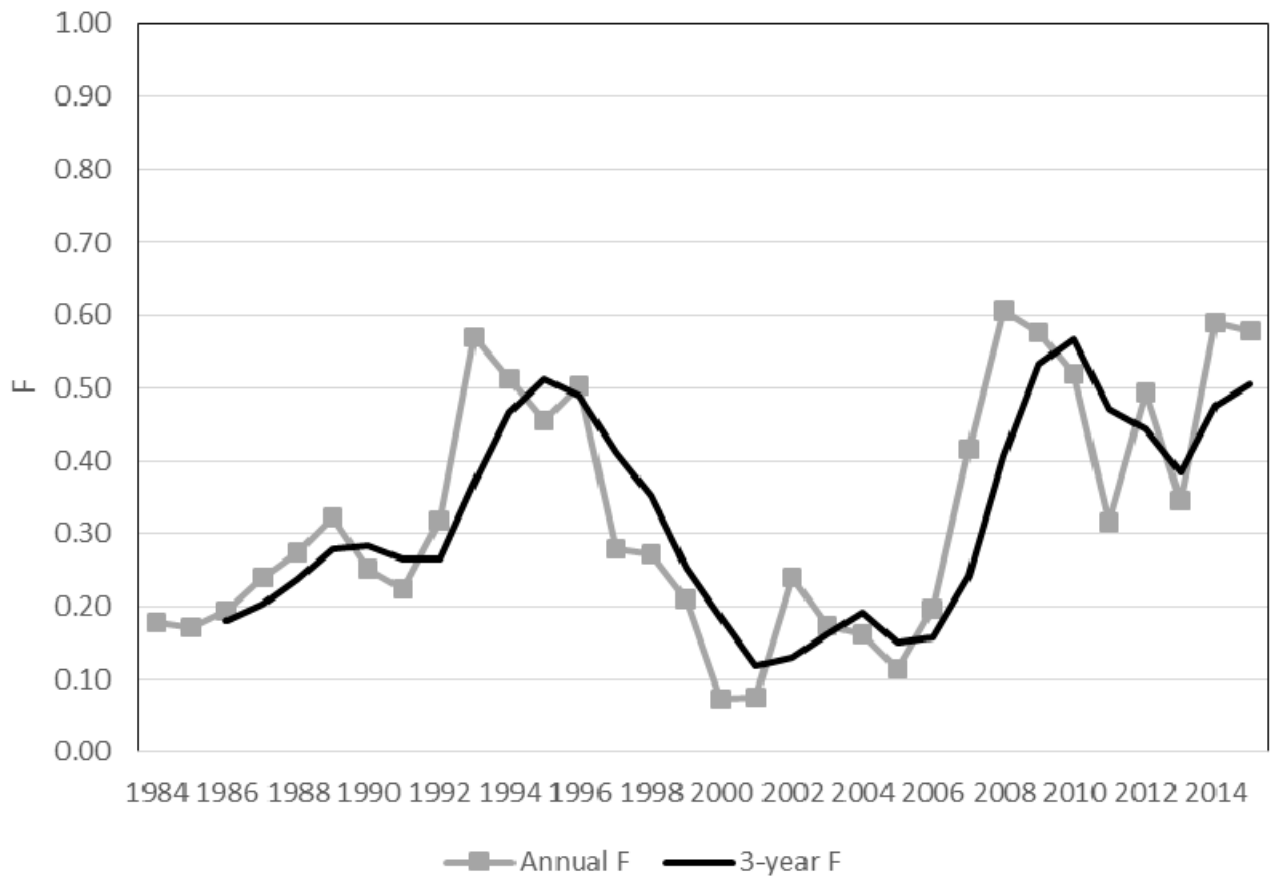


Figure 6. Annual fishing mortality (F) and 3-year average for LIS

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Spawning Stock Biomass:  $SSB_{2015}$  (1,603 mt,) is below MSY target and threshold ( $SSB_{MSY} = 2,865$  mt and  $SSB_{75\%MSY} = 2,148$  mt), indicating the stock is overfished.

Total abundance and spawning stock biomass declined rapidly from 1984 until the mid to late 1990s. Spawning stock biomass decreased by more than 75%, from over 6,350 mt at the beginning of the time-series to the current estimate of 1,551 mt.

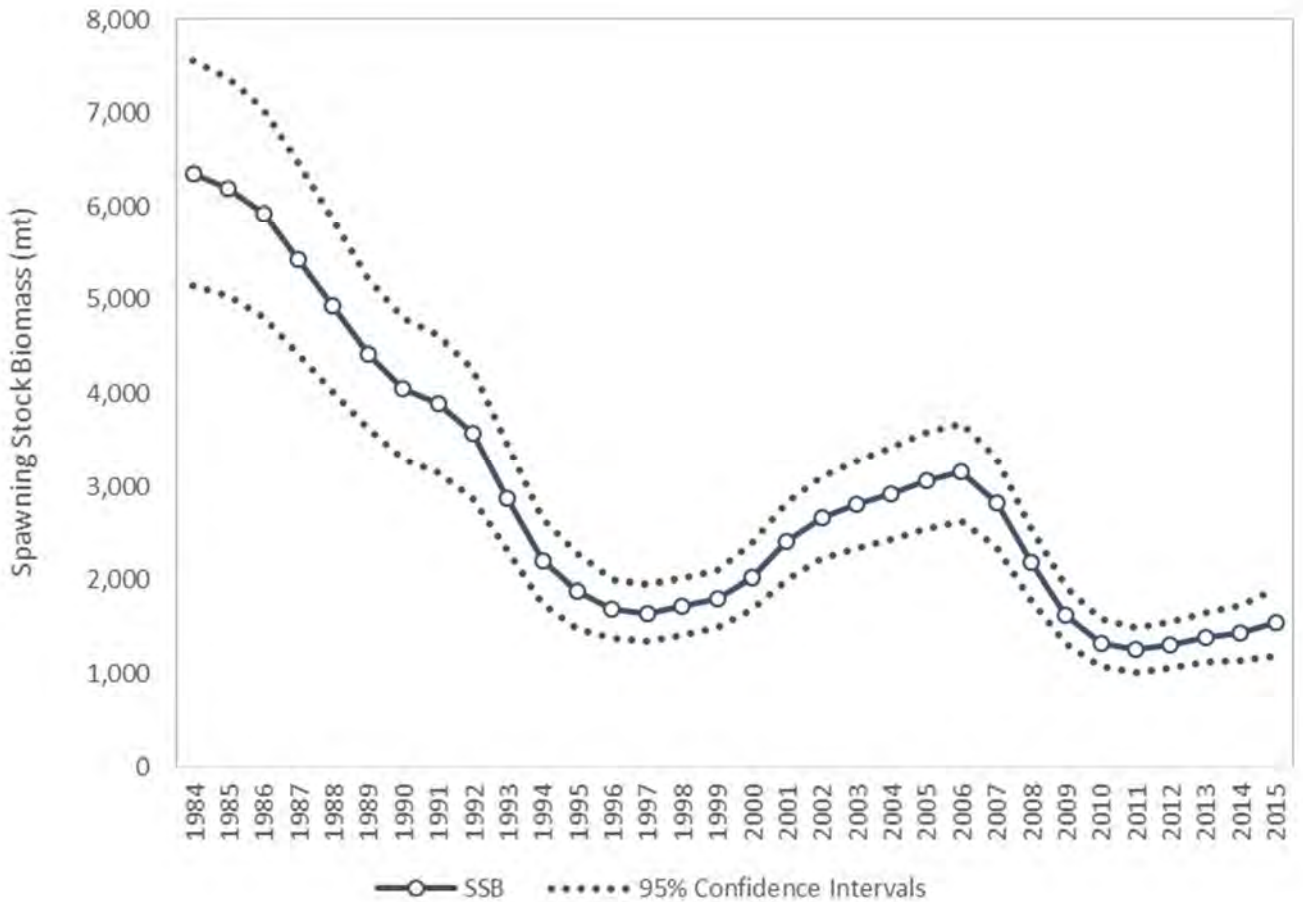
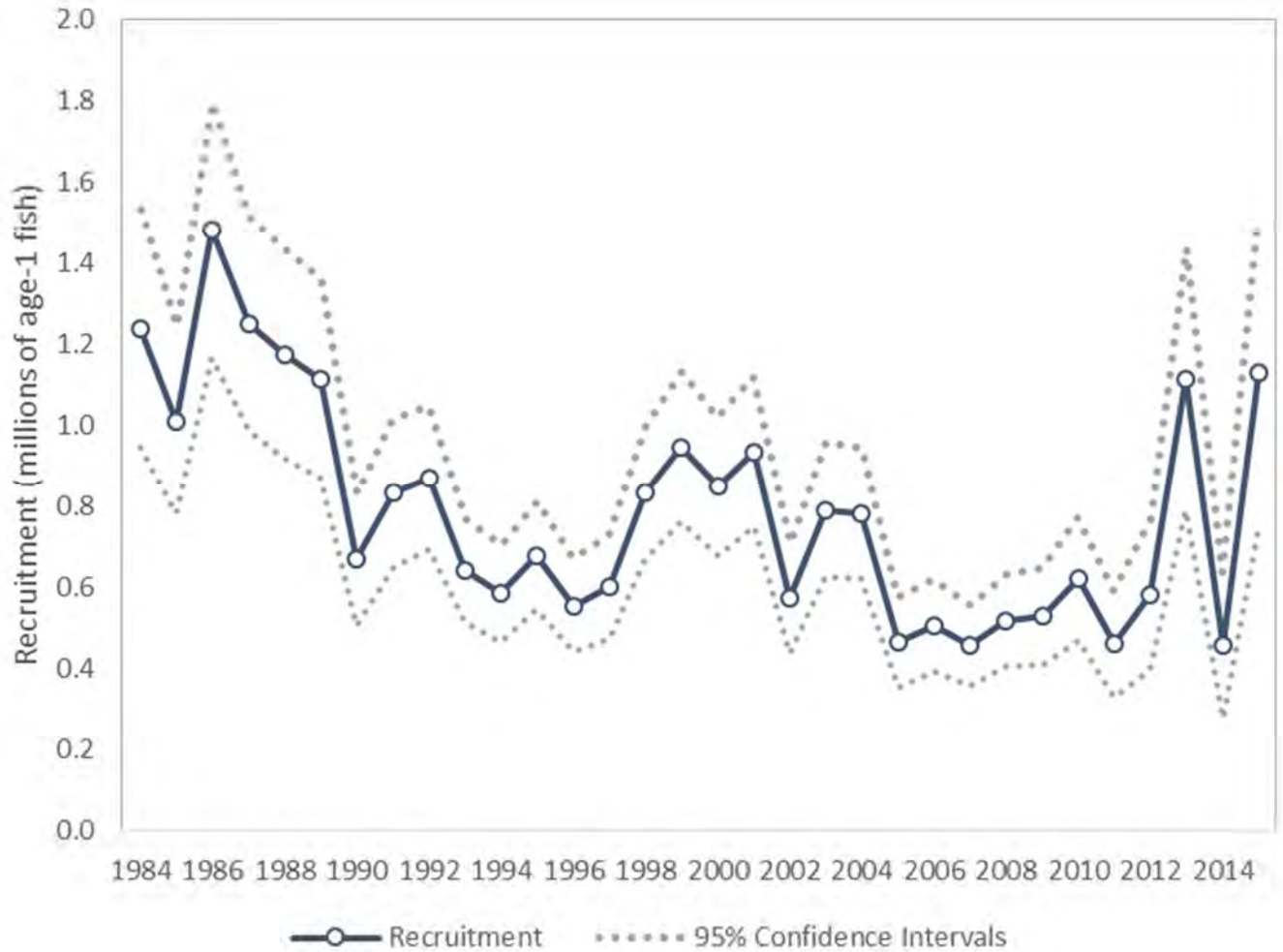


Figure 7. Estimates of spawning stock biomass for the LIS region.

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**Recruitment:** Recruitment was highest in the early years of the time series and again in 2013 and 2015. The two recent peaks in recruitment bracketed the lowest recruitment year on record.



**Figure 8. Recruitment estimates for LIS region**

**Abundance:** Total abundance and spawning stock biomass declined rapidly from 1984 until the mid to late 1990s. Despite a period of slightly increased abundance in the early to mid-2000s, the overall trend has been a slower but consistent decline since 1995. Total estimated abundance declined by more than half, from 8 million fish (1984) to 3.5 million fish (2015). Abundance at age in the stock of the terminal year (2015) shows a dominance of fish aged 1 and 3, fewer age 2 fish and declining abundance from age 4 through age 12.

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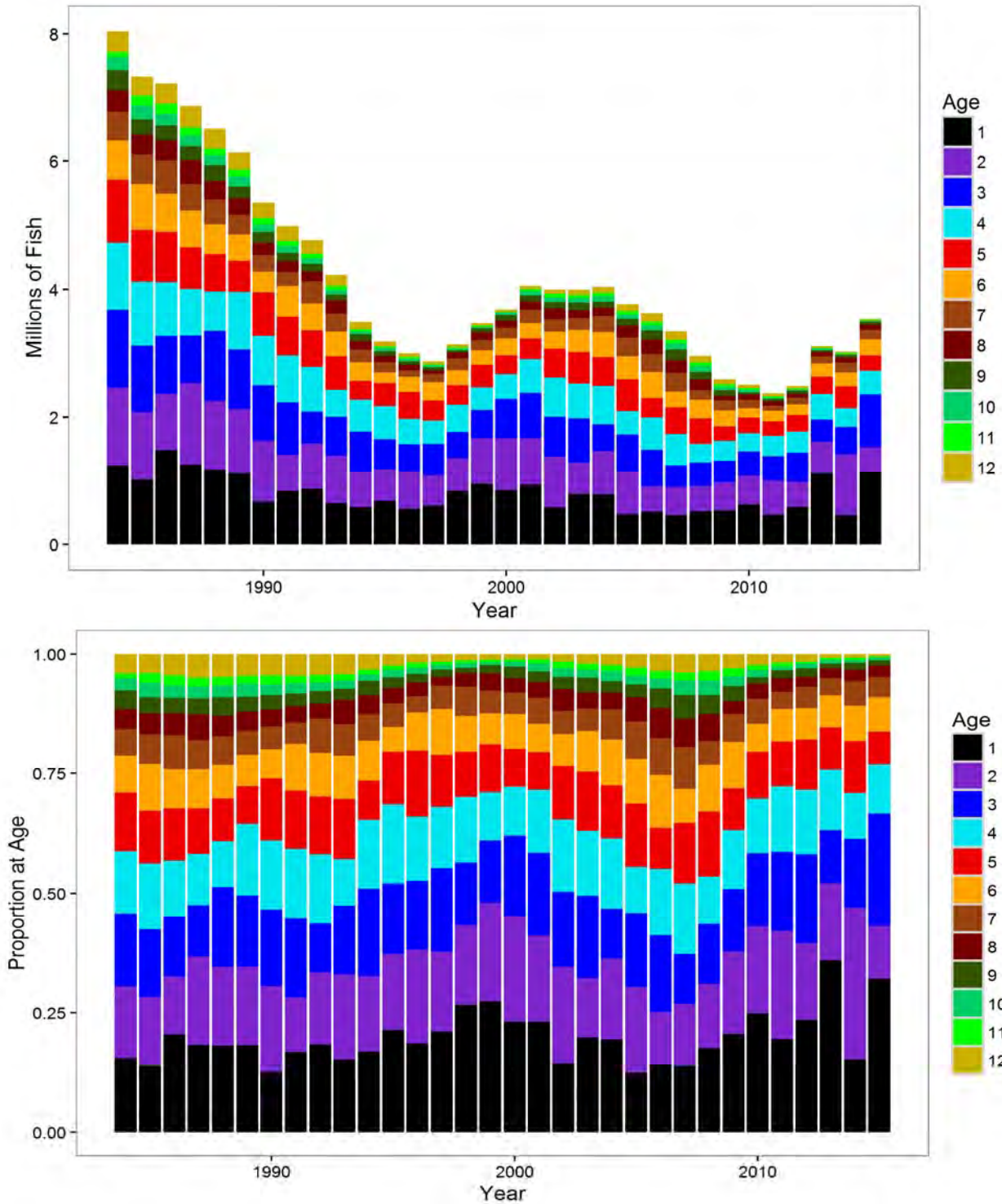


Figure 9. The top graph is the abundance at age for the LIS region in total numbers of fish. The bottom graph illustrates the data in terms of the overall percentage of fish at age within each year.

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### 1.2.2.3 New Jersey – New York Bight

The 2016 stock assessment update indicates the New Jersey-New York Bight (NJ-NYB) stock is overfished and overfishing is occurring.

**Fishing Mortality:** Fishing mortality target and threshold reference points in the NJ-NYB region are defined as  $F_{40\%SPR}$  and  $F_{30\%SPR}$ , respectively. ASAP model estimated values for the target and threshold are  $F_{40\%} = 0.20$  and  $F_{30\%} = 0.34$ . The ASAP model runs indicated overfishing was occurring in the NJ-NYB region in 2015. Both the point estimate of  $F_{2015} = 0.45$  and the 3-year average value of  $F_{3yr} = 0.54$  were above the fishing mortality threshold.

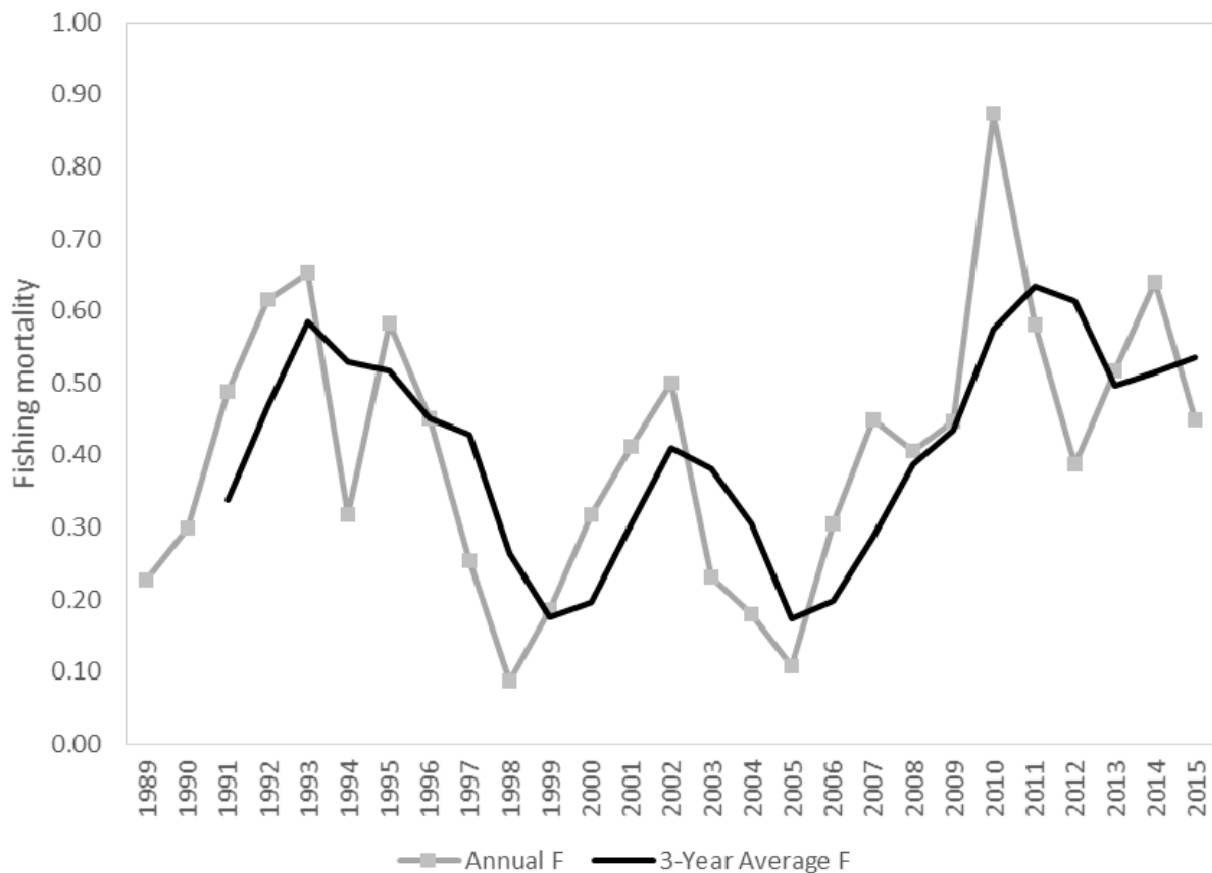


Figure 10. Fishing mortality estimates for the NJ-NYB region.

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Spawning Stock Biomass:  $SSB_{2015}$  was estimated at 1,809 mt, approximately 23% below the SSB threshold (2,351 mt) and 43% below the target (3,154 mt), indicating the stock is overfished.

SSB shows a general decline from approximately 6,000 mt in 1989 to around 1,900 mt by 1996. Regulations in 1997 and 2003 allowed slight increases in SSB in subsequent years, but these gains were short lived as F rebounded. From 2006 to 2011, SSB declined from around 2,000 mt to 1,000 mt, but has since recovered to 1,835 mt (90% confidence intervals 1,352 - 2,489 mt).

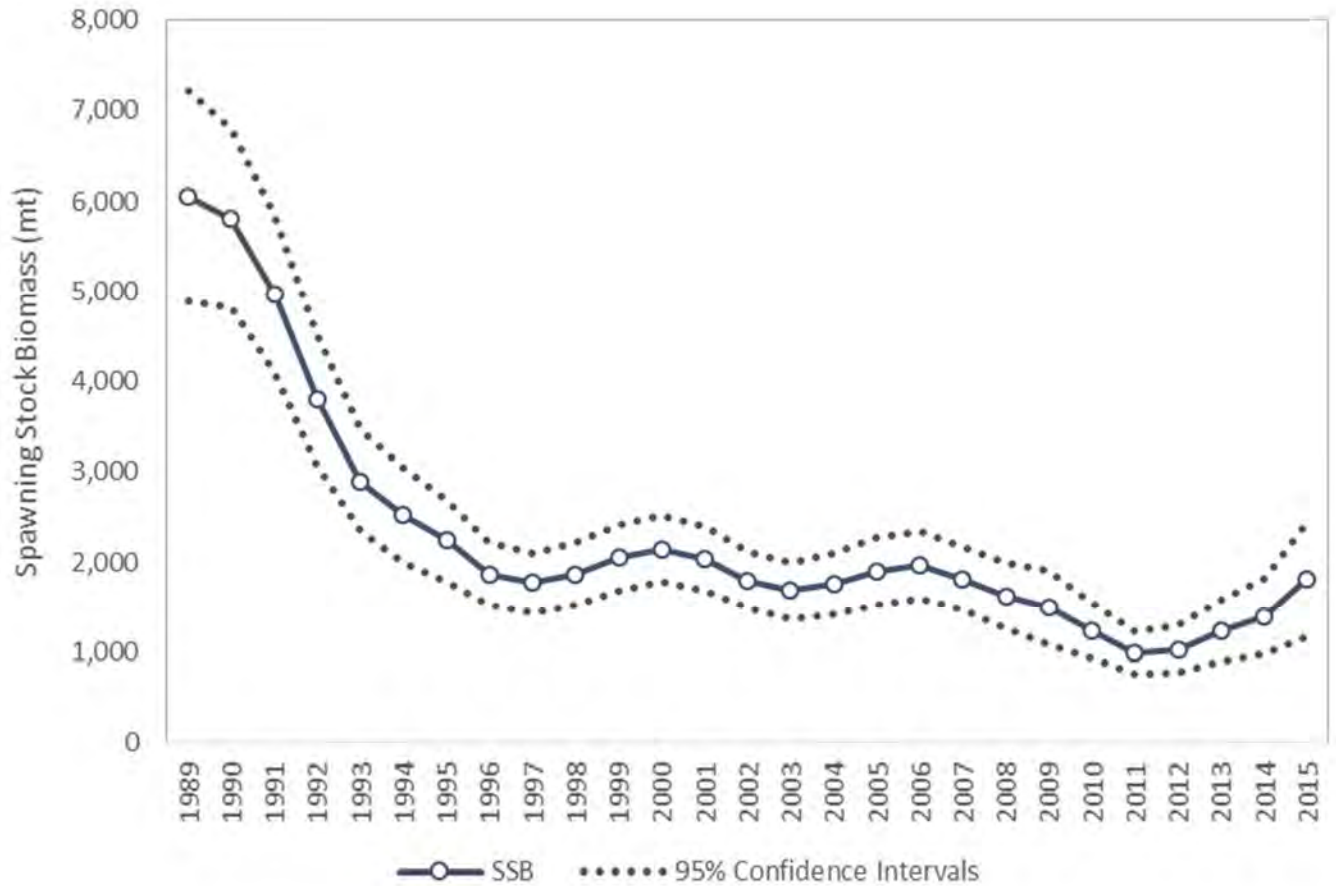


Figure 11. Spawning stock biomass estimates for the NJ-NYB region.

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Recruitment: During the early 1990s, recruitment (age 1) follows a similar pattern as SSB, declining from 1.5 million in 1989 to less than 1 million by 1993. From 1993 to 2011, recruitment varied without trend between approximately 560,000 and 1,010,000 fish annually. Estimates of recruitment in the last four years of the model were above 950,000 fish, with an apparent strong year class in 2014, estimated at 2.26 million.

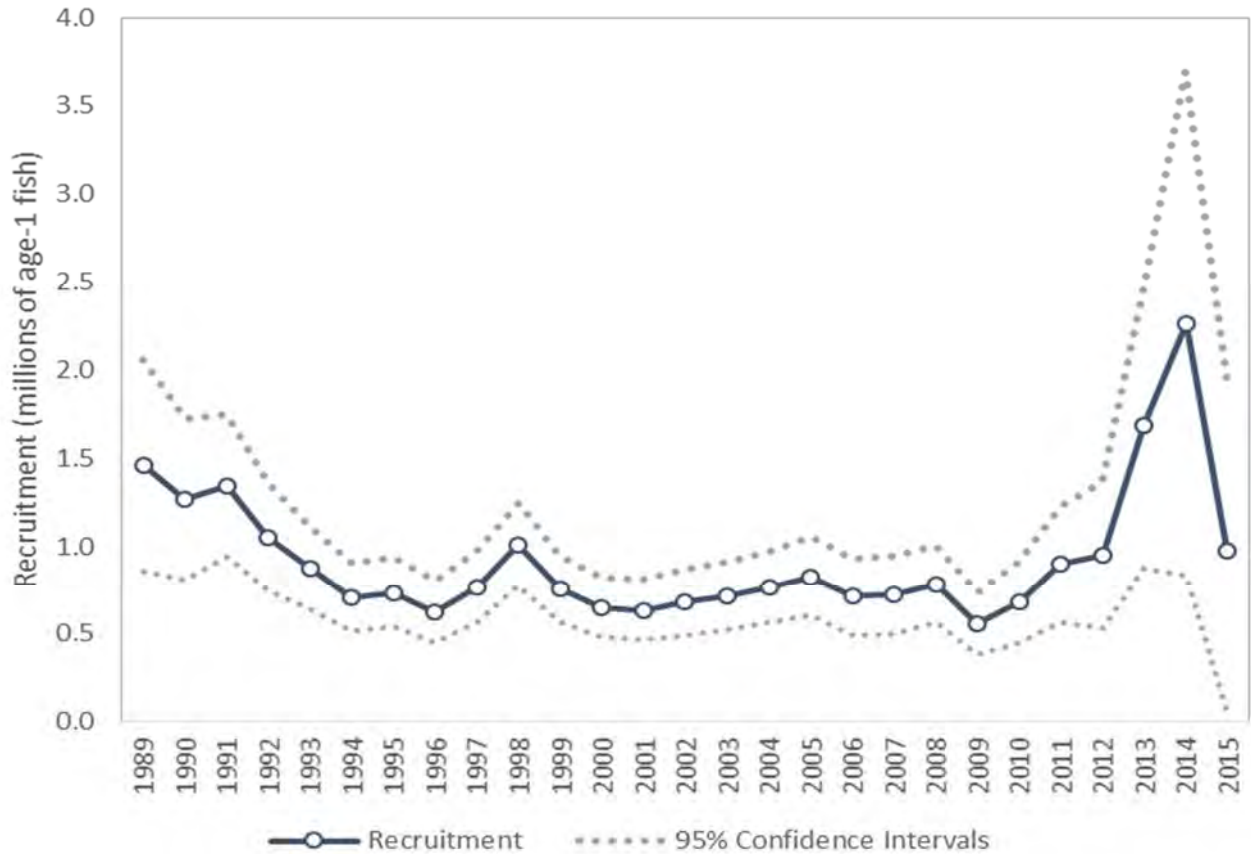


Figure 12. Recruitment estimates for the NJ-NYB region



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Abundance: Abundance at age in the stock of the terminal year shows a dominance of fish aged 1 through 3 with declining numbers from age 4 through age 12.

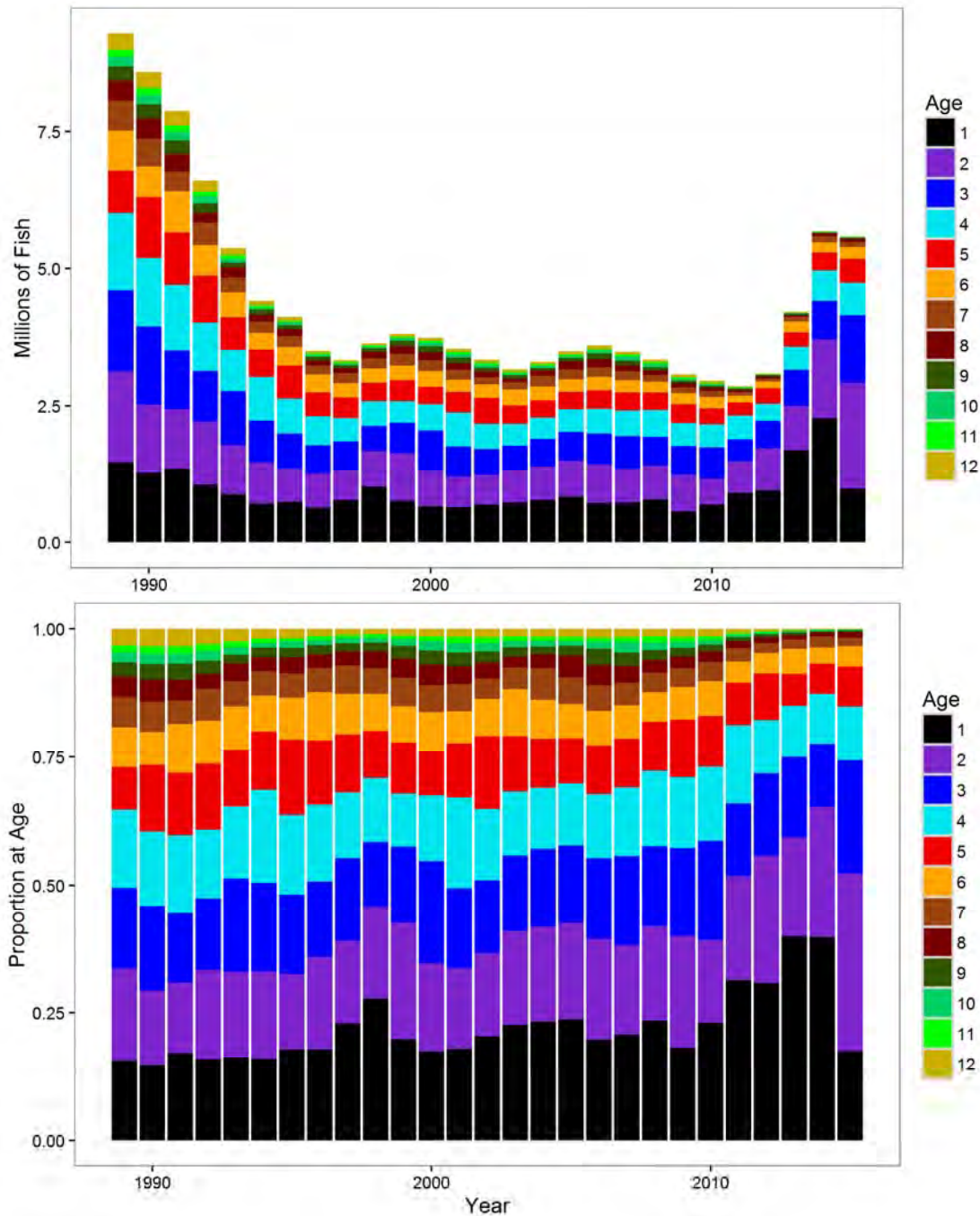


Figure 13. The top graph is the abundance at age for the NJ-NYB region in total numbers of fish. The bottom graph illustrates the data in terms of the overall percentage of fish at age within each year.

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### 1.2.2.4 Delaware-Maryland-Virginia

The 2016 stock assessment update indicates the Delaware-Maryland-Virginia (DelMarVa) stock is overfished and overfishing is not occurring.

**Fishing Mortality:**  $F_{\text{target}}$  is defined as  $F_{40\%SPR} = 0.16$ , and  $F_{\text{threshold}}$  is defined as  $F_{30\%SPR} = 0.24$ . The three year average  $F$  from 2013-2015 was 0.16, equal to the target and below the threshold, indicating overfishing is not occurring.

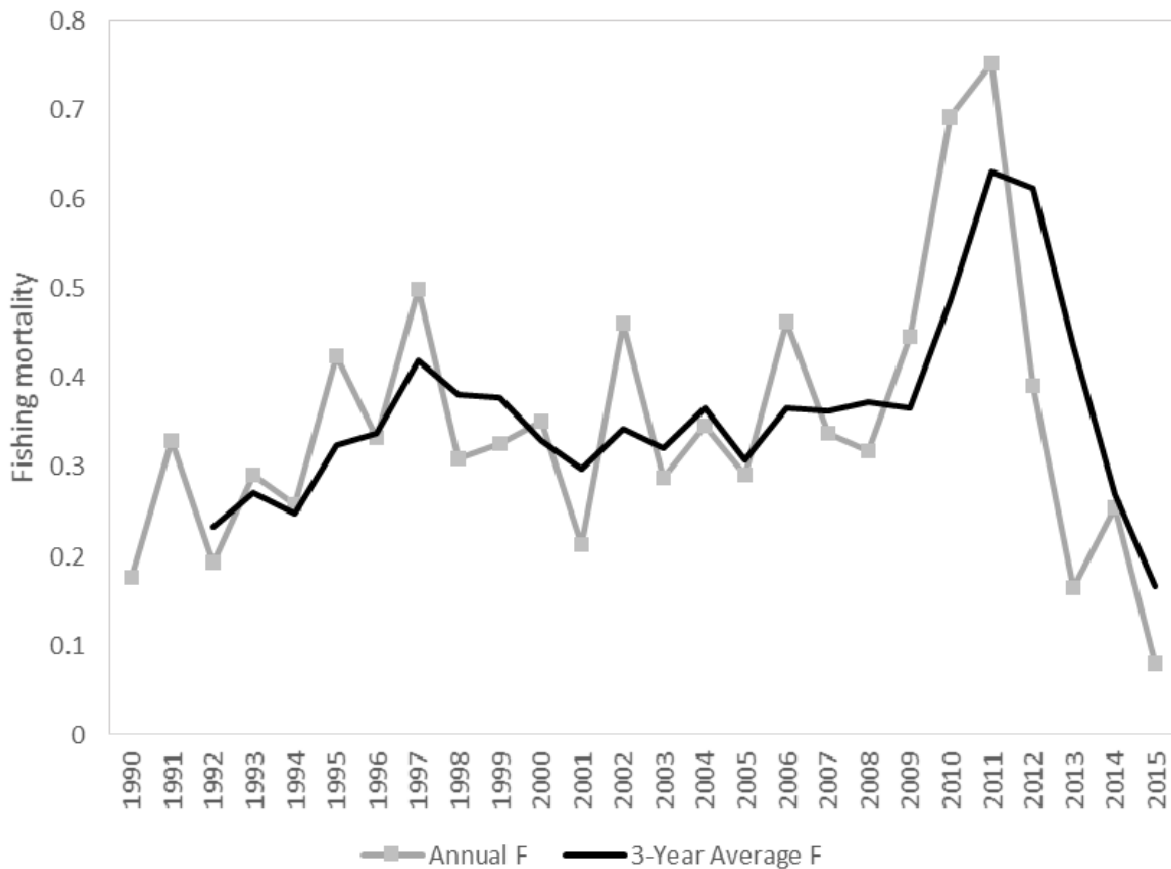


Figure 14. Fishing mortality estimates for the DelMarVa region

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Spawning Stock Biomass: The SSB target for DelMarVa is the long-term equilibrium SSB associated with  $F_{40\%SPR}$ , equal to 1,919 mt. The SSB threshold is the SSB associated with  $F_{30\%SPR} = 1,447$  mt. Terminal year SSB 2015 estimate is 620.9 mt, below both the target and the threshold, indicating the stock is overfished.

Both total abundance and spawning stock biomass have declined steadily in the DelMarVa region since 2009, and SSB reached historically low level of 609 mt in 2015.

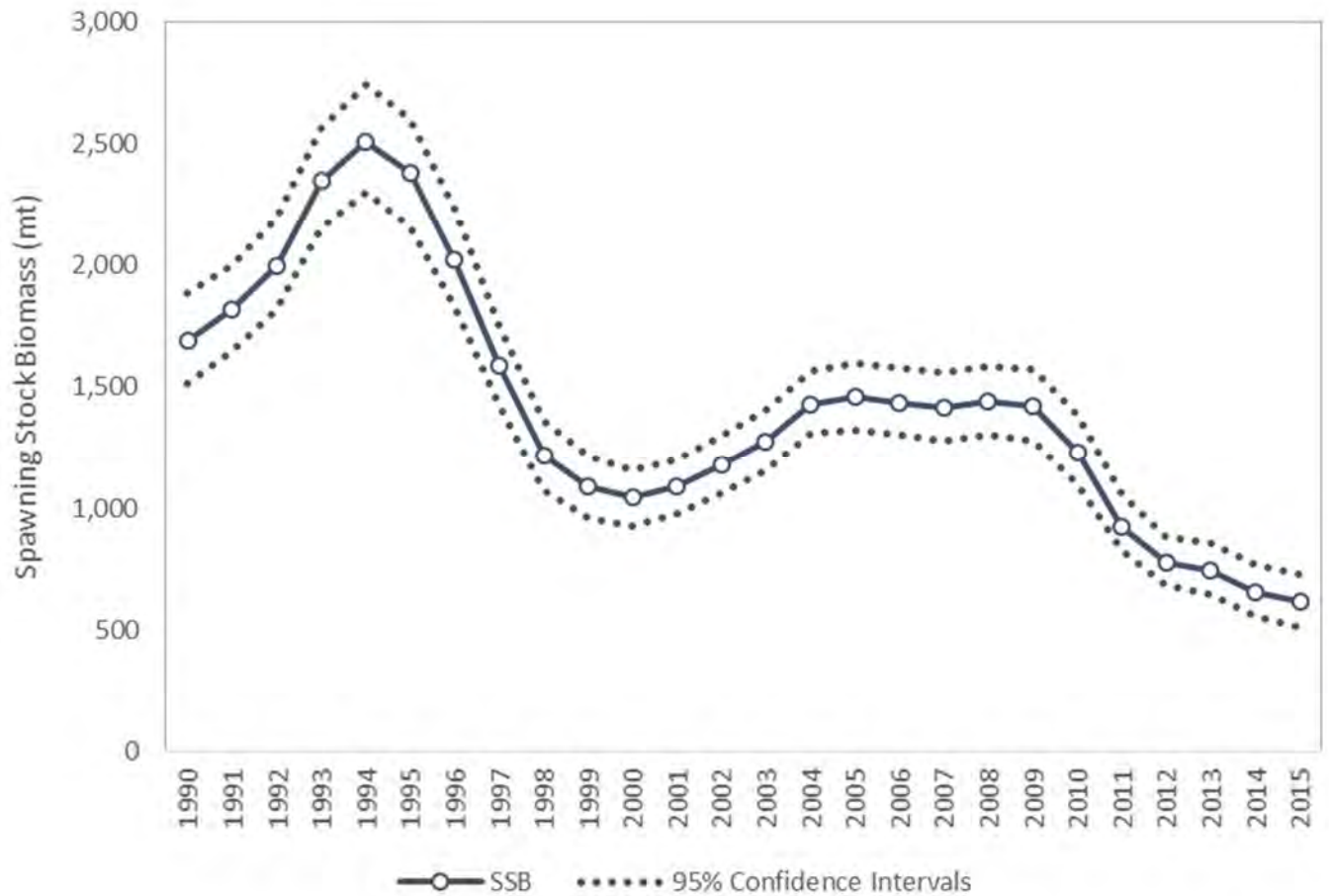


Figure 15. Spawning stock biomass estimates for the DelMarVa region

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Recruitment: Recruitment appears to have been on the decline since 2009, reaching the lowest level in 2013 at 110,620 fish, but began to increase thereafter. Overall, recruitment has exhibited low variability and a lack of sharp inter-annual changes.

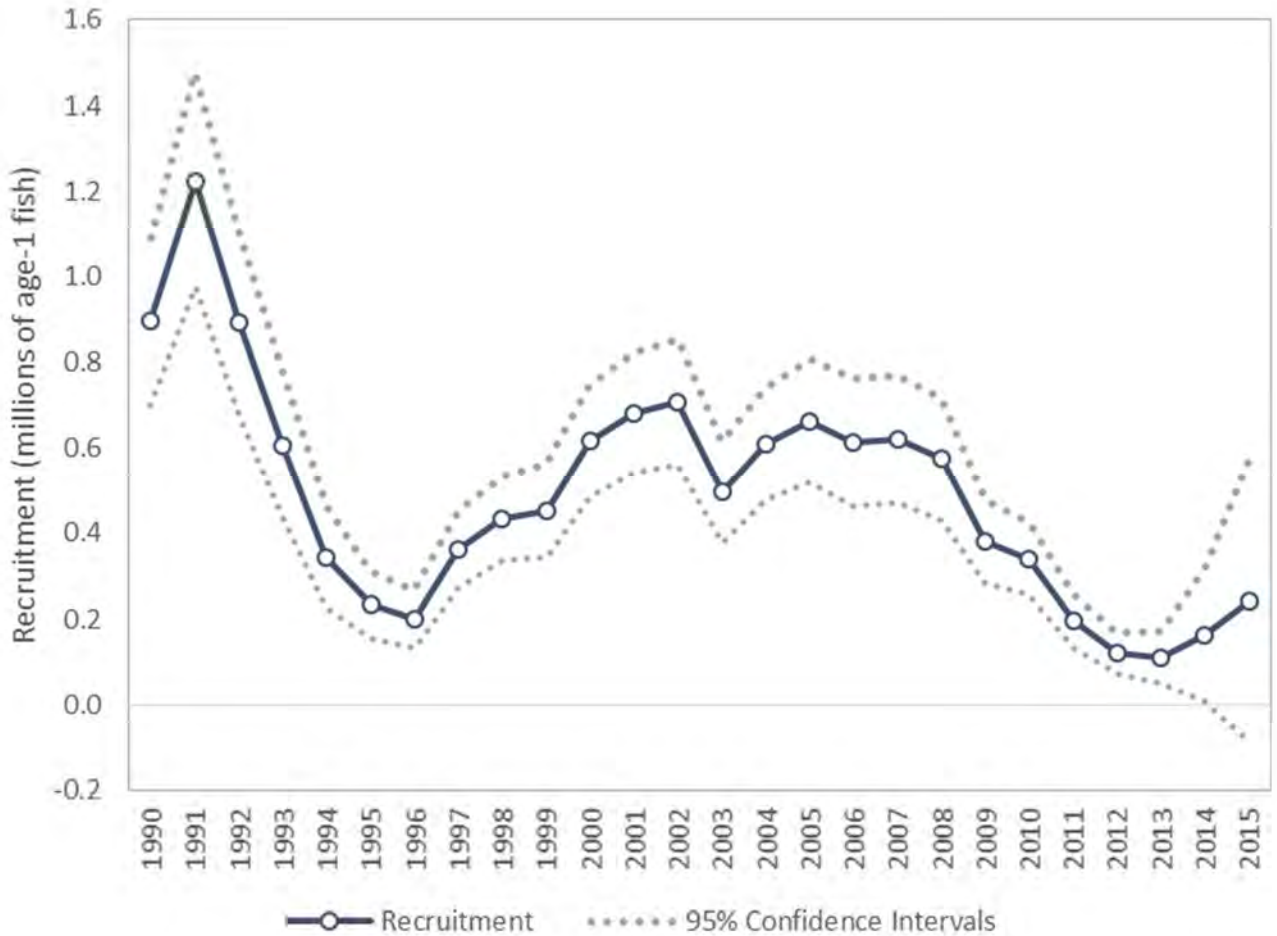
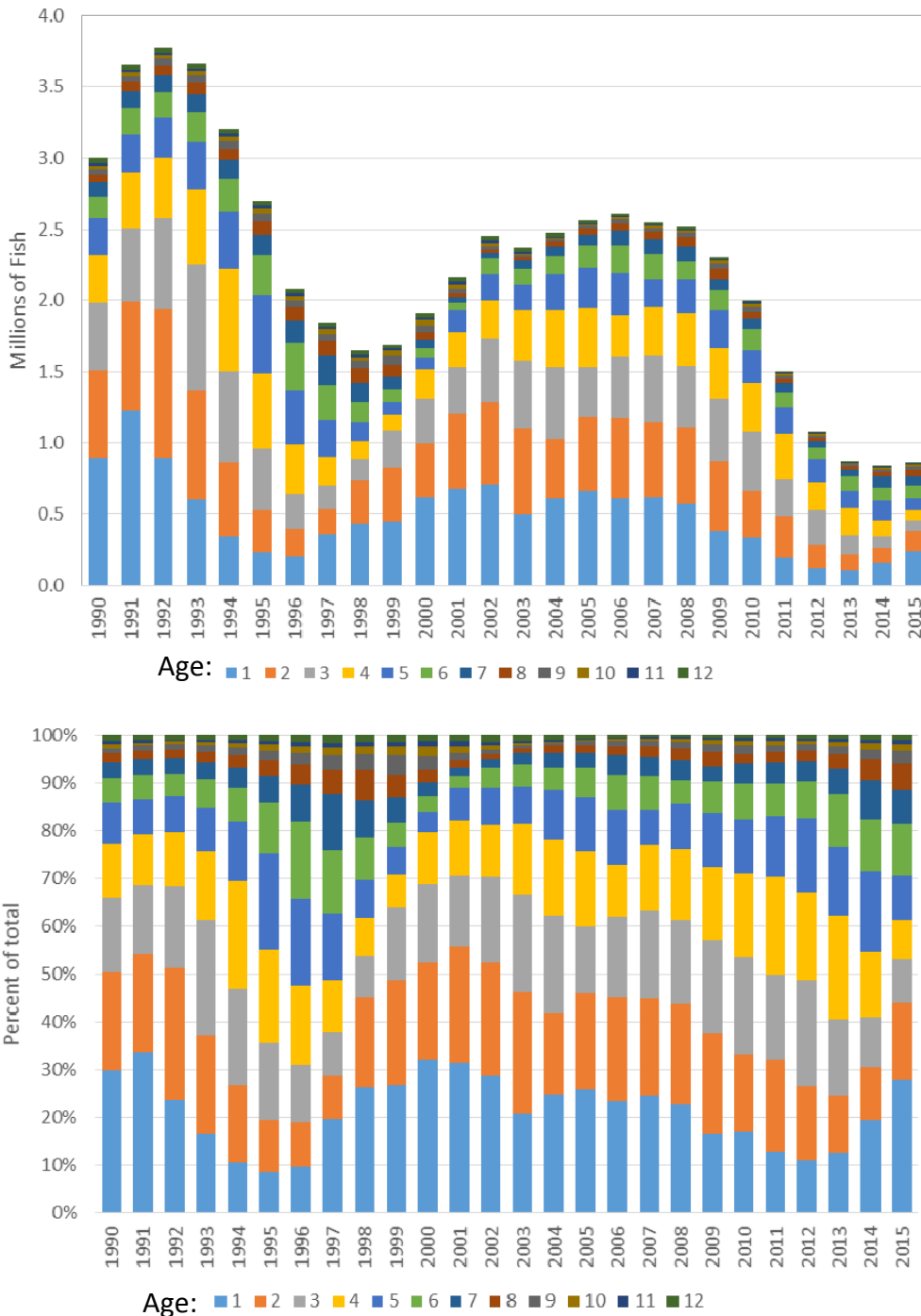


Figure 16. Recruitment estimates for the DelMarVa region

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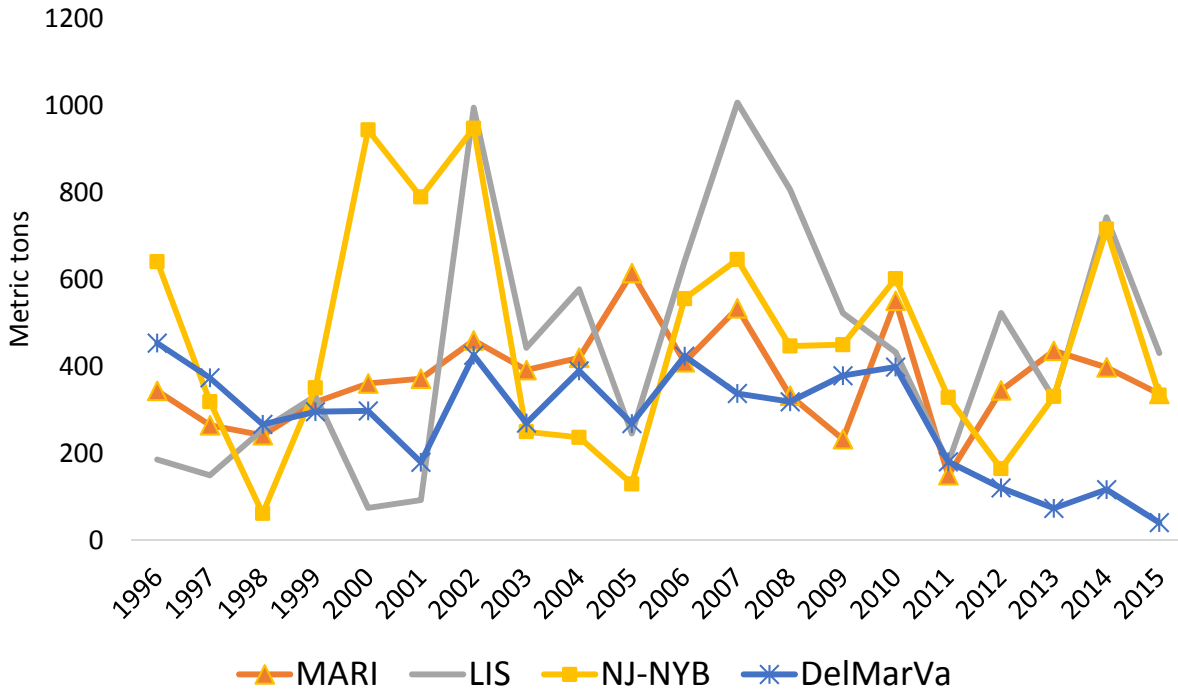
**Abundance:** Both total abundance and spawning stock biomass have declined steadily in the DelMarVa region since 2009. Total abundance declined from a stable level of about 2.5 million fish in 2002-2009 period to the current low of 0.86 million fish in 2015.



**Figure 17.** The top graph is the abundance at age for the DelMarVa region in total numbers of fish. The bottom graph illustrates the data in terms of the overall percentage of fish at age within each year.

**1.3 DESCRIPTION OF THE FISHERY**

The proportion of harvest from each region has fluctuated somewhat over the years (Figure 18), with the DelMarVa’s proportion declining in recent years and the LIS region’s proportion growing. From 2013-2015, MARI accounted for 27% of coastwide removals, LIS accounted for 35%, NJ-NYB accounted for 32%, and DMV accounted for 5%.



**Figure 18. Harvest by Region (1996-2015); including recreation harvest, recreational release mortality, and commercial landings**

Coastwide recreational harvest peaked in 1986 at over 7 million fish and since declined. Average recreational harvest from 2013-2015 was 708,136 fish, with 2014 nearly double the harvest of 2013 and 2015. In 2014, over 1 million fish were harvested compared to approximately 545,282 fish in 2015. The 2014 estimate was also more uncertain than the 2013 and 2015 estimates, with a PSE of 24.7% compared to 16-17% in 2013 and 2015.

Coastwide commercial harvest showed a similar pattern to recreational harvest, although the magnitude is smaller, representing approximately 9% of the total harvest over the entire time series. It peaked in the late 1980s at 1.2 million lbs (525 mt), and declined to an average of 273,373 lbs (124 mt) in 2013-2015. Commercial harvest in 2014 was 284,396 lbs (129 mt), not significantly different from the 2015 harvest of approximately 260,000 lbs.

**1.3.1 Massachusetts and Rhode Island**

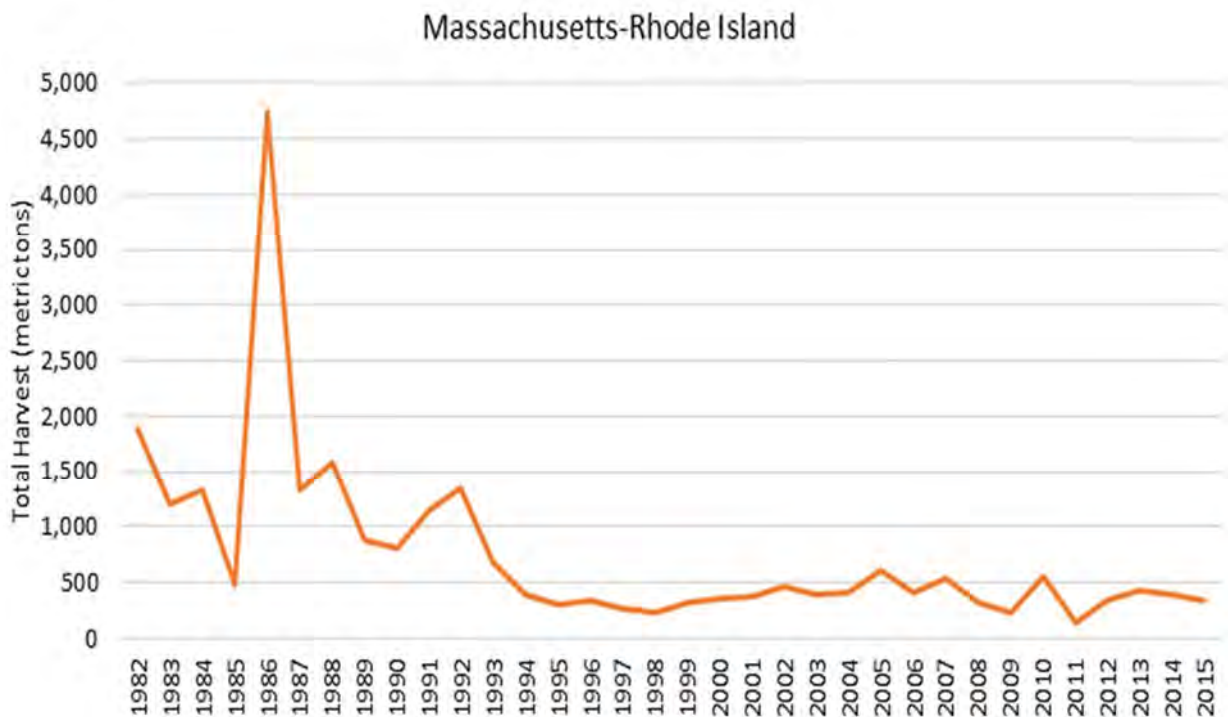
Recreational anglers account for upwards of 90% of landings in this region. In the MARI region, recreational landings peaked in 1986 at nearly 2.7 million fish and fell sharply to about 13% of

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its peak by the mid-1990s. Since then landings have remained low and have varied in the range of approximately 52,000 to 242,000 fish. The 2013-2015 average recreational landings are 167,085 fish. The majority (nearly 75%) of tautog recreational harvest in the MARI region comes from the private/rental boat mode. The remaining 25% is split relatively evenly among the shore and for-hire (party/charter boat) modes.

Commercial landings in the MARI region peaked in 1991 at approximately 725,300 lbs (329 mt), declined to 97,000 lbs (44 mt) in 1996, and since then has varied in the range of 110,000 – 200,000 lbs (50 to 90 mt). The 2013-2015 average landings in the MARI region were approximately 121,250 lbs (55 mt).

Total removals in the MARI region, including recreation harvest, recreational release mortality, and commercial landings averaged 390 mt from 2005-2015; 337 mt were taken in 2015 (Figure 19).



**Figure 19. MARI Harvest; including recreation harvest, recreational release mortality, and commercial landings**

### 1.3.2 Long Island Sound

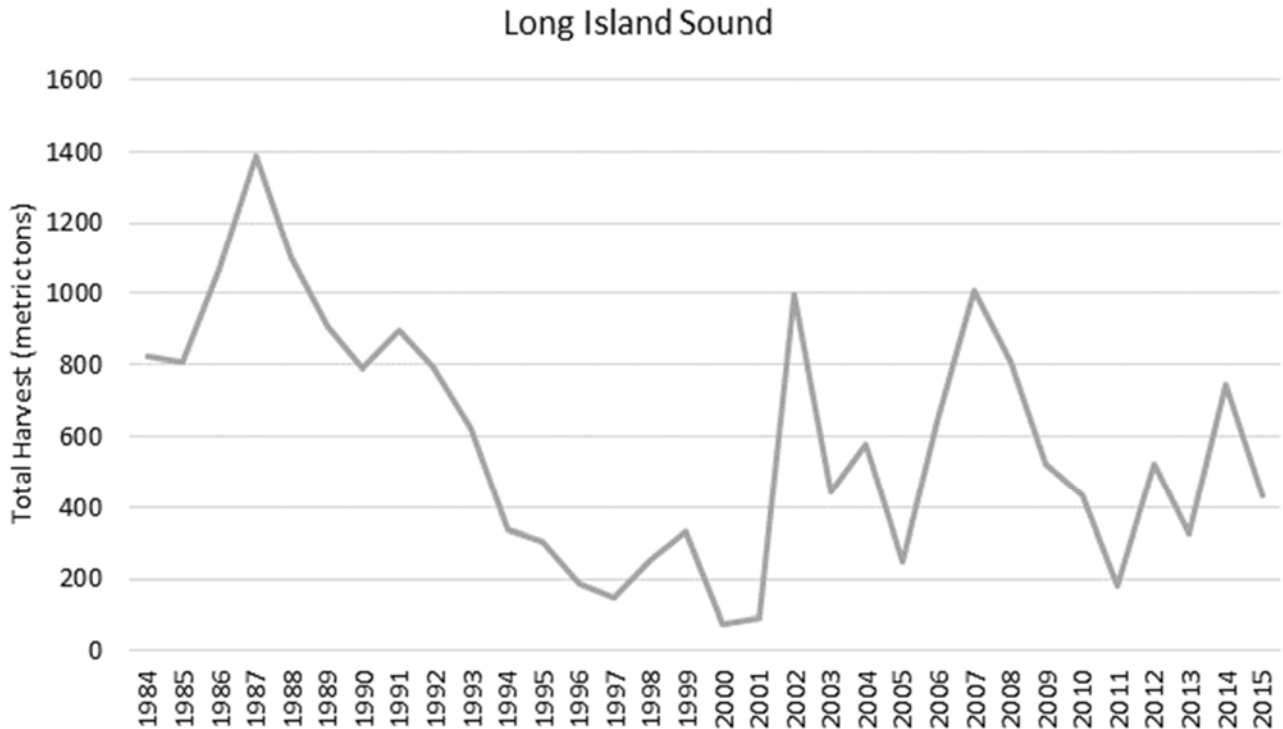
Recreational anglers account for approximately 88% of harvest in this region (landings and dead discards). In the LIS region, recreational landings peaked in 1988 at 667,000 fish and declined to 29,000 fish in 2000. Since then landings have increased and have varied in the range from 76,000-514,000 fish. The 2013-2015 average recreational landings are 220,000 fish.

Commercial harvest accounts for approximately 12% of total harvest. In the LIS region, commercial landings peaked in 1987 at 350,535 lbs (159 mt), declined to 33,069 lbs (15 mt) in

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1999 and 2000, and since then have stabilized in the range of 88,185 lbs (40 mt). The 2010-2014 average landings in LIS are 82,894 lbs (37.6 mt).

Total removals in the LIS region, including recreation harvest, recreational release mortality, and commercial landings averaged 1.16 million lbs (530 mt) from 2005-2015; 950,192 lbs (431 mt) were taken in 2015 (Figure 20).



**Figure 20. LIS Harvest; including recreation harvest, recreational release mortality, and commercial landings**

### 1.3.2 New Jersey - New York Bight

Recreational harvest accounts for approximately 90% of landings within the NJ-NYB region. Recreational harvest exceeded one million fish per year in most years between 1988 and 1993, with a peak of 1.56 million fish in 1991. Harvest dropped quickly following the peak, however, reaching a time series low of just 24,000 fish in 1998 with an average annual harvest of 415,000 fish between 1994 and 2002. Recreational landings dropped again in 2003, falling below 200,000 fish before recovering slightly by 2006. Between 2006 and 2015, annual landings had high inter-annual variability without a trend, ranging from approximately 70,000 to 400,000 fish, with an average of 268,000 fish.

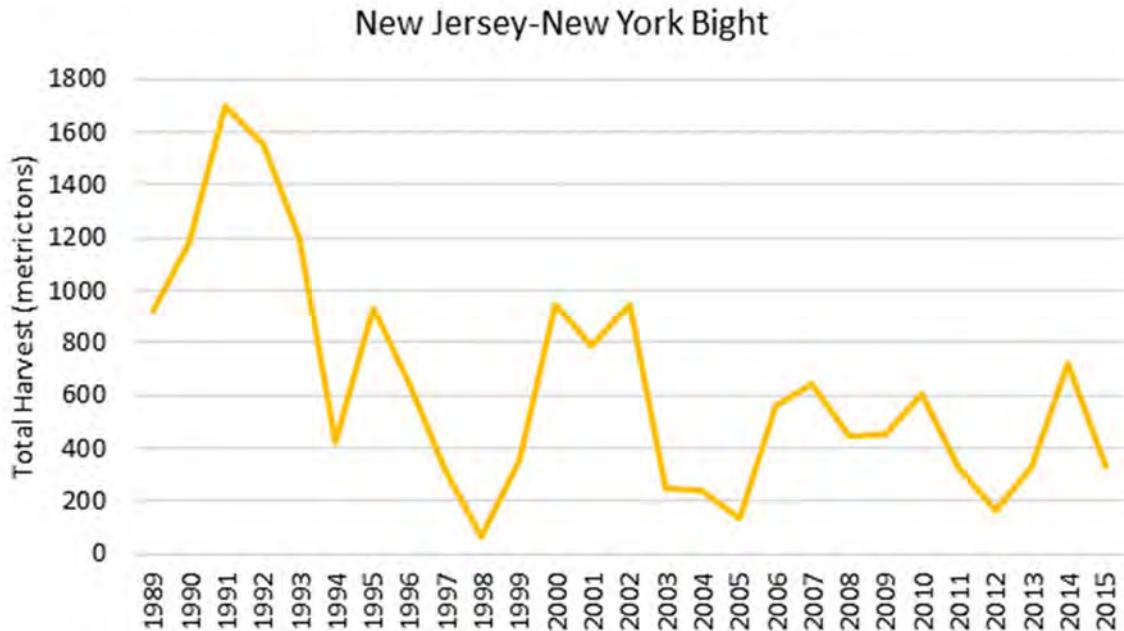
In the NJ-NYB region, commercial harvest during the late 1980s to mid-1990s fluctuated around 154,324 lbs (70 mt) annually, but declined rapidly to 44,092 lbs (20 mt) by 1999. Landings rebounded to 132,277 lbs (60 mt) by 2007 and 2008, and since then fell to 88,185 lbs (40 mt) and below. Commercial harvest during 2013 to 2015 has shown a declining trend falling from



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99,207 lbs (44 mt) in 2013 to nearly 86,000 lbs (39 mt) in 2015 with an average harvest of 90,389 lbs (41 mt) for this time period.

Total removals in the NJ-NYB region, including recreation harvest, recreational release mortality, and commercial landings averaged 947,988 lbs (430 mt) from 2005-2015; 736,344 (334 mt) were taken in 2015 (Figure 21).



**Figure 21. NJ-NYB Harvest; including recreation harvest, recreational release mortality, and commercial landings**

### 1.3.3 Delaware, Maryland, Virginia

Recreational harvest peaked in 1988, 1989 and 1995 at more than half a million fish. After the FMP was implemented, harvest levels decreased by half. Average recreational harvest from 2000-2009 was 188,000 fish and average harvest from 2010-2015 was 92,000 fish. Recreational harvest in DelMarVa has declined from 241,064 fish in 2010 to 22,215 fish in 2015. The decline coincided with the protective regulatory measures (minimum size increase and seasonal closures) instituted in 2012 to reduce fishing mortality. Recreational landings in 2015 were the lowest in time series. Recreational discards have also declined from 686,392 released fish in 2010 to 125,258 released fish in 2015.

Commercial landings have declined in recent years, primarily due to a decline in Virginia, which accounts for the majority of commercial effort. Average commercial landings for 2000-2009 were approximately 17,000 lbs. Average commercial landings for 2013-2015 were 10,740 pounds (4.9 mt), with 2015 being much lower at 6,233 lbs (2.8 mt). Data on commercial discards were not available, but discards are believed to be minimal.

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Total removals in the DelMarVa region, including recreation harvest, recreational release mortality, and commercial landings averaged 529,109 lbs (240 mt) from 2005-2015; 90,390 lbs (41 mt) were taken in 2015 (Figure 22).

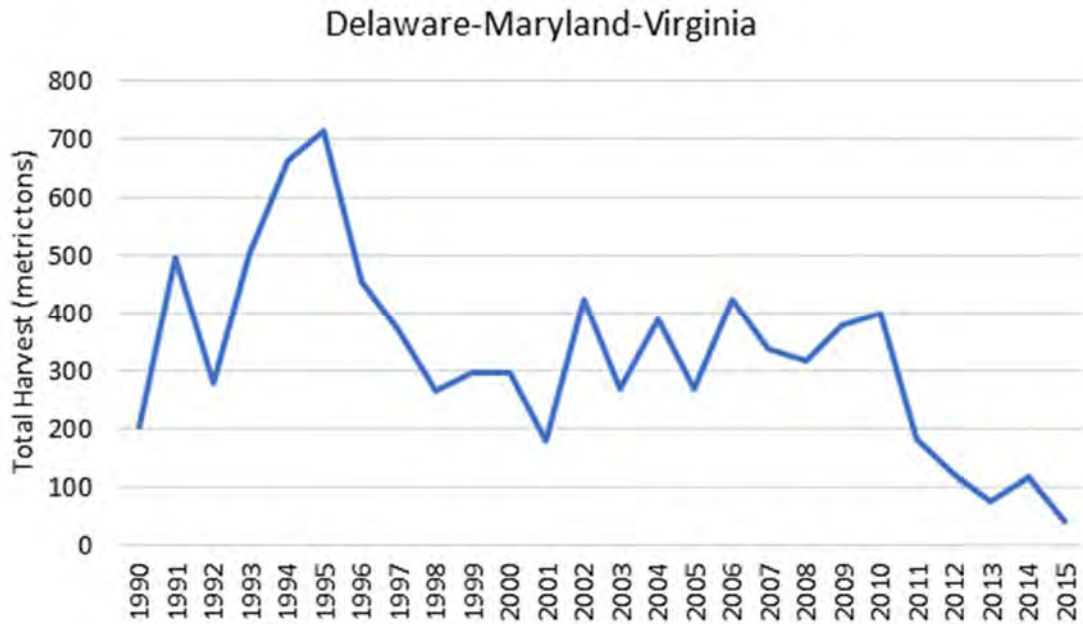


Figure 22. DelMarVa Harvest; including recreation harvest, recreational release mortality, and commercial landings

### 1.4 HABITAT CONSIDERATIONS

#### 1.4.1 Description of the Habitat

Tautog are attracted to many types of structured habitat in all stages of their life cycle after their three-week planktonic larval stage. Suitable structures include both natural and man-made, such as submerged vegetation, shellfish beds, rocks, pilings, shipwrecks and artificial reefs (Olla et al, 1974; Briggs 1975; Briggs and O'Connor 1971; Orth and Heck 1980; Dorf and Powell 1997; Steimle and Shaheen 1999). North of Long Island, New York, rocks and boulders left by glacial deposition are abundant and provide rock-reef habitat, especially for larger tautog. South of Long Island, natural rocky habitats are rare (Flint 1971) and tautog in southern areas commonly inhabit shellfish beds, coastal jetties, pilings, shipwrecks, and artificial reefs. Tautog are principally coastal fish, occurring most commonly inshore from the intertidal zone to within about 50km from shore (Collette and Klein-MacPhee 2002).

**Eggs and Larvae:** Studies have collected them on the inner continental shelf and within estuaries from May through August (Berrien et al. 1978, Colton et al. 1979, Ferraro 1980, Bourne and Govoni 1988, Monteleone 1992, Able and Fahay 1998, Witting et al. 1999). Viable eggs are 1 millimeter (mm) in diameter, buoyant and are found in the greatest numbers at the water surface. Hatching occurs in 81 hours at 15°C and 42 hours at 20°C (Auster 1989, Perry 1994). The larvae (2 mm at hatching) stay near the surface during the day and may go deeper

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at night (Malchoff 1993). After approximately 3 weeks, larvae undergo metamorphosis and settle out of the water column as juveniles (Sogard et al. 1992, Dorf 1994).

**Juveniles:** Juvenile tautog require sheltered areas for feeding and protection from predators. They are most often found in shallow nearshore vegetated areas such as eelgrass (*Zostera marina*) or algal beds, (commonly sea lettuce *Ulva lactuca*), growing equally well in all of these habitat types (Kuropat et al. 2002). However, environmental factors associated with temperature and dissolved oxygen appear to influence growth rates in these shallow habitats (Phelan et al. 2000). Other studies have found that newly settled individuals prefer areas less than one meter deep (Sogard et al 1992, Dorf and Powell 1997), but move out to deeper water as they grow. Juvenile tautog have been shown to have size specific preference when choosing a shelter (Dixon 1994) and appear to have a strong affinity to their home site, rarely venturing more than a few meters away (Olla et al. 1974, Able et al. 2005).

**Adults:** Tautog of all sizes exhibit diurnal activity and enter a torpid state at night during which they seek refuge in some type of structure. Soon after morning twilight, tautog have been observed leaving their night time shelter to feed throughout the day (Olla et al. 1974; 1975). When tautog are not feeding during the day, they can be found resting on sand or within shelter, lying on their sides, often grouped together (Bigelow 1974). Elevated temperatures also evoke shelter seeking behavior and depress feeding (Olla and Studholme 1975, Olla et al. 1975a, 1978).

Adult tautog undertake seasonal inshore-offshore migrations in the northern part of their range (New York and north), moving into deeper water when temperatures drop to 8-12°C (Collette and Klein-MacPhee 2002). However a study of the seasonal occurrence of tautog in the lower Chesapeake Bay indicated that most fish tagged and released in these southern waters remained inshore for the winter rather than moving offshore (Arendt et al. 2001). When water temperatures fall between 5-8°C, tautog enter a torpid state and hide in some type of structured habitat (Cooper 1966, Olla et al. 1974, 1979). Juvenile tautog have been observed overwintering in shallow water, lethargic or torpid and partially buried in silt when water temperatures fell below 6°C (Olla et al. 1974). During winter, juveniles appear to remain inshore at perennial sites and disperse during the spring (Stolgitis 1970; Olla et al. 1979).

Tautog are sight feeders, feeding during the day on mollusks, especially mussels (*Mytilus edulis* in the north and *Brachiodontes exustus* in the south), barnacles, decapods including lobster, and echinoderms (Collette and Klein-MacPhee 2002). Juveniles feed primarily on copepods, amphipods, and small decapods (Dorf 1994).

### 1.4.2 Physical Habitat Characteristics

#### 1.4.2.1 Dissolved Oxygen (DO) levels

No information is available on the effects of low DO levels on eggs or larval tautog. Juvenile tautog are considered to be “hypoxia-tolerant” (LC50 less than or equal to 1.6 mg/L) based on laboratory studies (D. Miller, EPA, Narragansett, Rhode Island, 1995, personal communication).

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No laboratory information is available on effects of hypoxia on adult tautog. A field study showed that catch rates declined by half when DO levels drop below 3.0 mg/l and were absent in areas with DO below 2 mg/l (Howell and Simpson 1994). Tautog are capable of leaving low oxygen areas (Ogren and Chess 1969), although some adult mortality has been reported in association with major anoxic events (Perlmutter 1952, Azarovitz et al. 1979).

### *1.4.2.2 Temperature*

High water temperatures (such as those that can result from passing through a power plant cooling water system) can result in egg mortality (Smith et al. 1979) as well as larval mortality or deformity (Olla and Samet 1978). At higher water temperatures larval metabolic rate and yolk usage increases. The resulting larvae may be smaller and at a competitive disadvantage with larger larvae, or other planktivores, when first required to feed on plankton (Laurence 1973). This may slow growth and reduce success in reaching the protected habitats required for settlement.

Adults seek shelter during the day at high water temperatures, and reduce their feeding and aggressive activities (Olla and Studholme 1975, Olla et al. 1978, Olla et al. 1980). Extended periods of high water temperatures may cause large adults to move to cooler water (Adams 1993).

Water temperature serves as the primary trigger for adult tautog seasonal migrations (Olla et al. 1980). At very low water temperatures, adult tautog become torpid (Cooper 1966, Olla et al. 1974). Some adults remain active throughout the year, particularly in the more southerly portion of the species range (Eklund and Targett 1991, Adams 1993, Hostetter and Munroe 1993).

### *1.4.2.3 Salinity*

Although reported from brackish water, tautog have not been collected in freshwater (Bigelow and Schroeder 1953).

## **1.4.3 Present Condition of Habitats**

Besides over exploitation, which primarily affects adult tautog, other sources of mortality can reduce abundance. Very little information is available on disease effects, although finrot has been reported in some locations (see Steimle and Shaheen, 1999). Tautog occur near areas immediately associated with human activity (shallow estuarine areas, rocky and artificial reefs, and submerged stormwater and sewage outfall pipes, etc.) which has resulted in past and current changes in habitat availability and quality. Development of nearshore areas through such activities as dredging of material for channel maintenance, marine construction and other shoreline development resulting in pollutant discharges will impact tautog populations at all life history stages. Shipwreck salvage or reduction in reef height and complexity (shelter sites) may reduce their value as adult tautog habitat. Use of "rock-hopper" roller trawling gear over wrecks, low profile reefs and mussel beds also threatens the quality of these habitats. Declining oyster beds is yet another threat to the estuarine habitat needs of juvenile tautog and other species with similar needs (Chesapeake Bay Program 1994).

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Loss or destruction of vegetated bottom areas eliminates juvenile nursery areas. Increased turbidity and siltation due to dredging activities may inhibit feeding in larvae, degrade submerged aquatic vegetation beds used as nursery habitat, as well as damage adult spawning areas. Contaminants, disturbed in the dredging process, and brought into the water column could affect egg, larval and juvenile survival directly, or indirectly, through their food sources.

Entrainment of eggs and larvae in power plant intakes may result in physical damage to early life history stages and heated effluent from these and other industrial outfalls may also result in thermal stress. Discharge of treated sewage effluent and industrial wastes may have direct effects on fish as well as indirect effects on habitat and potential food sources through eutrophication. Results could include alterations of community composition (animal and vegetation) due to nutrient enrichment, and resulting anoxic and hypoxic environments.

Contaminants in the environment can affect tautog directly through contact and indirectly through ingestion of contaminated food. Reductions in growth and reproductive success, as well as direct mortality, are possible effects due to metals, oil, or other chemicals, which often remain in natural environments for long periods of time without degradation to less harmful forms. Biological sources of contamination could include direct contact with or ingestion of food associated with noxious or toxic phytoplankton blooms.

No information is available on direct pollution effects in tautog, however chromium, copper, and nickel levels in New Jersey coastal adult tautog liver tissue decreased significantly with increasing body length (Mears and Eisler 1977). Hall et al. (1978) found low to average levels of 15 metals in tautog muscle tissue (unknown collection site). Recently, the National Marine Fisheries Service (1995) found metal concentrations (silver, cadmium, chromium, copper, nickel, lead, zinc, arsenic and mercury), as well as PCB, PAH and pesticide concentrations below FDA action concentrations in adult tautog collected from Manasquan Inlet, New Jersey. In a laboratory study, Deacutis (1982) found that adult tautog showed little tendency to avoid oil contaminated feeding locations and would readily consume fuel oil contaminated bivalve meat.

Greater direct contaminant effects could occur with eggs and larvae, but because tautog feed on bottom-dwelling organisms, juveniles and adults could experience trophic transfer, resulting in indirect effects and long-term accumulation of contaminants in edible flesh.

Prevention of habitat loss through the species range should be a high priority for restoration of the tautog resource.

### 1.5 IMPACTS OF THE FISHERY MANAGEMENT PROGRAM

#### 1.5.1 Biological and Environmental Impacts

The implementation of Amendment 1 should improve management of tautog. As proposed, the Amendment will create regional boundaries which allow the species to be managed according to localized population structures and harvesting patterns. The intent is to manage based on biology and behavior of the species including movement patterns. As indicated in tagging studies, tautog display strong site fidelity and limited north-to-south migration. If regional

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management is approved then the strategies to minimize overexploitation can be tailored to the unique circumstances of each region, thereby largely eliminating the problem of management generalization that can be associated with managing tautog as a coastwide stock. Any biological impacts resulting from this document are expected to be positive.

### 1.5.2 Social Impacts

#### 1.5.2.1 Recreational Fishery

Tautog is a highly prize game fish targeted by anglers fishing at natural and manmade structures. The recreational fishery accounts for approximately 90 percent of the coastwide harvest. In a 2013 National Saltwater Angler Survey, conducted by NMFS, 591 east coast anglers identified tautog as a frequently targeted species (Lovell, 2015). When asked in the survey about attitudes toward broad-level management objectives, 93% of angler respondents prefer a minimum size to some degree, and 90% prefer a bag limit. Eight-one percent of respondents identified recovering fish stocks that have been depleted as an 'extremely important' fisheries management objective. The actions proposed in this Amendment overlap with desired management approaches identified in the survey, additional proposed actions are an outcome of stakeholder discussions.

#### 1.5.2.2 Commercial Fishery

In recent years, commercial landings accounted for up to 40% of the catch in some states, largely due to the market for live fish. Steady demand has increased the price for live tautog and has further incentivized the black market for undersized, out-of-season, or illegal quantities of tautog. There is a preference for plate sized fish up to 12 inches, which is below the 15-16 inch size limits set by states.

The proposed management changes, such as the commercial harvest tagging program, were designed with input from the law enforcement community and feedback from commercial fishermen. The intent of the program is to minimize illegal, unreported and unregulated fishing that has perforated the fishery since the 1990s. It is an attempt to eliminate the backdoor practice of selling underpriced tautog by unlicensed fishermen in the black market. Desired outcomes from this management action are higher prices for those commercial fishermen that follow established regulations and greater accountability in the commercial fishing sector.

#### 1.5.2.3 Subsistence Fishery

A subset of illegal activity occurs among individuals and small groups harvesting fish for personal consumption or subsistence. These individuals may not even be aware they are violating specific regulations. Additional information on the subsistence fishery is not available at this time.

### 1.5.3 Economic Impacts

As described elsewhere in Amendment 1, the recreational component of the fishery accounts for the majority of harvest compared to the commercial harvest. In order to evaluate how dividing the current single coast-wide stock into regional stocks would affect anglers and commercial fisherman, information on how this would affect their behavior or the amount of

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fish they catch is needed. For recreational anglers, the information needed would include how the number of fishing trips for tautog change, if they keep taking the same number of trips but make substitutions for target species and/or change fishing mode (private boat, shore, for-hire), and if they travel to different locations as a result. Changes in the number of fish, size of fish, and species composition would also be important aspects of how they might be impacted.

### *1.5.3.1 Recreational Fishery*

There are no published or unpublished studies (as of 2016) that document the economic impacts or economic value of the recreational tautog fishery. Without specific information on how the proposed changes to the FMP would affect the number of recreational trips taken for tautog and/or the catch per angler, it is not possible to estimate any economic impacts or effects at this time.

However, there are a few recent socio-economic surveys and publications by the National Marine Fisheries Service, Office of Science and Technology, with limited data on anglers who fish for tautog. These may be useful to understand in general the socio-economic aspects of anglers who fish for tautog and may be useful in a future analysis of specific management options once those are better defined.

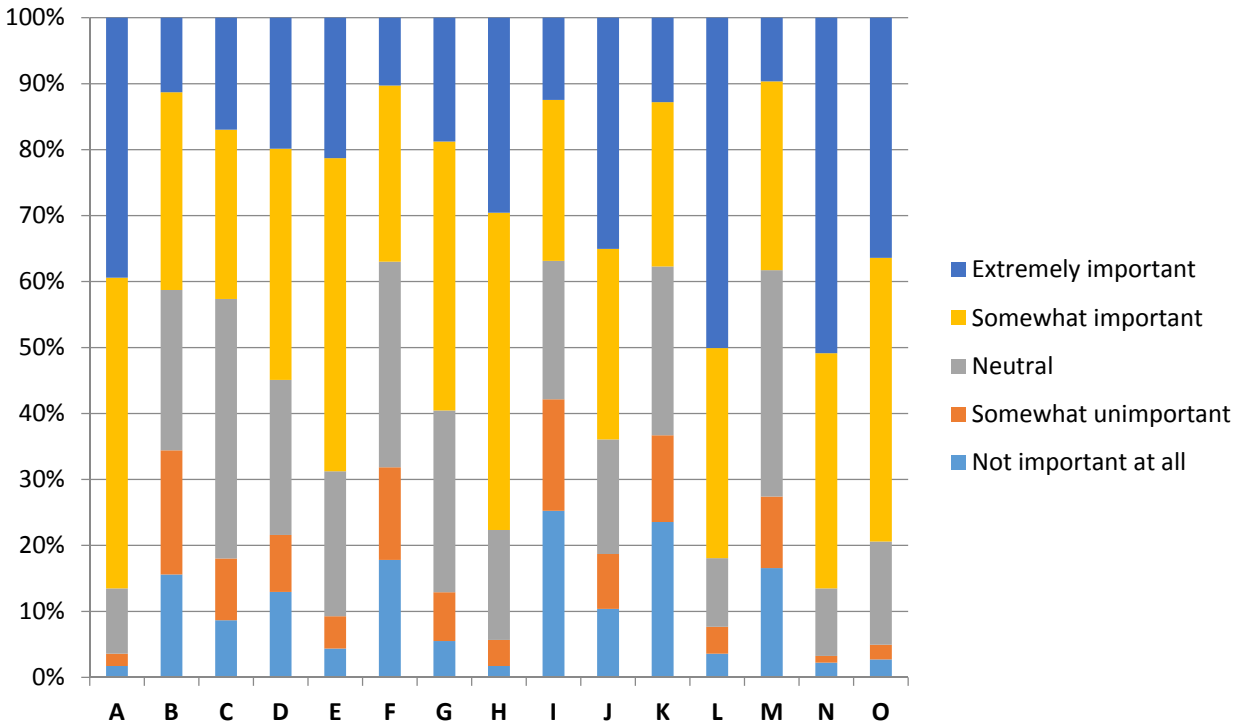
### *National Saltwater Angler Survey*

The first of these is the 2013 National Saltwater Angler Survey that asked recreational anglers about their attitudes and preferences for recreational fishing trips, management strategies and management objectives. An analysis of the data shows that 226 anglers who responded to the survey from the North Atlantic region (Maine to Connecticut) and 365 from the Mid-Atlantic (New York to Virginia) replied they frequently targeted tautog (Lovell 2013). For this document, the data on these 591 anglers was analyzed to understand their preferences for trip characteristics and management options and objectives. In the survey, respondents were asked to rate the importance of each characteristic listed below using a five-point scale, ranging from “Extremely important” to “Not important at all” (Figure 23).

- A. Catch fish
- B. Catch as many fish as I can for consumption
- C. Catch-and-release as many fish as possible
- D. Catch a trophy-sized fish
- E. Target a particular species
- F. Catch the bag limit of a species I am targeting
- G. Know that I will encounter abundant fish
- H. Fish in an area that is not heavily congested
- I. Be close to amenities such as parking, restrooms, cleaning stations, boat launches, etc.
- J. See information concerning fishing regulations clearly posted
- K. Have access to staff (park staff, marine operators, etc.) to answer questions or provide information
- L. Have easy access to weather and tide information
- M. Fish in a scenic area

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- N. Fish with family or friends
- O. Teach others about fishing



**Figure 23. Fishing Trip Characteristics Important to Tautog Anglers (Maine to Virginia)**

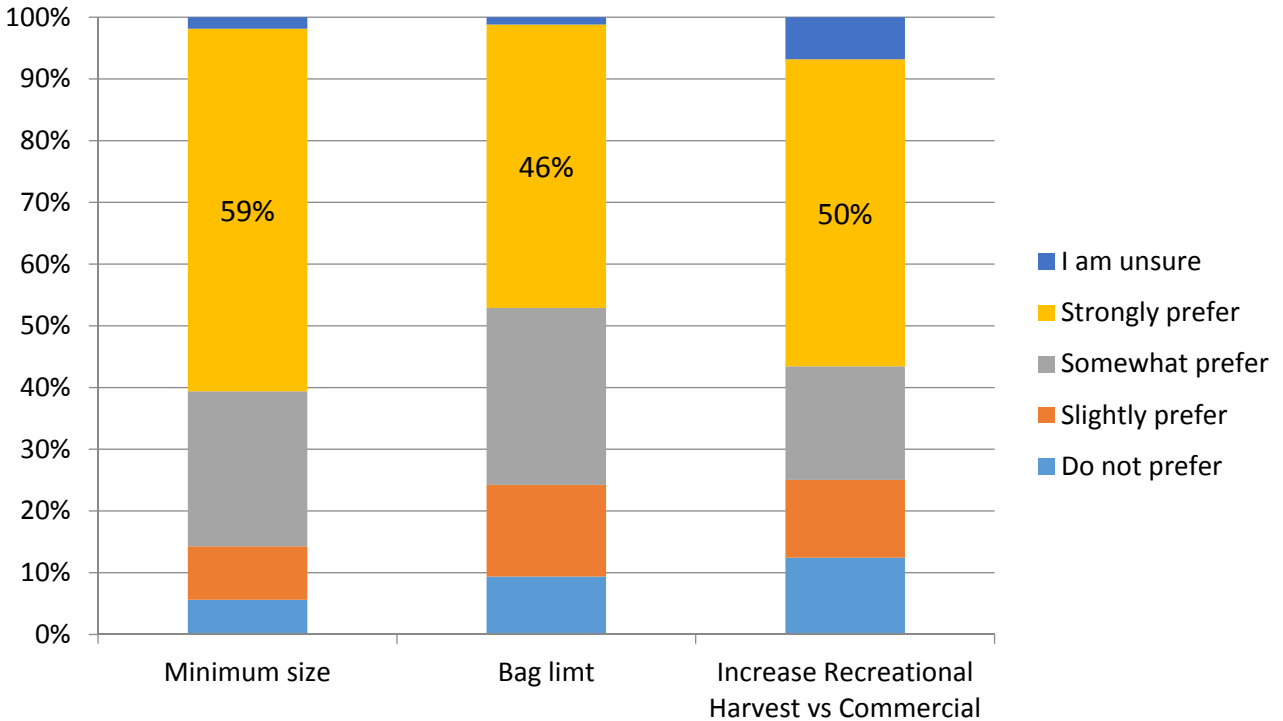
87% of the surveyed anglers fishing for tautog rated both “fishing with family or friends” and “catching fish” as important (defined as either somewhat or extremely important on the scale). Having easy access to weather and tide information was important to 82% of tautog anglers, and 78-79% rated “teach others about fishing” and “fish in an area that is not heavily congested” as important. Of concern to managers, the characteristics “catch the bag limit of a species I am targeting” was ranked as important by only 37% of anglers. In comparison to all anglers across the country as well as in the North Atlantic and Mid-Atlantic, these results are fairly consistent in terms of percentages ranking the various characteristics as important (Brinson and Wallmo 2013; Rubio et al 2014).

To help understand attitudes toward different types of management strategies, anglers were also asked to rate their preferences for a list of management strategies. Respondents rated each of a series of strategies using a five-point scale of “Strongly prefer,” “Somewhat prefer,” “Slightly prefer,” “Do not prefer at all,” and “I am unsure.” Results for a select group of management strategies relevant to the proposed changes in the tautog FMP are presented in Figure 24.

- Establish minimum size limits of the fish you can keep
- Limit the total number of fish you can keep
- Increase the recreational harvest limit by decreasing the commercial harvest limit



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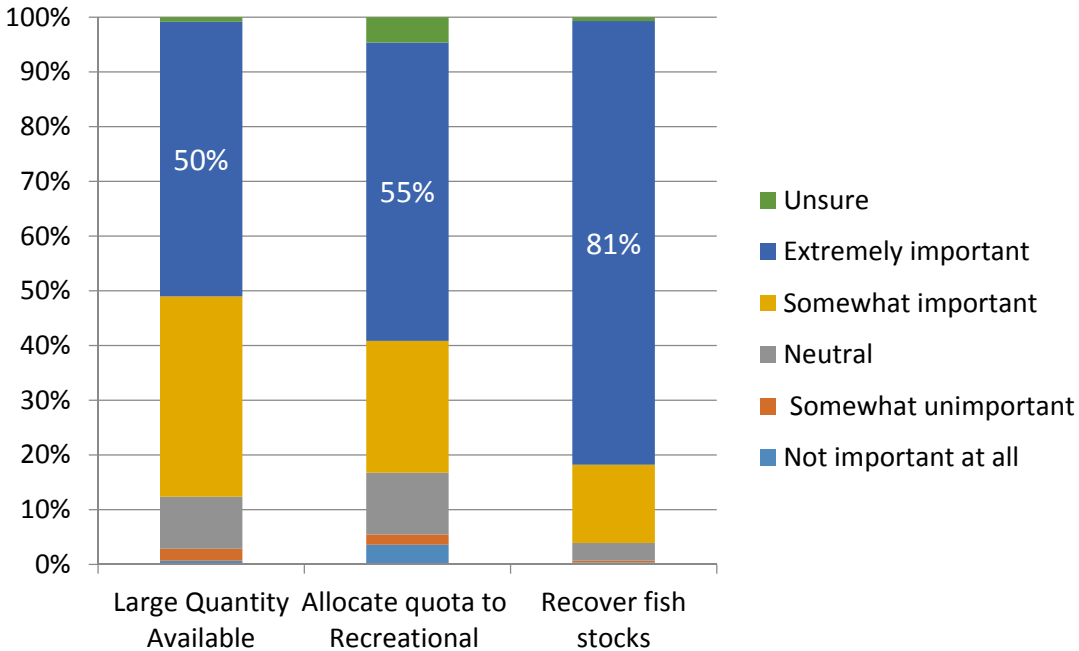


**Figure 24. Management Preferences of Tautog Anglers (Maine to Virginia)**

Another question the survey asked anglers included attitudes toward broad-level management objectives. Respondents were asked to rate each of several objectives using a six-point scale of “Extremely important,” “Somewhat important,” “Neutral,” “Somewhat unimportant,” “Not important at all,” and “I am unsure.” Results for some of the relevant objectives to the tautog FMP are presented in Figure 25.

- a. Ensure that large quantities of fish are available to catch
- b. Allocate some quota from commercial fisheries to recreational fisheries
- c. Recover fish stocks that have been depleted

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**Figure 25. Preferences of Tautog Anglers (Maine to Virginia) For Different Management Objectives**

Recovering fish stocks that have been depleted was extremely important to 81% of tautog anglers. Ensuring large numbers of fish to catch was ranked extremely important by 50% of tautog anglers. 55% said reallocating some of the quota from commercial to recreational anglers was extremely important, however, it is important to note the question did not ask about specific species in this context. The above responses to the survey can be useful in understanding what motivates recreational tautog anglers in general and how they may respond to changes in the tautog FMP.

### *Recreational Bait and Tackle Economic Survey*

The most recent NMFS survey was conducted in 2014. The survey obtained information from independently owned bait and tackle stores and other independent stores selling marine recreational bait and tackle in coastal areas. Store owners were asked a series of questions on what type of bait and tackle they sold, their cost and earnings, and questions on the top species targeted by customers. The information collected was used to estimate the economic impacts of these stores to the regions.

For the North Atlantic Region, independent bait and tackle stores supported 958 jobs and contributed toward \$140 million in regional economic output from sales of marine recreational bait and tackle (Hutt et al 2015). For the Mid-Atlantic region, bait and tackle stores supported 1,922 jobs and \$293 million in output. In the Mid-Atlantic and New England, Bait and Tackle and Other Store owners indicated tautog (8.6%; 11.9%) was the sixth and fourth highest generators of sales for their business, respectively (Table 3). The information in this survey may be used to

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analyze economic impacts to bait and tackle shops in the management areas if a clear link between changes in the tautog FMP and changes in sales of bait and tackle can be made.

**Table 3. Saltwater recreational fisheries that generated the greatest sales of bait and tackle for retail stores in the Mid-Atlantic and New England as identified by store owners and/or managers. Percentages exceed 100% as respondents were asked to select the top three fisheries (Hutt et al, 2015). N is the number of store owners that participated in the survey.**

<b>Fisheries Management Region: Mid-Atlantic</b>						
<b>Fishery</b>	<u>Total</u>		<u>Bait &amp; Tackle Stores</u>		<u>Other Stores</u>	
	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>
Striped bass/Bluefish	118	72.4	58	76.3	60	69
Summer or Winter flounder	83	50.9	46	60.5	37	42.5
Atlantic croaker/Spot/Scup	49	30.1	19	25	30	34.5
Black seabass	16	9.8	9	11.8	7	8
Marlin/Tuna	9	5.5	9	11.8	0	0
<b>Tautog/Triggerfish</b>	<b>14</b>	<b>8.6</b>	<b>8</b>	<b>10.5</b>	<b>6</b>	<b>6.9</b>
Red or Black drum	10	6.1	5	6.6	5	5.7
Weakfish	10	6.1	4	5.3	6	6.9
Other	30	18.4	13	17.1	17	19.5
<b>Fisheries Management Region: New England</b>						
<b>Fishery</b>	<u>Total</u>		<u>Bait &amp; Tackle Stores</u>		<u>Other</u>	
	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>
Striped bass/Bluefish	80	67.8	52	78.8	28	53.8
Summer or Winter flounder	29	24.6	22	33.3	7	13.5
Scup	21	17.8	16	24.2	5	9.6
<b>Tautog</b>	<b>14</b>	<b>11.9</b>	<b>11</b>	<b>16.7</b>	<b>3</b>	<b>5.8</b>
Atlantic cod	14	11.9	8	12.1	6	11.5
Atlantic mackerel	20	16.9	7	10.6	13	25
Bluefin tuna	12	10.2	6	9.1	6	11.5
Bonito	1	0.8	1	1.5	0	0
Other	23	19.5	11	16.7	12	23.1

### *National Marine Recreational Fishing Expenditure Survey*

The 2011 National Marine Recreational Fishing Expenditure Survey provides information on mean trip expenditures by state, fishing mode, and resident status (Lovell et al 2013). The number of directed trips for tautog by state and mode can be used together with mean trip expenditure to estimate the total expenditures on tautog trips and the resulting economic impacts to the coastal states from changes in the tautog FMP. This assumes such changes would affect the number and distribution of trips across the management area. Caution is noted however, because if anglers switch to fishing for other species with no or little change in

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the number, location, or type of trips taken, there will be no resulting impacts. Table 4 shows the 2014 mean expenditures by state, mode, and resident status using the 2011 estimates and inflating them to 2014 dollars using the Consumer Price Index. NMFS has developed state level economic impact models that can be used to estimate the economic impacts resulting from changes in fishing trips (Lovell et al 2013).

Aside from changes in economic impacts resulting from potential changes in the number of trips taken by anglers, data from the MRIP program on numbers of directed trip and catch of tautog could be used to develop a revealed preference model on the economic value of catching different numbers of tautog. The results can be used to show how changes in management measures would change the economic value, or benefits, anglers receive from fishing for and/or catching tautog. It would require some time to develop these models by an experienced economist.

**Table 4. Mean Trip Expenditures by State, Mode, and Resident Status, 2014**

<b>State</b>	<b>Mode</b>	<b>Resident Status</b>	<b>Mean</b>
Connecticut	For-Hire	Non-Resident	\$151.80
Connecticut	For-Hire	Resident	\$173.21
Connecticut	Private Boat	Non-Resident	\$29.71
Connecticut	Private Boat	Resident	\$32.03
Connecticut	Shore	Non-Resident	\$13.33
Connecticut	Shore	Resident	\$19.18
Delaware	For-Hire	Non-Resident	\$199.34
Delaware	For-Hire	Resident	\$124.56
Delaware	Private Boat	Non-Resident	\$42.74
Delaware	Private Boat	Resident	\$39.48
Delaware	Shore	Non-Resident	\$72.52
Delaware	Shore	Resident	\$30.82
Maryland	For-Hire	Non-Resident	\$394.78
Maryland	For-Hire	Resident	\$147.88
Maryland	Private Boat	Non-Resident	\$37.12
Maryland	Private Boat	Resident	\$46.55
Maryland	Shore	Non-Resident	\$70.75
Maryland	Shore	Resident	\$45.86
Massachusetts	For-Hire	Non-Resident	\$473.54
Massachusetts	For-Hire	Resident	\$178.38
Massachusetts	Private Boat	Non-Resident	\$79.08
Massachusetts	Private Boat	Resident	\$63.18
Massachusetts	Shore	Non-Resident	\$152.17
Massachusetts	Shore	Resident	\$42.20
New Jersey	For-Hire	Non-Resident	\$138.41
New Jersey	For-Hire	Resident	\$116.31
New Jersey	Private Boat	Non-Resident	\$94.07
New Jersey	Private Boat	Resident	\$58.44

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State	Mode	Resident Status	Mean
New Jersey	Shore	Non-Resident	\$53.49
New Jersey	Shore	Resident	\$30.81
New York	For-Hire	Non-Resident	\$122.19
New York	For-Hire	Resident	\$165.72
New York	Private Boat	Non-Resident	\$40.77
New York	Private Boat	Resident	\$61.95
New York	Shore	Non-Resident	\$46.92
New York	Shore	Resident	\$20.90
Rhode Island	For-Hire	Non-Resident	\$216.18
Rhode Island	For-Hire	Resident	\$98.34
Rhode Island	Private Boat	Non-Resident	\$38.50
Rhode Island	Private Boat	Resident	\$42.97
Rhode Island	Shore	Non-Resident	\$17.47
Rhode Island	Shore	Resident	\$16.06
Virginia	For-Hire	Non-Resident	\$189.54
Virginia	For-Hire	Resident	\$113.05
Virginia	Private Boat	Non-Resident	\$79.75
Virginia	Private Boat	Resident	\$59.42
Virginia	Shore	Non-Resident	\$104.20
Virginia	Shore	Resident	\$27.77

#### 1.5.3.2 Commercial Fishery

From 2009 to 2015, the states with the highest number of vessels and fisherman fishing for tautog on average are Rhode Island, Massachusetts, and New York. Table 5 shows the number of vessels, number of fishermen, total pounds, total revenue and average price per pound from 2009 to 2015 where data is available. For these vessels and fisherman, tautog is not the only species they catch. The top five species as measured in pounds for the vessels also reporting tautog were scup (#1), black sea bass (#3), longfin inshore squid (#4), and skates (#5). Tautog was second in terms of pounds. In terms of average pounds caught, the states with the highest catch are New York, Massachusetts, and Rhode Island.

**Table 5. Commercial Tautog Effort by State. Confidential data has been excluded.**

Year	State	Vessels	Fishermen	Landings (lbs)	Revenue	Price Per Pound
2009	MA	73	164	54,703	\$137,062	\$2.51
2010	MA	95	192	75,317	\$210,114	\$2.79
2011	MA	122	181	57,787	\$179,683	\$3.11
2012	MA	156	219	67,870	\$212,688	\$3.13
2013	MA	187	250	70,165	\$236,224	\$3.37
2014	MA	179	222	63,191	\$230,697	\$3.65
2015	MA	196	213	61,752	\$268,529	\$4.35

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<b>Year</b>	<b>State</b>	<b>Vessels</b>	<b>Fishermen</b>	<b>Landings (lbs)</b>	<b>Revenue</b>	<b>Price Per Pound</b>
2009	RI	157	253	50,920	\$98,854	\$1.94
2010	RI	219	233	44,054	\$101,427	\$2.30
2011	RI	228	228	47,426	\$124,862	\$2.63
2012	RI	239	247	50,126	\$151,008	\$3.01
2013	RI	236	235	53,428	\$168,471	\$3.15
2014	RI	240	232	53,384	\$182,347	\$3.42
2015	RI	234	226	47,140	\$172,694	\$3.66
2009	CT	69	45	21,194	\$44,178	\$2.08
2010	CT	82	47	16,948	\$41,842	\$2.47
2011	CT	76	66	14,787	\$38,693	\$2.62
2012	CT	64	35	6,233	\$18,501	\$2.97
2013	CT	60	36	5,887	\$15,950	\$2.71
2014	CT	55	34	5,164	\$14,647	\$2.84
2015	CT	56	48	7,249	\$22,774	\$3.14
2009	NY	118	183	87,289	\$276,169	\$3.16
2010	NY	126	187	93,153	\$299,080	\$3.21
2011	NY	120	174	82,761	\$261,467	\$3.16
2012	NY	132	171	76,373	\$254,907	\$3.34
2013	NY	140	181	110,849	\$359,138	\$3.24
2014	NY	153	206	121,538	\$375,909	\$3.09
2015	NY	137	179	111,925	\$401,668	\$3.59
2009	NJ	17	16	14,591	\$45,316	\$3.11
2010	NJ	23	20	49,213	\$122,781	\$2.49
2011	NJ	24	20	45,865	\$129,285	\$2.82
2012	NJ	20	17	20,831	\$66,577	\$3.20
2013	NJ	19	17	21,999	\$73,941	\$3.36
2014	NJ	12	11	31,655	\$101,049	\$3.19
2015	NJ	15	16	17,538	\$57,373	\$3.27
2009	DE	8	5	2,116	\$4,649	\$2.20
2012	DE	5	4	1,444	\$4,968	\$3.44
2015	DE	4	5	2,107	\$8,446	\$4.01
2009	MD	13	9	1,638	\$3,659	\$2.23
2010	MD	11	11	1,285	\$2,780	\$2.16
2015	MD	7	8	1,181	\$4,619	\$3.91

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Year	State	Vessels	Fishermen	Landings (lbs)	Revenue	Price Per Pound
2009	VA	35	15	11,132	\$19,169	\$1.72
2010	VA	35	10	6,081	\$13,819	\$2.27
2011	VA	34	9	14,590	\$42,050	\$2.88
2012	VA	36	10	13,870	\$33,611	\$2.42
2013	VA	24	8	11,776	\$88,407	\$7.51
2014	VA	26	9	7,545	\$26,378	\$3.50
2015	VA	27	23	6,937	\$25,569	\$3.69

### 1.5.3.3 Subsistence Fishery

No information exists on the subsistence fishery for tautog.

## 1.5.4 Other Resource Management Efforts

### 1.5.4.1 Artificial Reef Development/Management

Artificial reefs can enhance fish habitat, provide more access to quality fishing grounds, benefit fishermen, divers, and the economies of shore communities, and increase total biomass in a given area. Tautog rely on reef structures for protection, and reef-dependent species such as *Mytilus edulis* form a large portion of the diet of both juveniles and adults (Olla et al 1975).

Individual Atlantic states started deploying artificial habitat after the 1950s. Efforts became more formalized after the release of the 1985 National Artificial Reef Plan, which enhanced coordination and development of artificial reefs with state, interstate and federal agencies including ASMFC and the National Marine Fisheries Service. As shown in Table 6, the majority of states within tautog's distribution have state-administered artificial reef programs, and Rhode Island's artificial reef program is in development (McNamee, personal communication).

**Table 6. Number of artificial reefs by state in 2016**

State	# of artificial reefs inshore	# of artificial reefs offshore	Total # of artificial reefs built	Acres
Massachusetts	5	-	5	<160
Rhode Island	-	-	Artificial Reef Program in development	
Connecticut	1	-	1 no formal program	<6.4
New York	4	7	11	2,539
New Jersey	2	13	15	16,000
Delaware	8	4	12	7,080
Maryland	22	11	33	13,613
Virginia	18	5	23	487

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Artificial reefs are built out of hard, durable structures such as rock, concrete, and steel, usually in the form of surplus or scrap materials (vessels, dredge rock, military vehicles, etc.). All harmful substances are removed from the material prior to deployment. Various design approaches are used for Atlantic artificial reefs. New Jersey has sunken old ships and barges to create 16,000 acres of artificial reefs. Delaware has used donated concrete for eight bay sites, and ballasted tire units and sunken ships for ocean sites. Most Maryland reefs are constructed from concrete materials of opportunity, including rubble from bridge and pier demolition projects, and reef balls built with the help of volunteers (Michael Malpezzi, MDNR, personal communication, 2016).

Some states are monitoring the impact of artificial reefs on fishery performance and biological diversity. In New Jersey, party boat fishing effort on artificial reefs increased from 3 percent in 1970 to 47 percent in 2000 in conjunction with an extensive increase in reef building efforts during that period (Figley 2001). In Maryland, volunteer angler surveys carried out on artificial and nearby natural reefs confirm that artificial reefs provide fishing experiences equivalent to the natural reefs (Michael Malpezzi, MDNR, personal communication, 2016). New and continued monitoring and research on the effects of existing artificial reef sites will be most informative for habitat-orientated species like tautog.

### 1.5.4.2 Bycatch

Tautog is often listed as a bycatch species in trap and pot fisheries targeting lobster and black sea bass (ASMFC 1997, Skrobe and Lee 2004, Hasbrouck et al. 2007, NEFMC et al. 2007, NEFMC et al. 2015). In the federally permitted Mid-Atlantic fish pot fishery, on average tautog accounted for 5% of harvest from 2000-2004 and 8% of harvest from 2007-2011 (Table 7). Tautog catch, as bycatch, is of value, and is often harvested and sold (Skrobe and Lee 2004). Many lobstermen target tautog when the inshore lobster fishery slows simply by using longer sets of traps without bait (ASMFC 1996, personal communication Peter Clarke, NJDEP). In a 1994 study, tautog was the second most abundant species (23% of finfish bycatch) after scup in New York's lobster pot fishery (ASMFC 1996).

**Table 7. Average Landings in the Mid-Atlantic Fish Pot Fishery (Pounds)**

**Source: Northeast Region Standardized Bycatch Reporting Methodology (NEFMC 2007 & 2015)**

<b>Species</b>	<b>2000-2004</b>	<b>2007-2011</b>
<b>Tautog</b>	49,000	56,000
<b>Black Sea Bass</b>	723,000	472,000
<b>Lobster</b>	17,000	37,000
<b>Channeled Whelks</b>	35,000	31,000
<b>Eels</b>	21,000	20,000
<b>Other</b>	60,000	116,000
<b>Total</b>	905,000	732,000



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### 1.6 LOCATION OF TECHNICAL DOCUMENTATION FOR FMP

#### 1.6.1 Review of Resource Life History and Biological Relationships

See Section 1.2.1

#### 1.6.2 Stock Assessment Document

See Section 1.2.2

#### 1.6.3 Habitat Background Document

See Section 1.4

## 2.0 GOALS AND OBJECTIVES

### 2.1 HISTORY OF PRIOR MANAGEMENT MEASURES

Prior to adoption of the Interstate FMP, tautog had been managed on a state-by-state basis. For the majority of states, tautog were largely unmanaged although some states had commercial and/or recreational regulations, such as minimum size limits, possession limits, and effort controls. An increase in fishing pressure in the mid-1980s through early 1990s, and a growing perception of the species' vulnerability to overfishing, stimulated the need for a coastwide FMP. Accordingly, in 1993 the ASMFC recommended a plan be developed as part of its Interstate Fisheries Management Program. The states of Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland Virginia, and North Carolina declared an interest in jointly managing this species through the ASMFC. The FMP was implemented in 1996, with the goals of conserving the resource along the Atlantic coast and maximizing long-term ecological benefits, while maintaining the social and economic benefits of recreational and commercial utilization.

Following is a brief history of tautog management activities to date:

#### **Fishery Management Plan (FMP)** (March 1996)

The FMP established a 14" minimum size limit and a target fishing mortality of  $F = M = 0.15$ . The target  $F$  was a significant decrease from the 1995 stock assessment terminal year fishing mortality rate in excess of  $F = 0.70$ , so a phased in approach to implementing these regulations was established. Northern states (Massachusetts through New Jersey) were to implement the minimum size and achieve an interim target of  $F = 0.24$  by April 1997, while southern states (Delaware through North Carolina) had until April 1998 to do the same. All states were required to achieve the target  $F = 0.15$  by April 1999.

#### **Addendum I** (May 1997)

In response to northern states' difficulty in achieving the interim  $F$  by their deadline, Addendum I delayed implementation of the interim  $F$  and target  $F$  for all states until April 1998 or April 2000 depending on the state. It also established *de minimis* specifications.

#### **Addendum II** (November 1999)

The 1999 stock assessment incorporated data through 1998, which included only nine months

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of data under the Addendum I regulations. Given the life history of the species, the Board was concerned the assessment provided limited advice on the effects of Addendum I regulations. Addendum II further extended the deadline to achieve the  $F=0.15$  target until April 2002. It also clarified the fishing mortality targets in the FMP with respect to individual state management program flexibility.

### **Addendum III** (February 2002)

This addendum established a new target fishing mortality rate of  $F_{\text{target}} = F_{40\%SSB} = 0.29$  and mandated states collect a minimum of 200 age samples per year.

### **Addendum IV** (January 2007)

Addendum IV revised the target fishing mortality rate to  $F = 0.20$ , a 28.6% reduction in overall fishing mortality, and established biomass reference points for the first time. The biomass reference points were ad hoc, based on the average of the 1982-1991 SSB (target; 26,800 MT) and 75% of this value (threshold; 20,100 MT). It also required states to achieve the new target  $F$  by reductions in recreational harvest only.

### **Addendum V** (April 2007)

Addendum V allowed state flexibility in achieving  $F_{\text{target}} = 0.20$  through reductions in commercial harvest, recreational harvest, or some combination of both. A Massachusetts-Rhode Island model indicated regional  $F$  was lower than the coastwide target, therefore these two states were not required to implement management measures to reduce  $F$ .

### **Addendum VI** (April 2011)

Addendum VI established a new  $F_{\text{target}}$  of  $F = M = 0.15$  on the basis that stock biomass had not responded to previous  $F$  levels. The new  $F_{\text{target}}$  required states to take a 39% reduction in harvest. As in Addendum IV, a regional assessment of Massachusetts and Rhode Island demonstrated a lower regional  $F$  using ADAPT VPA model, and these states were not required to implement tighter regulations. To achieve the required harvest reduction, all other states adopted higher minimum size limits exceeding the FMP's minimum requirement of 14" in addition to other measures, such as possession limits, seasonal closures, and gear restrictions.

## **2.2 GOALS**

If approved, Amendment 1 replaces the 1996 Tautog FMP and its addenda.

*The Board is considering modifications to the goals that were enacted in 1996 to meet the current needs of the species and fishery.*

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### **Option A. Status Quo. Maintain the 1996 Goals**

- A. To perpetuate and enhance stocks of tautog through interstate fishery management so as to allow a recreational and commercial harvest consistent with the long-term maintenance of self-sustaining spawning stocks
- B. To maintain recent (i.e. 1982-1991) utilization patterns and proportions of catch taken by commercial and recreational harvesters
- C. To provide for the conservation, restoration, and enhancement of tautog critical habitat for all life history stages
- D. To maintain a healthy age structure
- E. To conserve the tautog resource along the Atlantic coast to preserve ecological benefits such as biodiversity and reef community stability, while maintaining the social and economic benefits of commercial and recreational utilization

### **Option B. Revised Goal Statement**

The goal of Amendment 1 is to sustainably manage tautog over the long-term using regional differences in biology and fishery characteristics as the basis for management. Additionally, the Amendment seeks to promote the conservation and enhancement of structured habitat to meet the needs of all stages of tautog's life cycle.

## **2.3 OBJECTIVES**

*The following objectives are being considered by the Board to support the goals of this amendment:*

### **Option A. Status Quo: Maintain the 1996 Objectives**

- A. To establish criteria, standards, and procedures for plan implementation as well as determination of state compliance with FMP provisions
- B. To allow harvest that maintains spawning stock biomass (SSB) in a condition that provides for perpetuation of self-sustaining spawning stocks in each spawning area, SSB, size and age structure, or other measures of spawning success at or above historical levels as established in the plan
- C. To achieve compatible and equitable management measures among jurisdictions throughout the fishery management unit
- D. To enact management recommendations which apply to fish landed in each state, so that regulations apply to fish caught both inside and outside of state waters
- E. To promote cooperative interstate biological, social, and economic research, monitoring and law enforcement
- F. To encourage sufficient monitoring of the resource and collection of additional data, particularly in the southern portion of the species range, that are necessary for development of effective long-term management strategies and evaluation of the management program. Effective stock assessment and population dynamics modeling require more information on the status of the resource and the

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biology/community/ecology of tautog than is currently available, in particular to facilitate calculation of F and stock trends

- G. To identify critical habitats and environmental factors that support or limit long-term maintenance and productivity of sustainable tautog populations
- H. To adopt and promote standards of environmental quality necessary to the long-term maintenance and productivity of tautog throughout their range
- I. To develop strategies that reduce fishing mortality, restore stock size composition and the historical recreational/commercial split, consider ecological and socio-economic impacts.
- J. To identify problems associated with the offshore fishery. Compatible regulations between the states and the EEZ are essential

### **Option B. Remove Objective A and B from Section 2.3 of the 1996 FMP**

These objectives are inherent within the FMP or included in other objectives, and therefore redundant.

### **Option C. Modify Objective C in Section 2.3 of the 1996 FMP to the following:**

- Adopt compatible management measures among states within a regional management unit

### **Option D. Combine Objectives D and J in Section 2.3 of the 1996 FMP to the following:**

- Encourage compatible regulations between the states and the EEZ, which includes enacting management recommendations that apply to fish landed in each state (i.e., regulations apply to fish caught both inside and outside of state waters).

### **Option E. Combine Objectives G and H in Section 2.3 of the 1996 FMP to the following:**

- Identify important habitat and environmental quality factors that support the long-term maintenance and productivity of sustainable tautog populations throughout their range.

### **Option F. Modify Objectives I in Section 2.3 of the 1996 FMP to the following:**

- Develop and implement management strategies to rebuild tautog stocks to sustainable levels (reduce fishing mortality to the target and restore spawning stock biomass to the target), while considering ecological and socio-economic impacts.

### **Option G. Add the following objective to Section 2.3 of the 1996 FMP:**

- Work with law enforcement to minimize factors contributing to illegal harvest.

### **Option H. Accept Options B through G into Section 2.3 of the 1996 FMP:**

This option will insert all modifications identified under Options B through G into Section 2.3. If adopted, the objectives will be:

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- Develop and implement management strategies to rebuild tautog stocks to sustainable levels (reduce fishing mortality to the target and restore spawning stock biomass to the target), while considering ecological and socio-economic impacts.
- Adopt compatible management measures among states within a regional management unit
- Encourage compatible regulations between the states and the EEZ, which includes enacting management recommendations that apply to fish landed in each state (i.e., regulations apply to fish caught both inside and outside of state waters).
- Identify important habitat and environmental quality factors that support the long-term maintenance and productivity of sustainable tautog populations throughout their range.
- Promote cooperative interstate biological, social, and economic research, monitoring and law enforcement
- Encourage sufficient monitoring of the resource and collection of additional data, particularly in the southern portion of the species range, that are necessary for development of effective long-term management strategies and evaluation of the management program.
- Work with law enforcement to minimize factors contributing to illegal harvest.

### 2.4 SPECIFICATION OF A MANAGEMENT UNIT

The management unit consists of all coastal states from Massachusetts through Virginia. The management unit is defined as all U.S. territorial waters of the northwest Atlantic Ocean, from the shoreline to the seaward boundary of the exclusive economic zone, and from US/Canadian border to the southern end of the species range. Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, the National Marine Fisheries Service and the U.S. Fish and Wildlife Service have declared an interest in tautog.

### 2.5 BIOLOGICAL REFERENCE POINTS

Threshold reference points are the basis for determining stock status (i.e., whether overfishing is occurring or a stock is overfished). When the  $F$  exceeds the  $F$ -threshold, then overfishing is occurring; the rate of removal of fish by the fishery exceeds the ability of the stock to replenish itself. When the reproductive output (measured as spawning stock biomass or population fecundity) falls below the biomass-threshold, then the stock is overfished, meaning there is insufficient mature female biomass (SSB) or egg production (population fecundity) to replenish the stock.

Reference points are recalculated during an update and benchmark stock assessment, see the latest stock assessment for reference points and stock status determination (ASMFC 2016b). In 2016, the Technical Committee recommended maximum sustainable yield based reference points and spawning potential ratio based reference points, depending on the region, based on data availability. The proposed biological reference tables are highlighted in Tables 8 and 9, and the two types of reference points are summarized below.

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### *Maximum sustainable yield (MSY) based reference points*

MSY-based reference points are estimated from ASAP, which uses a combination of spawning potential ratio, yield-per-recruit (YPR), and the stock-recruitment relationship to calculate the  $SSB_{MSY}$  and  $F_{MSY}$ .  $75\% F_{MSY}$  is calculated by projecting the population forward assuming the same stock-recruitment (S-R) relationship and finding the fishing mortality (F) that maintains the population at  $75\% SSB_{MSY}$ .  $SSB X\%$  is calculated by projecting the population forward while fishing at  $F X\%SPR$  with recruitment randomly drawn from the observed historical recruitment. MSY-based reference points are used in the LIS region because it has a longer time-series.

### *Spawning potential ratio (SPR) based reference points*

SPR-based reference points estimate the reproductive potential of a fished stock relative to its unfished condition. SPR based reference points are used in the MARI, NJ-NYB and DelMarVa regions.

**Table 8. Tautog Spawning Stock Biomass Status by Region When Compared to Proposed Reference Points. Source: ASMFC Stock Assessment Update, 2016**

Stock Region	Proposed SSB Reference Points			Status as of the 2016 Assessment	
	MSY or SPR	SSB Target (mt)	SSB Threshold (mt)	SSB 2015 (mt)	Stock Status
Massachusetts – Rhode Island	SPR	2,684	2,004	2,196	Stock Not Overfished
Long Island Sound	MSY	2,865	2,148	1,603	Overfished
New Jersey – New York Bight	SPR	3,154	2,351	1,809	Overfished
Delaware – Maryland – Virginia	SPR	1,919	1,447	621	Overfished
Coastwide	MSY	14,944	11,208	6,014	Overfished
	SPR	9,448	7,091	6,014	Overfished

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**Table 9. Tautog Fishing Mortality Status by Region When Compared to Proposed Reference Points.**  
**Source: ASMFC Stock Assessment Update, 2016**

Stock Region	Proposed F Reference Points			Status as of the 2016 Assessment	
	MSY or SPR	Fishing Mortality Target	Fishing Mortality Threshold	3-year Average (2013-15)	Stock Status
Massachusetts – Rhode Island	SPR	0.28	0.49	0.23	Overfishing Not Occurring
Long Island Sound	MSY	0.28	0.49	0.51	Overfishing
New Jersey – New York Bight	SPR	0.20	0.34	0.54	Overfishing
Delaware – Maryland – Virginia	SPR	0.16	0.24	0.16	Overfishing Not Occurring
Coastwide	MSY	0.17	0.24	0.38	Overfishing
	SPR	0.25	0.43	0.38	Overfishing Not Occurring

### **Option A. Status Quo - Reference Points can be Modified via a Management Document**

The Tautog Technical Committee or Stock Assessment Subcommittee can recommend alternative reference points (i.e. other than MSY or SPR), as long as modifications to the status determination criteria, and their associated values, are the result of the most recent peer-reviewed stock assessments for tautog. In response, the Board may initiate a management document to incorporate the new, peer-reviewed stock status determination criteria.

### **Option B. Reference Points can be Modified via Board Action (i.e., Management Document Not Required)**

The Tautog Technical Committee or Stock Assessment Subcommittee can recommend alternative reference points (i.e. other than MSY or SPR), as long as modifications to the status determination criteria, and their associated values, are the result of the most recent peer-reviewed stock assessments for tautog. In response, the Tautog Management Board may allow for the incorporation of new, peer-reviewed stock status determination criteria, when available, through Board action (at a Board Meeting).

Scientific advice, with respect to status determination criteria modifications, could follow three scenarios. First, the peer-review panel may reach consensus with respect to maintaining the current definitions of status determination criteria. There may be updates to the values associated with those same definitions based on the input of more recent (i.e., additional year's data) or updated information as well; however, the Board is not required to undertake any specific action when this occurs, as using the updated values is implied in this provision of the FMP. In this case the scientific advice can then move forward such that management advice can be developed.

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Under the second potential scenario for scientific advice, the peer-review panel can recommend changes or different definitions of the status determination criteria. If the panelists reach consensus as to how these status determination criteria should be modified or changed then the scientific advice can move forward such that management advice can be developed. Under these first two potential scenarios, consensus has been reached and therefore the scientific advice moving forward to the Section's management advisory groups should be clear.

The third potential scenario is the peer review scientific advice with respect to the incorporation to status determination criteria are split (consensus is not reached) or uncertain recommendations are provided (weak consensus). The scientific advice provided by the reviewers may be particularly controversial. In addition, the scientific advice may not be specific enough to provide adequate guidance as to how the maximum fishing mortality threshold and/or minimum stock size threshold should be defined or what resulting management advice should be developed from these changes. Under these circumstances, the Board may engage their TC to review the information and recommendations provided by the peer-review group. Based on the terms of reference provided to the TC, they may prepare a consensus report clarifying the scientific advice for the Board as to what the status determination criteria should be (e.g., modify, change, or maintain the same definitions). At that point the scientific advice on how the status determination criteria should be defined will be clear, and can move forward such that management advice can be developed.

### **2.6 DEFINITION OF OVERFISHING AND OVERFISHED**

Overfishing is defined relative to the rate of removals from the population as determined by the fishing mortality on the stock. The level of spawning stock biomass in a stock as the result of fishing mortality is the basis for determining if a stock has become overfished. A biomass target or threshold determines the condition of the stock whereas the mortality rate determines how fast the population is moving toward achieving the appropriate level of biomass.

### **2.7 MAINTENANCE OF STOCK STRUCTURE**

#### **2.7.1 Fishing Mortality (F) Target**

##### **Option A. Status quo**

Coastwide fishing mortality cannot exceed  $F_{\text{target}}=0.15$

##### **Option B. Managing to the Regional Target F**

The Management Board will evaluate the current estimates of F, as determined by the most recent stock assessment, with respect to its regional reference points (Section 2.5) before proposing any additional management measures. If the current F exceeds the regional threshold level (overfishing), the Board will take steps to reduce F to the regional target level; if current F exceeds the regional target, but is below the regional threshold, the Board should consider steps to reduce F to the regional target level. If current F is below the regional target F, then no action would be necessary to reduce F. At this time, the only way to assess the progress towards achieving the regional target F is through future stock assessments.



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### **Sub-option B1. No time requirement**

If the current F exceeds the regional threshold level (overfishing), the Board must take corrective action within a reasonable amount of time.

### **Sub-option B2. Board action within One Year**

If the current F exceeds the regional threshold level (overfishing), the Board must initiate corrective action, via a management document, within one year of receiving the overfishing stock status. Alternative management measures must be implemented in the second year. Each region and/or state must identify specific measures (e.g., possession limit, minimum size and seasonal closures, quota, etc.) to achieve necessary harvest reductions (if applicable) in the management document.

### **Sub-option B3. Board Action within Two Years**

If the current F exceeds the regional threshold level (overfishing), the Board must initiate corrective action, via a management document, within two years of receiving the overfishing stock status. Alternative management measures must be implemented by the third year. Each region and/or state must identify specific measures (e.g., possession limit, minimum size and seasonal closures, quota, etc.) to achieve necessary harvest reductions (if applicable) in the management document.

The Board can codify the level of risk for the TC to use when developing alternative management measures to achieve the reference points. The chosen probability impacts the percent reduction necessary.

### **Option A. Status Quo.**

The Board will select the probability of achieving F Target when modified management measures are necessary.

### **Option B. 50% Probability of Achieving F Target**

Management measures will be developed based on at least a 50% probability of achieving F Target. For example, the harvest reductions presented in this document have a 50% probability of achieving F Target by 2021.

## **2.7.2 F Reduction Schedule**

If F exceeds the regional threshold level (overfishing), the Board will take corrective action, as described under *Section 2.7.1*. The Board will provide the Technical Committee with a timeframe in which F must be brought down to the regional target level using harvest reductions. The Technical Committee will then develop short-term projection scenarios to determine the constant harvest levels necessary to achieve the regional F target within X years.

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The following management options refer to the harvest reduction timeframe:

### **Option A. Status Quo**

Draft Amendment 1 does not specify a time frame to reduce fishing mortality to the regional target F level. The time frame will be established when the Board initiates a harvest reduction management response.

### **Option B. Three Years**

Fishing mortality will be reduced to the regional target F level in a time frame that is no longer than 3 years.

### **Option C. Five Years**

Fishing mortality will be reduced to the regional target F level in a time frame that is no longer than 5 years.

## **2.7.3 Stock Rebuilding Target**

The Management Board will evaluate the current estimates of SSB with respect to its regional reference points (Section 2.5) before proposing any additional management measures. If the current SSB is below the regional threshold level, the Board may take steps to increase SSB to the regional target level (Section 2.7.4); if current SSB is below the regional target, but above the regional threshold, the Board may consider steps to increase SSB to the regional target level. If current SSB is above the regional target SSB, then no action would be necessary to increase SSB.

## **2.7.4 Stock Rebuilding Schedule**

### **Option A. Status Quo (from Addendum IV)**

No required management responses if SSB is below the threshold level.

### **Option B. A Stock Rebuilding Schedule can be Developed via an Addendum**

The Management Board will evaluate the current estimates of SSB with respect to the regional reference points (Section 2.5). The Board can initiate a regional SSB rebuilding plan via an addendum (Section 4.12).

### **Option C. A Stock Rebuilding Schedule can be Developed via an Addendum, Not to Exceed 10 Years**

The Management Board will evaluate the current estimates of SSB with respect to the regional reference points (Section 2.5). The Board can initiate a regional SSB rebuilding plan via an addendum (Section 4.12). The only limitation imposed under Amendment 1 is that the rebuilding schedule is not to exceed 10 years.

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### **2.8 RESOURCE COMMUNITY ASPECTS**

Tautog are an important recreational species for fishermen and a valuable resource in the live commercial market.

### **2.9 IMPLEMENTATION SCHEDULE**

*As part of the final approval of Amendment 1, the Management Board will establish an implementation schedule.*

## **3.0 MONITORING PROGRAM SPECIFICATIONS/ELEMENTS**

### **3.1 STOCK ASSESSMENT**

A tautog stock assessment will be performed every five to seven years, or sooner if necessary. The technical committee will meet to review the stock assessment and all other relevant data sources. The stock assessment report shall follow the general outline as approved by the ISFMP Policy Board for all Commission-managed species. In addition to the general content of the report as specified in the outline, the stock assessment report will also address the specific topics detailed in the following sections.

#### **3.1.1 Assessment of Annual Recruitment**

Annual recruitment of tautog will be estimated by examination of a variety of data sources. The first is the estimate of recruitment from the model. Second will be the examination of various fishery-independent data sources, including the juvenile abundance indices that are integrated in to the statistical modeling process. Although many of these surveys are not designed to specifically target tautog, continued examination of these surveys in the future is worthwhile. In addition, surveys designed to specifically monitor tautog abundance along the coast are needed, including the use of gears that are more appropriate for structure oriented species.

#### **3.1.2 Assessment of Spawning Stock Biomass**

Spawning stock biomass (SSB) will be estimated from the model every five to seven years or sooner if necessary. Model estimates will be used for evaluating stock status versus the approved reference points.

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### 3.1.3 Assessment of Fishing Mortality Target and Measurement

Fishing mortality (F) rates will be estimated by the model every five years or sooner, if necessary. Fishing mortality will be estimated for each age-class estimated by the model, but the metric used for comparison to the reference point values will be full F, or the comprehensive fishing mortality rate for all ages of the entire regional stock. Because of the inherent variability in some of the important data sources for the model (namely recreational catch estimates), a three-year running average of F should be developed and used as the reference estimate for the current state of the stock. Terminal year estimates for tautog generated by the model are subject to variability as additional data are added. Therefore, terminal year estimates may not accurately depict current conditions. The three-year running average is deemed to be more reflective of overall trends in fishing mortality and will reduce the risk of implementing management measures based on a false terminal year signal.

### 3.1.4 Assessment of Age Structure

Age structure will be estimated by the model every five to seven years or sooner, if necessary. Age structure will be estimated by the model, and is based off of the biological sampling done in each state, so is a good representation of the population structure in each region. Because of the inherent variability of age data it is important to use the model estimated age structure as the model synthesizes multiple sources of information to produce its estimates of numbers and weight at age, and therefore is accounting for some of this variability in its calculations. Additionally samples available for age analysis are affected by things such as the selectivity of the fisheries operating on the stock, which is another dynamic the model can account for in its estimates. As opposed to other population metrics, the population age structure can be used as an indicator of a healthy population if the age structure is robust and spans multiple ages including some of the oldest ages, and can also indicate when a population is becoming stressed as older ages are truncated or as there are multiple runs of low recruitment. Age structure may not immediately necessitate a management action, but can be viewed to preempt future problems in the population.

## 3.2 SUMMARY OF MONITORING PROGRAMS

In order to achieve the goals and objectives of Amendment 1, the collection and maintenance of quality data is necessary.

### 3.2.1 Catch and Landings Information

#### *3.2.1.1 Recreational Catch and Effort Data Collection*

Tautog is predominantly a recreationally caught species, with anglers accounting for about 90% of landings coastwide. The Marine Recreational Fisheries Statistics Survey (MRFSS) contains estimated tautog catches from 1981-2003 and the Marine Recreational Information Program (MRIP) contains estimated tautog catches from 2004 - present.

Recreational effort data is collected through phone surveys, but this will fully transition to mail surveys by 2018. Recreational catch data is collected through an access-site intercept survey. Interviewers routinely sample for biological data during angler intercepts by collecting length and weight measurements when possible. Sampling during night time and accounting for zero-

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catch trips are conducted to more accurately capture fishing behaviors. MRIP also leverages logbook reporting and tournament sampling to improve quality of data on the distinct for-hire fleet.

Tautog are not well-sampled by the MRFSS/MRIP program, resulting in higher percent standard errors (PSEs, approximately 20-25% in recent years at the regional level) and large year-to-year swings in catch estimates, often driven by small numbers of intercepts. When disaggregated by state, PSEs for the MRFSS/MRIP estimates of harvest and releases were generally high (>0.30), indicative of the low number of intercepts obtained by survey interviewers. Recreational catch information can be downloaded at: <http://www.st.nmfs.noaa.gov/st1/recreational/queries/>.

The recreational tautog fishery occurs throughout the year. The majority of the landings are captured through MRIP, which is administered by the National Marine Fisheries Service. However, MRIP does not sample landings during January and February (Wave 1). This amendment recommends the states initiate a sampling program to estimate the recreational harvest of tautog during January and February.

### *3.2.1.2 Commercial Catch and Effort Data Collection*

The ASMFC, NMFS, U.S. Fish & Wildlife Service, the New England, Mid-Atlantic, and South Atlantic Fishery Management Councils, and all the Atlantic coastal states have developed a coastwide fisheries statistics program, known as the Atlantic Coastal Cooperative Statistics Program (ACCSP). All harvesters and dealers are required to report a minimum set of standard data elements by the 10<sup>th</sup> of the following month (refer to the ACCSP Program Design document for details, <http://www.accsp.org/data-collectionstandards>). Landings are reported to NMFS and available online at <http://www.st.nmfs.noaa.gov/commercial-fisheries/index>.

Harvesters are required to report all commercial trips regardless of catch. Trips that yield no catch are still considered trips. Therefore, all data elements for effort must be reported. Dealers are required to submit monthly negative, or no activity, reports in the states where they are licensed. A single negative report may be submitted in advance to cover multiple negative reporting periods. Harvesters with no reported commercial landings during the previous license period are required to certify that fact at the time of license renewal.

New Jersey has a limited access tautog commercial fishery. As of 2016, there are 40 directed fishery and 22 non-directed fishery permittees in New Jersey. All permittees are required to submit monthly reports identifying tautog landings by day, gear, and location, as well as any bycatch.

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### 3.2.2 Biological Information

*3.2.2.1 Fishery Dependent Information—Biological Sampling from the Recreational Fishery* Length and weight samples are collected from the recreational fishery through MRIP. As a less commonly encountered species, sample sizes are often low, and average approximately 350-500 intercepts per year depending on the region.

In addition, states have dedicated short term sampling programs for specific fisheries in New York (head boat mode), New Jersey (head boat and shore mode), and Virginia (a directed fishing mortality study) and in some states that have a significant head boat or shore mode component to their recreational tautog catch. Most state's age samples come from a combination of state-run recreational, commercial and fisheries independent surveys.

In 2004, MRIP implemented observers on headboats to collect lengths of released alive fish (Type 9 measurements). Prior to 2004, the only information on the size of released fish came from the American Littoral Society's (ALS') volunteer angler tagging program, which provides lengths of fish that anglers report they have released alive. These two data sources provide the length frequency information used to develop the catch-at-age for released fish.

#### *Wave 1 Sampling*

Historically, only about five percent of the annual recreational catch on the Atlantic and Gulf coasts is taken during Wave 1 (Jan/Feb). Costs to sample these months are very high due to low fishing activity. With a few exceptions the recreational statistics program (MRFSS/MRIP) has not collected data in Jan/Feb on the Atlantic coast north of Florida since 1980.

#### *3.2.2.2 Fishery Independent Information—Biological Sampling Program*

All states in the stock unit are required to collect a minimum of 200 age and length samples annually (five fish per centimeter), within the range of lengths commonly caught by the fisheries. Specific sources are not mandated, therefore most states fulfill their obligations through a combination of fishery-dependent and fishery-independent sampling. This intent of this requirement, imposed in 2002, was to collect data necessary to support regional assessments and/or regional approaches to management. A summary of data collection efforts should be included in the annual compliance report.

The state marine fisheries agencies from Massachusetts through New Jersey conduct fisheries independent surveys that encounter tautog to record biological information such as age, length, sex, weight, and some measures of maturity. As shown in Table 10, data availability varies by region; northern states have more data from the earlier parts of the time series, when older, larger fish were present in the samples. The more southern states lack data from fishery-independent sources and thus have limited numbers of samples of the youngest, smallest fish.

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**Table 10. Ongoing fishery independent surveys, as of 2016**

State	Areas Surveyed	Survey Type	# of Survey Stations	Dates of Survey
MA	MA territorial waters	Trawl	1 station per 19 square nautical miles	May and September
RI	Narragansett Bay	Trawl	13 stations per month	June through October
	Narragansett Bay, Rhode Island Sound and Block Island Sound	Trawl	44 stations	Spring (April-May) Fall (Sept/October)
	Narragansett Bay Beach	Seine	18 stations per month	June through October
	Coastal Ponds	Seine	24 stations in 8 coastal ponds per month	May through October
	Narragansett Bay	Trap	10, 5 pot trawls set per month	April through October
CT	Long Island Sound (CT and NY waters)	Trawl	40 stations per month	Spring (April-June) Fall (Sept-Oct)
NY	Peconic Bay	Trawl	16 stations per week	May through October
	Western Long Island Sound (Little Neck, Manhasset Bay, Jamaica Bay)	Seine	5-10 sites, semimonthly	May through October
	Long Island Sound	Trap	35 stations per week	May through October
NJ	Nearshore ocean waters between Cape May and Sandy Hook	Trawl	30 tows in Jan; 39 tows per month in Apr, Jun, Aug & Oct	Jan, Apr, June, Aug & Oct
DE	Fisheries independent surveys do not collect tautog in quantities needed for monitoring purposes			
MD	Fisheries independent surveys do not collect tautog in quantities needed for monitoring purposes			
VA	Fisheries independent surveys do not collect tautog in quantities needed for monitoring purposes			

### 3.2.3 Social Information

No ongoing sociological data collection or monitoring is planned. Anecdotal information and insight on the fishery and regulatory changes are provided by the Tautog Advisory Panel, which

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maintains active participation. ACCSP is currently developing standards for collecting sociological data in all fishing sectors.

### 3.2.4 Economic Information

Currently there are no programs designed specifically to collect economic data pertaining to the tautog fishery. The ACCSP is currently developing standards for collecting economic data in all fishing sectors. See Section 1. 5.3 for a review of economic information that references tautog, but is not designed specifically for the tautog fishery.

### 3.2.5. Observer Program

As a condition of state and/or federal permitting, vessels are required to carry at-sea observers when requested. ACCSP currently has at-sea observer programs modeled after the NOAA Fisheries National Observer Program, adopting their standards and training protocols. A minimum set of standard data elements is defined through the ACCSP for biological or bycatch sampling data (refer to the ACCSP Program Design document for details: <http://www/accsp.org/programdocument.htm#prog>).

Observer data obtained from the Northeast Fisheries Observer Program for the years 1989-2012 indicates the overall sample size of observed trips that either retained or discarded tautog was low (Table 11 and Table 12). The data represents estimates of primarily incidental catch, not targeted tautog trips. Length sampling was also inconsistent and had a low sample size by year, but where available showed that discarded fish were smaller on average than retained fish (ASMFC 2015).

**Table 11. Sample size of gear of observed commercial trips that caught tautog (1989-2012)**

<b>Gear</b>	<b># of Trips</b>
Gillnet	710
Otter Trawl	604
Scallop Dredge	23
Fish pot/trap	19
Longline	6
Lobster pot/trap	4
Scottish Seine	1
Troll Line	1



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**Table 12. Sample size by state of observed commercial trips that caught tautog (1989-2012)**

<b>State</b>	<b># of Trips</b>
ME	2
NH	9
MA	456
RI	620
CT	7
NY	59
NJ	113
DE	1
MD	43
VA	47
NC	11

Discarded-to-observed ratios from the observer data were supplemented with Vessel Trip Report (VTR) data for some gears and regulatory periods when sample size was less than ten observed trips. VTR data are self-reported by fishermen and are not considered as reliable as observer data. Overall there is high uncertainty in the estimates of commercial discards, and they are a small component of total removals of tautog. In addition, observer data is provided by vessels that hold federal permits, therefore the information presented is incomplete because it does not include data from fishermen with state permits only.

As an example of a program that could benefit our understanding of tautog and improve fishery dependent data collection for this species, in 2008, New Jersey began a collaboration with ACCSP personnel for an at-sea monitoring and sampling program targeting both the recreational party/charter boat and commercial fisheries for various species including tautog. Through 2014, data has been collected from this program on over 4,000 tautog (harvest and discard) sampled on nearly 200 trips targeting tautog. Programs such as these are an important source of valuable fisheries dependent data, and their continuation and expansion should be encouraged beyond New Jersey. In particular, a focus on observer information in recreational and commercial fisheries could provide robust estimates of discards (abundance, weights, and lengths) where there are currently gaps.

### **3.3 STATE TAGGING PROGRAMS**

The Commission's Interstate Tagging Committee (ITC) was created in 1999 to improve the quality and utility of fish tagging data. A subcommittee of ITC members with expertise in tagging program design was established to review and certify interested tagging programs. In addition, it serves as a technical resource for jurisdictions other than the ASMFC, including private, non-profit tagging groups who plan to tag tautog. Protocols have been developed by the Committee as a source of information, advice and coordination for all Atlantic coast tagging programs; more information can be found at [www.fishtag.info](http://www.fishtag.info).

There are tautog tagging programs in the waters of Massachusetts, Maryland, and Virginia. The methods used to capture, tag, and track recaptures are described below.

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### *Massachusetts*

Massachusetts Division of Marine Fisheries tagged adult tautog using Floy internal anchor tags (model # FM-84). Tag anchors were implanted into the abdominal cavity, on the left side of fish just ventral and posterior to the pectoral fin apex. Tag number, total fish length in mm and sex was recorded for each fish, along with the latitude and longitude of the release point. Sex was determined by external examination of prominent morphological features. Subsequent recapture information on total length, recapture site, capture method, catch disposition (released, retained) was solicited from tag returnees.

Release and recapture sites were plotted on MapTech chart facsimiles for calculation of predicted straight line travel distance and travel vectors. Daily growth intervals were calculated using the difference between initial capture length and recapture length divided by the days at large, and compared to growth intervals of similar aged fish from the annual DMF Age and Growth Study.

### *Maryland*

Tautog tagging in Maryland and adjacent federal waters is conducted by volunteer anglers for the American Littoral Society (ALS). A yellow dorsal loop tag with the serial number is applied to the fish behind the dorsal fin (Figure attached). Information on the area of capture and release, date and fish size is sent to the ALS. ALS tagging began in 1982 and continues today throughout a number of the Atlantic states, including Maryland. There are about 8,000 records available for tautog tagged in Maryland. There is no specific tagging design, tags are applied to fish on ad hoc basis. No tagging is conducted by the MD Department of Natural Resources.

### *Virginia*

The Virginia Game Fish Tagging Program is a cooperative program of the Virginia Saltwater Fishing Tournament (Marine Resources Commission) and VIMS Marine Advisory Program. Initiated in 1995, it has been funded primarily by Saltwater Recreational Fishing License Funds and matching VIMS funds. This program provides annual training and enables a corps of ~200 experienced anglers to direct tagging effort on select target species important to VA's marine recreational fisheries. Through 2014, this program's database (used by researchers, fishery managers, anglers, etc.) includes over 240,000 records for fish tagged and over 25,900 fish recapture records (an overall >11% recapture rate). There are ten target species: black and red Tautog Stock Assessment Report 34 drum, black sea bass, cobia, flounder, gray triggerfish, sheepshead, spadefish, speckled trout, and tautog. There have been 17,705 tautog tagged since 1995 with 2,692 recaptures through 2013.

## **3.4 BYCATCH REDUCTION**

The extent of bycatch in the tautog fishery is minimized through gear restrictions including pot and trap degradable fasteners to reduce the mortality of fish in lost or abandoned pots or traps, see Section 4.5. In addition, New York has prohibited the possession of tautog caught using fish pots or traps, unless there is one circular vent measuring 3 1/8 inch opening diameter. States have implemented other gear restrictions and modifications to reduce overall bycatch in

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pots and traps that indirectly benefit tautog. Escape vent provisions mandated to reduce the catch of undersized lobster, black sea bass and scup have likely allowed juvenile tautog to escape. However, as the minimum sizes for tautog are larger than those for the other species, some adult tautog may be too large to fit through these escape panels. Increasing the size of the escape panels to accommodate the larger size of the tautog may increase the rate of escapement for other species, rendering the utilization of such pots unfeasible for commercial fishing. Research into retention of tautog along with the other associated species harvested in lobster/fish pots using varying sizes of escape panels may be informative to determine a commercially feasible maximum.

Several bycatch reduction devices have been researched for trawl nets, a gear involved in the harvest of tautog in the more northern states along the Atlantic coast. These devices utilize escape panels of larger mesh, grills allowing escape of smaller fish, or the use of different color net material to increase the selectivity of the nets (Glass 2000). Investigations on the behavior of tautog to trawl gear may be informative toward the possible utilization of these devices in the trawl fishery.

### **3.5 HABITAT MONITORING PROGRAM**

To enhance habitat for reef-associated fish and invertebrates, especially in the relatively featureless sand bottoms typical of ocean waters south of New England, artificial reefs have been created along the Atlantic coast, see Table 6. The construction of wide arrays of artificial reef sites reduce habitat fragmentation and act as networks supporting migratory movements of structure dependent species (Steimle and Zetlin 2000).

## **4.0 MANAGEMENT PROGRAM IMPLEMENTATION**

### **4.1 REGIONAL BOUNDARIES**

#### **Option A. Status Quo – Coastwide Management**

Currently, tautog are managed on a coastwide basis. If *Option A. Status Quo* is chosen then this section will be removed. The coastwide management unit is summarized under Section 2.4.

#### **Option B. Regional Management**

*The Board reviewed multiple regional approaches and stock assessment analyses prior to proposing a four-region approach (Table 13). This option includes a sub-option to delineate the Long Island Sound boundary.*

In the 1996 FMP, the document notes “there are apparent regional differences in the tautog fishery”, but did not specify regional boundaries due to limited biological data. In the 2015 Benchmark Stock Assessment, the TC identified a regional structure based on life history information, fishery characteristics, and data availability. Tagging data suggest strong site fidelity across years with limited north-south movement, although they undergo seasonal inshore-offshore migrations in the northern end of their range. Based on the analyses of

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biological and fisheries information, the TC determined the “coastwide” stock unit is inappropriate.

Draft Amendment 1 proposes delineating the stock into four regions due to differences in biology and fishery characteristics, as well as limited coastwide movement (Table 13 and Figures 26-30). Regional management is likely to reduce the risk of overfishing and acts upon prior research recommendations. The TC can recommend alternative regional boundaries as more data become available. In response, the Board may adjust the regional boundaries via *Adaptive Management, Section 4.12*.

**Table 13. Four-Region Management Approach**

**1) Massachusetts – Rhode Island**

**2) Long Island Sound (CT and NY LIS)**

**3) New Jersey – New York Bight (NJ and NY South Shore)**

**4) Delaware – Maryland – Virginia**

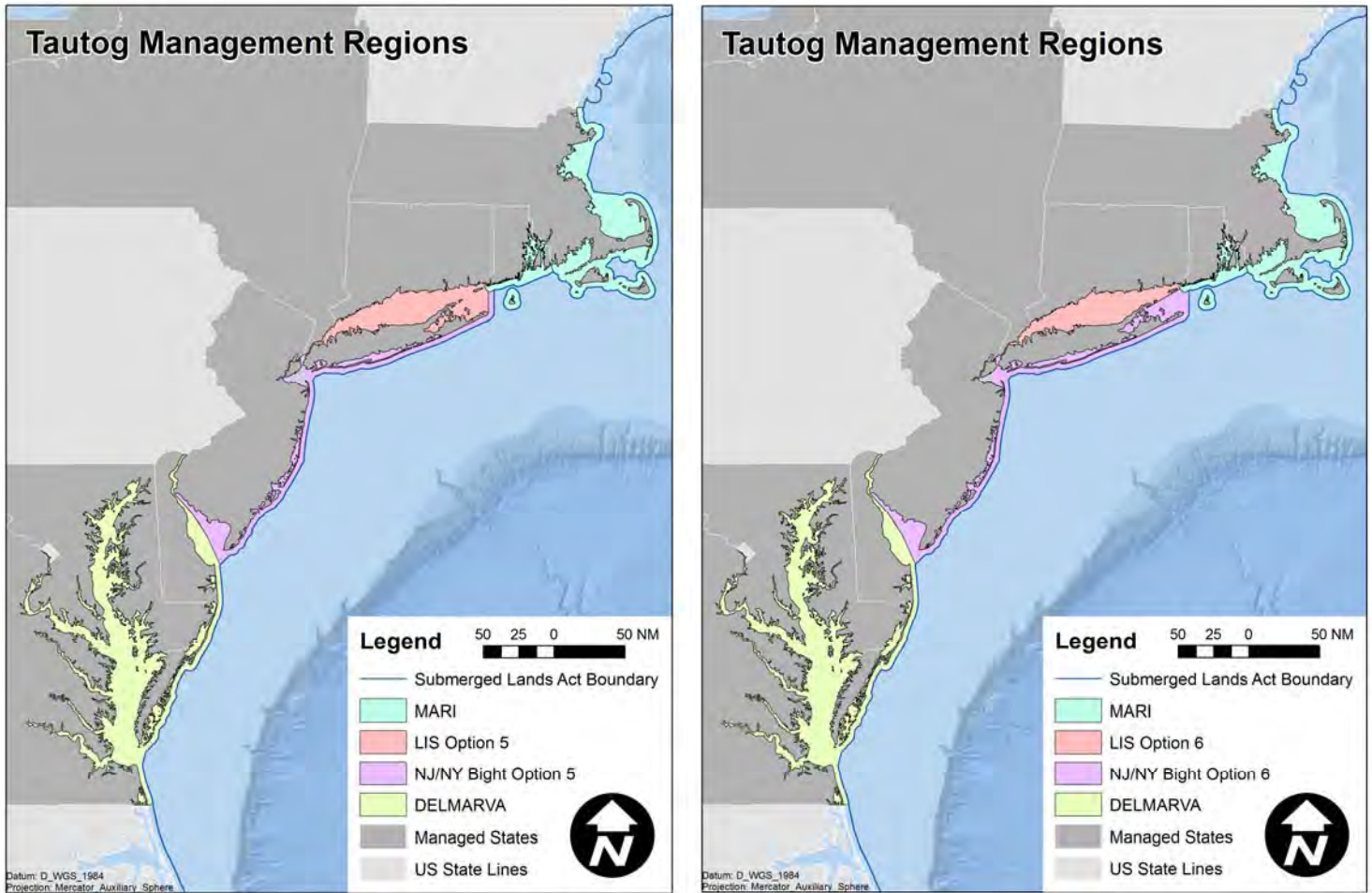


Figure 26. Proposed Tautog Management Regions; Showing Different LIS Boundaries

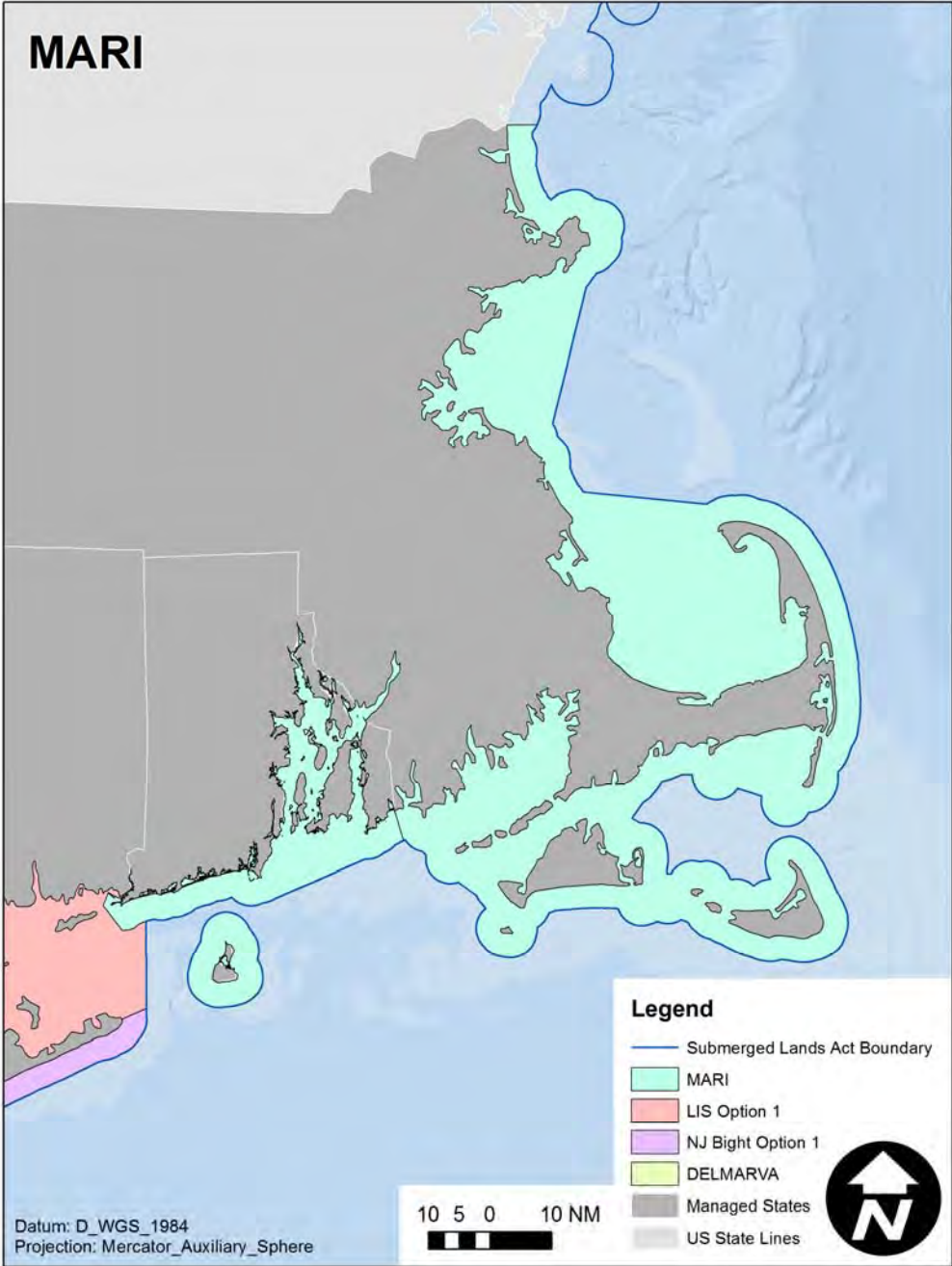
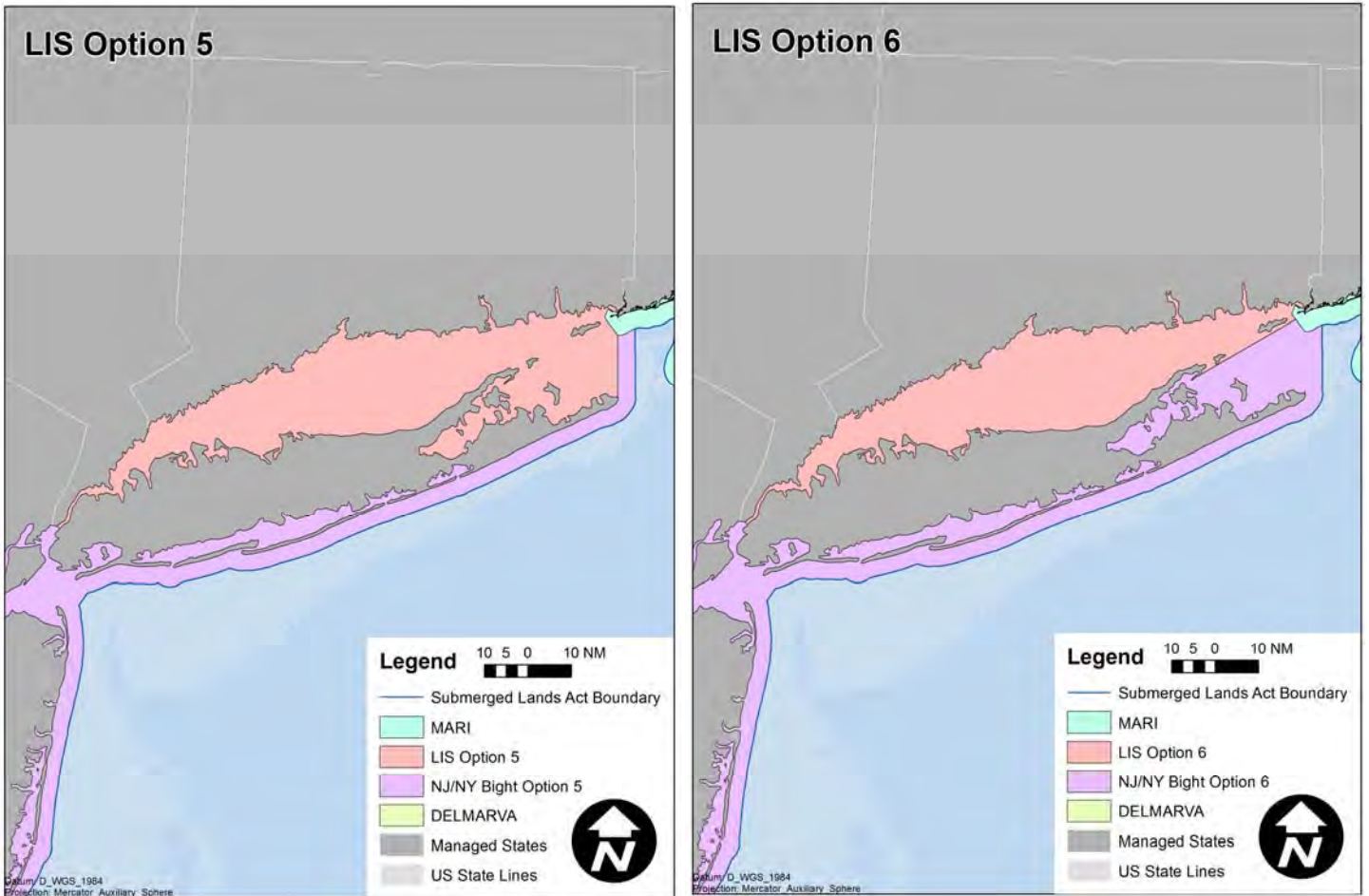


Figure 27. Proposed Massachusetts and Rhode Island Management Area

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**Figure 28. Proposed Long Island Sound Management Area**

*When Amendment 1 is finalized, the appropriate boundaries/maps will be included in the document.*

**Sub-Option B1 (map on the left):** Long Island Sound is delineated by a line that runs from Montauk Point, New York to Watch Hill, Rhode Island. All waters west of the line will follow the Long Island Sound management measures. The MRIP data that was used to evaluate the LIS stock status is aligned with this option.

**Sub-Option B2 (map on the right):** Long Island Sound is delineated by a line that runs from Orient Point, New York to Watch Hill, Rhode Island. All waters west of the line will follow the Long Island Sound management measures.

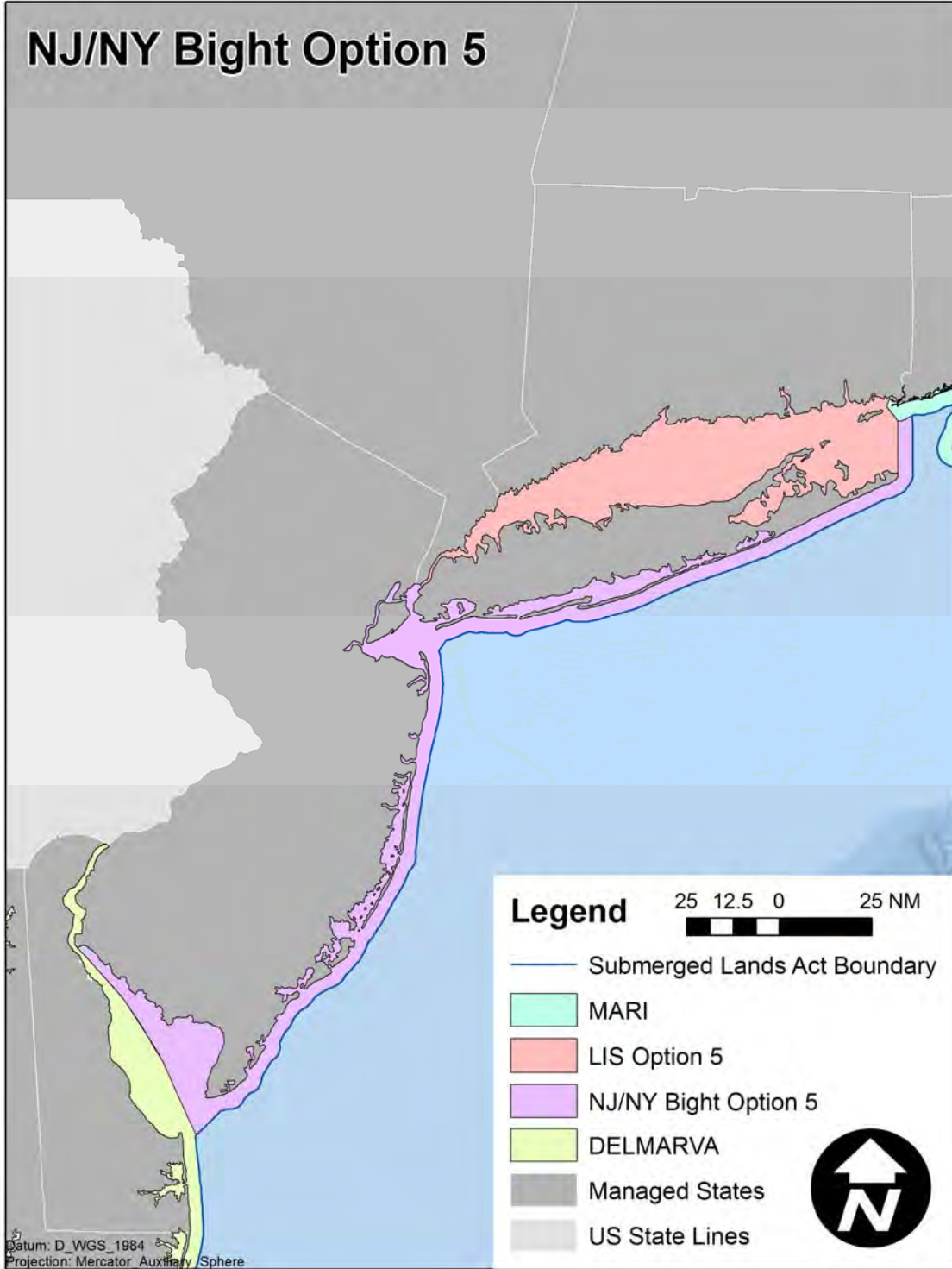


Figure 29. Proposed New Jersey-New York Bight Management Area





Figure 30. Proposed Delaware, Maryland, Virginia Management Area

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### 4.2 REGIONAL MANAGEMENT MEASURES

Management options by region were developed by the TC in response to the 2016 stock assessment update. Two regions would be required to take harvest reductions due to the regional stock status: LIS and NJ-NYB. Two regions would not have to take harvest reductions, but are proposing regional measures: MARI and DelMarVa.

#### 4.2.1 Procedure to Develop Regional Management Measures

Compatible regulations between adjacent states are desirable to prevent the shift of fishing effort to areas with more liberal regulations, or to an area with an open season. If a region is considering consistent measures across for all states within a region then a regional working group will be developed to discuss appropriate alternatives. A regional working group consists of representatives from each member state within the region. It is recommended that the regional working group decisions are made by consensus.

If a state within a region wants to implement different management measures than those within the region, the general procedure within *Section 4.11, Conservation Equivalency* will be followed. It is recommended that the state convene the regional working group to discuss and review the proposed management measures.

All modifications to management measures (e.g., bag limit, minimum size, seasonal closures, quota, etc.) will be reviewed by the TC and approved by the Management Board. Once approved by the Board, the management measures can be implemented.

#### 4.2.2 Massachusetts-Rhode Island (MARI)

Historically, tautog management measures in MARI have been state-specific (Tables 14 and 15). In response to the 2016 stock assessment update, managers are proposing regional management options for the public to consider (Table 16). If the regional management measures are modified at a future date, all states will agree to the new regulations prior to regional implementation (See Section 4.2.1).

**Table 14. 2017 MARI Recreational Regulations**

STATE	SIZE LIMIT (inches)	POSSESSION LIMITS (number of fish/person/day)	OPEN SEASONS
Massachusetts	16"	3	Jan 1 – Dec 31
Rhode Island	16"	3 (up to 10/private vessel)	Apr 15 – May 31
		3 (up to 10/private vessel)	Aug 1 – Oct 14
		6 (up to 10/private vessel)	Oct 15- Dec 15

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**Table 15. 2017 MARI Commercial Regulations**

STATE	SIZE LIMIT (inches)	POSSESSION LIMITS (number of fish/vessel/day)	OPEN SEASONS	2017 QUOTA (lbs.)
Massachusetts	16"	40	Sept 1 - Oct 31	64,643
Rhode Island	16"	10	Apr 15 - May 31	17,116
			Aug 1 - Sept 15	13,390
			Oct 15 - Dec 31	17,116

### ***4.2.2.1 Massachusetts-Rhode Island Proposed Recreational Management Measures***

The following tools were used by MARI to calculate harvest reductions to achieve similar regulations between the two states. The methods described below all use MRIP recreational data for the years of 2013 – 2015, only waves 2 – 6 are available for analysis in these states during these years.

Four methods of estimating future recreational tautog harvest were employed. These included; 1) seasonal reductions calculated from daily harvest rates based on MA and RI harvest from 2013 - 2015 waves 2 – 6 according to MRIP data; 2) bag limit reduction calculations based on MA and RI harvest from 2013 - 2015 waves 2 – 6 according to MRIP data; 3) reductions achieved from increasing the minimum size based on MRIP size distribution data from 2013 - 2015 waves 2 – 6, and 4) a methodology for combining size, bag, and season harvest reduction calculations based on MA and RI harvest from 2013 - 2015 waves 2 – 6 according to MRIP data.

**Table 16. Proposed MARI Recreational Regional Management Measures**

Option	Minimum Size	Possession Limit	Open Season	% Harvest Reduction
<b>A. Status Quo</b>	16"	See Table 14		NA
<b>B. All Measures Consistent</b>	16"	3	March 1 - May 31; Aug 1 - Oct 14	9%
		4	Oct 15 - Dec 31	
<b>C. All measures consistent</b>	16"	3	March 1 - May 31; Aug 1 – Dec 31	19%

### ***4.2.2.2 Massachusetts-Rhode Island Proposed Commercial Management Measures***

There are no proposals to adjust the commercial regulations for MA-RI. The regulations in Table 15 would continue to be enforced unless a state or region adjusts the measures following the procedures set forth in *Section 4.2.1 or 4.3*.

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### 4.2.3 Long Island Sound

Based on the 2016 stock assessment update, the LIS region is overfished and overfishing is occurring. The region will need to reduce commercial and recreational harvest by a minimum of 47.2% to achieve the F Target by 2021. The current management measures (Table 17 & 18) will be adjusted to meet the required reductions.

**Table 17. 2017 LIS Recreational Regulations**

STATE	SIZE LIMIT (inches)	POSSESSION LIMITS (number of fish/person/day)	OPEN SEASONS
Connecticut	16"	2	Apr 1-Apr 30
		2	July 1 – Aug 31
		4	Oct 10 – Dec 6
New York	16"	4	Oct 5 – Dec 14

**Table 18. 2017 LIS Commercial Regulations**

STATE	SIZE LIMIT (inches)	POSSESSION LIMITS (number of fish/vessel/day)	OPEN SEASONS	2017 QUOTA (lbs.)
Connecticut	16"	10	Apr 1- Apr 30	-
			Jul 1 - Aug 31	
			Oct 8 - Dec 24	
New York	15"	25 (except, 10 per vessel when fishing lobster pot gear and more than six lobsters are in possession)	Jan 1 – Feb 28	-
			Apr 8 – Dec 31	

#### ***4.2.3.1 Long Island Sound Proposed Recreational Management Measures***

Recreational options were developed by adjusting season, size and possession limit regulations using MRIP data from 2013 to 2015. Length analysis included data from MRIP, the CT Volunteer Angler Survey (> 16") and the NY Headboat Survey (> 16"). Alterations in season length were evaluated by converting percent of annual harvest by wave to percent of annual harvest by day in each wave. Due to limited data (driven by minimal harvest) from the CT spring fishery (Waves 2 and 4), analysis focused on projected harvest reductions in response to changes in bag limit and minimum size at current season length for Wave 4.

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The following LIS options were developed using a 50% probability of achieving F target, which is associated with a minimum harvest reduction of 47.2%.

**Table 19. LIS recreational harvest reduction (of 47.2% or more) options to the status quo state-by-state measures**

	State	Minimum Size	Possession Limit	Open Season	% Harvest Reduction
<b>A1. State-specific Reduction</b>	CT	17"	1	Apr. 1-30, Aug. 1-31	48.1%
			2	Oct 10-Nov 30	
	NY	16"	1	Oct. 5-Dec. 14	49.5%

**Table 20. LIS recreational regional harvest reduction (of 47.2% or more) options**

Regional Options	State	Minimum Size	Possession Limit	Open Season	% Harvest Reduction
<b>B1. Consistent Minimum Size &amp; Possession Limit</b>	CT	16"	1	Apr. 1-30, Oct. 6-Dec. 6	47%
	NY			Oct. 1-Dec. 14	
<b>B2. Consistent Minimum Size &amp; Possession Limit</b>	CT	17"	2	Apr 1-30, Aug 1-31, Oct. 10-Nov. 30	48.9%
	NY			Oct. 10-Nov. 30	
<b>B3. All measures consistent</b>	Regional	16"	1	Oct. 1-Nov. 9	47.1%

### ***4.2.3.2 Long Island Sound Proposed Commercial Management Measures***

Commercial options were developed based on seasonal closures. Connecticut's current commercial fishery has three open seasons and New York's commercial fishery has two open seasons. Total reported harvest from trip level reporting in 2013-2015 was calculated for each open season and converted to percent of total annual harvest. This was divided by the number of days in the season to provide an average daily percent of total annual harvest. It was then possible to look at seasonal closures that would reduce cumulative harvest by the required amount.

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The following LIS option was developed using a 50% probability of achieving F target, which is associated with a minimum harvest reduction of 47.2%.

**Table 21. LIS commercial harvest reduction (of 47.2% or more) options to the status quo state-by-state measures**

Option	State	Minimum Size	Possession Limit	Open Season	% Harvest Reduction
<b>A1. State-specific Reduction</b>	CT	16"	10	Apr. 1-30, Aug. 1-31, Oct. 21-Dec. 4	47.3%
	NY	15"	25 (except, 10 per vessel when fishing lobster pot gear and more than six lobsters are in possession)	Jan. 1-Feb. 28, Apr. 1-30, Aug. 1-Dec. 31	51.3%

**Table 22. LIS commercial regional harvest reduction (of 47.2% or more) option**

Regional Option	State	Minimum Size	Possession Limit	Open Season	Quota (lbs)	% Harvest Reduction
<b>B1. Quotas</b>	CT	16"	-	Jan.1 – Apr 30, Aug. 1-Dec.31	2,785	47.2%
	NY				39,021	

**4.2.3.3 Long Island Sound Proposed Slot Limit for the Commercial and Recreational Fisheries**

Harvest slot scenarios were calculated for Long Island Sound for recreational and commercial fisheries, combined. These calculations were based on the same catch and harvest length distributions used in the Long Island Sound stock assessment update for the years 2013-2015. Catch and harvest lengths were scaled by the mean number of fish caught and harvested in LIS in the given years. The proportion of catch in a size class ( $P_L$ ) was calculated (catch in length/total catch). As the proportion harvested in legal size classes was nearly 1, the proportion harvested was set to 1 for all subsequent calculations. Given that, the yield ( $Y_L$ ) in a size class was calculated:

$$Y_L = C \times P_L$$

The sum of  $Y_L$  for all the lengths of interest in a slot results in the yield ( $Y$ , number of fish harvested).

$$Y = \sum_{i=slot\ min}^{n=slot\ max} Y_i + Y_{i+1} + \dots + Y_n$$

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The number of dead discards was estimated by the product of the discard mortality (2.5%) and the sum of all  $Y_L$  outside of the harvest slot and was included in the percent reduction.  $Y_L$  was also calculated based on the biomass by converting length to mean weight.

$$Y_L = C \times P_L \times W_L$$

Yield in biomass ( $Y_b$ ) was calculated as above.

All harvest reductions for slot limits include season closures from May to July.

Harvest slots provide the opportunity to protect the large female spawners which produce exponentially more eggs (which are potentially of higher quality) than smaller females (LaPlante and Schultz, 2007). As tautog have a relatively low discard mortality rate (2.5%) harvest slots provide an opportunity for implementing harvest reductions without increasing the minimum size.

There are no viable harvest reduction options for slot limit for recreation and commercial fishery, with a size range of 14" - X" using status quo bag and seasonal closures. This is largely because of a high proportion of fish under 16" in the current size structure of the population. Reducing bag size and additional seasonal closures would be required to achieve these harvest reductions with such a slot limit.

A harvest slot between 16" and 18" is possible with no reductions in bag size (Table 23). This option includes a season closure for May, June and July. It would have no significant impact on these harvest reductions if bonus fish (recreational sector) within one inch of the state record (34" for CT and 32" for NY) were allowed. Reductions are shown in number of individuals and biomass (Table 23).

**Table 23. LIS regional management harvest reduction scenarios with harvest slot limits for commercial and recreational fisheries.**

Slot Limit Option	State	Minimum Size	Possession Limit	Open Season	% Harvest Reduction
C. 16"-18" harvest slot	CT	16-18"	Status quo (See Tables 17 & 18)	Apr. 1-30, Aug. 1-31, Oct. 10-Dec 6	51.3%
	NY			Oct. 5-Dec. 14	

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### 4.2.4 New Jersey-New York Bight

Based on the 2016 stock assessment update, the NJ-NYB region is overfished and overfishing is occurring. The region will need to reduce commercial and recreational harvest by a minimum of 2% to achieve the F Target by 2021. The current management measures (Table 24 & 25) will be adjusted to meet the required reductions.

**Table 24. 2017 NJ-NYB recreational regulations**

STATE	SIZE LIMIT (inches)	POSSESSION LIMITS (number of fish/person/day)	OPEN SEASONS
New York	16"	4	Oct 5 – Dec 14
New Jersey	15"	4	Jan 1 – Feb 28
		4	Apr 1 – Apr 30
		1	Jul 17 – Nov 15
		6	Nov 16 – Dec 31

**Table 25. 2017 NJ-NYB commercial regulations**

STATE	SIZE LIMIT (inches)	POSSESSION LIMITS (number of fish/vessel/day)	OPEN SEASONS	2017 QUOTA (lbs.)
New York	15"	25 (except, 10 per vessel when fishing lobster pot gear and more than six lobsters are in possession)	Jan 1 – Feb 28 Apr 8 – Dec 31	-
New Jersey	15"	> 100 lbs requires directed fishery permit	Jan 1 - 15 June 11 - 30 Nov 9 - Dec 31	103,000

#### **4.2.4.1 New Jersey-New York Bight Proposed Recreational Management Measures**

Data for this analysis were obtained from MRIP raw length and catch frequency data by wave from 2013 through 2015 using only records showing legal size, bag and season harvests (data excludes Long Island Sound harvests). Percent savings estimates by wave for size and bag limit options were calculated through an R code program. Wave (season) savings were estimated by calculating the percent harvest by wave of the total annual harvest for the sum of the years 2013 through 2015.

NJ-NYB region chose a 15-18 inch slot limit proposal as a way for fishermen to keep a good percentage of current harvests (between 73 – 80%) while allowing the largest fish (those equal



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to or greater than 18.5 inches) to remain in the population since research has shown larger tautog are the greatest contributors to the reproductive potential of the stock. The percent reductions for this slot limit were calculated by taking the proportion of total harvest of the fish legally landed in the recreational fishery in New Jersey and New York's south shore which exceeded 18 inches. The resulting reduction percentages were 19.6% and 26.9% for New Jersey and New York Bight respectively. These percentage savings were applied to both the recreational and commercial sectors due to the lack of length frequency data for commercial catches. The data were obtained from the MRIP length frequency and Type 9 information, New Jersey Volunteer Angler Survey, and the south shore component of New York's DEC Headboat Survey.

**The following NJ-NYB options were developed using a 50% probability of achieving F target, which is associated with a minimum harvest reduction of 2%.**

**Table 26. NJ-NYB recreational harvest reduction (of 2% or more) options to the status quo state-by-state measures**

Option	State	Minimum Size	Possession Limit	Open Season	% Harvest Reduction
<b>A1. State-specific Reduction</b>	NYB	16"	4	Oct 6 - Dec 13	2%
	NJ	15"	4	Jan 1 – Feb 28	
			4	Apr 1 - 18	
			1	Aug 21 – Nov 15	
			6	Nov 16 – Dec 31	

**Table 27. NJ-NYB recreational regional harvest reduction (of 2% or more) options**

Regional Options	State	Minimum Size	Possession Limit	Open Season	% Harvest Reduction
<b>B1. Consistent Minimum Size &amp; Possession Limit</b>	NYB	15"	4	Oct 10 - Dec 12	2%
	NJ			Sep 17 - Dec 31	
<b>B2. Consistent Minimum Size</b>	NYB	16"	4	Oct 6 - Dec 14	4%
	NJ		4	Jan 1 – May 31	
			6	Aug 31-Dec 31	
<b>C1. Slot Limit with Consistent Possession Limits</b>	NYB	15-18"	4	Oct 2 - Dec 26	2%
	NJ			Jan 1 - Mar 31; Aug 20 - Dec 31	

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**4.2.4.2 New Jersey-New York Bight Proposed Commercial Management Measures**

Length frequencies from the recreational sector were used for both the commercial and recreational sectors due to the lack of commercial length frequencies and to reflect the predominance of the recreational harvest (~90%) in the tautog fisheries for both New Jersey (NJ) and the south shore of New York (NYB). For NJ, the data were pulled from the MRIP NJ harvest expanded length frequencies, the state’s Volunteer Angler Survey’s kept length frequencies, and the Type 9 MRIP records. For NYB, the raw MRIP length frequency data were used due to the necessity of pulling out the records obtained from Long Island Sound. These data were supplemented by the New York State DEC Headboat Survey length frequencies and MRIP Type 9 data from the non-Long Island Sound records.

**The following NJ-NYB options were developed using a 50% probability of achieving F target, which is associated with a minimum harvest reduction of 2%.**

**Table 28. NJ-NYB commercial harvest reduction (of 2% or more) options to the status quo state-by-state measures**

Option	State	Minimum Size	Possession Limit	Open Season	% Harvest Reduction
<b>A1. State-specific Reduction</b>	NYB	15"	25	Jan 1 - Feb 28; Apr 14 - Dec 31	2%
	NJ		-	Jan 1 - 15; Jun 11 - 30; Nov 12 - Dec 31	

**Table 29. NJ-NYB commercial regional harvest reduction (of 2% or more) options**

Regional Options	State	Minimum Size	Possession Limit	Open Season	Quota (lbs)	% Harvest Reduction
<b>B1. Consistent Minimum Size</b>	NYB	15"	28	Jan 1 - May 31; Aug 1 - Dec 31	-	2%
	NJ		-	Jan 1 - May 1; Sep 19 - Dec 31	-	
<b>B2. Consistent Minimum Size</b>	NYB	16"	31	Jan 1 - May 31; Aug 1 - Dec 31	-	2%
	NJ		-	Jan 1 - May 11; Aug 1 - Dec 31	-	
<b>B3. Quotas</b>	NYB	15"	-	-	65,486	2%
	NJ				23,259	
<b>C4. 15"- 18" harvest slot</b>	NYB	15-18"	34	Jan 1 - May 31; Aug 1 - Dec 31	-	2%
	NJ		-	Jan 1 - Apr 21; Aug 11 - Dec 31	-	

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### 4.2.5 Delaware – Maryland - Virginia

Historically, tautog management measures in DelMarVa have been state-specific (Tables 30 and 31). In response to the 2016 stock assessment update, managers are proposing regional management options for the public to consider (Table 32). If the regional management measures are modified at a future date, all states will agree to the new regulations prior to regional implementation (See Section 4.2.1).

**Table 30. 2017 DelMarVa recreational regulations**

STATE	SIZE LIMIT (inches)	POSSESSION LIMITS (number of fish/person/day)	OPEN SEASONS
Delaware	15"	5	Jan 1 – Mar 31
		3	Apr 1 – May 11
		5	July 17 – Aug 31
		5	Sept 29 – Dec 31
Maryland	16"	4	Jan 1- May 15
		2	May 16 – Oct 31
		4	Nov 1 – 26
Virginia	16"	3	Jan 1 – April 30 Sept 20 – Dec 31

**Table 31. 2017 DelMarVa commercial regulations**

STATE	SIZE LIMIT (inches)	POSSESSION LIMITS (number of fish/vessel/day)	OPEN SEASONS	2017 QUOTA (lbs.)
Delaware	15"	5	Jan 1 - Mar 31	-
		3	Apr 1 - May 11	
		5	July 17 - Aug 31	
		5	Sept 29 - Dec 31	
Maryland	16"	4	Jan 1- May 15	-
		2	May 16 - Oct 31	
		4	Nov 1 - 26	
Virginia	15"	-	Jan 1 – Jan 21 Mar 1 – Apr 30 Nov 1 – Dec 31	-

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**4.2.5.1 Delaware-Maryland-Virginia Proposed Recreational Management Measures**

**Table 32. Proposed DelMarVa Recreational Regional Management Measures**

<b>Option</b>	<b>State</b>	<b>Minimum Size</b>	<b>Possession Limit</b>	<b>Open Season</b>	<b>% Harvest Reduction/ Liberalization</b>	
<b>A. Status Quo</b>		See Table 30			NA	
<b>B. Consistent Possession Limit &amp; Seasons</b>	DE	15"	4	Jan 1 – Apr 30; July 1 – Dec 31	8.5% Liberalization	
	MD	16"				
	VA					
<b>C. Consistent Minimum Size</b>	DE	16"	5	Jan – Mar 31	11.9% Reduction	
			3	Apr 1 – 30		
			5	July 1 – Dec 31		
	MD		4	Jan 1 – Apr 30 Aug 1 – Dec 31		
			VA	3		Jan 1 – Apr 30 Sept 20 – Dec 31
<b>D. All measures consistent</b>	Regional	16"	4	Jan 1 – April 30; July 1 – Dec 31	11.6% Reduction	

**4.2.5.2 Delaware-Maryland-Virginia Proposed Commercial Management Measures**

There are no proposals to adjust the commercial regulations for DelMarVa. However, Delaware and Maryland have traditionally adopted the recreational measures as the commercial measures; and could continue to do this if the recreational measures are changed (Option B). If the region would like to make this decision at a later date then it can do so following the procedures set forth in *Section 4.2.1 or 4.3*.

**Option A. Status Quo measures, as shown in Table 31**

**Option B. The modified recreational measures for Delaware and Maryland will be implemented as commercial measures (Section 4.2.5.1); Virginia commercial measures will remain status quo.**

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### 4.3. COMMERCIAL QUOTA

**Option A. Status Quo. No specific commercial quota procedures.**

**Option B. Commercial Quota Procedures (Option B includes Sections 4.3.1 – 4.3.5)**

A state or region may implement an annual commercial quota if the following procedures are met and Board approval is granted.

For the purposes of this section, a regional working group consists of representatives from each member state within the region. Regional working group decisions related to commercial quotas should be made by consensus.

Quota proposals will be reviewed by the TC according to *Sections 4.3.1* or *4.3.2.*; and develop a recommendation for the Board. The Board will meet to review and consider approval of the quota. Once approved by the Board, the regional quota can be implemented.

#### **4.3.1 Commercial Quota within a Region**

A regional working group will be developed to discuss the parameters of a regional quota across one or more states and develop rationale to justify the proposed quota. The proposal must include an agreed upon allocation method (by all member states within the region) and data to justify the quota must include the most recent 10 years of data. For example, a 2017 quota can include any combination of data from 2006-2016.

#### **4.3.2 State-Specific Quota within a Region**

If a state within a region wants to implement a quota and some or none of the other states have a quota then the proposed quota will need to be brought to the regional working group. Data to justify the quota must include the most recent 10 years of data. For example, a 2017 quota can include any combination of data from 2006-2016.

#### **4.3.3 Quota Rollover**

Due to the current stock condition, the PDT does not recommend the use of quota rollovers. If stock condition changes this management tool can be re-evaluated. Unused quota may not be rolled over from one fishing year to the next.

#### **4.3.4 Quota Transfer**

States can transfer quota to another state within the same region. The quota transfer must be finalized within the current fishing year. Quota cannot be transferred outside of a region.

States have the responsibility to close the tautog commercial fishery in their state once the quota has been reached. The Executive Director or designated ASMFC staff will review and approve all transfer requests before the quota transfer is finalized.

Once quota has been transferred to a state, the state receiving quota is responsible for any overages of transferred quota. That is, the amount over the final quota (that state's quota plus

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any quota transferred to that state) for a state will be deducted from the corresponding state's quota the following fishing season.

### 4.3.5 Quota Overage

If a region or state exceeds the quota in a fishing season, the overage will be deducted from the corresponding region or state in the subsequent fishing year.

## 4.4 COMMERCIAL HARVEST TAGGING PROGRAM

### Option A. Status Quo.

No commercial harvest tagging program.

### Option B. Implement a Commercial Harvest Tagging Program

*(Includes a sub-option under Section 4.4.3)*

*If a commercial harvest tagging program is implemented then a state would not need to adopt the proposed commercial effort controls (e.g., changes to the size limit, season length, etc.) to achieve the necessary reductions, but would simply use a cap on the number of tags distributed. The cap could be derived from the proposed regional quota.*

Law enforcement officials have evidence that indicates there is a significant illegal harvest of tautog, primarily in the live market. Reports of illegally harvested fish have been documented in cases against fishermen, fish houses and at retail markets and restaurants. In Massachusetts there have been a number of large cases made against licensed commercial fishermen, whereas in Delaware, New Jersey and New York illegal harvest seems mostly concentrated in the recreational fishery. Regardless of the source, most undersized, out-of-season or illegal quantities of live tautog are associated with the demand for tautog at ethnic food markets or restaurants. These markets are often found in large cities such as New York City and Philadelphia. To a lesser degree, illegal activity does occur among individuals and small groups harvesting fish for personal consumption or subsistence. This latter group may not even be aware they are violating specific regulations.

A commercial harvest tagging program was recommended to increase accountability in the fishery and curb illegal harvest. The tagging program would accommodate both the live and dead commercial markets. To evaluate the merits of such a program a Law Enforcement Subcommittee (Subcommittee), comprised of Tautog Board members and law enforcement representatives, was developed in 2015. As agreed upon by the Subcommittee, the tag should be easy to attach, secure and have minimal to no impact on the appearance or condition of live fish for the amount of time that live, tagged fish are maintained until consumption. The Subcommittee evaluated multiple tag types and fishermen were interviewed to describe the handling process from catch to market. A tautog tag trial was conducted to investigate the efficacy of a commercial tag that serves as a tool for law enforcement, while minimizing impact to the resource. The 30-day trial concluded with no mortality or degradation to fish health (Dumais et al 2016).

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### 4.4.1 Objectives

The intent of the Commercial Harvest Tagging Program is to provide accountability in the commercial fishery and minimize illegal, unreported and unregulated (IUU) fishing, while utilizing methods that are easy for fishermen to use and do not detract from fish quality or marketability, and serve as a tool for law enforcement to evaluate compliance. To achieve these goals, the Subcommittee developed the following objectives:

*Objective 1:* Implement a verifiable tagging system that can aid enforcement and help identify IUU fish from reaching markets.

*Objective 2:* Use tags of a consistent type and style among all states that include standardized identifiers of year, state, and tag number.

*Objective 3:* Employ tags that are single-use only. Tags must be difficult to replicate. All unused tags will be returned or otherwise accounted for annually.

*Objective 4:* Implement a tagging program that will accommodate both the live and dead commercial fish markets. The tags used must be easy to attach, secure and have minimal to no impact on the appearance or condition of live fish for the amount of time that live, tagged fish are maintained until consumption.

### 4.4.2 Commercial Tagging

All states within a regional management unit are required to participate in the commercial harvest tagging program. *De minimis* status does not preclude a state from the requirements of the commercial harvest tagging program.

All states will use the same single-use tag. The tag will be inscribed with the year of issue, state of issue and a unique number. The **unique number will be linked back to the permit holder.** States will distribute tags to participants. It is unlawful to sell or purchase commercially caught tautog (alive or dead) without a commercial tag. The cost of the tag will be financed by states or fishermen at the discretion of each state or jurisdiction.

### 4.4.3 Tag Application

#### **Option A. Harvester Application at Harvest or Prior to Offloading**

All commercially caught tautog will be tagged by the commercially-permitted harvester at the time of harvest or prior to offloading. Tautog must be landed in the state that is identified on the tag.

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### **Option B. Application by Dealer**

All commercially caught tautog will be tagged by a licensed dealer. The location (state) of the sale must correspond to the state identified on the tag. The tag will be applied to the fish immediately after the dealer buys the fish from the harvester.

#### **4.4.4 Tag Allowance (Biological Metric)**

States are required to allocate commercial tags to the recipients described in Section 4.4.3 based on a biological metric, which will be described in the Annual Commercial Tag Report (Section 4.4.7). This metric is an estimate to determine the number of fish tags that will be required per year; the goal is to avoid surplus tags. For example, the majority of states in the striped bass commercial tagging program use the average commercial weight per fish from the previous year, or some variation thereof as the biological metric.

#### **4.4.5 Tag Accounting**

All states will require the recipients described in Section 4.4.3 to return unused tags from the previous fishing year no later than **February 15**. The return method will be further described by each state. The number of unused tags will be included in the Annual Commercial Tag Report (Section 4.4.7), along with the disposition of other returned tags (e.g., used, broken, lost, etc). Tag recipients who do not comply with this section may be subject to penalties set forth in Section 4.4.6.

#### **4.4.6 Penalties**

It is recommended that states strengthen their penalties for tautog violations and include counterfeit tag operations, in order to deter illegal harvest of tautog. License revocation or suspension is supported as a primary penalty for state or federal violations. Civil and/or criminal penalties can be also effective deterrents. It is recommended that cases of undocumented “lost” tags should result in a 1-year suspension from the commercial tautog fishery (for the subsequent fishing year).

#### **4.4.7 Annual Commercial Tag Report**

The existing compliance report will be modified to include a Commercial Tag section that must be completed by each state. The report must include the following information. The Board may modify the sections of the report via Board action.

- Describe the biological metric
- Number of tag violations.
- Complete the following table:



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<b>State</b>	<b>MA</b>	<b>RI</b>	<b>CT</b>	<b>NY (LIS)</b>	<b>NY (south shore)</b>	<b>NJ</b>	<b>DE</b>	<b>MD</b>	<b>VA</b>
Quota (if applicable)									
Maximum Commercial Harvest per Region									
Avg. Commercial Weight									
Number of Participants									
Number of Tags Issued									
Number of Tags Returned									

**4.5 Gear Restrictions**

Tautog pots and traps are required to have hinges and fasteners on one panel or door made of one of the following degradable materials:

- 1) Untreated hemp or jute string of 3/16 inch (4.8mm) in diameter or smaller;
- 2) Magnesium alloy fasteners, timed float releases (pop-up devices) or similar magnesium alloy fasteners;
- 3) Ungalvanized or uncoated iron wire of 0.094-inch (2.39mm) diameter or smaller.

**4.6 SPAWNING TIME PERIODS**

After consideration of mandated spawning closures, the Board determined to leave the authority with the individual states. Each region reviewed the Estuarine Living Marine Resources Database <https://products.coastalscience.noaa.gov/elmr/> to determine peak spawning as well as scientific articles that are summarized in *Section 1.2.1 Species Life History*. The management measures presented in this document include measures intended to reduce disruption on tautog pairing and to protect spawning females. A state can modify future management measures to allow harvest during spawning time periods via conservation equivalency. The TC recommends implementing spawning closures during the following time periods:

- *Massachusetts-Rhode Island*: June through July
- *Long Island Sound*: May through July (See Appendix 1 for more biological information)
- *New Jersey-New York Bight*: June through July
- *Delaware-Maryland-Virginia*: May through June

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### 4.7 POSSESSION LIMIT REGULATORY LANGUAGE

Concern has been raised that the absence of tautog regulations in federal waters allows for loopholes that potentially contribute to overfishing. Possession restrictions have been used successfully to control federal waters fisheries for other species. While landing restrictions are enforceable, prohibiting possession allows for a larger area where marine enforcement can intercept vessels carrying tautog in amounts or sizes that violate state regulations. This Amendment requires that all state tautog regulations to prohibit *possession*. Therefore, harvesters should be aware of the strict possession limits that will apply once the vessel enters state waters.

### 4.8 FISHERY REGULATION ENFORCEMENT

The tautog fishery has many unique harvest, transportation, and marketing characteristics, which increase demand for small live fish. This Amendment emphasizes the need for state and federal enforcement agencies to place a high priority on the enforcement of tautog regulations. In addition, the public may also play an important role by reporting information on illegal harvest and sale of tautog to their state's marine fishery enforcement agency.

### 4.9 DATA COLLECTION

The recreational fishery occurs throughout the year. The majority of the landings are captured through the Marine Recreational Information Program (MRIP) administered by the National Marine Fisheries Service. However, the MRIP does not sample landings during January and February (wave 1). This Amendment recommends states initiate a sampling program to estimate the recreational harvest of tautog during January and February.

### 4.10 HABITAT CONSERVATION AND RESTORATION RECOMMENDATIONS

#### 4.10.1 Preservation of Existing Habitat

Management of existing habitat on a sustainable basis requires a thorough knowledge of essential habitat types, their distribution, and their use by all life history stages of tautog. Currently, additional research is needed to determine the extent and condition of essential tautog habitats on a coastwide basis. Once the locations and abundance of essential tautog habitats are determined, refuges and special fishery management zones (SMZ) that limit fishing access and gear types are one potential method of habitat management.

#### 4.10.2 Habitat Restoration, Improvement, and Enhancement

Restoration should be considered where well-known, historically "productive" tautog habitat has been degraded or lost.

Restoration could be directed specifically toward tautog habitat or it could occur as a component of other efforts. South of Cape Cod, restoration of lobster habitat should also consider the needs of tautog because habitat usage by the two species overlaps. Response plans for accidental toxic spills in coastal waters should focus on tautog as well as shellfish resources, because tautog are localized and depend on specific habitats and associated food

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sources that are susceptible to chemical contamination. Point source contamination and hypoxia near nursery grounds can be improved by minimizing sewage discharges and increasing wastewater treatment levels. Non-point source toxic contamination of groundwater and nearshore coastal habitats can be reduced by redirecting storm water runoff into catch basins.

Habitat enhancement requires the creation or expansion of essential habitat where little or none presently exists. Creation of artificial reef habitats (see *Section 1.5.4.1*) and breakwaters could mitigate habitat losses. Both intentional reef construction and accidental creation through shipwrecks may be expanding tautog habitat in open, sandy coastal areas where tautog would not normally be found.

### **4.10.3 Avoidance of Incompatible Activities**

Each state should establish windows of compatibility for activities known, to adversely affect tautog habitat, including projects involving water withdrawal, entrainment of eggs and larvae in cooling water systems and mortality from thermal effects, dredging, bulk-heading and channel construction. As a preventative measure, buffer zones could be established around important nursery areas.

### **4.10.4 Fishery Practices**

Certain gear types may disrupt tautog habitat, however, insufficient information is available to quantify effects at this time. Derelict lobster traps are known to entrap tautog, resulting in unquantified mortality. Any fishing gear having an unacceptable impact on tautog habitat should be prohibited within essential habitats.

## **4.11 ALTERNATIVE STATE/REGION MANAGEMENT REGIMES/MANAGEMENT PROGRAM EQUIVALENCY**

Once approved by the Tautog Management Board, states are required to obtain prior approval from the Board of any changes to their management program for which a compliance requirement is in effect. Other measures must be reported to the Board but may be implemented without prior Board approval. A state can request permission to implement an alternative to any mandatory compliance measure only if that state can show to the Board's satisfaction that its alternative proposal will have the same conservation value as the measure contained in this amendment or any addenda prepared under *Adaptive Management (Section 4.12)*. States submitting alternative proposals must demonstrate that the proposed action will not contribute to overfishing of the resource. States may submit alternative region/state proposals under this section following the procedures outlined in the Commission's Conservation Equivalency Policy and Technical Guidance Document.

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### 4.11.3 *De Minimis* Fishery Guidelines

#### 4.11.3.1 *Criteria for De Minimis Consideration*

To be eligible for *de minimis* consideration, a state must prove that its commercial landings in the most recent year for which data are available did not exceed *the greater of* 10,000 pounds or 1% of the regional landings.

#### 4.11.3.2 *Plan Requirements if De Minimis is Granted*

If *de minimis* status is granted, the *de minimis* state is required to implement the minimum size provisions, the pot and trap degradable fastener provisions, and regulations consistent with those in the recreational fishery (including possession limits and seasonal closures). The state must monitor its landings on at least an annual basis and provide a compliance report as outlined in *Section 5.1.2* of the Tautog FMP. If the FMP is altered through adaptive management as specified in *Section 4.12* of the Tautog FMP the Management Board will specify by motion which measures *de minimis* states must adopt.

#### 4.11.3.3 *Procedure to Apply for De Minimis Status*

States must specifically request *de minimis* status each year. Requests for *de minimis* status will be reviewed by the Tautog Plan Review Team (PRT) as part of the annual FMP review process. Requests for *de minimis* must be submitted to the ASMFC Tautog FMP Coordinator as a part of the state's yearly compliance report. The request must contain the following information: commercial landings for the most recent year, commercial regulations for the current year, and the proposed management measures the state plans to implement for the year *de minimis* status is requested. The FMP Coordinator will then forward the information to the PRT and, if necessary, the Tautog Technical Committee and Stock Assessment Subcommittee.

In determining whether or not a state meets the *de minimis* criteria, the PRT will consider the information provided with the request, the most recent available coastwide landings data, any information provided by the Technical Committee and Stock Assessment Subcommittee, and projections of future landings. The PRT will make a recommendation to the Board to either accept or deny the *de minimis* request. The Board will then review the PRT recommendation and either grant or deny the *de minimis* classification.

The Board must make a specific motion to grant a state *de minimis* status. By deeming a given state *de minimis*, the Board is recognizing that: the state has a minimal tautog fishery; there is little risk to the health of the tautog stock if the state does not implement the full suite of management measures; and the overall burden of implementing the complete management and monitoring requirements of the FMP outweigh the conservation benefits of implementing those measures in the particular state.

If commercial landings in a *de minimis* state exceed the *de minimis* threshold, the state will lose its *de minimis* classification, will be ineligible for *de minimis* in the following year, and will be required to implement all requirements of the FMP. If the Board denies a state's *de minimis* request, the state will be required to implement all the requirements of the FMP. When a state

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rescinds or loses its *de minimis* status the Board will set a compliance date by which the state must implement the required regulations.

### 4.12 ADAPTIVE MANAGEMENT

The Tautog Management Board may vary the requirements specified in this amendment as a part of adaptive management in order to conserve the tautog resource. The elements that can be modified by adaptive management are listed in *Section 4.12.2*. The process under which adaptive management can occur is provided below.

#### 4.12.1 General Procedures

The Plan Review Team (PRT) will monitor the status of the fishery and the resource and report on that status to the Tautog Management Board annually, or when directed to do so by the Section. The Plan Review Team may consult with the Technical Committee, the Stock Assessment Committee or the Advisory Panel, if any. The report may contain recommendations concerning proposed adaptive management revisions to the management program. If the PRT makes a recommendation, the Tautog Management Board will review the report and may consult further with Technical Committee, the Stock Assessment Committee or the Advisory Panel.

If an addendum is initiated, then the Board will provide guidance on the specific issues that the Plan Development Team (PDT) should address. The PDT will be convened after members are nominated and approved by the Board.

A public hearing will be held in any state that requests one. The PDT will also request comment from federal agencies and the public at large. The PDT will summarize the comments and prepare a final version of the addendum for the Board. The Board will consider the public comments received and the recommendations of the Technical Committee, the Stock Assessment Committee or the Advisory Panel. The Section shall then decide whether to adopt, or revise and then adopt, the addendum. The addendum shall contain a schedule for the states to implement its provisions.

Upon adoption of an addendum implementing adaptive management by the Board, states shall prepare plans to carry out the addendum, and submit them to the Board for approval according to the schedule contained in the addendum.

#### 4.12.2 Measures Subject to Change

The following measures are subject to change under adaptive management upon approval by the Tautog Management Board:

1. Rebuilding targets and schedules
2. Fishing season including seasonal closures
3. Trip limits/bag limits
4. Minimum size

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5. Commercial harvest tagging program
6. Reporting requirements
7. Gear restrictions
8. Management areas/regions
9. Recommendations to the Secretary for complimentary actions in federal jurisdictions
10. Research or monitoring requirements
11. Or any other management action

### **4.13 EMERGENCY PROCEDURES**

Emergency procedures may be used by the Tautog Management Board to require any emergency action that is not covered by or is an exception or change to any provision in Amendment 1. Procedures for implementation are addressed in the ASMFC Interstate Fisheries Management Program Charter, Section Six (c)(11) (ASMFC 2016).

### **4.14 MANAGEMENT INSTITUTIONS**

The management institutions for tautog shall be subject to the provisions of the ISFMP Charter (ASMFC, 2016). The following is not intended to replace any or all of the provisions of the ISFMP Charter. All committee roles and responsibilities are included in detail in the ISFMP Charter and are only summarized here.

#### **4.14.1 Atlantic States Marine Fisheries Commission and ISFMP Policy Board**

The ASMFC (Commission) and the ISFMP Policy Board are generally responsible for the oversight and management of the Commission's fisheries management activities. The Commission must approve all fishery management plans, and amendments, including this Amendment 1, and must also make all final determinations concerning state compliance or noncompliance.

#### **4.14.2 Tautog Management Board**

The Tautog Management Board Section is generally responsible for carrying out all activities under this Amendment. It establishes and oversees the activities of the Plan Development or Plan Review Team, the Technical Committee and the Stock Assessment Subcommittee and requests the establishment of the Commission's Tautog Advisory Panel. Among other things, the Board makes changes to the management program under adaptive management and approves state programs implementing the amendment and alternative state programs under Sections 4.12.

#### **4.14.3 Tautog Plan Development Team / Plan Review Team**

The Tautog Plan Development Team (PDT) and the Tautog Plan Review Team (PRT) will be composed of a small group of scientists and/or managers whose responsibility is to provide all of the technical support necessary to carry out and document the decisions of the Tautog Management Board. The ASMFC FMP Coordinator chairs both. The PDT/PRT is directly responsible to the Section for providing information and documentation concerning the

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implementation, review, monitoring and enforcement of Amendment 1. The PDT/PRT shall be comprised of personnel from state and federal agencies who have scientific and management ability and knowledge of tautog. The PDT will be responsible for preparing all documentation necessary for the development of Amendment 1, using the best scientific information available and the most current stock assessment information. The PDT will either disband or assume inactive status upon completion of Amendment 1. Alternatively, the Board may elect to retain PDT members as members of the PRT or appoint new members. The PRT will provide annual advice concerning the implementation, review, monitoring, and enforcement of Amendment 1 once the Commission has adopted it.

### **4.14.4 Tautog Technical Committee**

The Tautog Technical Committee will consist of representatives from state or federal agencies, Regional Fishery Management Councils, Commission, university or other specialized personnel with scientific and technical expertise and knowledge of the tautog fishery. The Board will appoint the members of the Technical Committee and may authorize additional seats as it sees fit. Its role is to act as a liaison to the individual state and federal agencies, provide information to the management process, and review and develop options concerning the management program. The Technical Committee will provide scientific and technical advice to the Management Board, PDT, and PRT in the development and monitoring of a fishery management plan or amendment.

### **4.14.5 Tautog Stock Assessment Subcommittee**

The Tautog Stock Assessment Subcommittee shall be appointed by the Technical Committee at the request of the Management Board, and will consist of scientists with expertise in the assessment of the tautog population. Its role is to assess the tautog population and provide scientific advice concerning the implications of proposed or potential management alternatives, or to respond to other scientific questions from the Board, Technical Committee, PDT or PRT. The Stock Assessment Subcommittee will report to the Technical Committee.

### **4.14.6 Tautog Advisory Panel**

The Advisory Panel is established according to the Commission's Advisory Committee Charter. Members of the Advisory Panel are citizens who represent a cross-section of commercial and recreational fishing interests and others who are concerned about tautog conservation and management. The Advisory Panel provides the Board with advice directly concerning the Commission's tautog management program.

### **4.14.7 Federal Agencies**

#### *4.14.7.1 Management in the Exclusive Economic Zone (EEZ)*

Management of tautog in the EEZ is within the jurisdiction of the Regional Fishery Management Councils under the Magnuson-Stevens Act (16 U.S.C. 1801 et seq.). In the absence of a Council Fishery Management Plan, management is the responsibility of the NMFS as mandated by the Atlantic Coastal Fishery Conservation and Management Act (16 U.S.C. 5105 et seq.)

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### *4.14.7.2 Federal Agency Participation in the Management Process*

The Commission has accorded the United States Fish and Wildlife Service (USFWS) and the NMFS voting status on the ISFMP Policy Board and the Tautog Management Board in accordance with the Commission's ISFMP Charter. The NMFS also participates on the Tautog Plan Development Team, Plan Review Team, Technical Committee and Stock Assessment Subcommittee.

### *4.14.7.3 Consultation with Fishery Management Councils*

At the time of adoption of Amendment 1, none of the Regional Fishery Management Councils had implemented a management plan for tautog nor have they indicated an intention to develop a plan.

## **4.15 RECOMMENDATIONS TO THE SECRETARY FOR COMPLIMENTARY ACTIONS IN FEDERAL JURISDICTIONS**

The ASMFC recommends the federal government promulgate all necessary regulations to implement compatible measures in the exclusive economic zone (EEZ). Specifically, the ASMFC recommends that the Secretary of Commerce fully implement regulations for tautog in the EEZ that are in accordance with state minimum sizes, possession limits, closed seasons, as well as other possession requirements for both the commercial and recreational fishery (Section 4.2).

## **4.16 COOPERATION WITH OTHER MANAGEMENT INSTITUTIONS**

The Board will cooperate, if necessary, with other management institutions during the implementation of this amendment, including the National Marine Fisheries Service and the New England, Mid-Atlantic, and South Atlantic Fishery Management Council.

## **5.0 COMPLIANCE**

Full implementation of the provisions of this amendment is necessary for the management program to be equitable, efficient and effective. States are expected to implement these measures faithfully under state laws. Although ASMFC does not have authority to directly compel states to implement these measures, it will continually monitor the effectiveness of state implementation and determine whether states are in compliance with the provisions of this fishery management plan. The Board sets forth specific elements that the Commission will consider in determining state compliance with this fishery management plan, and the procedures that will govern the evaluation of compliance. Additional details of the procedures are found in the ASMFC Interstate Fishery Management Program Charter (ASMFC 2016).



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### 5.1 MANDATORY COMPLIANCE ELEMENTS FOR STATES

A state will be determined to be out of compliance with the provision of this fishery management plan according to the terms of Section Seven of the ISFMP Charter if:

- It fails to meet any schedule required by Section 5.1.2, or any addendum prepared under adaptive management (Section 4.12); or
- It has failed to implement a change to its program when determined necessary by the Tautog Management Board; or
- It makes a change to its regulations required under Section 4 or any addendum prepared under adaptive management (Section 4.12), without prior approval of the Tautog Management Board.

#### 5.1.1 MANDATORY ELEMENTS OF STATE PROGRAMS

To be considered in compliance with this amendment, all state programs must include management measures for tautog fisheries consistent with the requirements listed throughout *Section 4.0 and Section 3.2.2.2 Fishery Independent Information—Biological Sampling Program*, except that a state may propose an alternative management program under Section 4.12, which, if approved by the Management Board, may be implemented as an alternative regulatory requirement for compliance.

##### *5.1.1.1 Regulatory Requirements*

States shall begin to implement Amendment 1 after final approval of the state's implementation proposal by the Commission. Each state must submit its required tautog regulatory program to the Commission through the ASMFC staff for approval by the Atlantic Tautog Management Board. During the period from submission and until the Management Board makes a decision on a state's program, a state may not adopt a less protective management program than contained in this amendment or contained in current state law.

Once approved by the Tautog Management Board, states are required to obtain approval from the Board prior to making any changes to their management program for which a compliance requirement is in effect. Other measures must be reported to the Board, but may be implemented without prior Board approval. A state can request permission to implement an alternative to any mandatory compliance measure only if that state can show to the Board's satisfaction that its alternative proposal will have the same conservation value as the measure contained in this management plan or any addenda prepared under Adaptive Management (Section 4.12). States submitting alternative proposals must demonstrate that the proposed action will not contribute to overfishing of the resource. All changes in state plans must be submitted in writing to the Board and to the Commission either as part of the annual FMP Review process or the Annual Compliance Reports.

##### *5.1.1.2 Monitoring Requirements*

All state programs must include the mandatory monitoring requirements contained in Sections 3.1, 3.2, and 3.3 and 4.4.7. States must submit proposals for all intended changes to required

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monitoring programs, which may affect the quality of the data or the ability of the program to fulfill the needs of the fishery management plan. State proposals for making changes to required monitoring programs will be submitted to the Technical Committee at least two weeks prior to its spring or fall meeting. Proposals must be on a calendar year basis. The Technical Committee will make recommendations to the Management Board concerning whether the proposals are consistent with Amendment 1.

In the event that a state realizes it will not be able to fulfill its fishery independent monitoring requirements, it should immediately notify the Commission in writing. The Commission will work with the state to develop a plan to secure funding or plan an alternative program to satisfy the needs outlined in Amendment 6. If the plan is not implemented 90 days after it has been adopted, the state will be found out of compliance with Amendment 1.

### *5.1.1.3 Research Requirements*

A prioritized list of research needs for tautog was created during the development of this FMP and can be found in Section 6.0. The PDT and Technical Committee will re-prioritize the research needs for tautog as part of the FMP Review or Stock Assessment process. Appropriate programs for meeting these needs may be implemented under *Section 4.12 (Adaptive Management)* through the Commission's addendum process including the opportunity for public comment.

### *5.1.1.4 Law Enforcement Requirements*

All state programs must include law enforcement capabilities adequate for successfully implementing a state's tautog regulations. The adequacy of a state's enforcement activity will be monitored annually by reports of the ASMFC Law Enforcement Committee to the Tautog Plan Review Team.

## **5.1.2 Compliance Schedule**

To be determined by the Tautog Management Board.

## **5.1.3 Compliance Report Content**

Each state must submit an annual report concerning its tautog fisheries and management program for the previous fishing year. Reports should follow the tautog report outline as sent by the PRT chair each year. The report shall cover:

- the previous fishing year's fishery and management program including activity and results of monitoring (including the results of 200 age and length samples), a copy of regulations that were in effect and harvest broken down between recreational and commercial, including estimates of non-harvest losses; and
- commercial harvest tagging program requirements as described in Section 4.4.7
- the planned management program for the current fishing year summarizing regulations that will be in effect and monitoring programs that will be performed, highlighting any changes from the previous year.

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### **5.2 PROCEDURES FOR DETERMINING NON-COMPLIANCE**

Detailed procedures regarding compliance determinations are contained in the ISFMP Charter, Section 7 (ASMFC 2016). The following summary is not intended to replace the language found in the ISFMP Charter.

The Plan Review Team will continually review the status of state implementation, and advise the Management Board at any time that a question arises concerning state compliance. The PRT will review state reports submitted under Section 5.1.3 and prepare a report by May 1 for the Management Board summarizing the status of the resource and the fishery and the status of state compliance on a state-by-state basis.

Upon review of a report from the Plan Review Team, or at any time by request from a member of the Management Board, the Management Board will review the status of an individual state's compliance. If the Management Board finds that a state's approved regulatory management program fails to meet the requirements of this section, it may be recommended that the state be found out of compliance. The recommendation must include a specific list of the state's deficiencies in implementing and enforcing this Amendment and the actions that the state must take in order to come back into compliance.

If the Management Board recommends that a state be found out of compliance, as referred to in the preceding paragraph, it shall report that recommendation to the ISFMP Policy Board for further review according to the Commission's Charter for the Interstate Fisheries Management Program. The state that is out of compliance or subject to a recommendation by the Management Board under the preceding paragraph may request at any time that the Management Board reevaluate its program. The state shall provide a written statement concerning actions which justify a reevaluation. The Management Board shall promptly conduct such reevaluation, and if it agrees with the state, shall recommend to the ISFMP Policy Board that the noncompliance finding be withdrawn. The ISFMP Policy Board and Commission shall deal with the Management Board's recommendation according to the Commission's Charter for the Interstate Fisheries Management Program.

### **5.3 ANALYSIS OF ENFORCEABILITY OF MANAGEMENT MEASURES**

The Law Enforcement Committee will, during the implementation of this amendment, analyze the enforceability of conservation and management measures as they are proposed.

## 6.0 MANAGEMENT AND RESEARCH NEEDS

The Technical Committee identified the following research recommendations in the 2015 benchmark stock assessment to improve future stock assessments and our understanding of tautog population and fishery dynamics. Research recommendations are organized by topic and level of priority. Research recommendations that should be completed before the next benchmark assessment are underlined.

### 6.1 FISHERY-DEPENDENT PRIORITIES

#### *High*

- Expand biological sampling of the commercial catch for each gear type over the entire range of the stock (including weight, lengths, age, sex, and discards).
- Continue collecting operculum from the tautog catch as the standard for biological sampling in addition to collecting paired sub-samples of otoliths and operculum.
- Increase catch and discard length sampling from the commercial and recreational fishery for all states from Massachusetts through Virginia.
- Increase collection of effort data for determining commercial and recreational CPUE.
- Increase MRIP sampling levels to improve recreational catch estimates by state and mode. Current sampling levels are high during times of the year when more abundant and popular species are abundant in catches, but much lower in early spring and late fall when tautog catches are more likely.

### 6.2 FISHERY-INDEPENDENT PRIORITIES

#### *High*

- Conduct workshop and pilot studies to design a standardized, multi-state fishery independent survey for tautog along the lines of MARMAP and the lobster ventless trap survey.
- Establish standardized multi-state long-term fisheries-independent surveys to monitor tautog abundance and length-frequency distributions, and to develop YOY indices.
- Enhance collection of age information for smaller fish (<20 cm) to better fill in age-length keys.

#### *Low*

- Investigate a nonlethal method for age determination based on pelvic-fin spines based on the Elzey and Trull, 2016 article.

### 6.3 LIFE HISTORY, BIOLOGICAL AND HABITAT PRIORITIES

#### *Moderate*

- Define local and regional movement patterns and site fidelity in the southern part of the species range. This information may provide insight into questions of aggregation versus

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recruitment to artificial reef locations, and to clarify the need for local and regional assessment.

- Assemble regional reference collections of paired operculum and otolith samples and schedule regular exchanges to maintain and improve the precision of age readings between states that will be pooled in the regional age-length keys.
- Calibrate age readings every year by re-reading a subset of samples from previous years before ageing new samples. States that do not currently assess the precision of their age readings over time should do so by re-ageing a subset of their historical samples.

### **Low**

- Evaluate the potential impacts of climate change on tautog range, life history, and productivity.
- Conduct a tag retention study to improve return rates, particularly in the northern region.
- Define the status (condition and extent) of optimum or suitable juvenile habitats and trends in specific areas important to the species. It is critical to protect these habitats or to stimulate restoration or enhancement, if required.
- Define the specific spawning and pre-spawning aggregating areas and wintering areas of juveniles and adults used by all major local populations, as well as the migration routes used by tautog to get to and from spawning and wintering areas and the criteria or times of use. This information is required to protect these areas from damage and overuse or excessive exploitation.
- Define larval diets and prey availability requirements. This information can be used as determinants of recruitment success and habitat function status. Information can also be used to support aquaculture ventures with this species.
- Define the role of prey type and availability in local juvenile/adult population dynamics over the species range. This information can explain differences in local abundance, movements, growth, fecundity, etc. Conduct studies in areas where the availability of primary prey, such as blue mussels or crabs, is dependent on annual recruitment, the effect of prey recruitment variability as a factor in tautog movements (to find better prey fields), mortality (greater predation exposure when leaving shelter to forage open bottom), and relationship between reef prey availability/quality on tautog condition/fecundity.
- Define the susceptibility of juveniles to coastal/anthropogenic contamination and resulting effects. This information can explain differences in local abundance, movements, growth, fecundity, and serve to support continued or increased regulation of the inputs of these contaminants and to assess potential damage. Since oil spills seem to be a too frequent coastal impact problem where juvenile tautog live, it may be helpful to conduct specific studies on effects of various fuel oils and typical exposure concentrations, at various seasonal temperatures and salinities. Studies should also be conducted to evaluate the effect of common piling treatment leachates and common antifouling paints on YOY tautog. The synergistic effects of leaked fuel, bilge water, treated pilings, and antifouling paints on tautog health should also be studied.

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- Define the source of offshore eggs and larvae (in situ or washed out coastal spawning).
- Confirm that tautog, like cunner, hibernate in the winter, and in what areas and temperature thresholds, for how long, and if there are special habitat requirements during these times that should be protected or conserved from damage or disturbance. This information will aid in understanding behavior variability and harvest availability.

### 6.4 MANAGEMENT, LAW ENFORCEMENT AND SOCIOECONOMIC PRIORITIES

#### *Moderate*

- Collect data to assess the magnitude of illegal harvest of tautog.

#### *Low*

- Collect basic sociocultural data on tautog user groups including demographics, location, and aspects of fishing practices such as seasonality.

### 6.5 RESEARCH RECOMMENDATIONS THAT HAVE BEEN MET

- ✓ Sample hard parts for annual ageing from the catches of recreational and commercial fisheries and fishery-independent surveys throughout the range of the stock. *Being conducted by all participating states.*
- ✓ Conduct hard part exchange and ageing workshop to standardize techniques and assess consistency across states. Conducted May 2012, report available at [http://www.asmf.org/uploads/file/2012\\_Tautog\\_Ageing\\_Workshop\\_Report.pdf](http://www.asmf.org/uploads/file/2012_Tautog_Ageing_Workshop_Report.pdf)

## 7.0 PROTECTED RESOURCES

In the fall of 1995, Commission member states, the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) began discussing ways to improve implementation and enforcement of the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA) in state waters. In November 1995, the Commission, through its Interstate Fisheries Management Program (ISFMP) Policy Board, approved an amendment of its ISFMP Charter (section 6(b)(2)) so that protected species and their interactions with ASMFC managed fisheries are addressed in the Commission's fisheries management planning process. Specifically, the Commission's fishery management plans (FMP) will describe impacts of state fisheries on certain marine mammals and endangered species (collectively termed "protected species"), and recommend ways to minimize these impacts. The following section outlines: (1) the federal legislation that guides protection of marine mammals and sea turtles, (2) the protected species with potential fishery interactions; and (3) the specific type(s) of fishery interaction.

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### 7.1 MARINE MAMMAL PROTECTION ACT (MMPA) REQUIREMENTS

The 1994 amendments to the MMPA established both short- and long-term goals for reducing mortality and serious injury, or bycatch, of marine mammal's incidental to commercial fisheries. The amendments also established take reduction plans (TRPs) and stakeholder-based take reduction teams (TRTs) as the mechanisms for achieving these goals. The MMPA requires NMFS to convene TRTs to develop TRPs for each strategic stock that interacts with a Category I or II fishery, fisheries with "frequent" or "occasional" marine mammal bycatch, respectively. (Fisheries that have a remote likelihood of or no known bycatch of marine mammals are classified in Category III.) A strategic stock is defined as a stock: (1) for which the level of direct human-caused mortality exceeds the potential biological removal (PBR)<sup>1</sup> level; (2) which is declining and is likely to be listed under the ESA in the foreseeable future; or (3) which is listed as a threatened or endangered species under the ESA or as a depleted species under the MMPA. In the short-term (within six months of implementation), TRPs must reduce marine mammal bycatch to levels below a marine mammals stock's potential biological removal level. In the long-term (within five years of implementation), TRPs must reduce marine mammal bycatch to insignificant levels approaching a zero mortality and serious injury rate taking into account the economics of the fishery, the availability of existing technology, and existing state or regional fishery management plans.

The 1994 amendments also required fishermen in Category I and II fisheries to register under the Marine Mammal Authorization Program (MMAP), the purpose of which is to provide an exception for commercial fishermen from the general taking prohibitions of the MMPA; to take on board an observer if requested to do so by the Secretary of Commerce; and to comply with any applicable TRP or emergency regulations. All commercial fishermen, regardless of the category of the fishery in which they participate, must report all marine mammal bycatch.

### 7.2 ENDANGERED SPECIES ACT REQUIREMENTS

The taking of endangered sea turtles and marine mammals is prohibited under section 9 of the ESA. NMFS may issue section 4(d) protective regulations necessary and advisable to provide for the conservation of threatened species. There are several mechanisms established in the ESA that exempt take prohibitions set forth in section 9. First, a 4(d) regulation may include less stringent requirements intended to reduce incidental take and thus allow for the exemption from the taking prohibition. Section 10(a)(1)(B) of the ESA authorizes NMFS to permit, under prescribed terms and conditions, any taking otherwise prohibited by section 9 of the ESA, if the taking is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Finally, section 7(a)(2) requires NMFS to consult with each federal agency to ensure that any action that is authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any listed species. Pursuant to Section 7(b), formal consultation will be

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<sup>1</sup> PBR is the number of human-caused deaths per year each stock can withstand and still reach an optimum population level. This is calculated by multiplying "the minimum population estimate" by "½ stock's net productivity rate" by "a recovery factor ranging from 0.1 for endangered species to 1.0 for healthy stocks."

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completed on any action that may adversely affect and/or result in the destruction or adverse modification of critical habitat. Formal consultation will conclude with NMFS issuing a Biological Opinion which will include an incidental take statement containing reasonable and prudent measures and terms and conditions that minimize take and must be complied for otherwise prohibited take to be authorized.

### 7.3 PROTECTED RESOURCES IN THE MANAGEMENT UNIT

Numerous protected species inhabit the environment within the tautog management unit (Table 33). These species are under NMFS jurisdiction and are afforded protection under the Endangered Species Act (ESA) of 1973 and/or the Marine Mammal Protection Act (MMPA) of 1972.

**Table 33. Species protected under the ESA and/or MMPA that may occur in the affected environment of the tautog fishery. Marine mammal species (cetaceans and pinnipeds) italicized and in bold are considered MMPA strategic stocks.<sup>1</sup>**

Species	Status <sup>2</sup>	Potentially affected by this action?
<b><u>Cetaceans</u></b>		
<b><i>North Atlantic right whale (<i>Eubalaena glacialis</i>)</i></b>	<b><i>Endangered</i></b>	<b><i>Yes</i></b>
<b><i>Humpback whale, West Indies DPS (<i>Megaptera novaeangliae</i>)</i></b>	<b><i>Protected (MMPA)</i></b>	<b><i>Yes</i></b>
<b><i>Fin whale (<i>Balaenoptera physalus</i>)</i></b>	<b><i>Endangered</i></b>	<b><i>Yes</i></b>
<b><i>Sei whale (<i>Balaenoptera borealis</i>)</i></b>	<b><i>Endangered</i></b>	<b><i>Yes</i></b>
Minke whale ( <i>Balaenoptera acutorostrata</i> )	Protected (MMPA)	Yes
Pilot whale ( <i>Globicephala spp.</i> ) <sup>3</sup>	Protected (MMPA)	Yes
Risso's dolphin ( <i>Grampus griseus</i> )	Protected (MMPA)	Yes
Atlantic white-sided dolphin ( <i>Lagenorhynchus acutus</i> )	Protected (MMPA)	Yes
Short Beaked Common dolphin ( <i>Delphinus delphis</i> ) <sup>4</sup>	Protected (MMPA)	Yes
Spotted dolphin ( <i>Stenella frontalis</i> )	Protected (MMPA)	No
<b><i>Bottlenose dolphin (<i>Tursiops truncatus</i>)</i></b> <sup>5</sup>	<b><i>Protected (MMPA)</i></b>	<b><i>Yes</i></b>
<i>Harbor porpoise (<i>Phocoena phocoena</i>)</i>	<i>Protected (MMPA)</i>	<i>No</i>
<b><u>Sea Turtles</u></b>		
Leatherback sea turtle ( <i>Dermochelys coriacea</i> )	Endangered	Yes
Kemp's ridley sea turtle ( <i>Lepidochelys kempii</i> )	Endangered	Yes
Green sea turtle, North Atlantic DPS ( <i>Chelonia mydas</i> )	Threatened	Yes
Loggerhead sea turtle ( <i>Caretta caretta</i> ), Northwest Atlantic Ocean DPS	Threatened	Yes
Hawksbill sea turtle ( <i>Eretmochelys imbricate</i> )	Endangered	No



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<b><u>Fish</u></b>		
Shortnose sturgeon ( <i>Acipenser brevirostrum</i> )	Endangered	No
Atlantic salmon ( <i>Salmo salar</i> )	Endangered	Yes
Atlantic sturgeon ( <i>Acipenser oxyrinchus</i> )		
<i>Gulf of Maine DPS</i>	Threatened	Yes
<i>New York Bight DPS, Chesapeake Bay DPS, Carolina DPS &amp; South Atlantic DPS</i>	Endangered	Yes
<i>Cusk</i>	Candidate	Yes
<b><u>Pinnipeds</u></b>		
Harbor seal ( <i>Phoca vitulina</i> )	Protected (MMPA)	Yes
Gray seal ( <i>Halichoerus grypus</i> )	Protected (MMPA)	Yes
Harp seal ( <i>Phoca groenlandicus</i> )	Protected (MMPA)	Yes
Hooded seal ( <i>Cystophora cristata</i> )	Protected (MMPA)	Yes
<b><u>Critical Habitat</u></b>		
North Atlantic Right Whale <sup>6</sup>	ESA (Protected)	No

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**Notes:**

<sup>1</sup> A strategic stock is defined under the MMPA as a marine mammal stock for which: (1) the level of direct human-caused mortality exceeds the potential biological removal level; (2) based on the best available scientific information, is declining and is likely to be listed as a threatened species under the ESA within the foreseeable future; and/or (3) is listed as a threatened or endangered species under the ESA, or is designated as depleted under the MMPA (Section 3 of the MMPA of 1972).

<sup>2</sup> The status of the species is defined by whether the species is listed under the ESA as endangered (species are at risk of extinction) or threatened (species at risk of endangerment), or protected under the MMPA. Note, marine mammals listed under the ESA are also protected under the MMPA. Candidate species are those species in which ESA listing may be warranted.

<sup>3</sup> There are two species of pilot whales: short finned (*G. melas melas*) and long finned (*G. macrorhynchus*). Due to the difficulties in identifying the species at sea, they are often just referred to as *Globicephala* spp.

<sup>4</sup> Prior to 2008, this species was called "common dolphin."

<sup>5</sup> This includes the following Stocks of Bottlenose Dolphins: Western North Atlantic Offshore, Northern Migratory Coastal (strategic stock), and Southern Migratory Coastal (strategic stock).

<sup>6</sup> Originally designated June 3, 1994 (59 FR 28805); Expanded on January 27, 2016 (81 FR 4837).

Cusk are a NMFS "candidate species" under the ESA. Candidate species are those petitioned species for which NMFS has determined that listing may be warranted under the ESA and those species for which NMFS has initiated an ESA status review through an announcement in the Federal Register. If a species is proposed for listing, the conference provisions under Section 7 of the ESA apply (see 50 CFR 402.10); however, candidate species receive no substantive or procedural protection under the ESA. As a result, this species will not be discussed further in this and the following sections; however, NMFS recommends that project proponents consider implementing conservation actions to limit the potential for adverse effects on cusk from any

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proposed action. Additional information on cusk can be found at <http://www.nmfs.noaa.gov/pr/species/esa/candidate.htm>

### **7.4 SPECIES AND CRITICAL HABITAT NOT LIKELY AFFECTED BY THE FMP**

Based on available information, it has been determined that the FMP is not likely to affect multiple ESA listed and/or marine mammal protected species or any designated critical habitat (see Table 33). This determination has been made because either the occurrence of the species is not known to overlap with the area primarily affected by the action and/or there have never been documented interactions between the species and the primary gear type (i.e., hook and line and pot/trap) used to prosecute the tautog fishery (see Waring *et al.* 2014, 2015, 2016; NMFS NEFSC FSB 2015, 2016; [http://www.nefsc.noaa.gov/fsb/take\\_reports/nefop.html](http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html)). In the case of critical habitat, this determination has been made because the action will not affect the essential physical and biological features of North Atlantic right whale critical habitat and therefore, will not result in the destruction or adverse modification of this species critical habitat (NMFS 2015a,b).

### **7.5 SPECIES POTENTIALLY AFFECTED BY THE FMP**

Table 33 provides a list of sea turtle, marine mammal, and fish species present in the affected environment of the tautog fishery, and that may also be affected by the operation of this fishery. Of primary concern is the potential for the fishery to interact (e.g., bycatch, entanglement) with these species. To understand the potential risk of an interaction, it is necessary to consider (1) species occurrence in the affected environment of the fishery and how the fishery will overlap in time and space with this occurrence; and (2) data and observed records of protected species interaction with particular fishing gear types. Information on species occurrence in the affected environment of the tautog fishery is provided in this section, while information on protected species interactions with specific fishery gear is provided in Section 7.6.

#### **7.5.1 Sea Turtles**

Green (North Atlantic DPS), Kemp's ridley, leatherback, and loggerhead (Northwest Atlantic Ocean DPS) sea turtle are the four ESA listed species of sea turtles that occur in the area of operation for the 13 GAR fisheries (see Table 33). Three of the four species are considered hard-shelled turtles (i.e., green, loggerhead, and Kemp's ridley). Additional background information on the range-wide status of the other four species, as well as a description and life history of the species, can be found in a number of published documents, including sea turtle status reviews and biological reports (NMFS and USFWS 1995; Hirth 1997; Turtle Expert Working Group [TEWG] 1998, 2000, 2007, 2009; Conant *et al.* 2009; NMFS and USFWS 2007a,b, 2013, 2015; Seminoff *et al.* 2015), and recovery plans for the loggerhead sea turtle (Northwest Atlantic DPS; NMFS and USFWS 2008), leatherback sea turtle (NMFS and USFWS 1992), Kemp's ridley sea turtle (NMFS *et al.* 2011), and green sea turtle (NMFS and USFWS 1991).

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### *Hard-shelled Sea Turtles*

#### *Distribution*

In U.S. Northwest Atlantic waters, hard-shelled turtles commonly occur throughout the continental shelf from Florida (FL) to Cape Cod, Massachusetts (MA), although their presence varies with the seasons due to changes in water temperature (Shoop and Kenney 1992; Epperly *et al.* 1995a, 1995b; Braun and Epperly 1996; Mitchell *et al.* 2003; Braun-McNeill *et al.* 2008; TEWG 2009). While hard-shelled turtles are most common south of Cape Cod, MA, they are known to occur in the Gulf of Maine (GOM). Loggerheads, the most common hard-shelled sea turtle in the GAR, feed as far north as southern Canada. Loggerheads have been observed in waters with surface temperatures of 7 °C to 30 °C, but water temperatures  $\geq 11$  °C are most favorable (Shoop and Kenney 1992; Epperly *et al.* 1995b). Sea turtle presence in U.S. Atlantic waters is also influenced by water depth. While hard-shelled turtles occur in waters from the beach to beyond the continental shelf, they are most commonly found in neritic waters of the inner continental shelf (Mitchell *et al.* 2003; Braun-McNeill and Epperly 2002; Morreale and Standora 2005; Blumenthal *et al.* 2006; Hawkes *et al.* 2006; McClellan and Read 2007; Mansfield *et al.* 2009; Hawkes *et al.* 2011; Griffin *et al.* 2013).

#### *Seasonality*

Hard-shelled sea turtles occur year-round in waters off Cape Hatteras, North Carolina (NC) and south. As coastal water temperatures warm in the spring, loggerheads begin to migrate to inshore waters of the southeast United States and also move up the Atlantic Coast (Epperly *et al.* 1995a, 1995b, 1995c; Braun-McNeill and Epperly 2002; Morreale and Standora 2005; Griffin *et al.* 2013), occurring in Virginia (VA) foraging areas as early as late April and on the most northern foraging grounds in the GOM in June (Shoop and Kenney 1992). The trend is reversed in the fall as water temperatures cool. The large majority leave the GOM by September, but some remain in Mid-Atlantic and Northeast areas until late fall. By December, sea turtles have migrated south to waters offshore of NC, particularly south of Cape Hatteras, and further south (Shoop and Kenney 1992; Epperly *et al.* 1995b; Hawkes *et al.* 2011; Griffin *et al.* 2013).

### *Leatherback Sea Turtles (Non-Hard Shelled Sea Turtles)*

Leatherbacks, a pelagic species, are known to use coastal waters of the U.S. continental shelf and to have a greater tolerance for colder water than hard-shelled sea turtles (James *et al.* 2005; Eckert *et al.* 2006; Murphy *et al.* 2006; NMFS and USFWS 2013; Dodge *et al.* 2014). Leatherback sea turtles engage in routine migrations between northern temperate and tropical waters (NMFS and USFWS 1992; James *et al.* 2005; James *et al.* 2006; Dodge *et al.* 2014). They are found in more northern waters (i.e., Gulf of Maine) later in the year (i.e., similar time frame as hard-shelled sea turtles), with most leaving the Northwest Atlantic shelves by mid-November (James *et al.* 2005; James *et al.* 2006; Dodge *et al.* 2014).

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### 7.5.2 Marine Mammals

#### 7.5.2.1 Large Whales

As provided in Table 34, as North Atlantic right, humpback, fin, sei, and minke whales are found throughout the waters of the Northwest Atlantic Ocean, these species will occur in the affected environment of the tautog fishery. In general, these species follow an annual pattern of migration between low latitude (south of 35°N) wintering/calving grounds and high latitude spring/summer foraging grounds (primarily north of 41°N; Waring *et al.* 2014; Waring *et al.* 2015; Waring *et al.* 2016; NMFS 1991, 2005, 2010, 2011a, 2012). This, however, is a simplification of whale movements, particularly as it relates to winter movements. It remains unknown if all individuals of a population migrate to low latitudes in the winter, although, increasing evidence suggests that for some species (e.g., right and humpback whales), some portion of the population remains in higher latitudes throughout the winter (Waring *et al.* 2014; Waring *et al.* 2015; Waring *et al.* 2016; Khan *et al.* 2009, 2010, 2011, 2012; Brown *et al.* 2002; NOAA 2008; Cole *et al.* 2013; Clapham *et al.* 1993; Swingle *et al.* 1993; Vu *et al.* 2012). Although further research is needed to provide a clearer understanding of large whale movements and distribution in the winter, the distribution and movements of large whales to foraging grounds in the spring/summer is well understood. Movements of whales into higher latitudes coincide with peak productivity in these waters. As a result, the distribution of large whales in higher latitudes is strongly governed by prey availability and distribution, with large numbers of whales coinciding with dense patches of preferred forage (Mayo and Marx 1990; Kenney *et al.* 1986, 1995; Baumgartner *et al.* 2003; Baumgartner and Mate 2003; Payne *et al.* 1986, 1990; Brown *et al.* 2002; Kenney and Hartley 2001; Schilling *et al.* 1992). For additional information on the biology, status, and range wide distribution of each whale species please refer to: Waring *et al.* 2014; Waring *et al.* 2015; Waring *et al.* 2016; NMFS 1991, 2005, 2010, 2011a, 2012.

To further assist in understanding how the tautog fishery may overlaps in time and space with the occurrence of large whales, a general overview on species occurrence and distribution in the area of operation for the tautog fishery is provided in the following table (Table 34).

**Table 34. Large whale occurrence in the area of operation for the tautog fishery**

Species	Prevalence and Approximate Months of Occurrence
North Atlantic Right Whale	<ul style="list-style-type: none"><li>• Distributed throughout all continental shelf waters from the GOM to the South Atlantic Bight (SAB) throughout the year; however, increasing evidence of year round presence in the GOM.</li><li>• New England waters (GOM and GB regions) = <b>Foraging Grounds</b> (January through October)). Seasonally important foraging grounds include, but not limited to:<ul style="list-style-type: none"><li>› Cape Cod Bay (January-April);</li></ul></li></ul>

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Species	Prevalence and Approximate Months of Occurrence
	<ul style="list-style-type: none"> <li>› Great South Channel (April-June);</li> <li>› western Gulf of Maine (April-May, and July-October);</li> <li>› Jordan Basin (August-October);</li> <li>› Wilkinson Basin (April-July); and</li> <li>› northern edge of GB (May-July);</li> <li>• Mid-Atlantic waters: Migratory pathway to/from northern (high latitude) foraging and southern calving grounds.</li> <li>• Increasing evidence of wintering areas (approximately November – January) in:               <ul style="list-style-type: none"> <li>› Cape Cod Bay;</li> <li>› Jeffreys and Cashes Ledges;</li> <li>› Jordan Basin; and</li> <li>› Massachusetts Bay (e.g., Stellwagen Bank).</li> </ul> </li> </ul>
Humpback	<ul style="list-style-type: none"> <li>• Distributed throughout all continental shelf waters of the Mid-Atlantic (SNE included), GOM, and GB throughout the year.</li> <li>• New England waters (GOM and GB regions) = <b>Foraging Grounds</b> (March-November).</li> <li>• Mid-Atlantic waters: Migratory pathway to/from northern (high latitude) foraging and southern (West Indies) calving grounds.</li> <li>• Increasing evidence of whales remaining in mid- and high- latitudes throughout the winter. Specifically, increasing evidence of wintering areas (for juveniles) in Mid-Atlantic (e.g., waters in the vicinity of Chesapeake and Delaware Bays; peak presence approximately January through March) and Southeastern coastal waters.</li> </ul>
Fin	<ul style="list-style-type: none"> <li>• Distributed throughout all continental shelf waters of the Mid-Atlantic (SNE included), GOM, and GB throughout the year.</li> <li>• Mid-Atlantic waters:               <ul style="list-style-type: none"> <li>› Migratory pathway to/from northern (high latitude) foraging and southern (low latitude) calving grounds; and</li> <li>› Possible offshore calving area (October-January).</li> </ul> </li> <li>• New England(GOM and GB)/SNE waters = <b>Foraging Grounds</b> (greatest densities March-August; lower densities September-November). Important foraging grounds include:               <ul style="list-style-type: none"> <li>&gt; Massachusetts Bay (esp. Stellwagen Bank);</li> </ul> </li> </ul>

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Species	Prevalence and Approximate Months of Occurrence
	<ul style="list-style-type: none"> <li>&gt; Great South Channel;</li> <li>&gt; Waters off Cape Cod (~40-50 meter contour);</li> <li>&gt; GOM;</li> <li>&gt; Perimeter (primarily eastern) of GB; and</li> <li>&gt; Mid-shelf area off the east end of Long Island.</li> </ul> <ul style="list-style-type: none"> <li>• Evidence of wintering areas in mid-shelf areas east of New Jersey (NJ), Stellwagen Bank; and eastern perimeter of GB.</li> </ul>
Sei	<ul style="list-style-type: none"> <li>• Uncommon in shallow, inshore waters of the Mid-Atlantic (SNE included), GB, and GOM; however, occasional incursions during peak prey availability and abundance.</li> <li>• Primarily found in deep waters along the shelf edge, shelf break, and ocean basins between banks.</li> <li>• Spring through summer, found in greatest densities in offshore waters of the GOM and GB; sightings concentrated along the northern, eastern (into Northeast Channel) and southwestern (in the area of Hydrographer Canyon) edge of GB.</li> </ul>
Minke	<ul style="list-style-type: none"> <li>• Widely distributed throughout continental shelf waters (&lt;100m deep) of the Mid-Atlantic (SNE included), GOM, and GB.</li> <li>• Most common in the EEZ from spring through fall, with greatest abundance found in New England waters.</li> </ul>
<p><b>Sources:</b> NMFS 1991, 2005, 2010, 2011a, 2012; Hain <i>et al.</i> 1992; Payne <i>et al.</i> 1984; Good 2008; Pace and Merrick 2008; McLellan <i>et al.</i> 2004; Hamilton and Mayo 1990; Schevill <i>et al.</i> 1986; Watkins and Schevill 1982; Payne <i>et al.</i> 1990; Winn <i>et al.</i> 1986; Kenney <i>et al.</i> 1986, 1995; Khan <i>et al.</i> 2009, 2010, 2011, 2012; Brown <i>et al.</i> 2002; NOAA 2008; 50 CFR 224.105; CETAP 1982; Clapham <i>et al.</i> 1993; Swingle <i>et al.</i> 1993; Vu <i>et al.</i> 2012; Baumgartner <i>et al.</i> 2011; Cole <i>et al.</i> 2013; Risch <i>et al.</i> 2013; Waring <i>et al.</i> 2014; Waring <i>et al.</i> 2015; Waring <i>et al.</i> 2016; 81 FR 4837(January 27, 2016); NMFS 2015b; Bort <i>et al.</i> 2015.</p>	

### 7.5.3 Small Cetacean

As provided in Table 35, as Atlantic white sided dolphins, short and long finned pilot whales, Risso’s dolphins, short beaked common dolphins, harbor porpoise, and several stocks of bottlenose dolphins are found throughout the year in the Northwest Atlantic Ocean, these species will occur in the affected environment of the tautog fishery (Waring *et al.* 2014; Waring *et al.* 2015; Waring *et al.* 2016). Within this range; however, there are seasonal shifts in species distribution and abundance. To further assist in understanding how fisheries may overlap in time and space with the occurrence of small cetaceans, a general overview of species occurrence and distribution in the area of operation for the tautog fishery is provided in the following table (Table 35). For additional information on the biology, status, and range wide distribution of each species please refer to Waring *et al.* (2014), Waring *et al.* (2015), and Waring *et al.* (2016).

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**Table 35. Small cetacean occurrence in the area of operation of the tautog fishery.**

Species	Prevalence and Approximate Months of Occurrence
Atlantic White Sided Dolphin	<ul style="list-style-type: none"> <li>• Distributed throughout the continental shelf waters (primarily to 100 meter isobath) of the Mid-Atlantic (north of 35°N), SNE, GB, and GOM ; however, most common in continental shelf waters from Hudson Canyon (~ 39°N) to GB, and into the GOM.</li> <li>• <b>January-May:</b> low densities found from GB to Jeffreys Ledge.</li> <li>• <b>June-September:</b> Large densities found from GB, through the GOM.</li> <li>• <b>October-December:</b> intermediate densities found from southern GB to southern GOM.</li> <li>• South of GB (SNE and Mid-Atlantic), low densities found year round, with waters off Virginia (VA) and NC representing southern extent of species range during winter months.</li> </ul>
Short Beaked Common Dolphin	<ul style="list-style-type: none"> <li>• Regularly found throughout the continental shelf-edge-slope waters (primarily between the 100-2,000 meter isobaths) of the Mid-Atlantic, SNE, and GB (esp. in Oceanographer, Hydrographer, Block, and Hudson Canyons).</li> <li>• Less common south of Cape Hatteras, NC, although schools have been reported as far south as the Georgia (GA)/South Carolina (SC) border.</li> <li>• <b>January-May:</b> occur from waters off Cape Hatteras, NC, to GB (35° to 42°N).</li> <li>• <b>Mid-summer-autumn:</b> Occur primarily on GB with small numbers present in the GOM; <i>Peak abundance</i> found on GB in the autumn.</li> </ul>
Risso's Dolphin	<ul style="list-style-type: none"> <li>• <b>Spring through fall:</b> Distributed along the continental shelf edge from Cape Hatteras, NC, to GB.</li> <li>• <b>Winter:</b> distributed in the Mid-Atlantic Bight, extending into oceanic waters.</li> <li>• Rarely seen in the GOM; primarily a Mid-Atlantic continental shelf edge species (can be found year round).</li> </ul>

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Species	Prevalence and Approximate Months of Occurrence
Harbor Porpoise	<ul style="list-style-type: none"> <li>• Distributed throughout the continental shelf waters of the Mid-Atlantic (north of 35°N), SNE, GB, and GOM.</li> <li>• <b>July-September:</b> Concentrated in the northern GOM (waters &lt; 150 meters); low numbers can be found on GB.</li> <li>• <b>October-December:</b> widely dispersed in waters from NJ to Maine (ME); seen from the coastline to deep waters (&gt;1,800 meters).</li> <li>• <b>January-March:</b> intermediate densities in waters off NJ to NC; low densities found in waters off New York (NY) to GOM.</li> <li>• <b>April-June:</b> widely dispersed from NJ to ME; seen from the coastline to deep waters (&gt;1,800 meters).</li> </ul>
Bottlenose Dolphin	<p><b><u>Western North Atlantic Offshore Stock</u></b></p> <ul style="list-style-type: none"> <li>• Distributed primarily along the outer continental shelf and continental slope in the Northwest Atlantic from GB to FL.</li> <li>• Depths of occurrence: ≥40 meters</li> </ul> <p><b><u>Western North Atlantic Northern Migratory Coastal Stock</u></b></p> <ul style="list-style-type: none"> <li>• Warm water months (e.g., July-August): distributed from the coastal waters from the shoreline to approximately the 25-meter isobaths between the Chesapeake Bay mouth and Long Island, NY.</li> <li>• Cold water months (e.g., January-March): stock occupies coastal waters from Cape Lookout, NC, to the NC/VA border.</li> </ul> <p><b><u>Western North Atlantic Southern Migratory Coastal Stock</u></b></p> <ul style="list-style-type: none"> <li>• <b>October-December:</b> stock occupies waters of southern NC (south of Cape Lookout)</li> <li>• <b>January-March:</b> stock moves as far south as northern FL.</li> <li>• <b>April-June:</b> stock moves north to waters of NC.</li> <li>• <b>July-August:</b> stock is presumed to occupy coastal waters north of Cape Lookout, NC, to the eastern shore of VA.</li> </ul>



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<b>Species</b>	<b>Prevalence and Approximate Months of Occurrence</b>
<p align="center">Pilot Whales: <i>Short- and Long-Finned</i></p>	<p><b><u>Short- Finned Pilot Whales</u></b></p> <ul style="list-style-type: none"> <li>• Except for area of overlap (see below), primarily occur south of 40°N (Mid-Atl and SNE waters); although low numbers have been found along the southern flank of GB, but no further than 41°N.</li> <li>• May through December (approximately): distributed primarily near the continental shelf break of the Mid-Atlantic and SNE; individuals begin shifting to southern waters (i.e., 35°N and south) beginning in the fall.</li> </ul> <p><b><u>Long-Finned Pilot Whales</u></b></p> <ul style="list-style-type: none"> <li>• Except for area of overlap (see below), primarily occur north of 42°N.</li> <li>• Winter to early spring (November through April): primarily distributed along the continental shelf edge-slope of the Mid-Atlantic, SNE, and GB.</li> <li>• Late spring through fall (May through October): movements and distribution shift onto/within GB, the Great South Channel, and the GOM.</li> </ul> <p><b><u>Area of Species Overlap:</u></b> between approximately 38°N and 41°N.</p>
<p><b>Notes :</b> <span style="float: right;"><sup>1</sup>Information</span>  presented in table is representative of small cetacean occurrence in the Northwest Atlantic continental shelf waters out to the 2,000 meter isobath.</p> <p><b>Sources:</b> Waring <i>et al.</i> 1992, 2007, 2014, 2015, 2016; Payne and Heinemann 1993; Payne <i>et al.</i> 1984; Jefferson <i>et al.</i> 2009.</p>	

**7.5.4 Pinnipeds**

As provided in Table 36, harbor, gray, harp, and hooded seals will occur in the affected environment of the tautog fishery. Specifically, pinnipeds are found in the nearshore, coastal waters of the Northwest Atlantic Ocean. They are primarily found throughout the year or seasonally from New Jersey to Maine; however, increasing evidence indicates that some species (e.g., harbor seals) may be extending their range seasonally into waters as far south as Cape Hatteras, North Carolina (35°N) (Waring *et al.* 2007, 2014, 2015, 2016). To further assist in understanding how the tautog fishery may overlap in time and space with the occurrence of

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pinnipeds, a general overview of species occurrence and distribution in the area of operation of the tautog fishery is provided in the following table. For additional information on the biology, status, and range wide distribution of each species of pinniped please refer to Waring *et al.* (2007), Waring *et al.* (2014), Waring *et al.* (2015), Waring *et al.* (2016).

**Table 36. Pinniped occurrence in the area of operation of the tautog fishery.**

Species	Prevalence
Harbor Seal	<ul style="list-style-type: none"> <li>• Primarily distributed in waters from NJ to ME; however, increasing evidence indicates that their range is extending into waters as far south as Cape Hatteras, NC (35°N).</li> <li>• <b>Year Round:</b> Waters of ME</li> <li>• <b>September-May:</b> Waters from New England to NJ.</li> </ul>
Gray Seal	<ul style="list-style-type: none"> <li>• Distributed in waters from NJ to ME.</li> <li>• <b>Year Round:</b> Waters from ME to MA.</li> <li>• <b>September-May:</b> Waters from Rhode Island to NJ.</li> </ul>
Harp Seal	<ul style="list-style-type: none"> <li>• Winter-Spring (approximately January-May): Waters from ME to NJ.</li> </ul>
Hooded Seal	<ul style="list-style-type: none"> <li>• Winter-Spring (approximately January-May): Waters of New England.</li> </ul>

**Sources:** Waring *et al.* 2007 (for hooded seals); Waring *et al.* 2014; Waring *et al.* 2015; Waring *et al.* 2016.

### 7.5.5 Atlantic Sturgeon

Table 37 lists the 5 DPSs of Atlantic sturgeon that occur in the affected environment of the tautog fishery and that may be affected by the operation of this fishery. The marine range of U.S. Atlantic sturgeon extends from Labrador, Canada, to Cape Canaveral, Florida. All five DPSs of Atlantic sturgeon have the potential to be located anywhere in this marine range; in fact, results from genetic studies show that, regardless of location, multiple DPSs can be found at any one location along the Northwest Atlantic coast (ASSRT 2007; Dovel and Berggren 1983; Dadswell *et al.* 1984; Kynard *et al.* 2000; Stein *et al.* 2004a; Dadswell 2006; Laney *et al.* 2007; Dunton *et al.* 2010; Dunton *et al.* 2012; Dunton *et al.* 2015; Erickson *et al.* 2011; Wirgin *et al.* 2012; O’Leary *et al.* 2014; Waldman *et al.* 2013; Wirgin *et al.* 2015a,b).

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**Table 37. Atlantic Sturgeon DPSs that occur in the area of operation for the tautog fishery**

Species	Listed Under the ESA
Gulf of Maine (GOM) DPS	threatened
New York Bight (NYB) DPS	endangered
Chesapeake Bay (CB) DPS	endangered
Carolina DPS	endangered
South Atlantic (SA) DPS	endangered

Based on fishery- independent and dependent data, as well as data collected from tracking and tagging studies, in the marine environment, Atlantic sturgeon appear to primarily occur inshore of the 50 meter depth contour (Stein *et al.* 2004 a,b; Erickson *et al.* 2011; Dunton *et al.* 2010); however, Atlantic sturgeon are not restricted to these depths, as excursions into deeper continental shelf waters have been documented (Timoshkin 1968; Collins and Smith 1997; Stein *et al.* 2004a,b; Dunton *et al.* 2010; Erickson *et al.* 2011). Data from fishery-independent surveys and tagging and tracking studies also indicate that some Atlantic sturgeon may undertake seasonal movements along the coast (Erickson *et al.* 2011; Dunton *et al.* 2010; Wipplehauser 2012). For instance, tagging and tracking studies found that satellite-tagged adult sturgeon from the Hudson River concentrated in the southern part of the Mid-Atlantic Bight, at depths greater than 20 meters, during winter and spring, while in the summer and fall, Atlantic sturgeon concentrations shifted to the northern portion of the Mid-Atlantic Bight at depths less than 20 meters (Erickson *et al.* 2011).

Within the marine range of Atlantic sturgeon, several marine aggregation areas have been identified adjacent to estuaries and/or coastal features formed by bay mouths and inlets along the U.S. eastern seaboard (i.e., waters off North Carolina, Chesapeake Bay, and Delaware Bay; New York Bight; Massachusetts Bay; Long Island Sound; and Connecticut and Kennebec River Estuaries); depths in these areas are generally no greater than 25 meters (Bain *et al.* 2000; Savoy and Pacileo 2003; Stein *et al.* 2004a; Laney *et al.* 2007; Dunton *et al.* 2010; Erickson *et al.* 2011; Oliver *et al.* 2013; Waldman *et al.* 2013; O’Leary *et al.* 2014; Wipplehauser 2012; Wipplehauser and Squiers 2015). Although additional studies are still needed to clarify why these particular sites are chosen by Atlantic sturgeon, there is some indication that they may serve as thermal refuge, wintering sites, or marine foraging areas (Stein *et al.* 2004a; Dunton *et al.* 2010; Erickson *et al.* 2011).

### **7.5.6 Atlantic Salmon (Gulf of Maine DPS)**

The wild populations of Atlantic salmon are listed as endangered under the ESA. Their freshwater range occurs in the watersheds from the Androscoggin River northward along the Maine coast to the Dennys River, while the marine range of the GOM DPS extends from the GOM (primarily northern portion of the GOM), to the coast of Greenland (Fay *et al.* 2006; NMFS

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& USFWS 2005, 2016). In general, smolts, post-smolts, and adult Atlantic salmon may be present in the GOM and coastal waters of Maine in the spring (beginning in April), and adults may be present throughout the summer and fall months (Baum 1997; Fay *et al.* 2006; Hyvarinen *et al.* 2006; Lacroix & Knox 2005; Lacroix & McCurdy 1996; Lacroix *et al.* 2004; NMFS & USFWS 2005, 2016; Reddin 1985; Reddin & Friedland 1993; Reddin & Short 1991). For additional information on the on the biology, status, and range wide distribution of the GOM DPS of Atlantic salmon, refer to NMFS and USFWS (2005, 2016); Fay *et al.* (2006).

### 7.6 INTERACTIONS BETWEEN GEAR AND PROTECTED RESOURCES

Protected species in Table 33 are all known to be vulnerable to interactions with various types of fishing gear. Available information on gear interactions with a given species (or species group) is provided in the sections below. These sections are not a comprehensive review of all fishing gear types known to interact with a given species; emphasis is only being placed on the primary gear types used to prosecute the tautog fishery (i.e., hook and line and pot/trap gear).

#### 7.6.1 Marine Mammals

Pursuant to the MMPA, NMFS publishes a List of Fisheries (LOF) annually, classifying U.S. commercial fisheries into one of three categories based on the relative frequency of incidental serious injuries and/or mortalities of marine mammals in each fishery (i.e., Category I=frequent; Category II=occasional; Category III=remote likelihood or no known interactions; 82 FR 3655 (January 12, 2017)). In the Northwest Atlantic, the 2017 MMPA LOF (82 FR 3655 (January 12, 2017) categorizes commercial Northeast and Mid-Atlantic bottom trawl, and Atlantic mixed species trap/pot fisheries as Category II fisheries.<sup>2</sup> General hook and line gear associated with rod and reel fishing has not been categorized as it is primarily prosecuted by recreational fisheries.

#### 7.6.2 Large Whales

##### 7.6.2.1 Hook and Line Gear

Large whales are known to interact with hook and line gear; however, in the most recent (2010-2014) mortality and serious injury determinations for baleen whales, the majority of cases identified with confirmed hook and line or monofilament entanglement did not result in the serious injury or mortality to the whale (89.5% observed/reported whales had a serious injury value of 0; 10.5% had a serious injury value of 0.75; none of the cases resulted in mortality; Henry *et al.* 2016).<sup>3</sup> In fact, 85.0% of the whales observed or reported with a hook/line or monofilament entanglement were resighted gear free and healthy; confirmation of the health of the other remaining whales remain unknown as no resightings had been made over the timeframe of the assessment (Henry *et al.* 2016). Based on this information, while large whale

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<sup>2</sup> Atlantic mixed species trap/pot fisheries include, but are not limited to: crab (red, Jonah, and rock), hagfish, finfish (black sea bass, scup, tautog, cod, haddock, pollock, redfish (ocean perch), and white hake), conch/whelk, and shrimp

<sup>3</sup> Any injury leading to a significant health decline (e.g., skin discoloration, lesions near the nares, fat loss, increased cyamid loads) is classified as a serious injury (SI) and will result in a SI value set at 1 (Henry *et al.* 2016).

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interactions with hook and line gear are possible, there is a low probability that an interaction will result in serious injury or mortality to any large whale species.

### 7.6.2.2 Bottom Trawl Gear

With the exception of minke whales, there have been no observed interactions with large whales and bottom trawl gear. To date, bottom trawl interactions with minke whales have only been observed in the MMPA LOF Category II Northeast bottom trawl fisheries. From the period of 2008-2012, the estimated annual mortality attributed to this fishery was 7.8 minke whales for 2008, and zero minke whales from 2009-2012; no serious injuries were reported during this time (Waring *et al.* 2015). Based on this information, from 2008-2012, the estimated annual average minke whale mortality and serious injury attributed to the northeast bottom trawl fishery was 1.6 (CV=0.69) whales (Waring *et al.* 2015). Lyssikatos (2015) estimated that from 2008-2013, mean annual serious injuries and mortalities from the northeast bottom trawl fishery were 1.40 (CV=0.58) minke whales. Based on above information, bottom trawl gear is likely to pose a low interaction risk to any large whale species. Should an interaction occur, serious injury or mortality to any large whale is possible; however, relative to other gear types discussed below (i.e., fixed gear (pot/trap)), bottom trawl gear represents a low source serious injury or mortality to any large whale.

### 7.6.2.3 Pot/Trap Gear

The greatest entanglement risk to large whales is posed by fixed fishing gear (e.g., sink gillnet and trap/pot gear) comprised of lines (vertical or ground) that rise into the water column. Any line can become entangled in the mouth (baleen), flippers, and/or tail of the whale when the animal is transiting or foraging through the water column (Johnson *et al.* 2005; NMFS 2014; Kenney and Hartley 2001; Hartley *et al.* 2003; Whittingham *et al.* 2005a,b). For instance, in a study of right and humpback whale entanglements, Johnson *et al.* (2005) attributed: (1) 89% of entanglement cases, where gear could be identified, to fixed gear consisting of pot and gillnets and (2) entanglement of one or more body parts of large whales (e.g., mouth and/or tail regions) to four different types of line associated with fixed gear (the buoy line, groundline, floatline, and surface system lines).<sup>4</sup> Although available data (e.g., Johnson *et al.* (2005), Waring *et al.* (2016); Henry *et al.* (2016)) provides insight into large whale entanglement risks with fixed fishing gear, determining which part of fixed gear creates the most entanglement risk for large whales is difficult (Johnson *et al.* 2005). The difficulties arise from uncertainties surrounding the nature of the entanglement event, as well as unknown biases associated with reporting effort and the lack of information about the types and amounts of gear being used (Johnson *et al.* 2005). As a result, any type or part of fixed gear is considered to create an entanglement risk to large whales and should be considered potentially dangerous to large whale species (Johnson *et al.* 2005).

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<sup>4</sup> Buoy line connects the gear at the bottom to the surface system. Groundline in trap/pot gear connects traps/pots to each other to form trawls; in gillnet gear, groundline connects a gillnet, or gillnet bridle to an anchor or buoy line. Floatline is the portion of gillnet gear from which the mesh portion of the net is hung. The surface system includes buoys and high-flyers, as well as the lines that connect these components to the buoy line.

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Table 38 summarizes confirmed human-caused injury and mortality to humpback, fin, sei, minke, and North Atlantic right whales along the Gulf of Mexico Coast, U.S. East Coast, and Atlantic Canadian Provinces from 2010 to 2014 (Henry *et al.* 2016); the data provided in Table Z5 is specific to confirmed injury or mortality to whales from entanglement in fishing gear. As many entanglement events go unobserved, and because the gear type, fishery, and/or country of origin for reported entanglement events are often not traceable, it is important to recognize that the information presented likely underestimates the rate of large whale serious injury and mortality due to entanglement. Further studies looking at scar rates for right whales and humpbacks suggests that entanglements may be occurring more frequently than the observed incidences indicate (NMFS 2014; Robbins 2009; Knowlton *et al.* 2012).

**Table 38. Summary of confirmed human-caused injury or mortality to fin, minke, humpback, sei, and North Atlantic right whales from 2010-2014 due to entanglement in fishing gear.<sup>1</sup>**

Species	Total Confirmed Entanglement: Serious Injury <sup>2</sup>	Total Confirmed Entanglement: Non-Serious Injury	Total Confirmed Entanglement: Mortality	Entanglement Events: Total Average Annual Injury and Mortality Rate (US waters/Canadian waters/unassigned waters)
North Atlantic Right Whale	16	31	8	4.65 (0.4/0/4.25)
Humpback Whale	30	53	8	6.85 (1.55/0/5.3)
Fin Whale	6	1	4	1.8 (0.2/0.8/0.8)
Sei Whale	0	0	0	0
Minke Whale	20	11	16	6.4 (1.7/2.45/2.25)

**Notes:**

<sup>1</sup>Information presented is based on confirmed human-caused injury and mortality events along the Gulf of Mexico Coast, US East Coast, and Atlantic Canadian Provinces; it is not specific to US waters only.

<sup>2</sup> NMFS defines a serious injury as an injury that is more likely than not to result in mortality (for additional details see: [http://www.nmfs.noaa.gov/pr/pdfs/serious\\_injury\\_procedure.pdf](http://www.nmfs.noaa.gov/pr/pdfs/serious_injury_procedure.pdf))

**Source:** Henry *et al.* 2016

Pursuant to the MMPA, NMFS publishes a LOF annually, classifying U.S. commercial fisheries into one of three categories based on the relative frequency of incidental serious injurious and mortalities of marine mammals in each fishery (i.e., Category I=frequent; Category II=occasional; Category III=remote likelihood or no known interactions). Large whales, in particular, humpback, fin, minke, and North Atlantic right whales, are known to interact with Category I and II fisheries in the (Northwest) Atlantic Ocean. In addition, as provided in Table

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38, humpback, fin, and North Atlantic right whales are considered strategic stocks under the MMPA. Section 118(f)(1) of the MMPA requires the preparation and implementation of a Take Reduction Plan (TRP) for any strategic marine mammal stock that interacts with Category I or II fisheries. In response to its obligations under the MMPA, in 1996, NMFS established the Atlantic Large Whale Take Reduction Team (ALWTRT) to develop a plan (Atlantic Large Whale Take Reduction Plan (ALWTRP or Plan)) to reduce serious injury to, or mortality of large whales, specifically, humpback, fin, and North Atlantic right whales, due to incidental entanglement in U.S. commercial fishing gear.<sup>5</sup> In 1997, the ALWTRP was implemented; however, since 1997, the Plan has been modified; recent adjustments include the Sinking Groundline Rule and Vertical Line Rules (72 FR 57104, October 5, 2007; 79 FR 36586, June 27, 2014; 79 FR 73848, December 12, 2014; 80 FR 14345, March 19, 2015; 80 FR 30367, May 28, 2015).

The TRP consists of regulatory (e.g., universal gear requirements, modifications, and requirements; area- and season- specific gear modification requirements and restrictions; time/area closures) and non-regulatory measures (e.g., gear research and development, disentanglement, education and outreach) that, in combination, seek to assist in the recovery of North Atlantic right, humpback, and fin whales by addressing and mitigating the risk of entanglement in gear employed by commercial fisheries, specifically trap/pot and gillnet fisheries (<http://www.greateratlantic.fisheries.noaa.gov/Protected/whaletrp/>; 73 FR 51228; 79 FR 36586; 79 FR 73848; 80 FR 14345; 80 FR 30367). The TRP recognizes trap/pot and gillnet Management Areas in Northeast, Mid-Atlantic, and Southeast regions of the U.S, and identifies gear modification requirements and restrictions for Category I and II gillnet and trap/pot fisheries in these regions; these Category I and II fisheries must comply with all regulations of the Plan.<sup>6</sup> For further details on the ALWTRP please see: <http://www.greateratlantic.fisheries.noaa.gov/Protected/whaletrp/>

### 7.6.3 Small Cetacean and Pinnipeds

#### 7.6.3.1 Hook and Line and Pot/Trap Gear

Over the past several years, observer coverage has been limited for fisheries prosecuted with hook and line or trap/pot gear. In the absence of extensive observer data for these fisheries, stranding data provides the next best source of information on species interactions with hook and line or trap/pot gear. It is important to note, however, stranding data underestimates the extent of human-related mortality and serious injury because not all of the marine mammals that die or are seriously injured in human interactions are discovered, reported, or show signs of entanglement. Additionally, if gear is present, it is often difficult to definitively attribute the animal's death to the gear interaction, or if pieces of gear are absent, attribute the death or serious injury to a specific fishery or fishing gear type. As a result, the conclusions below should

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<sup>5</sup> The measures identified in the ALWTRP are also beneficial to the survival of the minke whale, which are also known to be incidentally taken in commercial fishing gear.

<sup>6</sup> The fisheries currently regulated under the ALWTRP include: Northeast/Mid-Atlantic American lobster trap/pot; Atlantic blue crab trap/pot; Atlantic mixed species trap/pot; Northeast sink gillnet; Northeast anchored float gillnet; Northeast drift gillnet; Mid-Atlantic gillnet; Southeastern U.S. Atlantic shark gillnet; and Southeast Atlantic gillnet (NMFS 2014c).

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be taken with these considerations in mind, and with an understanding that interactions may occur more frequently than what we are able to detect at this time.

Table 39 provides a list of small cetacean and pinniped species that may be affected by the tautog fishery. Of these species, only several bottlenose dolphin stocks have been identified as species at risk of becoming seriously injured or killed by hook and line or trap/pot gear. For each dolphin stock identified, stranding data provides the best source of information on species interaction history with pot/trap and hook and line gear types. Specifically, based on stranding data from 2007-2013, estimated mean annual mortality for each stock due to interactions with trap/pot gear was approximately one animal; interactions with hook and line gear also caused approximately one annual mortality for each stock (Waring *et al.* 2014; Waring *et al.* 2016).<sup>7</sup> Based on this and the best available information, hook and line or trap/pot gear is not expected to pose an interaction risk to pinniped species. Interaction risks to small cetaceans (specifically bottlenose dolphins) are expected to be low. Should an interaction with a small cetacean occur, serious injury or mortality to the animal is possible; however, relative to other gear types discussed below (i.e., trawl or gillnet gear), hook and line or trap/pot gear represents a low source serious injury or mortality to any small cetacean.

### 7.6.3.2 Bottom Trawl Gear

Small cetaceans and pinnipeds are vulnerable to interactions with bottom trawl gear. Species that have been observed incidentally injured and/or killed by MMPA LOF Category II (occasional interactions) Northeast bottom or Mid-Atlantic trawl fisheries are provided in Table 39 (Waring *et al.* 2014; Waring *et al.* 2015; Waring *et al.* 2016; 82 FR 3655 (January 12, 2017)). Of the species provided, short-beaked common dolphins and Atlantic white-sided dolphins are the most frequently observed bycaught marine mammal species in Northeast bottom trawl gear, followed by gray seals, long-finned pilot whales, and risso's dolphins (Lyssikatos 2015). In the Mid-Atlantic, the most frequently observed bycaught marine mammal species in Mid-Atlantic bottom trawl gear was common dolphins, followed by Risso's dolphins, gray seals, offshore bottlenose dolphins, and harbor seals (Lyssikatos 2015).

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<sup>7</sup> Stranding data provided in Waring *et al.* (2015) was not considered in estimating mean annual mortality as not all bottlenose dolphin stocks are addressed in this stock assessment report. As all bottlenose dolphin stocks are considered in Waring *et al.* (2014) and Waring *et al.* (2016), these stock assessment reports were used to estimate mean annual mortality. Estimates of mean annual mortality were calculated based on the total number of animals that stranded between 2007-2013, and that were determined to have incurred serious injuries or mortality as result of interacting with hook and line or trap/pot gear. Please note, for bottlenose dolphin stocks, Waring *et al.* (2014) and Waring *et al.* (2016) provides two categories for trap/pot gear: (Atlantic Blue) Crab Pot, and Other Pot gear. We combined the two to get an overall number of interactions associated with trap/pot gear in general. In addition, any animals released alive with no serious injuries were not included in the estimate. Also, if maximum or minimum number of animals stranded were provided, to be conservative, we considered the maximum estimated number in calculating our mean annual estimate of mortality.



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**Table 39. Small cetacean and pinniped species observed seriously injured and/or killed by Category II bottom trawl fisheries in the affected environment of the tautog fishery.**

Fishery	Category	Species Observed or reported Injured/Killed
Northeast Bottom Trawl	II	Harp seal
		Harbor seal
		Gray seal
		Long-finned pilot whales
		Short-beaked common dolphin
		White-sided dolphin
		Harbor porpoise
		Bottlenose dolphin (offshore)
		Risso's dolphin
Mid-Atlantic Bottom Trawl	II	White-sided dolphin
		Pilot whales (spp)
		Short-beaked common dolphin
		Risso's dolphin
		Bottlenose dolphin (offshore)
		Gray seal
		Harbor seal
<i>Sources:</i> Waring <i>et al.</i> 2016; MMPA LOF 82 FR 3655 (January 12, 2017).		

**7.6.4 Sea Turtles**

*7.6.4.1 Hook and Line Gear*

ESA-listed species of sea turtles are known to interact with hook and line gear and are more commonly reported in nearshore, southern waters (Sea Turtle Disentanglement Network; NMFS 2013). Hook and line gear can cause injury and mortality to sea turtles, and therefore, can pose a risk to these species. However, the extent to which these interactions impact sea turtle populations is still under investigation and, therefore, no conclusions can currently be made on the impact of hook and line gear on the continued survival of sea turtle populations.

*7.6.4.2 Bottom Trawl Gear*

Sea turtle interactions bottom trawl gear have been observed in the Gulf of Maine, Georges Bank, and the Mid-Atlantic; however, most of the observed interactions have occurred in the Mid-Atlantic (see Murray 2011; Murray 2013; Murray 2015; Warden 2011a, b ). As few sea turtle interactions have been observed in the Gulf of Maine and Georges Bank regions of the Northwest Atlantic, there is insufficient data available to conduct a robust model-based analysis

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on sea turtle interactions with bottom trawl gear in these regions or produce a bycatch estimate for these regions. As a result, the bycatch estimates and discussion below are based on observed sea turtle interactions bottom trawl gear in the Mid-Atlantic.

Bottom trawl gear poses an injury and mortality risk to sea turtles, specifically due to forced submergence (Sasso and Epperly 2006). Green, Kemp's ridley, leatherback, loggerhead, and unidentified sea turtles have been documented interacting (e.g., bycaught) with bottom trawl gear. However, estimates are available only for loggerhead sea turtles. Warden (2011a,b) estimated that from 2005-2008, the average annual loggerhead interactions in bottom trawl gear in the Mid-Atlantic<sup>8</sup> was 292 (CV=0.13, 95% CI=221-369), with an additional 61 loggerheads (CV=0.17, 95% CI=41-83) interacting with trawls, but released through a Turtle Excluder Device.<sup>9</sup> The 292 average annual observable loggerhead interactions equates to approximately 44 adult equivalents (Warden 2011a,b). Most recently, Murray (2015) estimated that from 2009-2013, the total average annual loggerhead interactions in bottom trawl gear in the Mid-Atlantic<sup>10</sup> was 231 (CV=0.13, 95% CI=182-298); this equates to approximately 33 adult equivalents (Murray 2015b). Bycatch estimates provided in Warden (2011a) and Murray (2015) are a decrease from the average annual loggerhead bycatch in bottom otter trawls during 1996-2004, which Murray (2008) estimated at 616 sea turtles (CV=0.23, 95% CI over the nine-year period: 367-890). This decrease is likely due to decreased fishing effort in high-interaction areas (Warden 2011a, b).

### 7.6.4.3 Pot/Trap Gear

Leatherback, loggerhead, green, and Kemp's ridley sea turtles are known to interact with trap/pot gear, with interactions primarily associated with entanglement in vertical lines, although sea turtles can also become entangled in groundline or surface systems. Records of stranded or entangled sea turtles indicate that fishing gear can wrap around the neck, flipper, or body of the sea turtle and severely restrict swimming or feeding (Balazs 1985, STDN 2016). As a result, sea turtles can incur injuries and in some cases, mortality immediately or at a later time.

NMFS Northeast Region Sea Turtle Disentanglement Network's (STDN) database, a component of the Sea Turtle Stranding and Salvage Network, provides the most complete dataset of sea entanglements. Based on information provided in this database, a total of 333 sea turtle entanglements in vertical line gear were reported to the STDN and NMFS GARFO between 2002 and 2016 (STDN 2016).<sup>11</sup> Of the 333 reports, 316 were classified as probable or confirmed vertical line gear entanglement with a high confidence rating. Out of the 316 confirmed and

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<sup>8</sup> Warden (2011a) defined the Mid-Atlantic as south of Cape Cod, Massachusetts, to approximately the North Carolina/South Carolina border.

<sup>9</sup> Turtle Excluder Devices (TEDs) allow sea turtles to escape the trawl net, reducing injury and mortality resulting from capture in the net. TED regulations can be found at: 50 CFR 223.206, 68 FR 8456, and 50 CFR 223.206.

<sup>10</sup> Murray 2015 defined the Mid-Atlantic as the boundaries of the Mid-Atlantic Ecological Production; roughly waters west of 71°W to the North Carolina/South Carolina border)

<sup>11</sup> Data for 2016 was only available through September; data through the remainder of 2016 is still being processed.

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probable entanglement events, there were 147 cases in which the gear type associated with the entanglement could be assigned to a specific fishery. The majority of interactions involved leatherback sea turtles (130) followed by loggerhead (16), and green (1) sea turtles. Of the 130 leatherbacks, 68.5 % of the vertical line interactions involved gear associated with the lobster fishery (vertical line), 17.7 % the whelk fishery, 7.7% the seabass fishery, 2.3 % the crab fishery, 1.5 % the conch fishery, 1.5% research , and 0.77 % whelk and lobster fishery (both trap/pots present). Of the 16 loggerheads, 56.3% involved interactions with vertical line associated with the whelk fishery and 43.8% the crab fishery. The one green sea turtle case involved an interaction with vertical line associated with the whelk fishery.

### 7.6.5 Atlantic Sturgeon

#### 7.6.5.1 Hook and Line Gear

ESA-listed species of Atlantic sturgeon are known to interact with hook and line gear, particularly in nearshore waters from the Gulf Maine to Southern New England (NMFS 2013). Injury and mortality to Atlantic sturgeon can be incurred by hook and line gear interactions, and therefore, can pose a risk to these species. However, the extent to which these interactions are impacting Atlantic sturgeon DPSs is still under investigation and therefore, no conclusions can currently be made on the impact of hook and line gear on the continued survival of Atlantic sturgeon DPSs (NMFS 2013; NMFS 2011b).

#### 7.6.5.2 Bottom Trawl Gear

Atlantic sturgeon interactions (i.e., bycatch) with bottom trawl gear have been observed since 1989; these interactions have the potential to result in the injury or mortality of Atlantic sturgeon (NMFS NEFSC FSB 2015, 2016). Three documents, covering three time periods, that use data collected by the Northeast Fisheries Observer Program to describe bycatch of Atlantic sturgeon in gillnet and bottom trawl gear: Stein et al. (2004b) for 1989-2000; ASMFC (2007) for 2001-2006; and Miller and Shepard (2011) for 2006-2010; none of these documents provide estimates of Atlantic sturgeon bycatch by Distinct Population Segment. Miller and Shepard (2011), the most of the three documents, analyzed fishery observer data and VTR data in order to estimate the average annual number of Atlantic sturgeon interactions in gillnet and otter trawl in the Northeast Atlantic that occurred from 2006 to 2010. This timeframe included the most recent, complete data and as a result, Miller and Shepard (2011) is considered to represent the most accurate predictor of annual Atlantic sturgeon interactions in the Northeast gillnet and bottom trawl fisheries (NMFS 2013).

Based on the findings of Miller and Shepard (2011), NMFS (2013) estimated that the annual bycatch of Atlantic sturgeon in bottom otter trawl gear to be 1,342 sturgeon. Miller and Shepard (2011) observed Atlantic sturgeon interactions in trawl gear with small (< 5.5 inches) and large (≥ 5.5 inches) mesh sizes. Based on NEFOP observed sturgeon mortalities, Miller and Shepard (2011) concluded that, gillnet gear, in general, posed a greater risk of mortality to Atlantic sturgeon than did trawl gear. Estimated mortality rates in gillnet gear were 20.0%, while those in otter trawl gear were 5.0% (Miller and Shepard 2011; NMFS 2013). Similar conclusions were reached in Stein *et al.* (2004b) and ASMFC (2007) reports; after review of

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observer data from 1989-2000 and 2001-2006, both studies concluded that observed mortality is much higher in gillnet gear than in trawl gear. However, an important consideration to these findings is that observed mortality is considered a minimum of what actually occurs and therefore, the conclusions reached by Stein *et al.* (2004b), ASMFC (2007), and Miller and Shepard (2011) are not reflective of the total mortality associated with either gear type. To date, total Atlantic sturgeon mortality associated with gillnet or trawl gear remains uncertain.

### 7.6.5.3 Pot/Trap Gear

To date, there have been no observed/documentated interactions with Atlantic sturgeon and pot/trap gear (NMFS NEFSC FSB 2015, 2016). Based on this information, pot/trap gear is not expected to pose an interaction risk to any Atlantic sturgeon and therefore, is not expected to be a source of injury or mortality to this species.

## 7.6.6 Atlantic Salmon

### 7.6.6.1 Pot/Trap and Hook and Line Gear

To date, there have been no observed/documentated interactions with Atlantic salmon and hook and line or pot/trap gear (NMFS NEFSC FSB 2015, 2016). Based on this information, these gear types are not expected to pose an interaction risk to any Atlantic salmon and therefore, are not expected to be source of injury or mortality to this species.

### 7.6.6.2 Bottom Trawl Gear

Atlantic salmon interactions (i.e., bycatch) with bottom trawl gear have been observed since 1989; in many instances, these interactions have resulted in the injury and mortality of Atlantic salmon (NMFS NEFSC FSB 2015, 2016). According to the Biological Opinion issued by NMFS Greater Atlantic Regional Fisheries Office on December 16, 2013, NMFS Northeast Fisheries Science Center's (NEFSC) Northeast Fisheries Observer and At-Sea Monitoring Programs documented a total of 15 individual salmon incidentally caught on more than 60,000 observed commercial fishing trips from 1989 through August 2013 (NMFS 2013; Kocik *et al.* 2014). Of these fifteen Atlantic salmon, four were observed bycaught in bottom otter trawl gear (Kocik (NEFSC), pers. comm (February 11, 2013) in NMFS 2013). Since 2013, no additional Atlantic salmon have been observed in bottom trawl gear (NMFS NEFSC FSB 2015, 2016). Based on the above information, bottom trawl interactions with Atlantic salmon are likely rare (NMFS 2013; Kocik *et al.* 2014).

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## Appendix 1.

### Millstone Entrainment Sampling

Samples have been taken since 1976 at the Millstone Nuclear Power Plant in Waterford, Connecticut. Sampling frequency varies seasonally; over the period in which tautog eggs and larvae are collected, samples are taken day and night three times (May) or twice (June through August) a week. A conical plankton net (1.0 x 3.6 m, 335 microns mesh size) collects samples at outflow sites at the Millstone Nuclear Power Plant. Readings from four flowmeters mounted in the mouth of the net account for variations in horizontal and vertical flow. Sample volume is typically about 200 m<sup>3</sup>. All ichthyoplankton collections are immediately fixed in 10% formalin.

Samples are split repeatedly in the laboratory using a NOAA Bourne splitter. Successive splits are sorted and counted until at least 50 larvae (and 50 eggs for samples processed for eggs) are found, or until one half of the sample volume was processed. Tautog eggs are enumerated in all samples collected from April through October. Tautog and Cunner have eggs of similar appearance and were distinguished on the basis of a weekly bimodal distribution of egg diameters (Williams 1967).

Means of annual cumulative sum of egg entrainment for the years 2013 – 2015 show that 63% of the eggs are captured between weeks 18 and 30 (May 1 – July 31), 71% are captured between weeks 18 and 32 (May 1 – mid-August), and 78% are captured between weeks 18 and 34 (Figure 1). As Tautog eggs hatch between 42-48 hours after spawning (Kuntz and Radcliffe, 1918), the presence of eggs is a good indicator of spawning activity.

### Other resources

Other studies of Tautog in southern New England indicate that the majority of spawning takes place between May and end of July, with continued spawning through the end of August (LaPlante and Schultz, 2007; Berrien and Sibunka, 1999).

### References

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### Tautog egg entrainment at Millstone 2013-2015

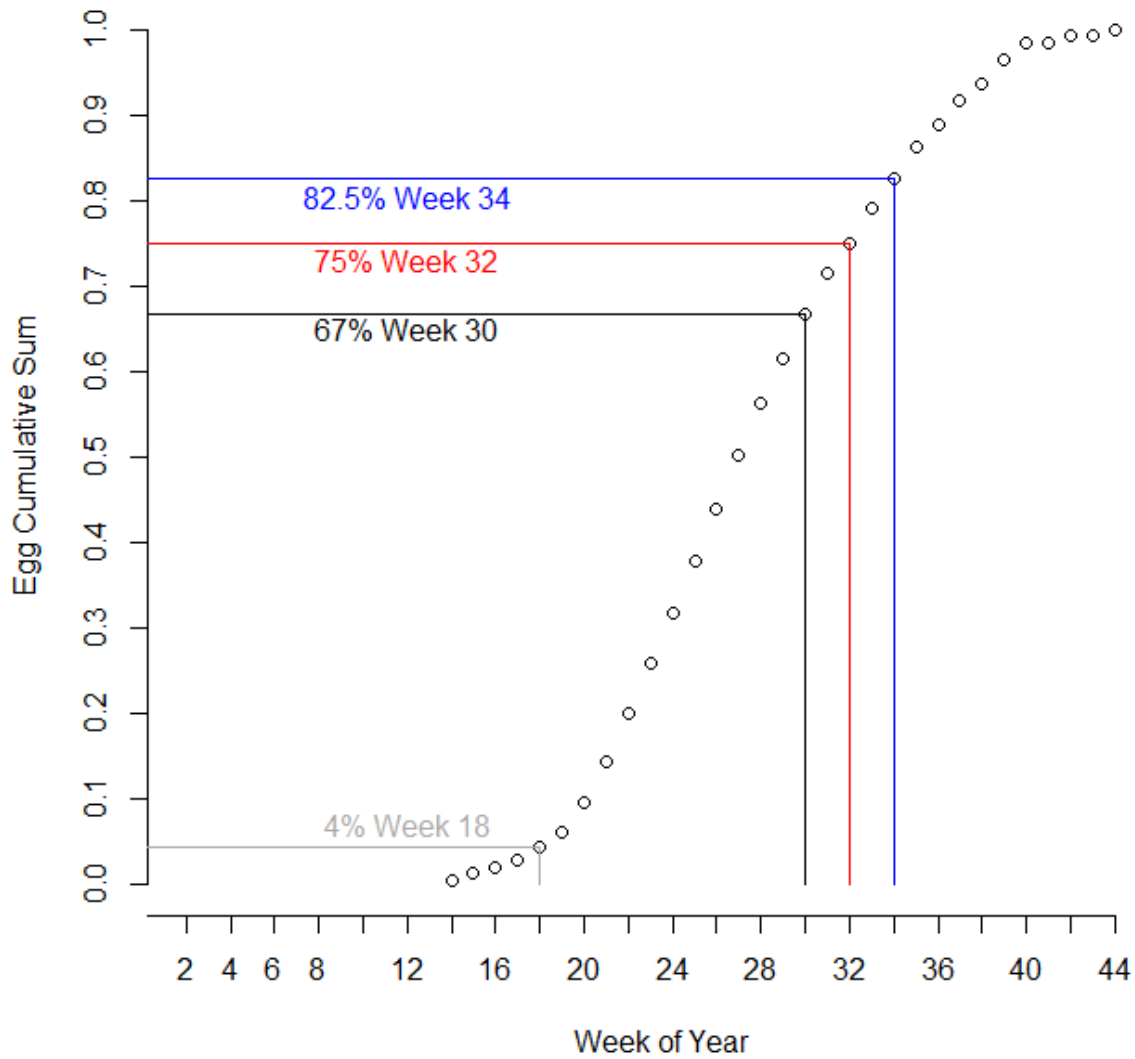


Figure 1: Mean annual cumulative sum of Tautog egg entrainment at the Dominion Millstone Power Station (Waterford, CT) for the years 2013-2015





# Atlantic States Marine Fisheries Commission

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## MEMORANDUM

**TO:** Tautog Management Board  
**FROM:** Toni Kerns ISFMP Director  
**DATE:** July 25, 2017  
**SUBJECT:** Public Comment on Tautog Draft Amendment I

The following pages represent a summary of all comments received by ASMFC on American draft Amendment I to the Tautog FMP as of 5:00 PM (EST) on July 14, 2017 (closing deadline).

A total of 253 written comments were received on Draft Amendment I. Of those comments, 8 were from organizations, 21 were from individuals, 2 form letters (one with 4 copies and one with 3 copies) and 1 petition with 317 signatures. Public hearings were held in 8 jurisdictions. Approximately 167 individuals attended the hearings.

The following tables (pages 2-10) are provided to give the Board an overview of the support for specific options and issues contained in Draft Amendment I. This is then followed by written comment (individual, groups, and form letters). Public Hearing summaries were provided in briefing materials.

## Public Comment Summary Tables

FMP Goals (pg 48-49)	Option A: Maintain the 1996 Goals (A-E)	Option B: Revised Goal Statement
<b>Written Comments</b>		
Individual Letters	2	
Groups/Organization Letters	3	1
Form Letters		
<b>Hearings</b>		
MA	x	
RI		x
CT		
NY		
NJ		
DE		
MD		x
VA		

Objectives(Pg49-51)	Option A: Maintain the 1996 objectives (A-J)	Option B: Suggest modifying or removing select objectives - F and SSB Targets	Option C: Suggest modifying or removing select objectives - Regional management	Option D: Suggest modifying or removing select objectives - EEZ management	Option E: Suggest modifying or removing select objectives - Habitat	Option F: Suggest modifying or removing select objectives - Monitoring	Option G: Suggest modifying or removing select objectives - Illegal harvest	Option H: Insert all modifications identified under Options B-G
<b>Written Comments</b>								
Individual Letters	2						1	
Group/Organization Letters	3				1	1	2	
Form Letters								
<b>Hearings</b>								
MA								
RI								
CT								
NY								
NJ								
DE								
MD								x
VA								1

Biological Reference Points (Pg 53-54)	Option A: Status Quo - Reference Points can be Modified via a Management Document	Option B: Reference Points can be Modified via Board Action (i.e., Management Document Not Required)
<b>Written Comments</b>		
Individual Letters	2	
Group/Organization Letters	5	
Form Letters		
<b>Hearings</b>		
MA		
RI		no objection
CT		
NY		
NJ		
DE		
MD	1	1
VA		1

F Target (pg 54-55)	Option A: Status Quo	Option B: Managing to the Regional Target F	Sub-Option B1: No time requirement	Sub-Option B2: Board action within one year	Sub-Option B3: Board action within two years
<b>Written Comments</b>					
Individual Letters	2				
Group/Organization Letters	3	1	1	1	
Form Letters					
<b>Hearings</b>					
MA					
RI	1				
CT					
NY					
NJ					
DE					
MD		5		1	3
VA		1		x	

Probability of Achieving F Target (pg 55)	Option A: Status Quo	Option B: 50% Probability of Achieving F Target
<b>Written Comments</b>		
Individual Letters	2	
Group/Organization Letters	4	1
Form Letters		
<b>Hearings</b>		
MA		1
RI		x
CT		
NY		
NJ		
DE		
MD	2	
VA		1

F Rebuilding Schedule (pg 55-56)	Option A: Status Quo	Option B: Three Years	Option C: Five Years
<b>Written Comments</b>			
Individual Letters	2		
Group/Organization Letters	24	1	
Form Letters			
<b>Hearings</b>			
MA		x	
RI		1	
CT			
NY			
NJ			
DE			
MD			3
VA		1	

**Other Comments:** Overfishing should be ended immediately.

Stock Rebuilding Schedule (pg 56)	Option A: Status Quo (from Addendum IV)	Option B: Stock Rebuilding Schedule can be Developed via an Addendum	Option C: Stock Rebuilding Schedule can be Developed via an Addendum, NTE 10 years
<b>Written Comments</b>			
Individual Letters	2		
Group/Organization Letters	3	1	1
Form Letters			
<b>Hearings</b>			
MA		x	
RI			
CT			
NY			
NJ			
DE			
MD		3	
VA			1

Regional Management (pg 65-66)	Option A: Status Quo - Coastwide Management	Option B: Regional Management	Sub-Option B1: LIS line from Montauk Pt, NY to Watch Hill, RI	Sub-Option B2: LIS line from Orient Pt, NY to Watch Hill, RI
<b>Written Comments</b>				
Individual Letters	2	5	1	
Group/Organization Letters	3	2	1	
Form Letters				
<b>Hearings</b>				
MA		x		
RI		x		
CT	x		1	
NY	79			
NJ			2	
DE		x		
MD			10	
VA			1	

**Other Comments:**

- Defer action until a more reasonable approach can be determined to not split NY in the middle of the state.
- Favor the regional approach but do not favor an unenforceable regulation where a state is split. Favor regions but thinks NJ should be in a region with Delaware.
- No region should face such a large reduction as LIS (48-50%).

MARI Rec Management Measures	Option A: Status Quo	Option B: All Measures Consistent - 3 fish poss limit in Mar-May and Aug-Oct 14, 4 fish Oct 15-Dec 31	Option C: All measures consistent - 3 fish poss limit
<b>Written Comments</b>			
Individual Letters	4		
Group/Organization Letters	3		
Form Letters			
<b>Hearings</b>			
MA			
RI	x		
CT			
NY			
NJ			
DE			
MD			
VA			

**Other Comments:**

Propose 6 fish bag limit Sept-Dec and April-May, and 1 fish all other times of the year

LIS Rec Measures	Option A1: State Specific Reductions to Current Measures	Option B1: Regional 16", 1 Fish, Apr (CT), Oct-Dec (CT & NY)	Option B2: Regional 17", 2 Fish, Apr (CT), Aug (CT), Oct-Dec (CT & NY)	Option B3: Regional 16", 1 Fish, Oct-Nov (CT & NY)	Option C: Recreational Slot Limit 16-18"
<b>Written Comments</b>					
Individual Letters	3				
Group/Organization Letters					
Form Letters					
<b>Hearings</b>					
MA					
RI					
CT					
NY					
NJ					
DE					
MD					
VA					

**Other Comments:**

- Favor status quo measures.
- Believe that the data used as a basis for setting the allowable catch limit (ACL), bag limit and season is inaccurate.
- If implemented, it will lead to overly restrictive regulation that will have a negative effect on the local economy while not effectively protecting the stock.
- Provide measures to the for-hire fleet that are more generous than measures for private boats
- Protect fish during the spawning season.

- Dropping the bag to 4 fish will be very hard on the for-hire fleet any lower will be devastating. Separate the regulations for the for-hire fleet. Eliminate the spring and summer fishery in CT and shorten the fall in both states. Put in a slot limit of 16-22" to protect the large egg-bearing females.

LIS Commercial Measures	Option A1: State Specific Reductions to Current Measures	Option B1: Regional 16" min size, commercial quota	Option B2: Regional 16" min size, status quo	Option C: Commercial slot limit, 16-18"
<b>Written Comments</b>				
Individual Letters	3			
Group/Organization Letters				
Form Letters				
<b>Hearings</b>				
MA				
RI				
CT				
NY				
NJ				
DE				
MD				
VA				

**Other Comments:**

Restrict Commercial fishing to a daily possession limit equal to the recreational fishery. Restrict the type of gear Commercial fishermen may use, specifically rod and reel. Include closure for spawning. Ban the sale of live tautog. The Commercial Lobster fishery is allowed to take too many tautog as bycatch in their pots.

Close the commercial pot fishery especially in the spring. Possession limit should be similar to the recreational fishery and have options for spawning closures.

NYNJ Recreational Measures	Option A1: State-specific reductions to current measures	Option B1: 15" min, 4 fish bag	Option B2: 16" min, 4 or 6 bag limit	Option C1: Recreational slot limit 15-18", 4 fish bag limit
<b>Written Comments</b>				
Individual Letters	3			
Group/Organization Letters	2			
Form Letters				
<b>Hearings</b>				
MA				
RI				
CT				
NY				
NJ				do not favor
DE				
MD				
VA				

Other Comments:

- Opposed to option B2, would be disaster for rebuilding biomass at Barnegat Light.
- C1 is Okay, but ending March 31 would eliminate the shore angler. Against a slot limit and opposed to an August and September closure.
- Propose Bay versus ocean regulations (like striped bass).

NYNJ Commercial Measures	Option A1: State-specific reductions to current measures	Option B1: 15" min, 28 fish bag NYB, no bag in NJ	Option B2: 16" min, 31 fish bag NYB, no bag in NJ	Option B3: 15" min, 65,486 lb quota NYB, 23,529 lb quota NJ	Option C2: Commercial slot limit 15-18", 34 fish bag NYB, no bag NJ
<b>Written Comments</b>					
Individual Letters	3				
Group/Organization Letters	1				
Form Letters					
<b>Hearings</b>					
MA					
RI					
CT					
NY					
NJ					
DE					
MD					
VA					

Other Comments:

Possession limit should be similar to the recreational fishery and have options for spawning closures

DelMarVa Recreational Measures	Option A: Status Quo	Option B: Spwn Closure May & June; 4 fish bag all states, 15" min size DE, 16" VA & MD	Option C: Spwn Closure May & June; 5 fish bag DE Jul-Mar, 4 fish bag MD, 3 fish bag VA, 16" all states	Option D: Spwn Closure May & June; 4 fish bag & 16" min size all states
<b>Written Comments</b>				
Individual Letters	3			
Group/Organization Letters				
Form Letters				
<b>Hearings</b>				
MA				
RI				
CT				
NY				
NJ				
DE			x	
MD		x		favor a modified D
VA				1



<b>DelMarVa Commercial Measures</b>	<b>Option A: Status Quo</b>	<b>Option B: Modified rec measures for DE and MD implemented as com measures; VA remains status quo</b>
<b>Written Comments</b>		
Individual Letters	3	
Group/Organization Letters		
Form Letters		
<b>Hearings</b>		
MA		
RI		
CT		
NY		
NJ		
DE		
MD		
VA		1

<b>Commercial Quota</b>	<b>Option A: Status Quo</b>	<b>Option B: Commercial Quota Procedures</b>
<b>Written Comments</b>		
Individual Letters	3	
Group/Organization Letters	1	
Form Letters		
<b>Hearings</b>		
MA		
RI		2
CT		
NY		
NJ		
DE		
MD		x
VA		1

Commercial Tagging Program and Tag Application	Option A: Status Quo	Option B: Implement a Commercial Harvest Tagging Program	Option A: Harvester Application at Harvest or Upon Landing	Option B: Application by Dealer
<b>Written Comments</b>				
Individual Letters	5	3		
Group/Organization Letters	1	4	2	
Form Letters				
<b>Hearings</b>				
MA				x
RI		x	3	
CT				
NY	x			
NJ		x	7	
DE		x	x	
MD		x	x	
VA			2	2

**Other Comments:**

Instead of putting the burden on the Commercial Fisherman to tag fish, do not allow recreational fishermen to land live tautog. They could keep them live for culling purposes while fishing but must kill all fish to be harvested before reaching the marina

TO: Toni Kerns, ASMFC ISFMP Director

FROM: Jason McNamee (RI DEM) & Daniel McKiernan (MA DMF), Tautog Management Board Administrative Members

DATE: September 21, 2017

SUBJECT: Tautog Amendment 1 Management Proposal for Massachusetts/Rhode Island Area

As requested by the Tautog Management Board, staff from Rhode Island DEM and Massachusetts DMF have worked cooperatively to devise a regional management proposal for the MA/RI area as required under Amendment 1. This proposal can now be reviewed by the Technical Committee and Management Board.

Tautog in the MA/RI region are not overfished nor is overfishing occurring. Our proposal is conservation neutral and will improve management of the stock in the region. Emphasis was placed on creating similar recreational regulations to promote compliance among anglers fishing between the region's two states.

Feel free to contact Dan or Jason if you have any questions.

# Tautog Management Options – MARI Region

## ***Background:***

In October of 2016 the Tautog Management Board (Board) approved the creation of an Amendment to the fishery management plan for tautog. The Amendment will set forth management measures for the recreational and commercial fisheries through the creation of regional management plans, which match the structure of the current stock assessment regions.

Four regions will be established by the Amendment. Each region will implement tautog management programs that utilize minimum size limits, maximum possession limits, quotas, and seasonal closures that are designed to achieve a specific regional harvest goal. The MARI region will contain the states of Massachusetts and Rhode Island. All states within a region will agree to the regulations implemented within the region, though they may differ. The goal, however, will be to get the regulations as consistent as possible.

Per the outcome of the Tautog Board meeting on January 31, 2017, the MARI region is not overfished and overfishing is not occurring based on the selection of SPR reference points. Despite this, some modest changes to management may be warranted in this region to bring the two states management plans in to synchrony. The following is a method and an option for the states of RI and MA to consider for tautog management.

## ***Methods and Results:***

MRIP data were queried to evaluate tautog catches from years 2013-2016 during waves 2-6 in Massachusetts and Rhode Island. Trip and harvest data were expanded using the MRIP weighting factor. MRIP raw trip and catch data were read in and merged on ID CODE. Trips with multiple contributors were identified using the leader code, and group catch was partitioned among contributors, such that each contributor has an integer value for catch. Trips over the bag limit were managed so that credit was not achieved for illegal harvest, but added back in for final calculations.

Massachusetts and Rhode Island data were analyzed separately, with separate tables to detail the estimate reductions and/or harvest increases based on the proposed regulations for 2018. The proposed scenario includes establishing four seasons for the recreational tautog fishery: spring (April 1 - May 31), summer (June 1 -July 31), late summer (August 1 – October 14), and fall (Oct 15 – Dec 31). The recreational fishery outside of these time periods will be closed. Intercept month was used to partition trip data down at a finer scale than wave.

The following scenario was evaluated:

1. 3-fish bag limit during April 1 - May 31
2. 1-fish bag limit from June 1 – July 31 in MA (RI will remain closed)
3. 3-fish bag limit from August 1 – October 14
4. 5-fish bag limit from October 15 – December 31

### ***Massachusetts***

The current recreational regulations in Massachusetts include a minimum fish size of 16", a 3-fish bag limit, and a season that is open 365 days of the year. The evaluation of MA catches against possible management actions assumes that the minimum size remains at 16".

The effects of the new management plan in MA as outlined in the scenario above is shown in Table 1 below. In general, the new management plan increases harvest in the fall period due to the increased bag limit, however the decrease during the summer spawning period offsets this increase to some degree. This leads to a predicted increase in harvest for MA, an average of 7% increase in harvest for the time period examined.

Table 1 – MA observed harvest in numbers of fish under status quo regulations versus predicted harvest in numbers of fish under the new regulatory scenario.

Year	Observed	Predicted	Change
2013	57,736	73,057	+27%
2014	100,297	93,265	-7%
2015	39,860	35,680	-10%
2016	24,243	35,541	+47%

### ***Rhode Island***

The current recreational regulations in Rhode Island include a minimum fish size of 16", a 3-fish bag limit from April 15 – May 31, a closure from June 1 – July 31, a 3-fish bag from August 1 – Oct 14, and a 6-fish bag from October 15 – December 31. The evaluation of RI catches against possible management actions assumes that the minimum size remains at 16".

The effects of the new management plan in RI as outlined in the scenario above is shown in Table 2 below. In general, the new management plan decreases harvest in the fall period due to the decreased bag limit, however the increase in season during the spring period offsets this decrease to some degree. This leads to a predicted decrease in harvest for RI, an average of 7% reduction in harvest for the time period examined.

Table 2 – RI observed harvest in numbers of fish under status quo regulations versus predicted harvest in numbers of fish under the new regulatory scenario.

Year	Observed	Predicted	Change
2013	136,190	128,954	-5%
2014	68,768	66,781	-3%
2015	98,404	85,621	-13%
2016	86,528	81,182	-6%

### ***Regional result***

Taking the above two state specific analyses together, the resulting impact to the regional harvest is a modest decrease of 2% from the current regulations (Table 3). This is a reduction of 2,737 fish. The MARI region is not overfished and overfishing is not occurring, therefore these changes essentially keep harvest at status quo, and as a result, harvest should not impact stock status. It is anticipated that moving towards more consistent regulations will add value by way of better understanding of fishery rules between the two states whose fisheries overlap. Additionally it is hoped that adding in the tagging program will help to minimize illegal harvest, thus further offsetting the increase in harvest seen in the effort to synchronize the two states management plans.

Table 3 – Average observed harvest in numbers of fish under status quo regulations versus predicted harvest in numbers of fish under the new regulatory scenario.

Regional Average	Observed	Predicted	Change
2013 - 2016	153,007	150,270	-2%

### ***Projection***

Using similar methodology to that used for the update assessment projections in 2016, a projection was run with the decreased harvest to verify that this will not impact stock status. Differences in what was used for these projections from what was used in the update assessment projections is that updated landings in metric tons were used instead of total removals, and these landings were decreased by 2% for the projection years based on the outcome of the management analysis above. The years were updated to the most recent 3 years, based on MRIP data (Table 4). It is important to note that this decreases the landings as recreational harvest has declined in both MA and RI relative to the assumptions made during the update assessment.

It is not necessarily a direct comparison to use a 2% decrease in weight as equating to the 2% decrease in numbers calculated for the new management program, but given time constraints, this assumption was made and is believed to be close enough for this exercise. Two final differences are that a Beverton-Holt stock recruit relationship was used, and the projection window was extended to 2025. Given these two elements, the impact of the stock recruit relationship assumption is believed to be minimal.

The result of the projections, assuming that the harvest decreases by 2%, is that we do not increase above the SPR F threshold of 0.49, but we do increase above the SPR F target of 0.28 slightly in 2 of the projection years before declining back below it. This maintains the MARI region in a not overfishing state, and therefore does not impact the stock status determination with regard to F. The maximum F for the projection period is 0.286 (Table 5, Figure 1). This F allows for stock rebuilding over time (Figure 2), though rebuilding occurs slowly and has a short term period of decline. The period of decline does drop the SSB below the SPR threshold for 5 of the projection years, but it rebuilds back above it during the projection period.

Table 4 – Recreational and commercial harvest for MARI region for 2014 – 2016 with the combined 3 year average.

Year	2014	2015	2016
MA recreational	181.354 mt	82.155 mt	32.814 mt
RI recreational	135.152 mt	170.732 mt	153.543 mt
Combined Commercial	50 mt	50 mt	50 mt
Combined 3 year Average	302 mt		
Decreased harvest assumption for projection	296 mt		

Table 5 – Projected fishing mortality for new management scenario.

Year	F rate
2016	0.227
2017	0.241
2018	0.255
2019	0.272
2020	0.282
2021	0.286
2022	0.285
2023	0.277
2024	0.268
2025	0.258

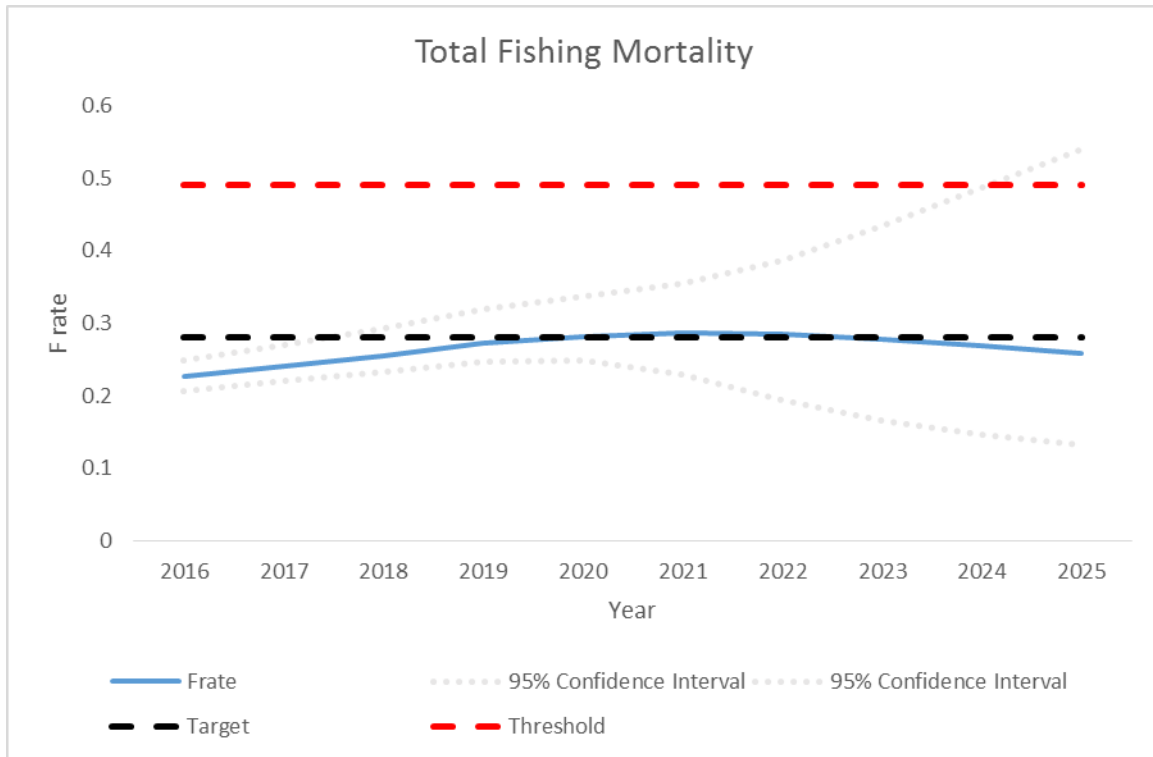


Figure 1 – Projected Fishing mortality with 95% confidence intervals.

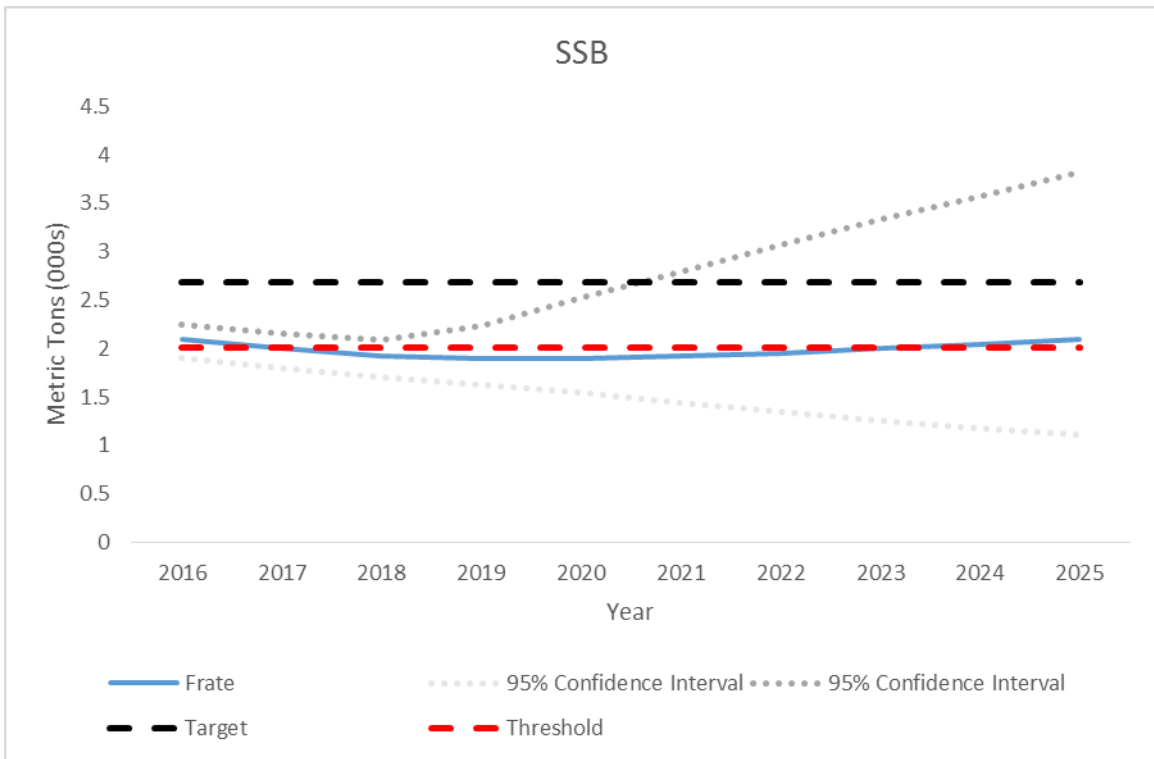


Figure 2 – Projected Spawning Stock Biomass with 95% confidence intervals.

### ***Conclusion***

The predicted harvest associated with the new proposed management plan is not ideal and has some short term impacts to the population, but these impacts are minimal compared to the current state of the stock. The attributes of relatively consistent regulations between the states in the region and the improved accountability of harvest with the tagging program may prevent the projected declines from occurring or may mitigate them to some extent, therefore we believe there is value in moving forward with this set of measures for the MARI region. The MARI region will continue to be proactive in their management and if large changes occur that were not accounted for in the analyses above that might lead to negative consequences for the stock, management adjustments will be made.





Fisheries Division  
333 Ferry Rd,  
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Rob Klee, Commissioner



**New York State  
Department of Environmental  
Conservation**

Division of Marine Resources  
205 N. Belle Mead Rd, Suite 1  
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Basil Seggos, Commissioner

## Memorandum

TO: Toni Kerns, Interstate Fisheries Management Program Director  
Atlantic States Marine Fisheries Commission

FROM: Justin Davis, Supervising Fisheries Biologist      Gregory Wojcik, Fisheries Biologist  
CT DEEP Marine Fisheries      CT DEEP Marine Fisheries

John Maniscalco, Finfish Unit Leader  
NY DEC Division of Marine Resources

DATE: September 26, 2017

### **Long Island Sound Tautog Fishery Options for Draft Amendment 1 to the Tautog FMP**

#### *Background*

The 2016 Tautog Stock Assessment Update concluded that the Long Island Sound (LIS) tautog stock was overfished and overfishing was occurring. Draft Amendment 1 to the Tautog FMP included regulation options to end overfishing in the LIS tautog fishery (which occurs in both CT and NY state waters). Specifically, the proposed measures, assuming 2018 implementation, provided a 50% probability of achieving the F target by 2021 (three-year time frame), and translated into an estimated 47-50% reduction in annual tautog harvest.

Both CT DEEP and NY DEC held public hearings on Draft Amendment 1 during summer of 2017. At these hearings, members of the public expressed overwhelmingly negative response to the management measures proposed in the Draft Amendment. Adoption of these measures for Long Island Sound would produce severely disjointed tautog regulations within the relatively small NY/CT/RI region. For instance: although recreational anglers in all three areas would be subject to a 16" minimum length limit during the fall (when the majority of tautog angling occurs), LIS anglers would potentially be subject to a one fish bag limit while RI anglers and NY anglers fishing outside of LIS would be subject to six and four fish bag limits, respectively. Such an outcome would subject the LIS for-hire sector to undue economic hardship, as customers would likely make the relatively short drives to ports in adjacent areas to take advantage of higher bag limits. Anglers and businesses fishing from New Jersey would have even more disparate regulations that include higher bag limits (4-6 fish) and a 15" minimum size limit during the fall fishery. In addition, owners of tackle shops frequented by LIS anglers reported that the tautog fishery was directly (through sales of bait and tackle used for tautog) and indirectly (through driving almost all foot traffic into the store) responsible for the majority of their revenue during fall months. Therefore, the substantial curtailing of LIS tautog angling likely to result from adoption of Draft Amendment 1 regulations would also cause tackle shop owners undue economic hardship. Finally, the disjointed regional regulations prescribed by Draft Amendment 1 as currently constituted would create substantial public outreach and enforcement

challenges for NY DEC, as NY state waters would be divided between two management regions (LIS and NJ/NY Bight) subject to very different tautog regulations.

CT DEEP and NY DEC also feel that there are strong reasons to reconsider LIS regulations options in Draft Amendment 1 on biological and technical grounds. Despite the overfished/overfishing determination from the 2016 stock assessment update, there are positive indicators for the future condition of the LIS tautog stock, including strong 2013 and 2015 year classes (Figure 1) and a slow but steady increase in biomass since the adoption of more conservative management measures in 2012 pursuant to Addendum VI (Figure 2). Additionally, tautog are a slow-growing, long-lived species; a timeframe longer than that proposed in Draft Amendment 1 (three years) may therefore be more appropriate and realistic to achieve substantial change in the condition of the LIS tautog stock. The calculations underlying the proposed management options in the Draft Amendment relied heavily on data from the Marine Recreational Information Program (MRIP). Recent MRIP estimates of annual recreational tautog harvest in LIS displayed high levels of inter-annual variation (e.g. 31-304% variation in CT during 2013-15) absent changes to prevailing management, calling into question precision of the estimates and therefore the precision of harvest reduction estimates calculated using these data. Additionally, multiple parties raised substantial concerns over the accuracy of MRIP estimates for the for-hire sector during public hearing.

### *Proposed Management Options*

For the reasons detailed above, CT and NY are jointly proposing alternative tautog management measures for LIS for inclusion in Draft Amendment 1. These management options (Attachment 1) propose lower levels of annual harvest reduction (18.4% - 31.4%). It is our strong opinion that these alternative measures will effectively end overfishing of the LIS tautog stock, albeit over a longer time frame, while avoiding the severe socio-economic impacts and enforcement challenges likely to result from adoption of current Draft Amendment 1 management options.

### *Methods*

The options provided include seasonal reductions, possession limit reductions, size limit increases as well as reductions associated with two slot limits (see Attachment 1). Any combinations of reductions between the size, season and creel limits were accounted for using the formula  $(x+y)-(x*y)$  where  $x$  = the percent reduction associated with season closures and  $y$  = the percent reduction associated with size/possession limit reductions.

- Seasonal Adjustment Analysis: harvest reductions achieved by closing days in the season were estimated for options 1, 3 and 5 using harvest-per-day (HPD) rates derived from MRIP (Table 1). HPD rates by wave were estimated using the mean of 2013-2015 MRIP harvest estimates, using only intercepts where “area fished” was within LIS. Since both NY and CT fall seasons are open for portions of both waves 5 and 6, harvest estimates for the fall fishery were calculated by aggregating data from both waves.

All six options propose opening for the month of April in NY to create greater regulatory consistency for LIS anglers (CT is currently open during April; see Attachment 1). Very little harvest is expected during April in both states. CT MRIP harvest estimates from wave 2 have been less than 2,000 tautog since 1990. It is estimated that a total of 2,000 tautog will be harvested in April in NY based on MRIP harvest estimates from 2008-2011 when the spring season was open (note: the minimum size limit during these years was 14”).

All options assume no changes in the harvest rate of non-compliant fish that are below the current minimum length of 16”. MRIP measured lengths (non-imputed) indicate that 19.1% of the harvest was below the current legal minimum size.

**Table 1. Harvest-Per-Day Rates**

	2013	2014	2015
<b>NEW YORK</b>			
<b>WAVE 5</b>	168	1,036	1,695
<b>WAVE 6</b>	304	196	682
<b>CONNECTICUT</b>			
<b>WAVE 4</b>	71	28	47
<b>WAVE 5</b>	2,980	12,228	4,579
<b>WAVE 6</b>	958	1,319	615

- Size and Possession Limit Analysis: the MRIP sample size of measured tautog in 2013-2015 was a total of 894 fish for both CT and NY (harvested from LIS only). This sample size allowed compilation of a robust length frequency table for use in reduction estimation. The length frequency table was weighted by the MRIP effort estimates in all calculations. Two minimum lengths were evaluated for options 2 and 3: an increase to 16.5” (resulting in an 11.5% harvest reduction) and 17” (31.4% reduction).

A possession limit reduction from four to three fish was analyzed using combined MRIP harvest data from 2013-2015. There was a total of 220 trips with harvest used in analyses of adjusted creel limits for the spring and fall fishery. The proportion of ‘saved’ fish was converted to number of fish and applied to the total season’s harvest. The CT summer fishery creel limit remains two fish (status quo) for all options. The CT summer season only accounts for 1.6% of the annual LIS harvest.

- Slot Limit Analysis: the methods used to calculate the reduction associated with a harvest slot limit in proposed options 4 and 6, are the same as provided in Draft Amendment 1, Section 4.2.3.3. Since a slot limit will result in an increase in discarded fish, these analyses incorporated the discard mortality rate (2.5%) of fish released above the slot maximum (i.e. the reductions calculated for option 4 and 6 reflect reductions in total removals; harvest + discard mortality).
- Model Projections: all projections used to determine the number of years needed to reach the F target under each option followed the same methodology outlined in the 2016 Tautog Stock Assessment Update. In addition to estimating years needed to reach the F target under each option, we also estimated the probability of reducing F below the F threshold in three years (matching the timeframe prescribed for reaching F target in Draft Amendment 1) and the number of years needed to achieve a 50% probability of reducing F below the threshold. These metrics provide additional information on the timeframes in which each option might be expected to end overfishing of the LIS tautog stock. All model projections assumed equivalent percent reductions to the recreational and commercial fishery.
- Commercial Fishery: The commercial fishery accounts for approximately 10% of annual LIS tautog harvest. Given the relatively minor contribution of commercial harvest, we have chosen not to prescribe commercial regulations for any option at this time. It is our intent that if one of the alternate management options presented in this document is approved for LIS tautog, that the corresponding percent reduction in annual recreational harvest will be applied to the commercial sector (note that, as stated above, model projections assumed these equivalent reductions in commercial harvest). Regulations that achieve the necessary reduction in commercial harvest will be formulated using changes to season length and/or bag limits (length limits for the commercial fishery will be kept

consistent with the recreational fishery) and using the same methods described above for reduction estimation in the recreational fishery.

*Results*

- Annual LIS tautog harvests (recreational + commercial) under the six management options presented here are expected to range from 342.92 mt (31.4% reduction from status quo) to 407.96 mt (18.4% reduction; see Table 2). For comparison, the mean annual harvest during 2013-2015 was 499.95 mt.

<b>TABLE 2</b>	<b>OPTIONS</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<b>PERCENT REDUCTION IN HARVEST</b>		20.3%	30.5%	18.4%	22.5%	23.6%	31.4%
<b>PROJECTED HARVEST (STATUS QUO = 499.95)</b>		398.46	347.47	407.96	387.46	381.96	342.92
<b>PROBABILITY OF BEING UNDER F-THRESHOLD IN 3 YEARS</b>		33%	59%	28%	32%	41%	67%
<b>NUMBER OF YEARS TO ACHIEVE F-TARGET WITH A 50% PROBABILITY</b>		12	8	14	NA	10	8
<b>NUMBER OF YEARS REQUIRED TO BE BELOW F-THRESHOLD WITH A 50% PROBABILITY</b>		5	3	7	5	5	2

- For options other than Option 4, the number of years required to achieve the F target with 50% probability ranged from a low of eight (Option 2: 17” min. length, status quo bags and seasons) to a high of 14 (Option 3: 16.5” min. length, status quo bags, reductions in fall season). For comparison, Draft Amendment 1 measures were designed to achieve the F target with 50% probability in three years.
- The projection run using the Option 4 slot limit management measures (16”-19” slot limit, 3 fish creel limit) was unable to achieve F target; it did, however, estimate that F threshold would be achieved with a 50% probability in five years. This suggests that there is a potential need to have further reductions in the short term in order to allow the slot-aged fish to rebuild and pass beyond the slot before harvest can increase using this option. The model not being able to achieve F target may also be the result of using a twelve-plus age group which could be inadequate to assess fishing mortality using slot limit management measures on such a long lived fish.
- Multiple options could end overfishing of the LIS tautog stock within relatively short time frames. Option 1 (status quo min length of 16”, reductions in bags and fall season), Option 2 (17” min. length, status quo bags and seasons), and Option 5 (status quo min length of 16”, reductions in bags and fall season) all have a 50% probability of reducing F below the threshold in five years or less. Option 2 would provide a 50% probability of ending overfishing within the same three-year timeframe prescribed for reaching the F target within Draft Amendment 1. The probability of ending overfishing of the LIS tautog stock within three years was approximately 33% or greater under each of these options.

Figure 1. Recruitment estimates for LIS region (Fig. 5.2.5 from 2016 Tautog Stock Assessment Update).

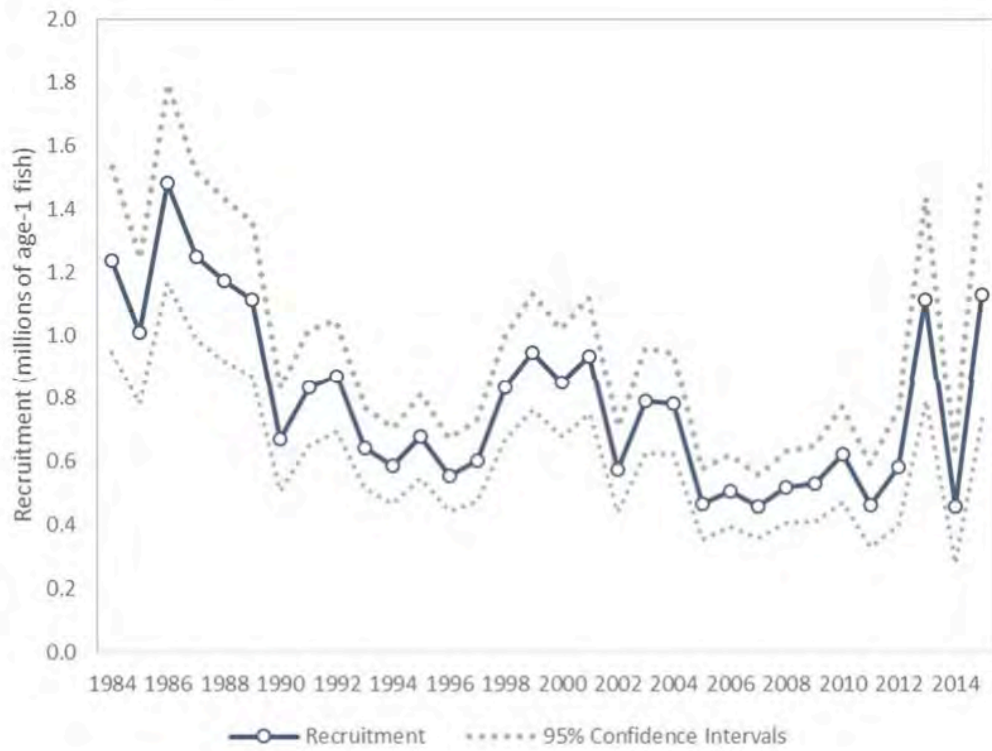
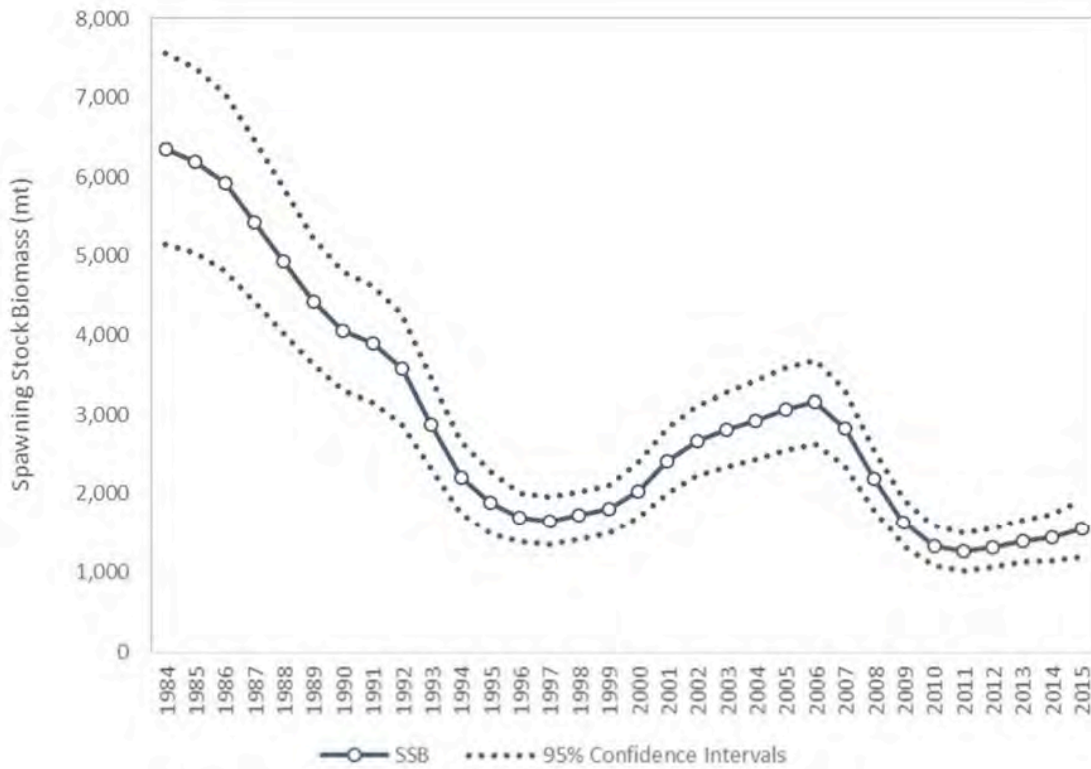


Figure 2. Estimates of spawning stock biomass for the LIS region (Figure 5.2.3 from 2016 Tautog Stock Assessment Update).



**Attachment 1, Proposed Options.**

**Status Quo**

	<b>Minimum Length</b>	<b>Creel Limit</b>	<b>CT Days Open</b>	<b>NY Days Open</b>
<b>Spring Season</b>	16"	4	30	0
<b>Summer Season</b>		2	62	0
<b>Fall Season</b>		4	58	71

**Option 1 (20.3% Reduction)**

	<b>Minimum Length</b>	<b>Creel Limit</b>	<b>CT Days Open</b>	<b>NY Days Open</b>
<b>Spring Season</b>	16"	3 (-1)	30	30 (+30)
<b>Summer Season</b>		2	62	0
<b>Fall Season</b>		3 (-1)	50 (-8)	60 (-11)

**Option 2 (30.5% Reduction)**

	<b>Minimum Length</b>	<b>Creel Limit</b>	<b>CT Days Open</b>	<b>NY Days Open</b>
<b>Spring Season</b>	17" (+1")	4	30	30 (+30)
<b>Summer Season</b>		2	62	0
<b>Fall Season</b>		4	58	71

**Option 3 (18.4% Reduction)**

	<b>Minimum Length</b>	<b>Creel Limit</b>	<b>CT Days Open</b>	<b>NY Days Open</b>
<b>Spring Season</b>	16.5" (+.5")	4	30	30 (+30)
<b>Summer Season</b>		2	62	0
<b>Fall Season</b>		4	53 (-5)	63 (-8)

**Option 4 (22.5% Reduction)**

	<b>Minimum Length</b>	<b>Creel Limit</b>	<b>CT Days Open</b>	<b>NY Days Open</b>
<b>Spring Season</b>	16"-19"	3 (-1)	30	30 (+30)
<b>Summer Season</b>	Slot	2	62	0
<b>Fall Season</b>	Limit	3 (-1)	58	71

**Option 5 (23.6% Reduction)**

	<b>Minimum Length</b>	<b>Creel Limit</b>	<b>CT Days Open</b>	<b>NY Days Open</b>
<b>Spring Season</b>	16"	3 (-1)	30	30 (+30)
<b>Summer Season</b>		2	62	0
<b>Fall Season</b>		3 (-1)	48 (-10)	57 (-14)

**Option 6 (31.4% Reduction)**

	<b>Minimum Length</b>	<b>Creel Limit</b>	<b>CT Days Open</b>	<b>NY Days Open</b>
<b>Spring Season</b>	16"-18"	4	30	30 (+30)
<b>Summer Season</b>	Slot	2	62	0
<b>Fall Season</b>	Limit	4	58	71



# COMMONWEALTH of VIRGINIA

*Marine Resources Commission*  
2600 Washington Avenue  
Third Floor  
Newport News, Virginia 23607

Molly Joseph Ward  
Secretary of Natural Resources

John M.R. Bull  
Commissioner

September 12, 2017

TO: Toni Kerns, ISFMP Director

FROM: Joe Cimino, Deputy Chief Fisheries Division, VMRC

RE: Amendment 1 to the Tautog FMP consideration for commercial seasonal changes

The Virginia Marine Resources Commission (VMRC) has restricted both the commercial and recreational fisheries in Virginia to make harvest reductions in recent years, such as those implemented because of Addenda V and VI. Once it is adopted, Amendment 1 will create the possibility for regional management options by setting regional targets for biological reference points. Some of the potential recreational options in the Amendment, or others currently being considered as conservationally equivalent, would result in a slight liberalization for Virginia. However, as a region, these options are projected to achieve a harvest reduction for the recreational fishery. Since Addendum VI regulations have been in place, Virginia's commercial landings have averaged 5% of the total DELMARVA landings (2012-2016 commercial and recreational landings combined). Below is a table that provides commercial landings for Virginia for April and May. Prior to the seasonal closure for May, the maximum amount of commercial landings was under 2,000 pounds for the month. Monthly harvest for April has exceeded 4,000 pounds, which is relevant to a May opening, given environmental and fisheries-related variability. Therefore, assuming a two-week opening at the beginning of May for Virginia, the VMRC would consider an additional 2,000 pounds of landings as a high-end estimate for the Technical Committee to incorporate into the region's F value.

*An Agency of the Natural Resources Secretariat*

[www.mrc.virginia.gov](http://www.mrc.virginia.gov)

Telephone (757) 247-2200 (757) 247-2292 V/TDD Information and Emergency Hotline 1-800-541-4646 V/TDD



Virginia Commercial Tautog Landings, by month (in pounds; May was closed to harvest in 2008)

<b>Year</b>	<b>April</b>	<b>May</b>
2000	1,662	1,881
2001	2,520	677
2002	3,047	1,159
2003	2,373	290
2004	4,014	156
2005	1,065	315
2006	2,282	385
2007	955	277
2008	1,231	
2009	2,124	
2010	2,649	
2011	3,831	
2012	4,174	
2013	1,928	
2014	4,123	
2015	1,599	
2016	1,684	
2017	2,501	

**REVIEW OF THE  
ATLANTIC STATES MARINE FISHERIES COMMISSION  
FISHERY MANAGEMENT PLAN FOR  
TAUTOG  
(*Tautoga onitis*)**

**2015 and 2016 Fishing Years**  
(January 1 – December 31)



**Prepared by the Tautog Plan Review Team**

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October 2017

**2017 REVIEW OF THE  
ASMFC FISHERY MANAGEMENT PLAN FOR  
TAUTOG (*Tautoga onitis*)  
Fishing Years 2015 and 2016**

**I. Status of Fishery Management Plan**

<u>Date of FMP Approval</u>	March 1996
<u>Amendments</u>	None
<u>Addenda</u>	Addendum I (May 1997) Addendum II (November 1999) Addendum III (February 2002) Addendum IV (January 2007) Addendum V (August 2007) Addendum VI (March 2011, revised March 2012)
<u>Stock Assessments</u>	Benchmark: 1999, 2005, 2015 Update: 2011 (revised in 2012), 2016
<u>Management Unit</u>	US state waters from Massachusetts through North Carolina.
<u>States with Declared Interest</u>	Massachusetts Rhode Island Connecticut New York New Jersey Delaware Maryland Virginia
<u>Active Boards/Committees</u>	Tautog Management Board (Board) Tautog Plan Development Team (PDT) Tautog Plan Review Team (PRT) Tautog Technical Committee (TC) Tautog Stock Assessment Subcommittee (SAS) Tautog Advisory Panel (AP)

## History of Management

### *Fishery Management Plan for Tautog*

The FMP established the following goals and objectives:

#### **Goals**

- To perpetuate and enhance stocks of tautog through interstate fishery management so as to allow a recreational and commercial harvest consistent with the long term maintenance of self-sustaining spawning stocks.
- To maintain recent (i.e. 1982 – 1991) utilization patterns and proportions of catch taken by commercial and recreational harvesters.
- To provide for the conservation, restoration and enhancement of tautog critical habitat for all life history stages.
- To maintain a healthy age structure.
- To conserve the tautog resource along the Atlantic coast to preserve ecological benefits such as biodiversity and reef community stability, while maintaining the social and economic benefits of commercial and recreational utilization.

#### **Objectives**

- To establish criteria, standards, and procedures for plan implementation as well as determination of states' compliance with management plan provisions.
- To allow harvest that maintains spawning stock biomass in a condition that provides for perpetuation of self-sustaining spawning stocks in each spawning area, based on maintaining young-of-the-year indices, SSB, size and age structure, or other measures of spawning success at or above historical levels as established in the plan.
- To achieve compatible equitable management measures among jurisdictions throughout the fishery management unit.
- To enact management recommendations which apply to fish landed in each state, so that regulations apply to fish caught both inside and outside of state waters.
- To promote cooperative interstate biological, social, and economic research, monitoring and law enforcement.
- To encourage sufficient monitoring of the resource and collection of additional data, particularly in the southern portion of the species range, that are necessary for development of effective long-term management strategies and evaluation of the management program. Effective stock assessment and population dynamics modeling require more information on the status of the resource and the biology/community ecology of tautog than is currently available, in particular to facilitate calculation of F and stock trends.

- To identify critical habitats and environmental factors that support or limit long term maintenance and productivity of sustainable tautog populations.
- To adopt and promote standards of environmental quality necessary to the long term maintenance and productivity of tautog throughout their range.
- To develop strategies that reduce fishing mortality, restore size competition and the historical recreational/commercial split, consider ecological and socio-economic impacts and identify problems associated with the offshore fishery. Compatible regulations between the states and the EEZ are essential.

The FMP adopted a fishing mortality rate (F) target of 0.15 to rebuild the stocks and prevent overfishing; however, an interim target of 0.24 would apply for two years (1997–1998). States were required to implement state-specific, Board-approved plans to reduce F from the coastwide average of 0.58 (i.e., a 55% reduction), or an alternative state-specific F, if it could be demonstrated as equivalent. Recreational and commercial minimum size limits of 13” in 1997 and 14” beginning in 1998 were required. Tautog pots and traps were also required to have degradable fasteners on one panel or door.

#### ***Addendum I***

Addendum I modified the FMP’s compliance schedule to allow all states until April 1, 1998 to implement management measures to reach the interim F target. Several states were having difficulty determining a state-specific F to meet the original compliance schedule due to data deficiencies. In addition, the compliance schedule implemented the interim F target one year earlier in the area north of Delaware Bay (April 1, 1997) than further to the south (April 1, 1998). The addendum also delayed the implementation of management measures to achieve the permanent F target from April 1, 1999 to April 1, 2000. Finally, the Addendum included *de minimis* requirements and corrected several typographical errors in the FMP.

#### ***Addendum II***

Addendum II further extended the compliance schedule to achieve the permanent F target until April 1, 2002 because the effects of the regulations to achieve the interim F target were uncertain. It also listed four issues to be considered in subsequent revisions of the FMP: (1) development of alternative F targets that will allow states to quantify harvest reductions associated with a variety of management approaches, (2) clarification of the F targets to be met by sector or overall state program, (3) monitoring requirements to improve fisheries and biological data collection, and (4) data requirements to analyze management options by fishing modes within commercial and recreational fisheries.

#### ***Addendum III and Technical Addendum I***

Addendum III addressed the four issues listed in Addendum II. It adopted a new F target based on achieving 40% of the spawning stock biomass ( $F_{40\% \text{ SSB}}$ ), which was estimated at 0.29 (compared to the coastwide average F estimate of 0.41). The addendum required states to maintain current or more restrictive measures for 2002 and implement measures to achieve the new F target—a 48% reduction through restrictions in the recreational fishery only—by April 1, 2003. It also updated information on tautog habitat and established monitoring requirements to

support stock assessments. Technical Addendum 1 corrected a typographical error in Addendum III.

#### ***Addendum IV***

Addendum IV established SSB target and threshold reference points based on a benchmark stock assessment completed in 2005. The target was set as the average SSB over 1982–1991, and the threshold at 75% of this value. It also set a new F target of 0.20 to initiate rebuilding. States were required to implement recreational management programs to achieve a 28.6% reduction in F relative to 2005 (and maintain existing commercial management programs) by January 1, 2008.

#### ***Addendum V***

As individual states developed management proposals to comply with Addendum IV's mandated reduction in fishing mortality, it became apparent that commercial harvest of tautog had grown in proportion to the recreational fishery in some states. The Board approved Addendum V to give states flexibility for implementing reductions in their recreational *and/or* commercial fisheries to reach the fishing mortality target rate of  $F = 0.20$  established in Addendum IV by January 1, 2008.

#### ***Addendum VI***

Based on the 2011 stock assessment update indicating that tautog were still overfished and experiencing overfishing, Addendum VI reduced the F target to 0.15 to rebuild the stock. States were required to implement Board-approved regulations in their commercial and/or recreational fisheries to reduce harvest by 39%. The addendum also allowed for regional considerations if a state or group of states could demonstrate that the local F is below the rates indicated in the stock assessment update.

## **II. Status of Stocks**

A benchmark stock assessment with data through 2013 was completed and peer-reviewed in 2014. The assessment proposed regional stock definitions based on life history characteristics and harvest patterns. While several stock structures were modeled, the Technical Committee preferred the following three-region breakdown: Southern New England (MA-CT), New Jersey-New York (NJ-NY), and Delaware-Maryland-Virginia (DMV). Each region was assessed independently using the statistical catch-at-age model ASAP.

The Board accepted the benchmark stock assessment for management use and initiated Draft Amendment 1 in May 2015 to develop regional management alternatives. To further develop a range of regional alternatives for Draft Amendment 1, the Board requested additional spatial resolution in the Mid-Atlantic region, specifically development of a separate assessment for Long Island Sound that includes Connecticut plus New York's north shore of Long Island (LIS), and an assessment for the rest of New York through New Jersey (NJ-NYB). ASAP assessments for these two regions were conducted in early 2016 and subsequently accepted for management use. This resulted in the northernmost region including only Maryland and Rhode Island (MARI).

In 2016 a stock assessment update was completed in which all four regions (MARI, LIS, NJ-NYB, and DMV) were updated incorporating landings and index data through 2015. **The assessment update indicated that all regions except MARI were overfished in 2015. It also found overfishing was occurring in the LIS and NJ-NYB regions in 2015.** Overfishing was not occurring in the MARI nor DMV regions, although F was still above the target in the MARI region. F was at the target in the DMV region. The current overfishing and overfished definitions for management use are shown in Table 1, and spawning stock biomass (SSB) for each region relative to the respective targets and thresholds are shown in Figures 1-4. It is important to note that the status determinations were made using SPR reference points for the MARI and DMV regions, and MSY reference points for the LIS and NJ-NYB regions.

### III. Status of Assessment Advice

The current reference points for this fishery are based on a regional stock assessment update that includes data through 2015. The peer review panel in the 2005 and 2015 benchmark stock assessments advised a regional approach for tautog because of the potential for sub-stock structure; this species does not appear to make north-south migrations. The 2015 benchmark stock assessment peer review panel endorsed the use of estimates from the ASAP regional model and believes the new reference points should be used in conjunction with a regional management approach. The Board has approved the benchmark stock assessment and subsequent assessment updates for management use, but the regional reference points have not been adopted. Regional management alternatives are included in Draft Amendment 1, which went out for public comment in early 2017 and will be reviewed by the Tautog management board for approval in late 2017. The next assessment (update or benchmark) has not been scheduled.

### IV. Status of the Fishery

#### Total Harvest

Between 1981 and 2016<sup>1</sup>, the total coastwide harvest (recreational harvest + commercial landings) for tautog peaked at 17.8 million pounds in 1986. Landings have significantly declined, even before state regulations were implemented to restrict landings. Since the Tautog FMP was implemented in 1996, the highest total harvest was in 2002 at nearly 5.8 million pounds, which is about 32% of the historic peak. Total harvest during the managed period from 1996-2016 averaged 3.3 million pounds per year (Figure 6).

#### Recreational Harvest

Tautog is predominantly taken by the recreational fishery, which accounts for a consistent average of 90% of coastwide landings by weight from 1981 to 2016 (Table 2). Coastwide, anglers caught a historic high of 16.9 million pounds of tautog in 1986 (Figure 6, Table 2). However, 1986

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<sup>1</sup> Systematic recreational data collection for tautog began in 1981, while commercial data exists back to 1950.

was a unique year in which recreational harvest in Massachusetts was unusually high. Since then, harvest has generally declined. The smallest harvests occurred in both 1998 and 2011, at 1.5 million pounds each year, which equal 9% of the historic high and 31% of the time series average. Recreational harvest increased from 2015 to 2016, with totals of 2.0 and 2.7 million lbs in each respective year. The time series average for recreational harvest from 1981-2016 is 4.7 million pounds per year. At the state level, Connecticut and New York anglers harvested the most tautog in 2015 and 2016, respectively (Tables 4 and 5).

Recreational live discards have generally increased relative to harvest over the time series. Prior to the FMPs implementation in 1996, discards were usually less than harvest, but since 1996 the estimated number of fish discarded annually has generally been 2-3 times greater than the harvested number (Table 4). In 2015 and 2016, live discards were 4.8 and 6 times the estimated harvest, respectively. Recreational discard mortality for tautog is estimated in the 2016 stock assessment update at 2.5%.

### Commercial Landings

Historically, tautog was considered a “trash fish” until the late 1970s, when demand increased and directed fishery developed. Landings quickly rose, peaking in 1987 with nearly 1.2 million pounds, then quickly began to decline. In 1992, states began to implement regulations, which contributed to a decline in landings (Figure 7, Table 2). The value (dollars per pound) for tautog has increased since the late 1970s, coinciding with the increase of landings. In 2015, the value reached \$3.76 per pound (Figure 7).

Commercial landings accounted for only 11% and 9% of all total landings coastwide in 2015 and 2016, respectively. Yet, in some states commercial landings were more significant; 2016 Massachusetts commercial landings made up 44.5% of total tautog landings by weight (Table 3). At the state level, New York’s commercial tautog fishery landed the greatest amount in both 2015 and 2016, with Massachusetts landing the second greatest amount in these years (Table 6). Data on commercial discards are not available.

## **V. Status of Research and Monitoring**

Addendum III requires all states to collect the following data to continue support of a coast-wide stock assessment: commercial and recreational catch estimates and 200 age and length samples per state, within the range of lengths commonly caught by the fisheries<sup>2</sup>. Table 9 lists number and source of samples collected by states in 2015 and 2016. A list of monitoring programs performed by each state is given below. Details of monitoring results are found in the state compliance reports.

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<sup>2</sup> Addendum III also required a suitable time series of fisheries independent indices of abundance as determined by the Tautog Technical Committee; however the TC has not defined this and as such there are no fishery independent monitoring requirements



## **Massachusetts**

### **Fishery-independent:**

- Directed sampling of pots and rod and reel for age and growth parameters
- Spring and fall coast-wide resource assessment trawl surveys
- Saltonstall-Kennedy grant through NOAA Fisheries to evaluate the efficacy of a rod and reel survey for tautog; pilot study began in 2016 and will evaluate a rod and reel survey's ability to address limitations in generating reliable indices of abundance from our trawl survey
- Tautog samples also obtained in ventless trap survey that is used primarily to assess lobster

### **Fishery-dependent:**

- Commercial landings data are collected at the trip level from harvesters and primary buyers
- Market sampling for length data

## **Rhode Island**

### **Fishery-independent:**

- Narragansett Bay monthly trawl survey
- Narragansett Bay beach seine survey
- RI coastal ponds beach seine survey

### **Fishery-dependent:**

- Fall recreational fishery sampling for age and length
- Fish Pot Survey collects age data
- Commercial landings monitored by the Standard Atlantic Fisheries Information System (SAFIS). Recreational fishery monitored by Marine Recreational Information Program (MRIP) calculation methodology.

## **Connecticut**

### **Fishery-independent:**

- Tautog abundance monitored since 1984 via Connecticut's Long Island Sound Trawl Survey.

### **Fishery-dependent:**

- Mandatory commercial fishery reporting requirements include monthly logbooks of daily fishing activity and sales from fishermen and monthly reports of individual purchase transactions from dealers; reported annually to the ACCSP SAFIS Data Warehouse

## **New York**

**Fishery-independent:**

- Finfish Trawl Survey: since 1987 (except for 2005 and 2006, when there were no data) uses small-mesh trawls to sample 60 to 80 randomly chosen stations each month from May through October.
- Long Island Sound Tautog Study: 35 fish traps were deployed between June 16 and November 1, 2016 between Mattituck Inlet, Mattituck NY, and Rocky Point in East Marion, NY. Traps were placed near submerged rocks where blackfish would be expected to be found. Traps were checked and all fish measured weekly.

**Fishery-dependent:**

- Samples collected from commercial markets and dockside in April, May, July, September, October and November 2016; Age data used to obtain an age-length key.

**New Jersey****Fishery-independent:**

- Five near shore (within the 15 fathom isobath boundary) trawl surveys are conducted each year in January/February, April, June, August, and October. All tautog are weighed and measured, and catch per unit effort (CPUE) in number of fish per tow and biomass (kilograms) per tow is calculated each year.

**Fishery-dependent:**

- Ongoing biological data collection since 1993 with emphasis in recent years of encompassing the entire year and seasonality of the fishery while amassing length, weight, sex and age data.
- Sampling from the commercial fishery and the party/charter boat sector of the recreational fishery.
  - Sampling on the commercial vessels focus on the collection of live length, weight and sex data from fish retained for sale in the live fish market
  - Age data from undersize fish donated to onboard New Jersey Atlantic Coastal Cooperative Statistical Program (ACCSP) staff members for biological sampling.
  - From the recreational fishery, length, sex and age data are collected strictly from fish retained for harvest

**Delaware****Fishery-independent:**

- Delaware Bay and Inland Bay surveys from April through October
  - Juvenile 16 ft. trawl survey conducted monthly from April through October
  - 30 ft. adult finfish abundance trawl conducted from March to December.

**Fishery-dependent:**

- Mandatory, fisherman-reported, monthly logbook submissions to the State of Delaware.

- 100 operculum bones were collected in the spring recreational season and 101 operculum bones were collected in the fall season for constructing age-length keys.

## **Maryland**

### **Fishery-independent:**

- Maryland Department of Natural Resources (MDNR) Coastal Bays Fishery Investigations (CBFI) Trawl and Beach Seine Survey.  
CBFI SAV Habitat Survey was conducted in Sinepuxent Bay in 2016

### **Fishery-dependent:**

- Sampling for aging structures was conducted by hook and line during two charter boat trips in the spring of 2016.

## **Virginia**

### **Fishery-independent:**

- None

### **Fishery-dependent:**

- Biological Sampling Program collects biological data (lengths, weights, otoliths) from Virginia's commercial and recreational fisheries.
- Samples are collected from commercial hook-and-line gear, haul seines, pots and traps, and pound nets.
- Virginia's recreational fishery participates in the MRIP biological sampling program, Virginia Game Fish Tagging Program, and VMRC Marine Sport Fish Collection Project.

## **VI. Status of Management Measures and Issues**

Draft Amendment 1 was initiated by the Management Board in May 2015. The amendment updates the 1996 FMP with new fishery management principles and consolidates associated addenda into a single document. The document proposes regional management for tautog to address the overfishing stock status present in some regions. In addition, a commercial harvest tagging program is proposed to address an illegal, unreported and undocumented fishery that has persisted for more than a decade. If approved, Draft Amendment 1 would be the comprehensive management document for tautog management in state waters.

The amendment went out for public comment in June and July 2017. The Board will consider final approval of Draft Amendment 1 at the October 2017 meeting.

## VII. Implementation of FMP Compliance Requirements

### A. Submission of Compliance Report

All states in the tautog management unit submitted state compliance reports for fishing years 2015 and 2016.

### B. De Minimis Status Requests

Addendum I established qualifications for *de minimis* status. A state must prove that its commercial landings in the most recent year for which data are available did not exceed the greater of 10,000 pounds or 1% of the coastwide commercial landings, whichever is greater. States must request *de minimis* status each year and requests for *de minimis* status will be reviewed by the PRT as part of the annual FMP review process.

A state that is granted *de minimis* status is still required to implement the 14" minimum size limit for the commercial fishery, the pot and trap degradable fastener provisions, and regulations in the commercial fishery that are consistent with those in the recreational fishery. If granted *de minimis* status, a state must continue to collect 200 age/length samples as required in Addendum III. *De minimis* status does not impact a state's compliance requirements in the recreational fishery.

The commercial landings threshold for *de minimis* status for both 2015 and 2016 is 10,000 pounds. The states of Delaware and Maryland qualify for and have requested continued *de minimis status* for the commercial sector. The PRT recommends that the Board approve the states of Delaware, Maryland, and North Carolina's requests.

### C. Regulatory Requirements: 14" minimum size limit for recreational and commercial fisheries (FMP); degradable fasteners on one panel or door in fish pots and traps (FMP); and state-specific management programs to achieve the target F of 0.15 (Addendum VI).

State regulations are summarized in Tables 7 and 8. The PRT finds that each state has met the regulatory requirements and recommends that Board find all states in compliance with the regulatory requirements.

### D. Biological Sampling Requirements: commercial and recreational catch estimates; and 200 age/length samples (Addendum III)

Most states collected 200 or more age/length samples in 2015 and 2016 as required by Addendum III (Table 9). Rhode Island fell short with 178 and 158 samples. Sampling is dependent on the donation of tautog racks from the recreational fishery, and sampling on board recreational charter vessels. Staff were unable to obtain 200 samples due to low participation of recreational fishers. Additionally, in 2016 the Fish Pot Survey ended early due to vessel problems and therefore only a limited number of samples were obtained.

The PRT finds that all states meet (or tried to meet) the intent of the Addendum III sampling requirements and recommends the Board find all states in compliance with the sampling requirements of the FMP .

As some states are unable to meet the 200 age/length sample requirement, the PRT suggests that the required number of samples should be proportional to a state's harvest up to 200 samples, rather than set at a fixed number.

The PRT recommends that the TC be tasked with evaluating the biological sampling needs to support continued regional stock assessments for tautog, and recommending any revisions to the biological sampling requirements.

## VIII. Prioritized Research Needs

The Technical Committee identified the following research recommendations to improve the stock assessment and our understanding of tautog population and fishery dynamics. Research recommendations are organized by topic and level of priority. Research recommendations that should be completed before the next benchmark assessment are underlined. The Technical Committee will update these recommendations as part of the next benchmark stock assessment.

### 8.1 Fishery-Dependent Priorities

#### *High*

- Expand biological sampling of the commercial catch for each gear type over the entire range of the stock (including weight, lengths, age, sex, and discards).
- Continue collecting operculum from the tautog catch as the standard for biological sampling in addition to collecting paired sub-samples of otoliths and operculum.
- Increase catch and discard length sampling from the commercial and recreational fishery for all states from Massachusetts through Virginia.
- Increase collection of effort data for determining commercial and recreational CPUE.
- Increase MRIP sampling levels to improve recreational catch estimates by state and mode. Current sampling levels are high during times of the year when more abundant and popular species are abundant in catches, but much lower in early spring and late fall when tautog catches are more likely.

### 8.2 Fishery-Independent Priorities

### **High**

- Conduct workshop and pilot studies to design a standardized, multi-state fishery independent survey for tautog along the lines of MARMAP and the lobster ventless trap survey.
- Establish standardized multi-state long-term fisheries-independent surveys to monitor tautog abundance and length-frequency distributions, and to develop YOY indices.
- Enhance collection of age information for smaller fish (<20 cm) to better fill in age-length keys.

### **8.3 Life History, Biological, and Habitat Priorities**

#### **Moderate**

- Define local and regional movement patterns and site fidelity in the southern part of the species range. This information may provide insight into questions of aggregation versus recruitment to artificial reef locations, and to clarify the need for local and regional assessment.
- Assemble regional reference collections of paired operculum and otolith samples and schedule regular exchanges to maintain and improve the precision of age readings between states that will be pooled in the regional age-length keys.
- Calibrate age readings every year by re-reading a subset of samples from previous years before ageing new samples. States that do not currently assess the precision of their age readings over time should do so by re-ageing a subset of their historical samples.

#### **Low**

- Evaluate the potential impacts of climate change on tautog range, life history, and productivity.
- Conduct a tag retention study to improve return rates, particularly in the northern region.
- Define the status (condition and extent) of optimum or suitable juvenile habitats and trends in specific areas important to the species. It is critical to protect these habitats or to stimulate restoration or enhancement, if required.
- Define the specific spawning and pre-spawning aggregating areas and wintering areas of juveniles and adults used by all major local populations, as well as the migration routes used by tautog to get to and from spawning and wintering areas and the criteria or times of use. This information is required to protect these areas from damage and overuse or excessive exploitation.

- Define larval diets and prey availability requirements. This information can be used as determinants of recruitment success and habitat function status. Information can also be used to support aquaculture ventures with this species.
- Define the role of prey type and availability in local juvenile/adult population dynamics over the species range. This information can explain differences in local abundance, movements, growth, fecundity, etc. Conduct studies in areas where the availability of primary prey, such as blue mussels or crabs, is dependent on annual recruitment, the effect of prey recruitment variability as a factor in tautog movements (to find better prey fields), mortality (greater predation exposure when leaving shelter to forage open bottom), and relationship between reef prey availability/quality on tautog condition/fecundity.
- Define the susceptibility of juveniles to coastal/anthropogenic contamination and resulting effects. This information can explain differences in local abundance, movements, growth, fecundity, and serve to support continued or increased regulation of the inputs of these contaminants and to assess potential damage. Since oil spills seem to be a too frequent coastal impact problem where juvenile tautog live, it may be helpful to conduct specific studies on effects of various fuel oils and typical exposure concentrations, at various seasonal temperatures and salinities. Studies should also be conducted to evaluate the effect of common piling treatment leachates and common antifouling paints on YOY tautog. The synergistic effects of leaked fuel, bilge water, treated pilings, and antifouling paints on tautog health should also be studied.
- Define the source of offshore eggs and larvae (in situ or washed out coastal spawning).
- Confirm that tautog, like cunner, hibernate in the winter, and in what areas and temperature thresholds, for how long, and if there are special habitat requirements during these times that should be protected or conserved from damage or disturbance. This information will aid in understanding behavior variability and harvest availability.

#### **8.4 Management, Law Enforcement, and Socioeconomic Priorities**

##### ***Moderate***

- Collect data to assess the magnitude of illegal harvest of tautog and the efficacy of the tagging program.

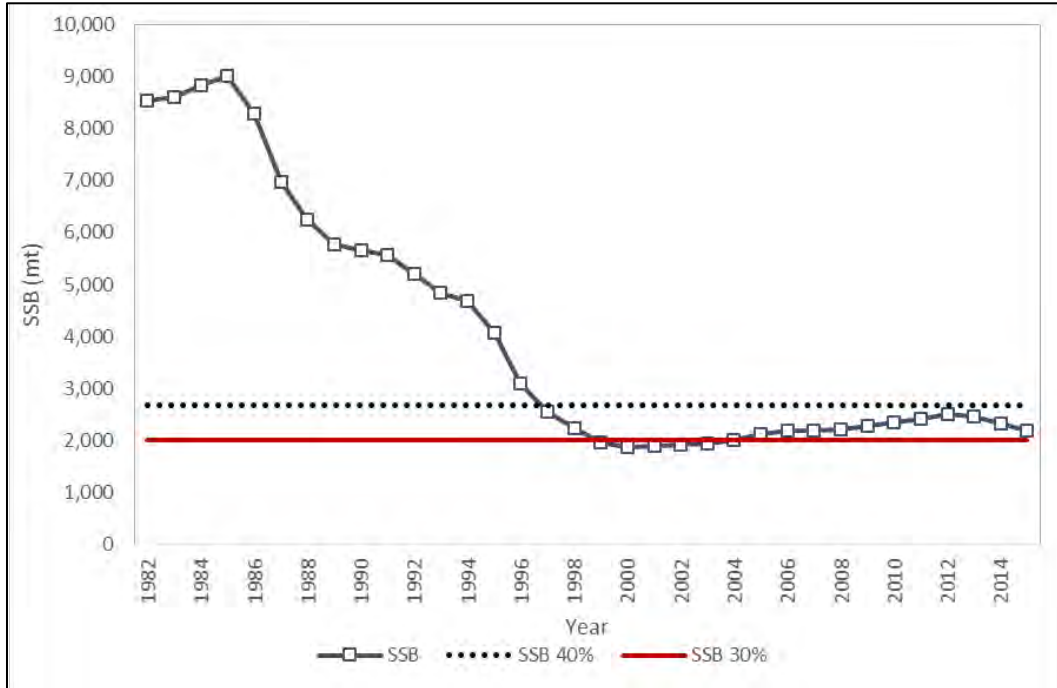
##### ***Low***

- Collect basic sociocultural data on tautog user groups including demographics, location, and aspects of fishing practices such as seasonality.

## Figures & Tables

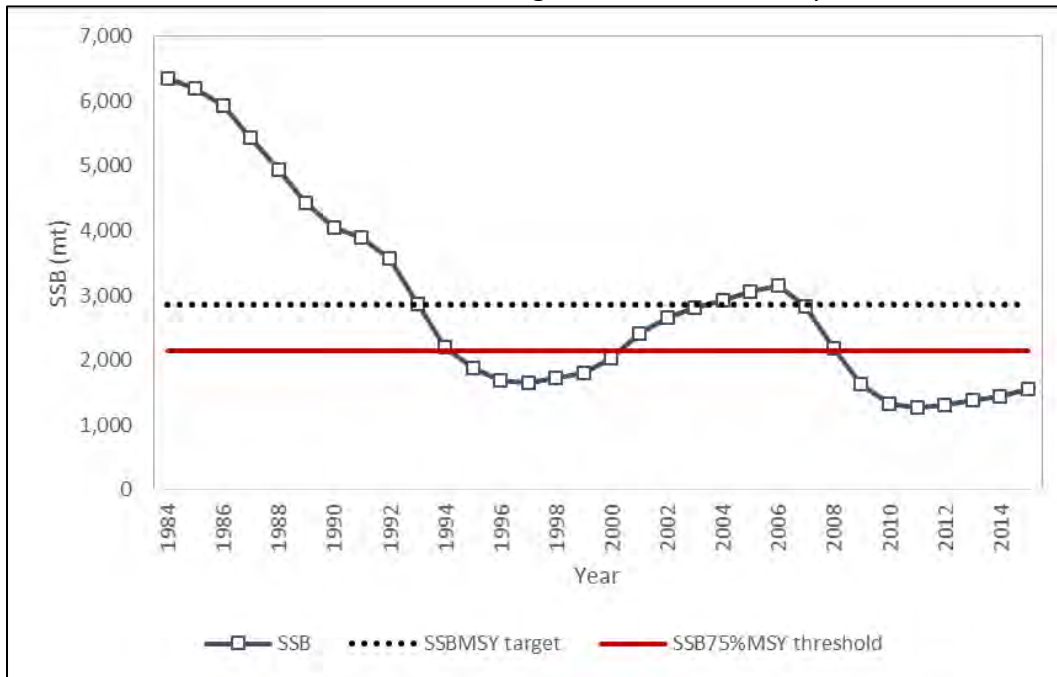
**Figure 1. Spawning Stock Biomass targets and thresholds for MARI region.**

Source: 2016 ASMFC Tautog Stock Assessment Update.



**Figure 2. Spawning Stock Biomass targets and thresholds for LIS region.**

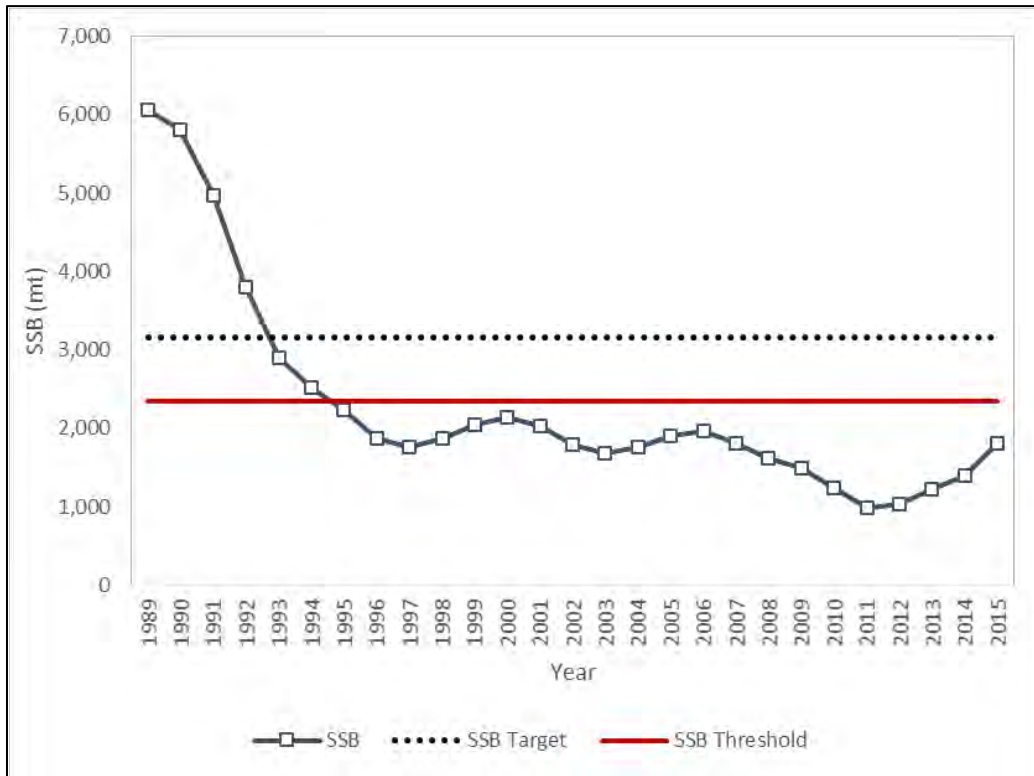
Source: 2016 ASMFC Tautog Stock Assessment Update.





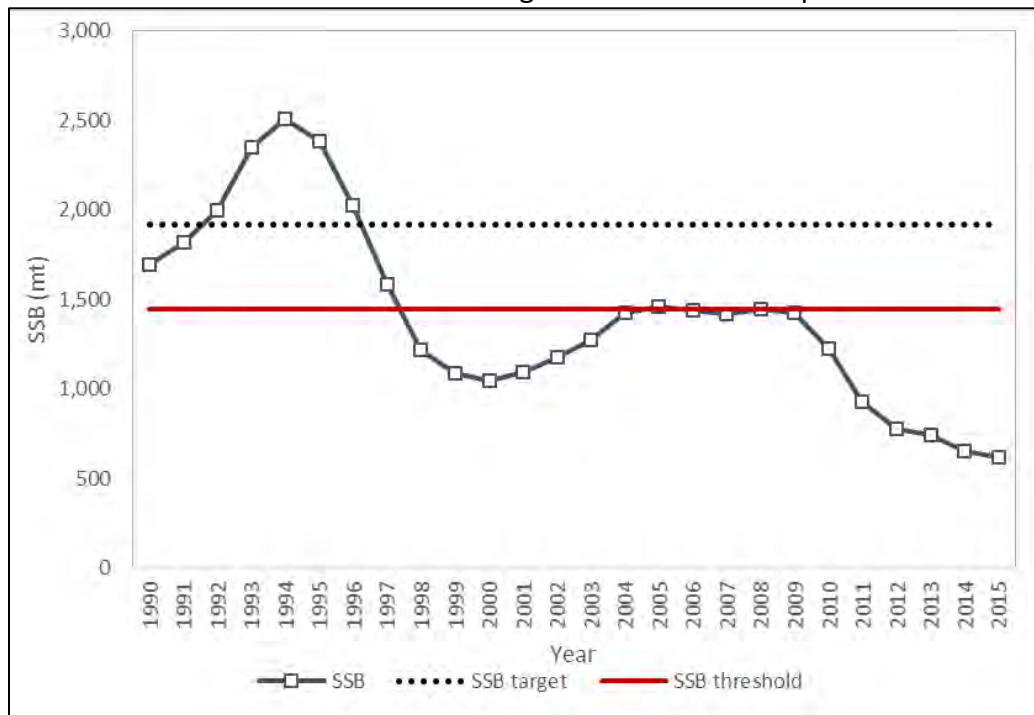
**Figure 3. Spawning Stock Biomass targets and thresholds for NJ-NYB region.**

Source: 2016 ASMFC Tautog Stock Assessment Update.

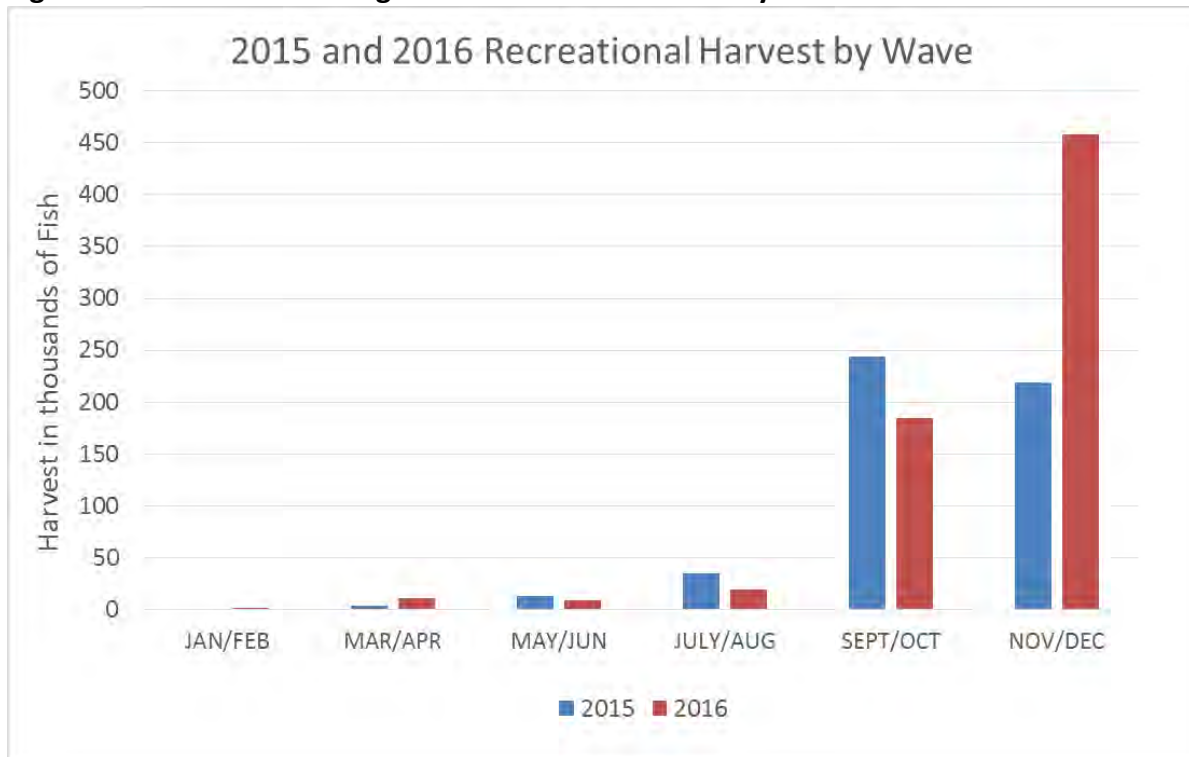


**Figure 4. Spawning Stock Biomass targets and thresholds for DMV region.**

Source: 2016 ASMFC Tautog Stock Assessment Update.

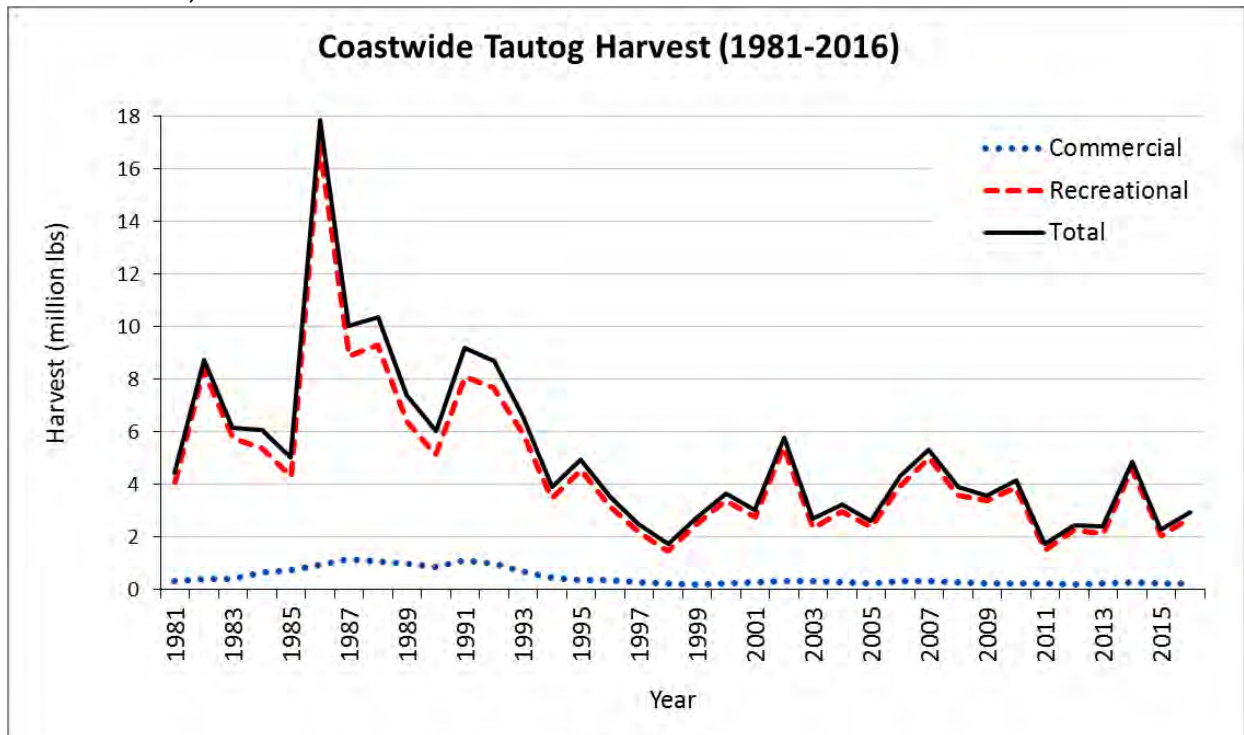


**Figure 5. Recreational tautog harvest in 2015 and 2016 by wave.**



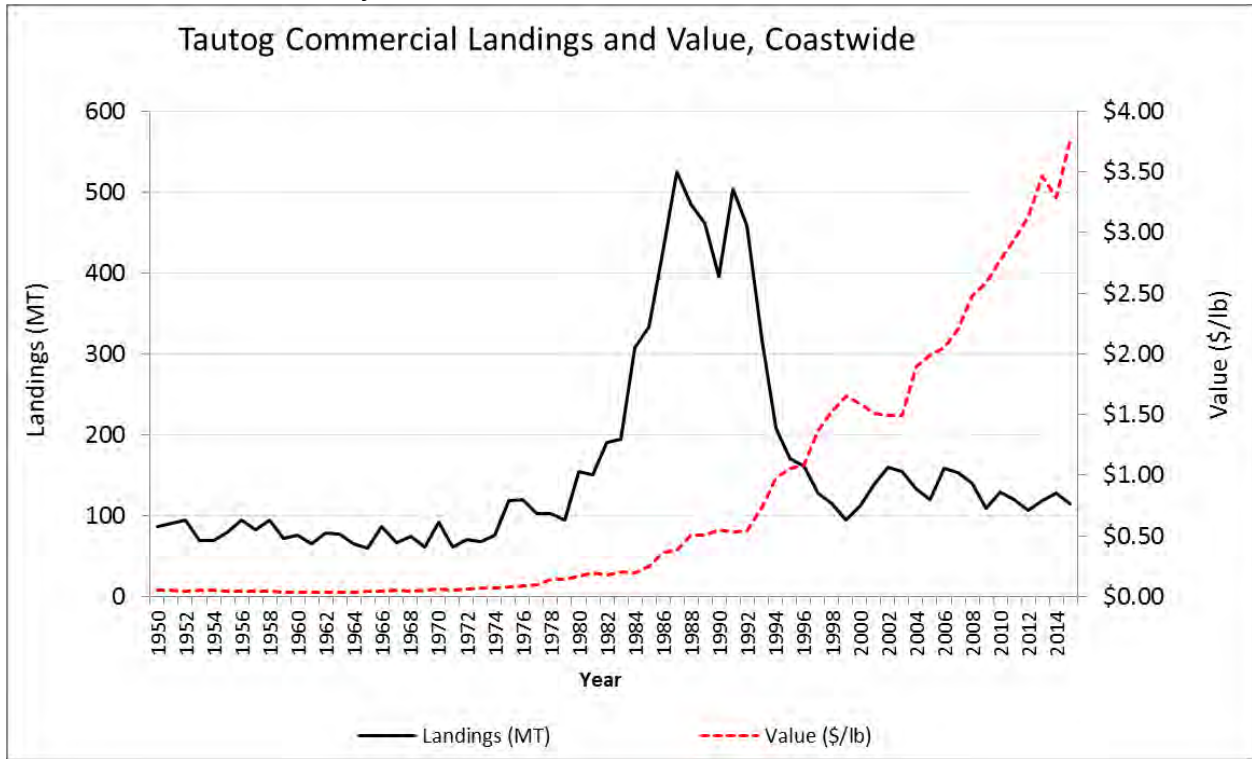
**Figure 6. Total tautog harvest (recreational A+B1 and commercial, excluding discard).**

Source: NMFS, MRIP.



**Figure 7. Changes in tautog commercial landings (lbs) and value (\$/lb) over time.**

Source: NMFS. Values unadjusted for inflation.



**Table 1. Current fishing mortality and biomass targets and thresholds for each region. Source: 2016 Tautog Assessment Update (ASMFC).**

<b>Region</b>	<b>F<sub>target</sub></b>	<b>F<sub>threshold</sub></b>	<b>F<sub>3yravg</sub></b>	<b>SSB<sub>target</sub></b>	<b>SSB<sub>threshold</sub></b>	<b>SSB<sub>2015</sub></b>	<b>MSY or SPR</b>	<b>Status</b>
MARI	0.28	0.49	0.23	3,631 mt	2,723 mt	2,196 mt	SPR	Not overfished, overfishing not occurring
LIS	0.28	0.49	0.51	2,865 mt	2,148 mt	1,603 mt	MSY	Overfished, overfishing
NJ-NYB	0.20	0.34	0.54	3,154 mt	2,351 mt	1,809 mt	MSY	Overfished, overfishing
DMV	0.16	0.24	0.16	1,919 mt	1,447 mt	621 mt	SPR	Overfished, overfishing not occurring

**Table 2.** Tautog recreational and commercial landings from 1981 – 2016, in pounds.  
Source: State Compliance Reports, NMFS, and ACCSP Data Warehouse.

<b>Year</b>	<b>Commercial Landings (lbs)</b>	<b>Recreational Harvest, A + B1 (lbs)</b>	<b>Total Harvest (lbs)</b>	<b>%Recreational</b>
1981	332,000	4,115,046	4,447,561	92.5
1982	419,656	8,337,959	8,757,614	95.2
1983	427,919	5,749,537	6,178,736	93.1
1984	677,615	5,381,193	6,058,808	88.8
1985	734,370	4,305,086	5,039,457	85.4
1986	941,012	16,906,397	17,847,409	94.7
1987	1,157,280	8,888,783	10,046,062	88.5
1988	1,071,017	9,301,700	10,372,717	89.7
1989	1,016,631	6,377,750	7,395,958	86.2
1990	873,510	5,156,175	6,029,685	85.5
1991	1,110,344	8,101,442	9,215,355	87.9
1992	1,012,176	7,671,225	8,683,401	88.3
1993	698,493	5,927,020	6,625,513	89.5
1994	459,529	3,468,112	3,927,641	88.3
1995	375,567	4,567,374	4,942,941	92.4
1996	357,434	3,184,899	3,542,335	90.0
1997	280,912	2,204,039	2,484,951	88.7
1998	254,186	1,479,761	1,733,948	85.3
1999	208,825	2,532,689	2,741,515	92.4
2000	247,456	3,398,349	3,645,804	93.2
2001	305,487	2,749,700	3,055,188	90.0
2002	351,451	5,431,146	5,782,596	93.9
2003	342,651	2,357,940	2,700,591	87.4
2004	299,602	2,959,167	3,250,218	91.2
2005	292,194	2,379,790	2,665,337	90.2
2006	349,602	3,923,886	4,312,596	91.0
2007	340,898	5,009,022	5,309,156	94.4
2008	310,896	3,589,421	3,909,229	91.9
2009	242,723	3,408,159	3,576,790	95.3
2010	286,724	3,885,106	4,192,231	93.7
2011	262,226	1,503,075	1,754,723	85.8
2012	213,854	2,248,763	2,419,740	91.3
2013	259,744*	2,158,564	2,408,672	89.3
2014	279,541**	4,608,252	4,878,458	94.5
2015	245,168	2,043,033	2,285,615	89.4
2016	268,425***	2,704,453	2,968,569	91.1

\* 2013 commercial landings do not include data from Maryland, which was confidential.

\*\*2014 commercial landings did not include Connecticut, which was confidential

\*\*\*2016 commercial landings did not include Maryland, which was confidential

**Table 3.** Tautog landings by sector for 2015 and 2016: percent recreational (A + B1) and commercial based on weight.

State	2015		2016	
	Commercial Landings (%)	Recreational (A+B1) (%)	Commercial Landings (%)	Recreational (A+B1) (%)
MA	25.4	74.6	44.5	55.5
RI	11.1	88.9	13.0	87.0
CT	1.4	98.6	1.1	98.9
NY	23.1	76.9	10.4	89.6
NJ	3.3	96.7	3.1	96.9
DE	7.6	92.4	2.0	98.0
MD	8.5	91.5	confidential	confidential
VA	12.0	88.0	10.3	89.7
NC	3.4	96.6	1.0	99.0
Coastwide	11.1	88.9	9.0	91.0

**Table 4. Recreational harvest (A+B1) and discards for tautog in number of fish, 1981-2016 (MRIP).**

Year	MA	RI	CT	NY	NJ	DE	MD	VA	NC	Coastwide Total	Coastwide Live Discards (B2)
1981	228,736	233,508	100,308	721,062	132,271	3,457	4,670	236,768	3,072	1,663,852	386,614
1982	1,051,022	214,938	231,187	646,693	583,550	137,328	35,105	71,599	15,062	2,986,485	292,888
1983	670,508	245,796	200,676	612,163	344,580	4,350	2,126	579,795	36,549	2,696,543	676,332
1984	258,256	490,128	287,470	286,077	516,086	28,388	42,835	207,192	NA	2,116,431	647,963
1985	100,941	115,404	182,318	1,105,234	840,627	62,001	486	91,957	8,252	2,507,218	718,180
1986	1,980,719	671,592	333,396	1,183,114	2,369,852	141,290	5,476	322,905	12,660	7,021,003	1,103,147
1987	617,068	130,729	312,430	929,887	1,015,123	99,706	90,523	126,783	3,698	3,325,949	1,405,775
1988	621,679	207,799	234,198	828,183	564,286	94,491	107,570	368,320	4,462	3,030,988	1,244,947
1989	250,077	116,506	303,782	562,549	710,958	249,928	34,709	284,477	11,354	2,524,340	1,068,626
1990	233,444	153,433	75,871	953,622	841,770	61,526	45,467	111,998	3,428	2,480,562	1,237,775
1991	176,905	291,946	191,137	871,221	1,067,283	128,985	26,770	168,068	6,804	2,929,119	2,260,230
1992	357,949	193,786	319,221	413,236	1,018,205	68,769	106,255	100,952	5,249	2,583,621	1,607,758
1993	216,553	118,775	180,055	505,632	773,213	82,475	60,231	300,484	4,785	2,242,204	1,971,467
1994	78,483	82,304	150,109	196,937	208,003	65,837	157,260	231,740	2,271	1,172,942	1,480,320
1995	72,461	54,570	120,259	118,006	707,963	300,303	43,542	222,186	3,178	1,642,466	2,103,564
1996	79,798	55,528	72,558	82,826	470,431	57,751	9,695	224,447	6,605	1,059,640	1,158,157
1997	39,075	70,628	32,200	92,907	196,724	65,133	85,682	106,678	11,432	700,457	1,090,444
1998	25,034	56,084	66,797	68,887	11,667	62,584	6,512	50,923	9,487	357,975	1,398,973
1999	91,476	52,136	15,701	196,564	165,505	95,309	20,180	42,880	8,437	688,187	2,286,716
2000	87,552	38,687	10,648	79,245	462,371	113,686	20,129	34,725	5,555	852,596	1,731,884
2001	115,658	39,993	16,579	45,913	467,728	50,541	23,715	28,985	2,418	791,532	2,033,955
2002	102,662	62,423	100,240	629,772	347,831	185,684	42,038	25,987	4,514	1,501,153	3,177,322
2003	46,808	120,061	167,875	128,729	102,593	63,181	13,555	76,236	12,185	731,221	1,679,385
2004	21,816	124,419	16,464	278,749	90,214	70,608	8,690	150,703	9,137	770,799	1,739,740
2005	72,038	160,524	35,699	84,280	43,055	60,831	28,129	60,484	13,603	558,646	1,456,161
2006	79,639	81,611	200,708	246,882	200,725	111,028	14,894	105,137	1,234	1,041,857	2,648,386
2007	91,304	125,233	352,819	223,798	300,179	99,605	43,308	60,992	15,181	1,312,419	3,629,353
2008	34,237	103,760	167,179	318,899	172,518	101,735	19,128	56,384	689	974,528	2,495,079
2009	24,879	85,416	85,915	346,276	127,403	119,941	37,963	60,470	2,895	891,160	2,309,449
2010	45,743	197,062	116,058	145,663	374,599	56,505	57,338	127,221	3,720	1,123,910	2,878,417
2011	32,828	19,304	25,823	111,406	136,674	45,483	11,853	46,441	981	430,792	1,923,086
2012	24,796	104,425	194,101	61,508	37,611	46,570	5,356	13,920	9,936	498,222	2,021,177
2013	57,736	136,190	104,451	76,797	111,377	38,368	3,851	5,976	5,963	540,706	2,185,251
2014	100,297	68,768	318,201	300,399	169,879	50,467	494	25,917	3,997	1,038,419	4,066,058
2015	39,860	98,404	125,819	99,119	157,008	7,483	2,988	11,540	2,014	544,235	2,579,952
2016	24,243	86,528	165,315	270,944	83,466	30,032	1,870	17,127	1,517	681,042	4,105,503

**Table 5. Recreational harvest (A + B1) for tautog in pounds, by state, 1981-2016.**

Source: MRFSS/MRIP, State Compliance Reports.

Year	MA	RI	CT	NY	NJ	DE	MD	VA	NC
1981	790,610	664,568	242,337	1,496,039	161,423	6,584	10,296	742,653	536
1982	3,226,868	777,930	610,608	1,674,949	1,241,155	428,036	90,645	271,919	15,849
1983	1,837,262	615,595	458,582	1,124,844	414,957	4,437	6,551	1,267,165	20,144
1984	733,876	1,809,822	733,710	541,805	717,261	95,740	79,110	669,869	NA
1985	328,041	277,384	471,185	2,034,903	741,656	144,859	1,107	298,797	7,154
1986	7,862,584	2,042,584	838,346	2,833,208	2,132,571	264,744	10,049	918,138	4,173
1987	1,751,372	507,424	1,106,606	2,288,076	2,130,955	387,075	266,094	442,751	8,430
1988	2,255,930	612,123	610,171	2,380,285	1,331,833	249,803	446,947	1,410,003	4,605
1989	1,076,366	296,889	1,038,217	1,018,015	1,289,185	743,339	78,391	806,336	31,012
1990	895,327	389,579	200,000	1,980,289	1,256,488	142,627	59,720	229,442	2,703
1991	798,889	1,007,549	648,634	2,352,646	2,189,144	354,498	106,223	619,214	24,645
1992	1,668,485	656,712	1,048,639	1,199,558	2,485,693	183,854	159,730	255,995	12,559
1993	752,598	389,733	531,023	1,800,794	1,361,612	217,881	105,231	758,410	9,738
1994	373,189	328,668	417,438	585,037	330,551	152,033	177,358	1,101,130	2,708
1995	309,224	237,093	402,616	369,643	1,722,713	793,339	115,993	613,348	3,405
1996	397,284	248,840	245,816	193,045	1,123,174	158,751	26,483	778,315	13,191
1997	166,042	301,109	84,297	331,529	483,639	204,419	182,995	391,258	58,751
1998	96,695	316,339	231,622	208,743	41,431	257,348	27,648	273,515	26,420
1999	363,471	223,763	61,142	761,446	511,673	358,328	37,677	203,249	11,940
2000	442,816	203,602	58,475	258,100	1,812,960	373,581	56,126	188,187	4,502
2001	502,247	165,380	63,157	171,927	1,482,613	159,961	72,357	127,555	4,503
2002	521,611	265,116	447,140	2,135,221	1,184,560	652,007	104,246	116,797	4,448
2003	221,843	479,345	603,861	315,384	164,327	200,618	43,212	308,838	20,512
2004	104,513	682,329	77,219	965,837	276,724	243,467	21,633	553,866	33,579
2005	376,624	815,377	148,564	310,961	145,311	221,132	89,237	242,590	29,994
2006	296,636	380,140	842,213	782,424	734,509	406,336	47,463	430,157	4,008
2007	349,950	635,094	1,383,278	823,475	1,065,237	301,005	144,111	246,827	60,045
2008	106,871	491,403	715,317	1,094,903	518,813	365,619	62,710	232,557	1,228
2009	70,806	322,955	305,077	1,478,263	414,249	400,120	130,369	268,314	18,006
2010	163,057	918,693	409,370	508,487	1,044,598	151,793	201,769	477,734	9,605
2011	129,669	80,300	88,728	450,171	381,449	152,899	33,859	184,445	1,555
2012	94,699	534,716	982,891	252,745	133,048	171,329	17,670	49,988	11,677
2013	197,775	629,896	389,918	355,232	395,539	138,051	18,681	23,836	9,636
2014	399,812	297,955	1,643,470	1,365,338	579,934	187,915	3,004	121,352	9,472
2015	181,119	376,395	512,650	373,240	508,685	25,580	11,897	50,787	2,680
2016	72,342	338,501	705,146	1,162,729	262,665	100,253	7,708	52,236	2,873



**Table 6. Commercial landings for tautog in pounds, by state, 1981-2016.**

Source: personal communication from the National Marine Fisheries Service, Fisheries Statistics Division, Silver Spring, MD (commercial 1981 – 2009) and ACCSP Data Warehouse (2010). States are sorted from north to south.

Year	MA	RI	CT	NY	NJ	DE	MD	VA	NC
1981	102,900	69,800	20,500	81,400	54,400	1,000	1,200	700	na
1982	69,300	86,300	21,200	90,400	148,200	800	100	2,600	656
1983	57,600	142,600	33,500	88,400	100,600	800	na	1,700	319
1984	68,100	334,700	32,700	102,500	129,700	1,400	2,600	1,200	4,715
1985	63,300	403,200	50,100	84,500	125,500	3,200	2,400	1,639	531
1986	165,800	363,100	104,200	201,300	100,700	300	2,600	1,800	1,006
1987	250,000	420,500	159,200	225,200	95,200	500	3,800	2,700	80
1988	277,100	328,900	112,100	255,000	88,000	600	6,100	2,800	214
1989	352,100	214,800	99,700	285,400	51,900	500	4,000	7,500	531
1990	289,074	211,084	82,008	181,543	99,112	500	3,954	5,151	1,079
1991	354,346	371,597	54,000	226,413	93,022	1,300	3,164	5,058	1,211
1992	292,291	359,767	65,700	169,011	116,332	200	4,058	4,389	424
1993	160,336	201,593	86,064	89,467	153,474	300	1,432	5,423	351
1994	37,062	130,719	43,000	71,375	162,641	400	1,718	11,441	1,134
1995	35,298	94,989	20,466	72,879	115,970	600	4,416	30,020	929
1996	32,579	64,817	33,327	105,466	89,435	1,599	3,622	26,137	452
1997	64,240	39,601	14,519	78,228	49,726	841	7,663	25,471	623
1998	91,319	20,304	6,905	68,892	42,426	1,715	5,682	14,770	2,173
1999	75,619	26,090	12,961	37,886	27,307	844	6,489	20,901	728
2000	96,001	43,719	8,504	39,953	39,636	272	3,896	14,794	674
2001	84,330	56,065	22,259	62,795	60,152	287	4,591	14,587	414
2002	148,073	50,007	26,781	60,805	36,605	629	5,010	22,834	705
2003	86,205	56,749	40,784	72,264	66,766	3,816	5,213	10,705	98
2004	88,192	36,581	26,037	76,606	49,910	3,064	6,049	13,079	84
2005	99,344	42,838	24,053	52,525	61,163	2,210	4,338	5,667	56
2006	147,609	46,629	16,841	68,432	55,532	433	5,411	8,533	47
2007	95,820	63,428	30,002	73,787	62,979	2,814	3,293	8,588	187
2008	73,867	48,024	20,160	88,552	63,958	2,253	2,942	10,946	194
2009	54,703	50,896	20,298	87,289	14,591	2,116	1,638	11,132	61
2010	75,317	44,054	16,484	92,487	49,213	1,770	1,285	6,081	34
2011	57,787	47,427	14,205	82,534	42,125	2,192	1,333	14,590	28
2012	67,870	50,127	5,638	69,786	4,112	1,444	1,040	49,983	227
2013	69,686	53,433	5,886	110,680	7,662	415	confid	11,776	206
2014	63,191	53,384	confid	121,538	31,665	1,071	1,147	7,545	137
2015	61,752	47,137	7,250	111,925	17,219	2,107	1,103	6,937	94
2016	58,095	50,686	7,558	135,487	8,486	2,083	confid	5,884	30

**Table 7. State recreational regulations implemented for tautog in the 2015 and 2016 fishing years.**

<b>STATE</b>	<b>SIZE LIMIT</b> (inches)	<b>POSSESSION LIMITS</b> (number of fish/ person/ day)	<b>OPEN SEASONS</b> (dates inclusive)
Massachusetts	16"	3	Jan 1 – Dec 31
Rhode Island	16"	3	Apr 15 – May 31
		3	Aug 1 – Oct 15
		6 (up to 10 per vessel)	Oct 16- Dec 15 (private)
		6	Oct 20 – Dec 15 (party, charter)
Connecticut	16"	2	Apr 1-Apr 30
		2	July 1 – Aug 31
		4	Oct 10 – Dec 6
New York	16"	4	Oct 5 – Dec 14
New Jersey	15"	4	Jan 1 – Feb 28
		4	Apr 1 – Apr 30
		1	Jul 17 – Nov 15
		6	Nov 16 – Dec 31
Delaware	15"	5	Jan 1 – Mar 31
		3	Apr 1 – May 11
		5	July 17 – Aug 31
		5	Sept 29 – Dec 31
Maryland	16"	4	Jan 1- May 15
		2	May 16 – Oct 3
		4	Nov 1 – 26
Virginia	16"	3	Jan 1 - Apr 30 Sept 20 - Dec 31

**Table 8. State commercial regulations implemented for tautog in the 2015 and 2016 fishing years.**

STATE	SIZE LIMIT	POSSESSION LIMITS (number of fish)	OPEN SEASONS	QUOTA (pounds)	GEAR RESTRICTIONS
Massachusetts	16"	40	April 16-28% Quota Sept 1-100% of Quota*	54,984, 57,985	Mandatory pot requirements. Limited entry and area/time closures for specific gear types.
Rhode Island	16"	10	Apr 15 - May 31 Aug 1 - Sept 15 Oct 15 - Dec 31	51,348**	Harvest allowed by permitted gear types only.
Connecticut	16"	4 (restricted licenses) 10 (all other)	Apr 1- Apr 30 Jul 1 - Aug 31 Oct 8 - Dec 24	-	Mandatory pot requirements.
New York	15"	25 (10 fish w/ lobster gear and when 6 lobsters are in possession)	Jan 1 - Feb 28 Apr 8 - Dec 31	-	Mandatory pot requirements. Gill or trammel net is prohibited.
New Jersey	15"	> 100 lbs requires directed fishery permit	Jan 1 - 15 June 11 - 30 Nov 9 - Dec 31	103,000	Mandatory pot requirements.
Delaware	15"	5 3 5 5	Jan 1 - Mar 31 Apr 1 - May 11 July 17 - Aug 31 Sept 29 - Dec 31	-	Mandatory pot requirements.
Maryland	16"	4 2 4	Jan 1- May 15 May 16 - Oct 31 Nov 1 - 26	-	Mandatory pot requirements.
Virginia	15"	-	Jan 1 – Jan 21 Mar 1 – Apr 30 Nov 1 – Dec 31	-	Mandatory pot requirements. Pots prohibited in tidal waters.

\* Massachusetts' spring open season closes when the Director projects that 28% of the quota is taken, and fall season closes when the Director projects 100% of the quota is taken.

\*\* Rhode Island's quota of 51,438 lbs is divided equally among the three sub-periods.

**Table 9. Number of age/length samples by state in 2015 and 2016.** Addendum III requires all states to collect 200 samples per year. Source: State compliance reports

<b>State</b>	<b>2015 Samples</b>	<b>2016 Samples</b>	<b>Sample Sources</b>
<b>MA</b>	553	779	Fishery independent pot, rod and reel, and trawl surveys, ventless trap survey for Lobster
<b>RI</b>	178	158	Recreational fishery sampling, RIDFW Fish Pot Survey
<b>CT</b>	318	276	Long Island Sound Trawl Survey
<b>NY</b>	256	232	Commercial markets and dockside sampling
<b>NJ</b>	425	621	Recreational fishery, commercial sampling and NJ Bureau of Marine Fisheries Ocean Trawl Survey
<b>DE</b>	200	201	Recreational sampling
<b>MD</b>	200	200	Coastal Bays Fishery Investigations Trawl and Beach Seine Survey
<b>VA</b>	491	221	Commercial sampling and Marine Sport Fish Collection Project

# Atlantic States Marine Fisheries Commission

## Spiny Dogfish Management Board

*October 16, 2017*

*3:00 – 3:45 p.m.*

*Norfolk, Virginia*

### Draft Agenda

The times listed are approximate; the order in which these items will be taken is subject to change; other items may be added as necessary.

1. Welcome/Call to Order (*D. Borden*) 3:00 p.m.
2. Board Consent 3:00 p.m.
  - Approval of Agenda
  - Approval of Proceedings from October 2016
3. Public Comment 3:05 p.m.
4. Review and Set Specifications for the 2018-2019 Season **Final Action** 3:15 p.m.
  - Review Mid-Atlantic Fishery Management Council's Recommended 2018 Specifications (*M. Appelman*)
  - Set 2018-2019 Specifications (*D. Borden*)
5. Consider 2017 Fishery Management Plan Review and State Compliance Reports (*M. Appelman*) **Action** 3:35 p.m.
6. Other Business/Adjourn 3:45 p.m.

The meeting will be held at the Waterside Marriott Hotel; 235 East Maine Street; Norfolk, Virginia 757.627.4200

*Vision: Sustainably Managing Atlantic Coastal Fisheries*

## MEETING OVERVIEW

### Spiny Dogfish Management Board

October 16, 2017

3:00 – 3:45 p.m.

Norfolk, Virginia

Chair: David Borden (RI) Assumed Chairmanship: 10/15	Vice Chair: Rob O'Reilly	Law Enforcement Committee Representative: Moran
Spiny Dogfish Technical Committee Chair: Scott Newlin	Spiny Dogfish Advisory Panel Chair: VACANT	Previous Board Meeting: October 24, 2016
Voting Members: ME, NH, MA, RI, CT, NY, NJ, DE, MD, VA, NC, NMFS, USFWS (13 votes)		

#### 2. Board Consent

- Approval of Agenda
- Approval of Proceedings from October 2016

**3. Public Comment** – At the beginning of the meeting public comment will be taken on items not on the Agenda. Individuals that wish to speak at this time must sign in at the beginning of the meeting. For agenda items that have already gone out for public hearing and/or have had a public comment period that has closed, the Board Chair may determine that additional public comment will not provide additional information. In this circumstance the Chair will not allow additional public comment on an issue. For agenda items that the public has not had a chance to provide input, the Board Chair may allow limited opportunity for comment. The Board Chair has the discretion to limit the number of speakers and/or the length of each comment.

#### 4. Review and Set Fishery Specifications for the 2018-2019 Season (3:15 – 3:35 p.m.) Final Action

##### Background

- The Mid-Atlantic and New England Councils (Councils) implemented multiyear fishery specifications (i.e., ABC, commercial quota, and possession limits) for 2016 – 2018 (May 2016 – April 2019).
- In September, the Mid-Atlantic Council's Scientific and Statistical Committee reviewed the 2017 data update and Advisory Panel's Fishery Performance Report for spiny dogfish. Based on the information presented, the SSC decided not to change its ABC recommendation for the 2018 fishing year of ABC = 22,635 mt (49.9 million pounds). **(Briefing Materials)**

- The Councils will consider changes to the 2018 fishery specifications, October 11<sup>th</sup>, in Riverhead, New York.

**Presentations**

- Review of the MAFMC and NEFMC 2016-2018 Specifications by M. Appelman

**Board Actions for Consideration at this Meeting**

- Set the spiny dogfish specifications, including trip limit for the northern region, for the 2018-2019 fishing year

**5. Consider 2016 Fishery Management Plan Review and State Compliance (3:35 – 3:45 p.m.) Action**

**Background**

- Annual state compliance reports for spiny dogfish are due July 1<sup>st</sup>
- The Plan Review Team reviewed the reports and drafted the 2017 Fishery Management Plan Review (**Briefing Materials**)

**Presentations**

- 2017 Draft Fishery Management Plan Review by M. Appelman

**Board Actions for Consideration at this Meeting**

- Consider 2017 Fishery Management Plan Review and State Compliance

**6. Other Business/Adjourn**

**DRAFT PROCEEDINGS OF THE  
ATLANTIC STATES MARINE FISHERIES COMMISSION  
SPINY DOGFISH MANAGEMENT BOARD**

**The Harborside Hotel  
Bar Harbor, Maine  
October 24, 2016**

These minutes are draft and subject to approval by the Spiny Dogfish Management Board.  
The Board will review the minutes during its next meeting.



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1. **Approval of agenda by consent** (Page 1).
2. **Approval of proceedings of February 2016 by consent** (Page 1).
3. **Move to adopt the 2017 commercial quota of 39,099,717 pounds, which is consistent with the commercial quota recommended by the Mid-Atlantic Fishery Management Council to NOAA Fisheries, and a 6,000 pound trip limit for the Northern Region** (Page 2). Motion by Terry Stockwell; second by Eric Reid. Motion passes unanimously (Page 2).
4. **Move to approve the 2016 Spiny Dogfish FMP Review and state compliance, and *de minimis* status for Delaware in 2016**. Motion adopted by consensus (Page 5).
5. **Motion to adjourn** by consent (Page 6).

**ATTENDANCE**

**Board Members**

Terry Stockwell, ME, proxy for P. Keliher (AA)	Tom Fote, NJ (GA)
Doug Grout, NH (AA)	John Clark, DE, proxy for D. Saveikis (AA)
Dennis Abbott, NH, proxy for Sen. Watters (LA)	Roy Miller, DE (GA)
G. Ritchie White, NH (GA)	Craig Pugh, DE, proxy for Rep. Carson (LA)
Rep. Sarah Peake, MA (LA)	Rachel Dean, MD (GA)
David Pierce, MA (AA)	Ed O'Brien, MD, proxy for Del. Stein (LA)
William Adler, MA (GA)	Mike Luisi, MD, proxy for D. Blazer (AA)
David Borden, RI (GA)	Rob O'Reilly, VA, proxy for J. Bull (AA)
Eric Reid, RI, proxy for S. Sosnowski (LA)	Cathy Davenport, VA (GA)
Dave Simpson, CT (AA)	Kyle Schick, VA, proxy for R. Stuart (LA)
Lance Stewart, CT (GA)	Chris Batsavage, NC, proxy for B. Davis (AA)
Steve Heins, NY, proxy for J. Gilmore (AA)	Doug Brady, NC (GA)
Adam Nowalsky, NJ, proxy for R. Andrzejczak (LA)	Wilson Laney, USFWS
Tom Baum, NJ, proxy for D. Chanda (AA)	Peter Burns, NMFS

**(AA = Administrative Appointee; GA = Governor Appointee; LA = Legislative Appointee)**

**Ex-Officio Members**

**Staff**

Robert Beal	Max Appelman
Toni Kerns	Amy Hirrlinger

**Guests**

Derek Orner, NOAA	Colleen Giannini, CT DEEP
Harold Mears, NMFS	Matthew Gates, CT DEEP
Kelly Denit, NMFS	Katie Westfall, Environmental Defense Fund
Alan Risenhoover, NMFS	Doug Christel, MA F&G
Tim Sartwell, NMFS	Pat Augustine, Coram, NY
Kim McKown, NYS DEC	Arnold Leo, E. Hampton, NY
Rich Wong, DE DFW	Ray Kane, CHOIR
Kevin Sullivan, NH F&G	

The Spiny Dogfish Management Board of the Atlantic States Marine Fisheries Commission convened in the Statesbury Grand Ballroom of the Bar Harbor Club, Harborside Hotel, Bar Harbor, Maine, October 24, 2016, and was called to order at 1:25 o'clock p.m. by Chairman David V. Borden.

**CALL TO ORDER, APPROVAL OF AGENDA AND PROCEEDINGS**

CHAIRMAN DAVID V. BORDEN: **Welcome, call to order, approval of agenda and proceedings from February, 2016 meeting had technical difficulties. The agenda and proceedings were approved.**

**PUBLIC COMMENT**

CHAIRMAN BORDEN: Public comment, we allow individuals to speak on behalf of important issues that do not appear on the agenda. No one signed up on the attendance sheet.

Is there anyone in the audience who would like an opportunity to address the board on issues that did not appear on the agenda? No hands up again.

**REVIEW AND SET FISHERY SPECIFICATIONS FOR THE 2017-2018 SEASON**

CHAIRMAN BORDEN: We are going to proceed with Item 4 on the agenda, which is a review and set the specifications. Just for everyone's edification, this is a two-part action, which will be required. One is to set the actual quota, and the second is to set the trip limit. I've asked the staff to develop some language that we can look at after the presentation. Max.

**REVIEW MID-ATLANTIC FISHERY MANAGEMENT COUNCIL 2016-2018 SPECIFICATIONS RECOMMENDATION**

MR. MAX APPELMAN: I'll try to get us back on schedule. I'll get through this pretty quickly. If you were at the Mid-Atlantic Council meeting earlier this month, a lot of this information and some of the slides are taken straight from that

presentation. For new members around the table and any public listening in, this is a jointly managed species; managed jointly with the Mid-Atlantic and New England Councils. The Interstate FMP is complementary to that federal plan.

The council is currently in the middle of a three-year-specification cycle. Up on the screen there is the reminder that the fishing season is from May 1st to April 30th. The commission is going one year at a time with this, so right now, we're looking at that middle time period, May 1, 2017 to April 30, 2018. That is the 2017 fishing season.

In September, the SSC met to review the 2016 data update and the APs Fishery Performance Report. Based on those materials, they saw no compelling evidence to change its ABC recommendations for the 2017 and 2018 fishing season. Also, in September, the Monitoring Committee met and reviewed that same information and made no changes to their previous recommendations either.

This is just a table of that multiyear specification cycle. Starting with the OFLs and ABCs up at the top there, working its way down through the commercial quotas at the bottom. Taking Canadian landings into account, management uncertainty, discards, recreational landings, and at the bottom there the commercial quota for the current fishing season is 40.4 million pounds, 2017 is 39.1 and for 2018 is 38.2 million pounds. You did see that there is a decreasing trend in the ABC and the quotas throughout that specification cycle, and that is based on information coming out of the latest stock assessment, which projected SSB to dip somewhat through 2019, before rebounding back up again. Just making a point that those findings did show us it will be climbing again after that specification cycle, and you could expect to see quota increases while during the next Specs cycle; but of course, that does depend on survey results and other fishery information.

This is a figure of the spring survey data, observed index values through time. This is the primary fishery independent data source going into stock assessment. The red dots are the observed values, the blue and green lines are the Kalman filter. You'll recall, last year, there was limited information coming from that spring survey, and the council directed or asked the Science Center to do some additional exploration of some smoothing options or smoothing techniques to address that missing data.

The Kalman filter is what came out of that process. It was also endorsed by the SSC. The big take-home from this figure, though, is that the survey value was up in the last year, in 2016; so no hiccups or cause for alarm there. This figure is showing commercial landings through time. The orange line is last year's landings, and the blue line is this year; up-to-date.

This was taken from the GARFO quota monitoring page just late last week. You can see that landings have been a little bit higher this year, compared to last. There was pretty steep trajectory there over the summer, and it seems like it has tapered off a little bit; but just pointing out that if this trajectory continues throughout the season, we could see some fishery closures this year.

A couple things to keep in mind when you look at that trajectory compared to last year, is there were some measures that went into place recently and are just starting to impact the fishery. One was a trip limit increase from 5,000 pounds to 6,000 pounds. That went into effect August 15th. Then the second thing here is a framework action taken at the councils that sort of clarifies this gray area, whether spiny dogfish and monkfish could be targeted on the same trip using different gears and different areas.

I'm not exactly sure how much this could impact effort, as more as it just clarifies something that has already been going on. A

few points from the Fishery Performance Report to just put on your radar here, is that demand continues to be a critical part of this fishery. It is characterized as a low price-per-pound fishery, so any little changes in that price can have big impacts on the participation in the fishery.

Another point is that most participants seem to want small incremental changes, if any, although there is a small group that wants to see some bigger trip limits to explore some other market possibilities. Then this last point here is getting at that there are still some marketing and regulatory issues discouraging interest.

In the southern regions, the lack of processors, and it just continues to be a road block to participation in that region. Then one more slide here, just put some topics on the horizon, some reoccurring topics that have been coming up. One is the AP and the Monitoring Committee continue to note the need for a benchmark assessment. There are a couple bullets here. This is not a comprehensive list by any means, but just some things that they've noted that they would like explored further in that benchmark, one is the survey sampling design, how we're surveying the population and is it adequate? Then the other reviewing some reproductive information that goes in the stock assessment that might be a little bit outdated, and see if we can improve that. Then this last bullet is, continue discussion about interest in a male-only fishery.

There was some thesis work done in collaboration with GARFO and Science Center staff that sort of suggests that this could be possible; that there are certain times of the year and in very specific areas where male-only harvest is a viable option. To wrap it all up, the Mid-Atlantic Council met October 5<sup>th</sup>. They reviewed this exact same information and recommended no changes to the previously recommended specifications.

That is 39.1 million pounds for 2017, the commercial quota, and 38.2 million pounds for the commercial quota in 2018 and the 6,000 pound trip limit. This is, again, just that same slide I showed you earlier of all those specifications. But I think this next slide, I'll keep this up on the screen once I finish here, but this is showing you the state specific and regional specific allocations based on those quotas. That concludes my presentation. I'll take any questions.

CHAIRMAN BORDEN: Any questions for Max? No hands up. Let me try to speed this along and ask, is there anyone at the table, any of the board members want to propose anything different than what the Mid-Atlantic Council proposed, anyone? Is there anyone in the audience that thinks we should consider? No hands up. Okay, we anticipated this. I asked the staff to prepare a joint motion on both of these. If you could put it up. Then I would ask someone to make this motion, please. Terry Stockwell.

MR. TERRY STOCKWELL: **I move to adopt the 2017 commercial quota of 39,099,717 pounds, which is consistent with the commercial quota recommended by the Mid-Atlantic Fishery Management Council to NOAA Fisheries, and a 6,000 pound trip limit for the northern region.**

CHAIRMAN BORDEN: Seconded by Eric. We had like four hands up simultaneously. We have a motion and a second on the table, any discussion on the motion? No hands up. Are you ready for the question? Since it is a final action, we have to do this by roll call. Max, can you read the roll, please.

MR. APPELMAN: Yes. Maine.

MR. STOCKWELL: Yes.

MR. APPELMAN: New Hampshire.

MR. DENNIS ABBOT: Yes.

MR. APPELMAN: Massachusetts.

MR. WILLIAM A. ADLER: Yes.

MR. APPELMAN: Rhode Island.

MR. ERIC REID: Yes.

MR. APPELMAN: Connecticut.

MS. MELISSA ZIOBRON: Yes.

MR. APPELMAN: New York.

MR. STEPHEN HEINS: Yes.

MR. APPELMAN: New Jersey.

MR. TOM BAUM: Yes.

MR. APPELMAN: Delaware.

MR. JOHN CLARK: Yes.

MR. APPELMAN: Maryland.

MR. MICHAEL LUISI: Yes.

MR. APPELMAN: Virginia.

MR. JOE CIMINO: Yes.

MR. APPELMAN: North Carolina.

MR. W. DOUGLAS BRADY: Yes.

MR. APPELMAN: U.S. Fish and Wildlife Service.

DR. WILSON LANEY: Yes.

MR. APPELMAN: National Marine Fisheries Service.

MR. PETER BURNS: Yes.

CHAIRMAN BORDEN: It's unanimous, motion passes.

**CONSIDER 2016 FISHERY MANAGEMENT PLAN  
REVIEW AND STATE COMPLIANCE**

CHAIRMAN BORDEN: All right, next item on the agenda is to consider the Fishery Performance Report. Max.

MR. APPELMAN: Again, a very brief presentation here. This is an FMP review of the 2015 fishing year. Again, that is May 1st, 2015 through April 30, of 2016. A quick review of the latest stock status information, the latest info is coming from the 2015 stock assessment update. Based on those findings, spiny dogfish is not overfished and overfishing is not occurring.

In 2015, female SSB was estimated at just over 168,000 metric tons, which is above the target value, and fishing mortality was estimated at 0.21, which is similarly below the target value. This is a figure showing commercial landings versus the quota through time. You can see that there was a bit of a spike in the quota in 2012; whereas, landing sort of tapered off. Thoughts are these most likely are reflecting market conditions during that time. A quick summary of some harvest statistics in 2015, the commercial quota was 50.6 million pounds with a 5,000 pound trip limit for the northern region.

Commercial landings from the U.S. were estimated at 22 million pounds, and this is less than 50 percent of that quota; again, probably reflecting market conditions. A note here that all states and regions harvested within their quota allocations, and so no compliance issues there. Recreational landings were just over almost 87,000 pounds, and discards were estimated at 7.3 million pounds, which is actually a few million pounds lower compared to recent years.

This could be indicating improved utilization of the resource. The Plan Review Team reviewed all the state compliance reports, and based on those reports found that all states had implemented regulations consistent with the requirements of the interstate FMP in Addenda

I through V; however, the PRT does note that Connecticut did not meet the May 1, 2015 compliance schedule of Addendum V; that addendum requires fins to remain attached to the carcass through landing, and Connecticut just recently came into compliance with that addendum.

The last thing I have up here is a request for de minimis status by Delaware, the FMP states that de minimis status can be granted if their state landings are less than 1 percent of the commercial coastwide landings, and based on those estimates, Delaware does meet the requirements for de minimis status in 2016. That concludes my presentation, thank you.

CHAIRMAN BORDEN: Questions on the report, any questions? Yes; Dave Pierce.

DR. DAVID PIERCE: Yes, Max, you indicated that right now we're not overfishing dogfish. At the same time, on the report that you provided, it appears that we are a hairs breath under what would classify as overfishing. Do you have any information that would help us understand the significance of that; notably, the assessment information we have in hand, or updates that might be scheduled that will address this question. Have we got any preview of where we might find ourselves relative to overfishing or not?

MR. APPELMAN: I think the best way for me to answer that is back to what the AP and MC have been noting that we really need another benchmark assessment. I think we're scheduled for an update in two years; next year is still a data update. I'm not super familiar with the assessment. I'm kind of relatively new to this species management plan in the assessment, but I can look into that a little bit more maybe, and get back to you.

DR. PIERCE: It's a great assessment. Paul Rego, Dr. Rego of the Northeast Fisheries Science Center has retired. He is the one who did so many magical things with spiny dogfish, such as the Kalman Filter. I just want to bring to the

attention of the board a potential problem that might affect us, actually for 2017 going into '18.

The Kalman Filter was used in a creative way in order to deal with the fact that the albatross, actually the Bigelow, the Bigelow was not able to survey important areas in the Mid-Atlantic area, southern New England area, where dogfish were expected to be abundant. Those survey stations were not accomplished; so we had a missing data point for 2014. We used a three-year-moving average to come up with the biomass estimates and also estimates of fishing mortality. My understanding is that in 2016, this year in the spring, there was about a month, maybe over a month delay in the spring survey. My fear is that we may find ourselves with some update that would indicate that we don't have 2014 information and we don't have 2016 information, so we have two years missing from a three-year-moving average.

This is just something we need to follow; I wanted to call it to Max's attention, in particular, since you now have this responsibility. There is a lot of history behind how this stock has been assessed, so that is just some information for the board's consideration; since as I said, we're a hairs breath, according to the figure in front of me here.

Figure 1 in the Review of the Interstate Plan, actually it's Figure 2. We're very close to the threshold, so if there was a problem with the 2016 spring survey relative to getting us a good indication of the biomass; that I continue to think is so very high, we may find ourselves suddenly with an update that will tell us that we are overfishing. Again, for Max's consideration.

MS. TONI KERNS: David, we talked about, at our last NRCC meeting, the schedule for all the assessments. There is a data update. We've been doing a lot of what I call rumble strips that we are going to actually run the model with new years of data. I can't remember off the top of my head if we actually got a benchmark assessment put onto the books, because of all

of the MRIP species that need to be looked at in 2018.

I've sent an e-mail over to Emily Gilbert, who keeps track of everything that we do at the NRCC meeting, to see how we revised that SAW/SARC schedule. I will let the board know at the Policy Board, likely, how we change that.

CHAIRMAN BORDEN: Max, did you want to respond further to Dr. Pierce?

MR. APPELMAN: I'm just looking at the same figure. The dashed line at the top there is actually the target line. We are getting close to the target, but overfished wouldn't occur until it hits the threshold line.

CHAIRMAN BORDEN: Any other questions on the report? Any objection to approving the report as presented, which would include granting Delaware de minimis status? Yes.

MELISSA ZIOBRON: I just had more of a comment. I didn't catch you in time before we moved on. In terms of the compliance, I think it would be very helpful for states if we were able to get a list of the compliance requirements and the corresponding implementation dates, and then the states could respond with the actions taken. I think it would have been helpful for us to have implemented ours in a more-timely manner.

CHAIRMAN BORDEN: Okay, thank you. We've heard the report. **There are no questions on the report, any objections to approving a report as submitted, which would include granting Delaware de minimis status. No objections? Then it is adopted with unanimous consent.** Is there any further business to come before the board? If not, the meeting is adjourned. Coastal Sharks will start in two minutes.

MS. KERNS: Emily just sent an e-mail, and we are doing just a data update, we're actually not doing an assessment update in 2017, and we do



not have anything on the books for dogfish in 2018 currently.

CHAIRMAN BORDEN: Terry Stockwell, you've got a point?

MR. STOCKWELL: Before you completely adjourn Spiny Dogfish, you and I had a sidebar conversation about potential for a working group prior to setting the specs next year.

CHAIRMAN BORDEN: Oh yes. Thank you for reminding me. I'll just make this really brief. There have been a number of suggestions. Michael has made suggestions in the past, Rob O'Reilly, Terry Stockwell, I think some of the Rhode Island delegation have made the same suggestion that we put together like a subcommittee to evaluate some of the suggestions that have been put forth in the Fishery Performance Report by the Mid-Atlantic Council.

The idea would be not necessarily to take any action on it; it would be to just work through some of those concepts in anticipation of next year. This is kind of a long range planning group. Those suggestions have been made by a fair number of people. Does anyone object to doing that? If there are no objections, then we'll circulate a memo. If individual states want to volunteer for it at that point, we'll do that. I see no hands up and no objections. Then we will do that.

#### **ADJOURNMENT**

CHAIRMAN BORDEN: That concludes the meeting, this portion of the board meeting.

(Whereupon the meeting adjourned at 1:50 o'clock p.m. on October 24, 2016.)



**Mid-Atlantic Fishery Management Council**  
800 North State Street, Suite 201, Dover, DE 19901  
Phone: 302-674-2331 | FAX: 302-674-5399 | [www.mafmc.org](http://www.mafmc.org)  
Michael P. Luisi, Chairman | G. Warren Elliott, Vice Chairman  
Christopher M. Moore, Ph.D., Executive Director

## MEMORANDUM

**Date:** August 30, 2017  
**To:** Chris Moore, Executive Director  
**From:** Jason Didden, Staff *JDD*  
**Subject:** Spiny Dogfish Specifications Review for 2018 Fishing Year

Dogfish is in multi-year specifications for 2016-2018 (the 2018 fishing year ends April 30, 2019). The Council's Scientific and Statistical Committee (SSC) is scheduled to review the 2018 dogfish ABCs (year 3 of 3) during its September 2017 meeting. The Dogfish ABC is scheduled to decrease from approximately 51 million pounds in 2017 to 50 million pounds in 2018 under multi-year specifications.

A data update from NMFS' Northeast Fisheries Science Center (NEFSC), a fishery information document that supported the Advisory Panel's meeting, and the Advisory Panel's Fishery Performance Report have been posted to <http://www.mafmc.org/ssc>.

Staff recommends no changes to 2018 dogfish ABCs. While the historically-low 2017 spring survey data point does give pause for concern, the biology of dogfish does not lend itself to rapid changes in biomass given the moderate catches observed in recent years. The industry members of the Advisory Panel also have not reported any substantial changes in catch rates.



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Michael P. Luisi, Chairman | G. Warren Elliott, Vice Chairman  
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# MEMORANDUM

**Date:** 18 September 2017  
**To:** Michael P. Luisi, Chairman, MAFMC  
**From:**  John Boreman, Ph.D., Chair, MAFMC Scientific and Statistical Committee  
**Subject:** Report of the September 2017 SSC Meeting

The SSC met in Baltimore on the 13<sup>th</sup> of September 2017. The main objective of the meeting was to affirm (or develop new) ABC recommendations for Spiny Dogfish in light of updated information on stock status. Other topics discussed at the meeting included a presentation by Dr. John Wiedenmann on a management strategy evaluation he is currently conducting on ABC control rule alternatives for the Mid-Atlantic Fishery Management Council, and continued development of criteria for setting coefficients of variation (CVs) for overfishing limits (OFLs) (Attachment 1).

A total of 14 SSC members were in attendance (Attachment 2), 12 of whom were present for the discussion of the Spiny Dogfish ABC, which constituted a quorum. Also in attendance were MAFMC staff, staff from NMFS Northeast Fisheries Science Center (by phone), and a representative from the public. All documents referenced in the report can be accessed via the SSC's meeting website (<http://www.mafmc.org/ssc-meetings/2017/september-13>).

## Spiny Dogfish

Jason Didden (MAFMC staff), with assistance from Kathy Sosebee (NEFSC lead assessment scientist for Spiny Dogfish), presented the Advisory Panel's Fishery Performance Report and data update for Spiny Dogfish. Of particular note, the estimate of female spawning stock biomass for 2017 is the lowest in the time series, and a huge drop in Spiny Dogfish biomass on Georges Bank was also observed. However, all size and sex classes decreased in 2017, which likely indicates a year-specific availability issue. Mike Frisk (SSC) mentioned that he is completing an analysis of environmental and gear-related factors affecting distribution and abundance estimates of Spiny Dogfish along the Atlantic Coast, and will have that information available in time for next year's ABC deliberations.

Based on the information presented, the SSC decided not to change its ABC recommendation for the upcoming fishing year of **ABC = 22,635 mt (49.9 million pounds)**. A benchmark

assessment of Spiny Dogfish is listed as a possibility for 2019; the SSC requests an updated assessment for its September 2018 meeting.

## **ABC Control Rule Alternatives**

Dr. John Wiedenmann (Rutgers University) is under contract to the MAFMC to evaluate the impact of different types of ABC control rules on stock dynamics and fishery performance metrics. He is using a management strategy evaluation (MSE) approach, and has completed a preliminary analysis using Summer Flounder as a test species. He also plans to expand his analysis to include life history characteristics and stock assessment information for Butterfish and Scup. The SSC offered a number of suggestions regarding selection of approaches to setting ABCs, as well as content and format of output information from the MSE that would be most useful to the SSC (and Council). Dr. Wiedenmann has been working closely with the SSC's OFL CV Working Group, as his efforts coincide closely with the Working Group's objectives (see the following section of this report).

## **Criteria for Setting CVs for OFLs**

The SSC discussed objectives and considerations for determination of the coefficients of variation (CVs) for estimates of the overfishing limit (OFL), as well as a draft set of decision criteria for assigning OFL CVs into categories representing low, moderate, and high uncertainty in the OFL estimate. The SSC also discussed the estimation of low, moderate, and high OFL CVs that could represent default values.

The SSC adopted the following objectives for its OFL CV determination process:

We intend to elevate confidence in ABCs by establishing a replicable process that meets Council risk policy objectives, and identifies relevant components of assessment uncertainty to be provided to the SSC.

The SSC's approach to setting OFL CVs will:

- Result in prudent decisions for catch advice that are consistent in meeting the objectives of the Council's Risk Policy in considering the trade-offs of biological, social, and economic benefits;
- Be based on clear and transparent decision criteria; and
- Be supportable with evidence.

The SSC further discussed and refined a set of decision criteria for OFL CVs that had been presented at prior meetings, deciding on the following wording:

1. Rigor of model identification during the assessment process
2. Informed by retrospective analysis
3. Informed by empirical estimates of abundance, stock biology, and fishing pressure

4. How the reference points are informed by ecosystem factors or comparisons with other species
5. Informed by measures of trends in recruitment
6. Informed by prediction error
7. Informed by simulation analysis or a full management strategy evaluation
8. Assessment accuracy under different fishing pressures

The SSC agreed that the entire set would be considered for discussion related to the generic ToR 2 (provide an OFL estimate) during an ABC setting process, but each consideration would not necessarily be weighed against the others. There would not be a need for quantification of elements on the list; a narrative from the assessment team/review panel is more helpful to the SSC than a score.

The SSC discussed a process for using this information and the example decision framework proposed: a table aligning the eight decision criteria with different assessment characteristics that would result in low, moderate, or high OFL CVs. All SSC members agreed that such a table would help structure the discussion and ensure that a consistent set of considerations were applied to all stocks. Overall, the SSC considered the framework to structure discussion in a way that does not obligate the group to make a certain decision, but helps lead the SSC to a consensus decision in a transparent manner.

A range of opinions were provided on how formulaic the decision rules should be, with some members preferring to retain flexibility and a continuous range of OFL CV options, and others preferring a more formulaic “robotic” approach with a small set of pre-determined default OFL CV bins. A continuum from 0-100% would be difficult to use consistently given that OFL CV is generally unknown. Differences in OFL CV on the order of 5-10-15% are probably too hard to justify and distinguish. Simulation testing could determine whether there are any meaningful differences in performance of the control rule with OFL CV bins at least 30-50% apart. Further work on determining levels of OFL CV that reasonably represent low, moderate, and high uncertainty for the range of species and assessments in the Mid-Atlantic region is necessary and will be conducted by the Working Group in collaboration with Dr. John Wiedenmann (see the preceding section of this report).

The SSC OFL CV Working Group will summarize the revisions from this meeting and make further refinements to the approach during a call in the upcoming month. The full SSC may meet by webinar to review and approve refinements to the approach so that it can be presented to the Council at its December 2017 meeting, and at the National SSC meeting in January.

c: SSC Members, Warren Elliott, Chris Moore, Rich Seagraves, Brandon Muffley, Jason Didden, Kathy Sosebee, John Wiedenmann, Jan Saunders

**Mid-Atlantic Fishery Management Council  
Scientific and Statistical Committee Meeting**

September 13, 2017  
Royal Sonesta Harbor Court Baltimore  
550 Light Street, Baltimore, MD 2120

**Agenda**

**Wednesday, September 13, 2017**

- 9:00 Spiny dogfish data and fishery update; review of 2018-2019 fishing year ABC (Didden)
- 10:30 Review of Council's current and alternative ABC control rules (Wiedenmann)
- 12:00 Lunch
- 1:00 Review of OFL CV Working Group progress and recommendations
- 4:00 Adjourn

MAFMC Scientific and Statistical Committee  
19-20 July 2017 Meeting Attendance

<u>Name</u>	<u>Affiliation</u>
<i>SSC Members in Attendance:</i>	
John Boreman (SSC Chairman)	NC State University
Tom Miller (SSC Vice-Chair) *	University of Maryland - CBL
Mark Holliday	NMFS (Retired)
Wendy Gabriel	NMFS Northeast Fisheries Science Center
Sarah Gaichas	NMFS Northeast Fisheries Science Center
Ed Houde	University of Maryland – CBL
Dave Secor	University of Maryland - CBL
Paul Rago (via phone)	NMFS (retired)
Yan Jiao	Virginia Tech
Lee Anderson	University of Delaware (retired)
Cynthia Jones	Old Dominion University
Mike Frisk	SUNY Stony Brook
Mike Wilberg	University of Maryland - CBL
Brian Rothschild *	UMass Dartmouth (retired)

\*not present for Spiny Dogfish ABC discussion

<i>Others in attendance:</i>	
Rich Seagraves	MAFMC staff
Brandon Muffley	MAFMC staff
Jason Didden	MAFMC staff
Kathy Sosebee (by phone)	NMFS Northeast Fisheries Science Center
John Wiedenmann	Rutgers University

**Spiny Dogfish Advisory Panel (AP) Informational Document - August 2017**  
**Prepared by Jason Didden, Council Staff**

**\*\*Note - Data Sources for the following are generally from unpublished standard NMFS databases unless noted...everything should be considered preliminary at this point.**

### **Basic Biology**

Spiny dogfish (*Squalus acanthias*) is a coastal shark with populations on the continental shelves of northern and southern temperate zones throughout the world. It is the most abundant shark in the western north Atlantic and ranges from Labrador to Florida, but is most abundant from Nova Scotia to Cape Hatteras, North Carolina. Its major migrations on the northwest Atlantic shelf are north and south, but it also migrates inshore and offshore seasonally in response to changes in water temperature. Spiny dogfish have a long life, late maturation, a long gestation period, and relatively low fecundity, making them generally vulnerable to depletion. Fish, squid, and ctenophores dominate the stomach contents of spiny dogfish collected during the Northeast Fisheries Science Center (NEFSC) bottom trawl surveys but they are opportunistic and have been found to consume a wide variety of prey. More detailed life history information can be found in the essential fish habitat (EFH) source document for spiny dogfish at: <http://www.nefsc.noaa.gov/publications/tm/tm203/tm203.pdf>.

### **Status of the Stock**

Reports on “Stock Status,” including Stock Assessment Workshop (SAW) reports and peer-review reports are available online at the NEFSC website: <http://www.nefsc.noaa.gov/nefsc/saw/>. An assessment update in 2015 found that the stock is not overfished nor subject to overfishing. A data update including the 2017 spring survey is available at <http://www.mafmc.org/ssc-meetings/2017/september-13>. The point estimate of mature female biomass from the 2017 spring survey is the lowest in the time series.

### **Regulatory Summary**

Spiny Dogfish regulations are summarized at <https://www.greateratlantic.fisheries.noaa.gov/regs/infodocs/spinydogfactsheet.pdf>. We are currently in multi-year regulations from May 2016-April 2019 (see Table 1 below), but the Council and its Scientific and Statistical Committee review multi-year specifications each year.



**Table 1. May 2016 to April 2019 Spiny Dogfish Specifications**

Specifications	Basis	2016 (pounds)	2016 (mt)	2017 (pounds)	2017 (mt)	2018 (pounds)	2018 (mt)
OFL	Projected Catch at Fmsy	64,414,664	29,218	na	na	na	na
New ABCs	Council Risk Policy	52,066,572	23,617	50,805,528	23,045	49,901,633	22,635
Canadian Landings	= avg last 3 years (10,11,12)	143,300	65	143,300	65	143,300	65
Domestic ABC	= ABC – Canadian Landings	51,923,272	23,552	50,662,228	22,980	49,758,333	22,570
ACL	= Domestic ABC	51,923,272	23,552	50,662,228	22,980	49,758,333	22,570
Mgmt Uncert. Buffer	Ave pct overage since 2011	0	0	0	0	0	0
ACT	= ACL - mgmt uncertainty	51,923,272	23,552	50,662,228	22,980	49,758,333	22,570
U.S. Discards	=3 year average 12-13-14	11,494,167	5,214	11,494,167	5,214	11,494,167	5,214
TAL	ACT – Discards	40,429,105	18,338	39,168,060	17,766	38,264,165	17,356
U.S. Rec Landings	= 2014 estimate	68,343	31	68,343	31	68,343	31
Comm Quota	TAL – Rec Landings	40,360,761	18,307	39,099,717	17,735	38,195,822	17,325

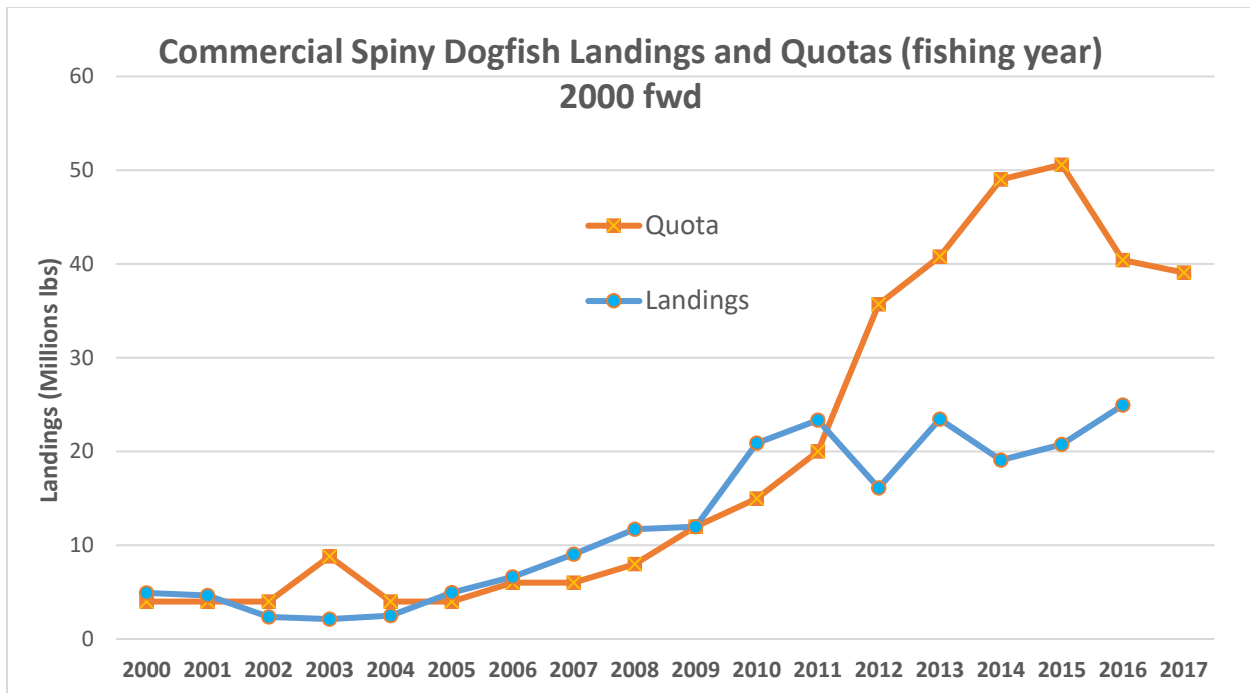
OFL = Overfishing Level; ABC = Acceptable Biological Catch; ACL = Annual Catch Limit; ACT = Annual Catch Target; TAL = Total Allowable Landings; Rec = Recreational; Comm = Commercial.

## Fishery Performance

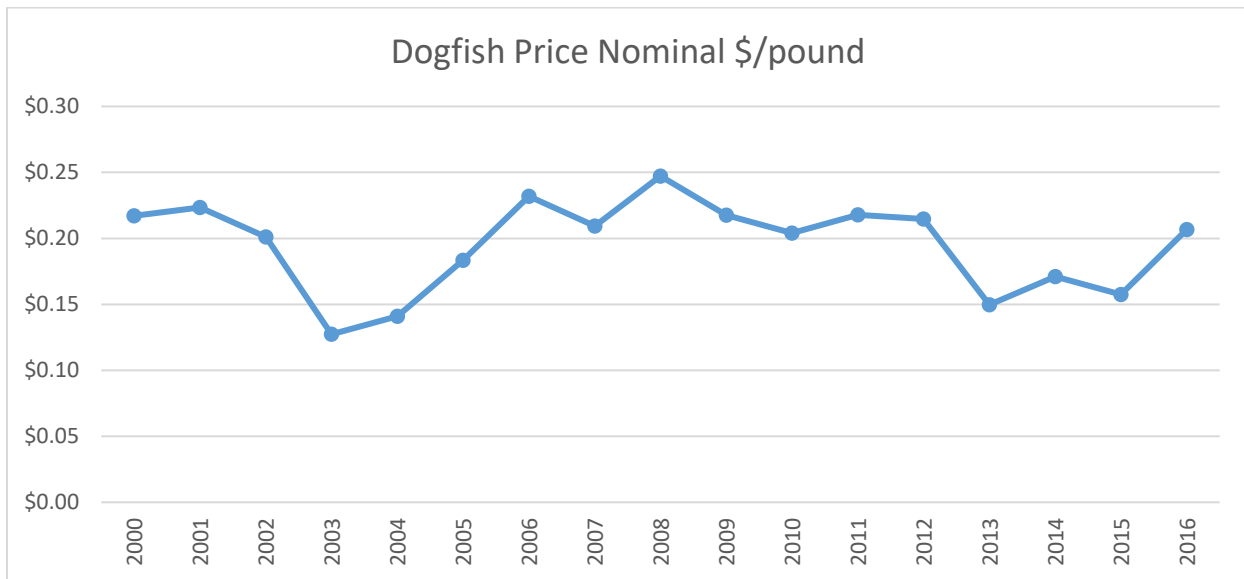
At the onset of the domestic commercial fishery in the early 1990's, population biomass for the Northwest Atlantic stock of spiny dogfish was at its highest estimated level (approx. 1.2 billion lb). A large scale unregulated fishery developed and quickly depleted the stock of mature female spiny dogfish such that in 1997 a stock assessment showed that the stock was overfished (NEFSC 1997). The Spiny Dogfish FMP was developed in 1998 and implemented in 2000 in order to halt further depletion of mature female spiny dogfish and allow the stock to recover to a sustainable level. Because the directed commercial fishery concentrated on mature females, rebuilding required elimination of that directed fishery. In 2010 NMFS communicated the rebuilt status of the stock to the Councils.

The current (May 1, 2016 – April 30 2019) quotas are derived from the recommendations of the Council's Scientific and Statistical Committee (SSC) for Acceptable Biological Catch (ABC), and how various components of fishing mortality are handled by the spiny dogfish fishery management plan, as described in the table above. The SSC uses the best available scientific information to set ABC consistent with the Council's risk policy to avoid overfishing and achieve optimum yield. The trip limit is 6,000 pounds in Federal waters; individual states may set more restrictive possession limits.

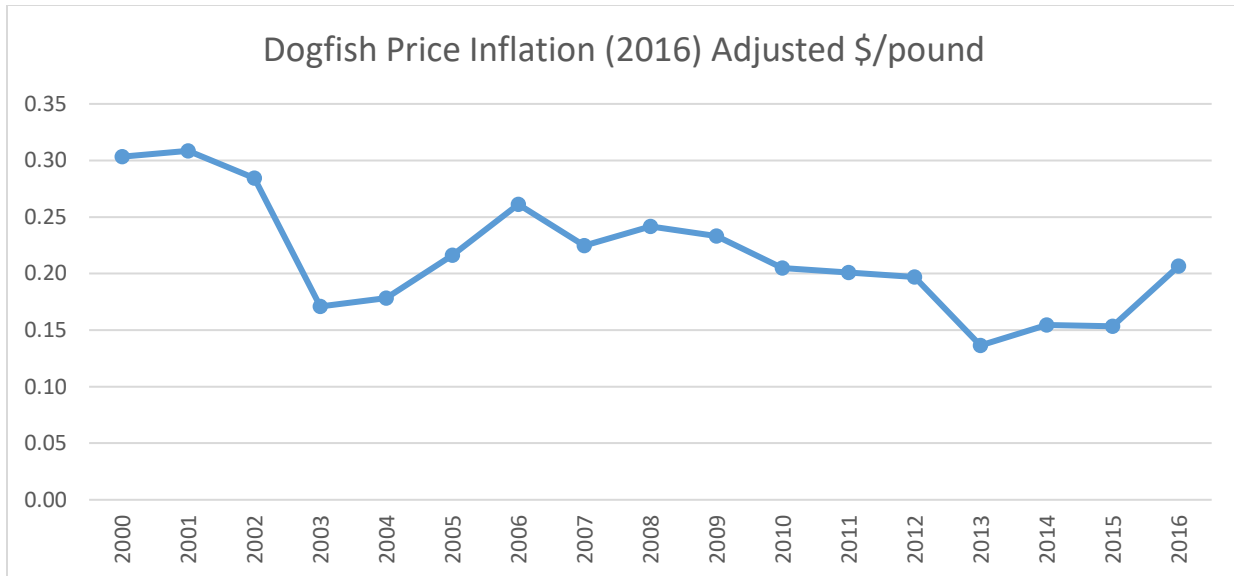
The following pages provide information on landings and prices since 2000 (pages 3-4), the progression of landings through the year for the current and previous fishing years (page 4), landings by state, month, and gear for 2014-2016 (page 5), and vessel activity since 2000 (page 6).



**Figure 1. Spiny Dogfish Landings and Quotas 2000-2016. 2016 = May 1, 2016 to April 30, 2017.**  
 Source: Unpublished NMFS dealer reports

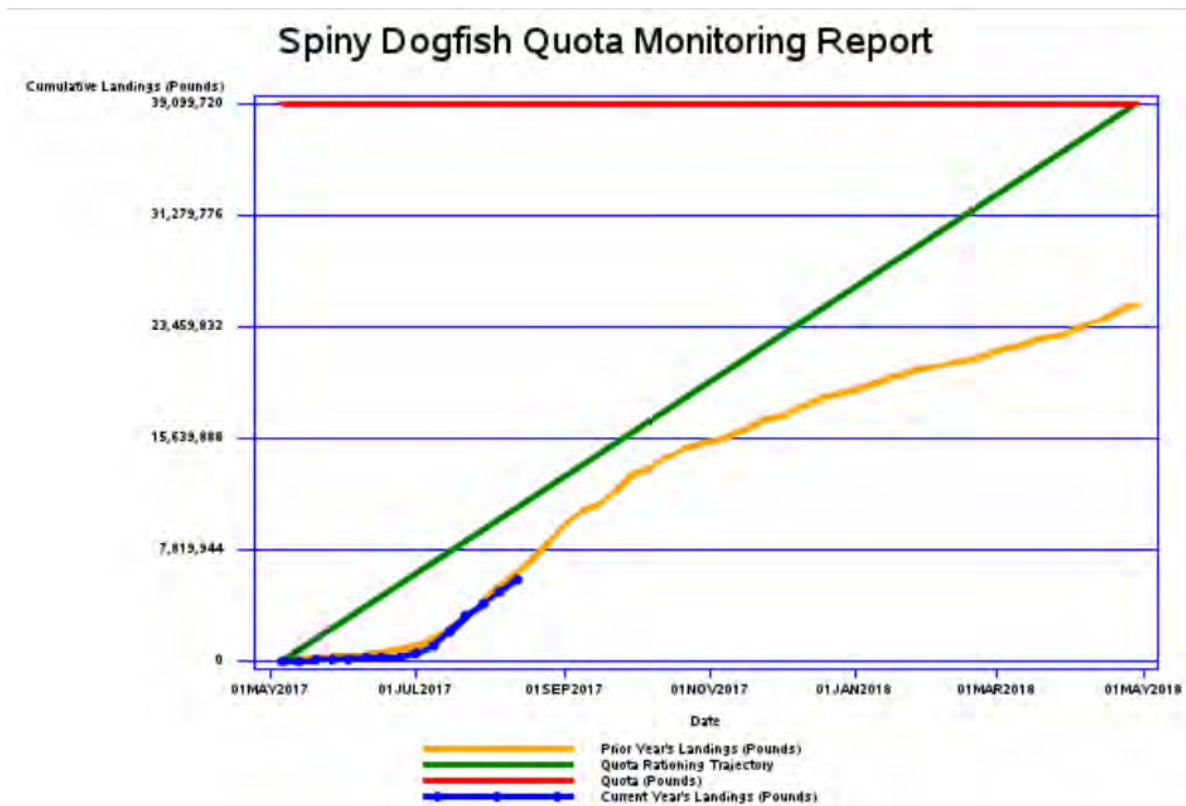


**Figure 2. U.S. Spiny Dogfish fishing year ex-vessel prices Calendar Year (Nominal)**  
 Source: Unpublished NMFS dealer reports  
 Note: Avg. Price since May 1, 2017 = 22 cents; Avg Price Aug 1-Aug 16, 2017 = 22 cents (Preliminary)



**Figure 3. U.S. Spiny Dogfish fishing year ex-vessel prices Calendar Year (Producer Price Index adjusted, 2016 dollars)**

Source: Unpublished NMFS dealer reports



**Figure 4. Spiny Dogfish Landings (Blue = 2017-2018 Fishing Year; Orange = 2016-2017 Fishing Year)**  
(Data through 8/12/17)

**Table 2. 2014-2016 Calendar Year dogfish landings by state (pounds)**

YEAR	CT	MA	MD	ME+Other	NC	NH	NJ	NY	RI	VA	Total
2014	33,864	9,422,869	1,051,609	230,687	5,396,223	1,704,651	2,202,747	69,034	689,445	2,641,962	23,443,091
2015	34,400	7,849,795	1,140,724	20,530	3,835,242	923,635	1,910,056	29,835	528,559	2,796,559	19,069,335
2016	33,128	14,365,312	1,381,015	678	2,320,523	755,605	3,607,489	39,064	670,682	3,495,086	26,668,582

Source: unpublished NEFSC dealer reports

**Table 3. 2014-2016 Calendar Year dogfish landings by month. (pounds)**

YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2014	1,330,398	2,407,670	1,948,007	711,112	189,828	649,121	3,150,575	2,911,739	2,818,723	1,817,351	2,220,089	3,288,478	23,443,091
2015	2,149,252	1,879,910	1,042,833	664,004	217,713	188,187	3,051,504	2,879,635	1,859,773	811,894	1,737,913	2,586,717	19,069,335
2016	2,848,995	1,352,475	1,845,163	1,413,103	299,780	1,140,263	3,834,146	4,962,902	3,162,140	2,089,312	1,970,507	1,749,796	26,668,582

Source: unpublished NEFSC dealer reports

**Table 4. 2014-2016 Calendar Year dogfish landings by gear.**

YEAR	GILL_NET_SINK_ OTHER	LONGLINE_ BOTTOM	GILL_NET_SET_ STAKE_SEA_ BASS	HAND_LINE_ OTHER	TRAWL_OTTER_ BOTTOM_FISH	GILL_NET_ DRIFT_LA RGE_PELA GIC	GILL_NET_ RUNAROUND	GILL_NET_ OTHER	Other/Unk nown
2014	11,632,466	3,662,223	4,733,309	1,058,551	1,157,981	277,303	148,709	15,098	757,451
2015	10,103,553	2,939,522	3,283,804	1,228,404	846,502	184,228	169,974	25,895	287,453
2016	15,540,703	6,446,262	1,618,757	991,391	975,895	262,135	311,992	138,640	382,807
Total	37,276,722	13,048,007	9,635,870	3,278,346	2,980,378	723,666	630,675	179,633	1,427,711

Source: unpublished NEFSC dealer reports

**Table 5. Number of vessels active in various annual landing ranges (pounds per vessel per year). Federally-permitted vessels.**

YEAR	Vessels 200,000+	Vessels 100,000 - 199,999	Vessels 50,000 - 99,999	Vessels 10,000 - 49,999
2000	30	24	25	122
2001	4	12	11	32
2002	2	14	8	31
2003	4	5	3	11
2004	0	0	0	43
2005	0	0	2	65
2006	0	0	8	117
2007	1	5	17	74
2008	0	11	18	107
2009	0	11	42	191
2010	0	22	42	124
2011	2	55	71	140
2012	20	40	56	181
2013	10	29	43	83
2014	29	37	39	88
2015	26	26	34	56
2016	50	31	27	45

*Source: unpublished NEFSC dealer reports*

# Update of Landings, Discards and Survey Indices for Spiny Dogfish in 2016-2017

**Katherine Sosebee**  
**Northeast Fisheries Science Center**  
**National Marine Fisheries Service**

**Mid Atlantic Fishery Management Council**  
**Scientific and Statistical Committee**  
**August 18, 2017**

*This information is distributed solely for the purpose of pre-dissemination peer review. It has not been formally disseminated by NOAA. It does not represent any final agency determination or policy.*

## ***Commercial Data***

This document summarizes the most recent information on spiny dogfish stock status through 2017 and catch data through 2016. Landings data include landings from US and distant water commercial fisheries, and US recreational landings. Discard information includes discards from US commercial fisheries and US recreational fisheries. Estimates of dead discards are obtained by multiplying the total discards, estimated by the SBRM approach, by the gear-specific discard mortality rates.

Recreational landings and discards were obtained from the Marine Recreational Information Program (MRIP) <http://www.st.nmfs.noaa.gov/recreational-fisheries/access-data/run-a-data-query/index>. Canadian and distant water landings were obtained from the Northwest Atlantic Fisheries Organization (NAFO) catch statistics database (<https://www.nafo.int/Data/STATLANT>) for both spiny dogfish and unclassified dogfishes for NAFO Subareas 2-4.

Total landings are summarized in Table 1 and Fig. 1. US commercial landings in 2016 increased 40% from 8,663 mt in 2015 to 12,097 mt in 2016 (Table 1). These landings were the highest since 1999. Recreational landings and distant water fleet landings were negligible, totaling only 97 mt. Canadian landings have been less than 100 tons since 2009.

The precision of the recreational landings (catch types A and B1) in 2016 was relatively poor with Proportional Standard Errors of 67.3 and 73.4% respectively (Table 2). The precision of the discarded dogfish estimates (B2) was much better at 17.3%

The primary sources of commercial discards are otter trawls (5,084 mt; CV=7.9%) and sink gill nets (1,941 mt; CV=23.0%). Discards of spiny dogfish by scallop dredges (120 mt; CV=14.0%) and long lines (165 mt; CV=40.0%) are less important (Table 3). Additional estimates of precision of discard estimates by gear and sex may be found in Appendix 1.

Total discards in 2016 of 10,437 mt were 30% more than the 8,033 in 2015 but 13% less than the previous 5 year average (Table 4). Similar patterns were observed for dead discards. There were no major changes in the discarding patterns among fleets. The ratio of dead discards to landings

of 32% in 2016 was lower than 2015. The ratios of total discards to landings and total dead discards to landings exhibit a generally declining trend since 2004 (Fig. 3). The patterns suggest a continuing trend of improved utilization of the spiny dogfish resource. The total catch estimate in 2016 of 16,087 mt (Table 4) was about 96% of the 2016 ABC of 16,765 mt.

Biological samples collected by port agents are used to estimate the size and sex composition of the spiny dogfish landings (Table 5). Overall landings are dominated by females, a trend that has persisted since the US EEZ fishery began (Fig. 4). Most fishing takes place near shore where females are more abundant (Appendix 2).

The fraction of male dogfish in the landings decreased in 2016 to about 7%. This is more in line with the percentage in the previous decade of 4 to 9%, compared to the 18% of 2015. The average weights of male and female dogfish landed in 2016 were similar to recent averages compared to the average weights in 2015.

About 4.7 million spiny dogfish were landed in 2016. This was an increase of about 24% in total numbers landed (Table 5). In contrast the total weight of landings increased by 40% due to the increased average weight of both males and females. This is the highest number of spiny dogfish landed since 6.4 million fish were landed in 2000.

The sex ratios of discarded fish are dominated by females, but represent only 57% of total discards by weight (Table 6). This difference, compared to landings, is likely due to the much higher rate of discarding of male fish. On a numerical basis, about 58% of the female dogfish caught in 2015 were landed (Tables 5 and 6). In contrast, only about 13% of male dogfish caught were landed.

### ***Survey Data***

The Northeast Fisheries Science Center (NEFSC) bottom trawl survey was completed on time in 2017 but delayed in 2016 while all of the core survey strata were completed. In contrast, mechanical problems on the FSV Bigelow in 2014 not only delayed the NEFSC spring bottom trawl survey but also resulted in the loss of critical survey strata in the Mid-Atlantic region. The potential effects of the delay in survey timing in 2016 on the abundance indices are unknown.

Survey estimates of relative abundance were converted to Albatross-equivalent estimates using the methods described in Miller et al. (2010).

Female spawning stock biomass estimates from 2009 to 2015 exceeded the female spawning stock biomass target (159,288 mt; Rago and Sosebee 2015). The biomass estimates increased in 2016. Swept area abundance estimates for both male and female spiny dogfish decreased in 2017 compared to 2016 (Table 7, Figure 10). The female SSB estimate for 2017 of 24.4 kt is the lowest in the time series. However, all size and sex classes decreased, which likely indicates a year specific availability. The spatial distribution for 2017 is very different than 2016 with almost no dogfish caught on Georges Bank (Appendix 3). The 3-yr average of the mature female swept area biomass estimates was 112 kt which is less than the biomass target of 159 kt but above the threshold (79,644 mt). It is important to note that the comparisons with the biomass target and threshold are based on outputs of the stochastic model (which was not updated this

year) rather than the simple 3-yr average. However, these quantities are closely correlated so the raw survey data provides a first approximation.

Pup production (Fig. 5) in 2017 was below both the long term mean and median values. The ratio of mature males to mature females increased five-fold (Fig. 6). Both of these are likely a year specific effect. The mean length of mature females declined in 2017 (Fig. 7) but was above the average of 1997-2003 when recruitment was low. The mean length of pups (Fig. 8) in 2017 was above the long term mean and median values and well above the average of 1997-2003 when recruitment was low. The sizes of mature females have been maintained while males are relatively unchanged (Fig. 9). The size composition of sub adults is broadening and approaching distribution seen prior to major fisheries in 1990s.

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Table 1. Total spiny dogfish landings (mt, live) in NAFO Areas 2 to 6, 1962-2016.

Year	United States		Canada	Distant Water Fleets	Total Landings
	Commercial	Recreational			
1962	235		0	0	235
1963	610		0	1	611
1964	730		0	16	746
1965	488		9	198	695
1966	578		39	9,389	10,006
1967	278		0	2,436	2,714
1968	158		0	4,404	4,562
1969	113		0	9,190	9,303
1970	106		19	5,640	5,765
1971	73		4	11,566	11,643
1972	69		3	23,991	24,063
1973	89		20	18,793	18,902
1974	127		36	24,513	24,676
1975	147		1	22,523	22,671
1976	550		3	16,788	17,341
1977	931		1	7,199	8,131
1978	828		84	622	1,534
1979	4,753		1,331	187	6,271
1980	4,085		660	599	5,344
1981	6,865	1,493	564	974	9,896
1982	5,411	70	389	364	6,234
1983	4,897	67		464	5,428
1984	4,450	91	2	391	4,935
1985	4,028	89	13	1,012	5,142
1986	2,748	182	20	368	3,318
1987	2,703	306	281	139	3,429
1988	3,105	359	1	647	4,112
1989	4,492	418	167	256	5,333
1990	14,731	179	1,309	393	16,611
1991	13,177	131	307	234	13,848
1992	16,858	215	868	67	18,008
1993	20,643	120	1,435	27	22,225
1994	18,798	155	1,820	2	20,774
1995	22,578	68	956	14	23,615
1996	27,136	25	431	236	27,827
1997	18,351	66	446	214	19,078
1998	20,628	39	1,055	607	22,329
1999	14,855	53	2,091	554	17,552
2000	9,257	5	2,741	402	12,405
2001	2,294	28	3,820	677	6,819
2002	2,199	205	3,584	474	6,462
2003	1,170	40	1,302	643	3,155
2004	982	105	2,362	330	3,778
2005	1,147	45	2,270	330	3,792
2006	2,249	94	2,439	10	4,792
2007	3,503	84	2,384	31	6,002
2008	4,108	214	1,572	131	6,025
2009	5,377	34	113	82	5,606
2010	5,440	21	6	127	5,594
2011	9,480	32	124	143	9,779
2012	10,660	19	65	137	10,881
2013	7,312	37	NA	61	7,410
2014	10,651	31	54	31	10,767
2015	8,663	39	1	23	8,726
2016	12,097	73	37	24	12,231

Table 2. Summary of spiny dogfish landings and discards based on Marine Recreational Information Program estimates. As in previous assessments, the average weight of landed and discarded spiny dogfish is assumed to be 2.5 kg. Discard mortality is assumed to be 20%. The revised MRIP estimator was used for 2004 to 2016. Differences between MRFSS and MRIP were considered minor relative to total catch (ie Commercial landings and discards); no adjustments were made to historical recreational data.

Year	Catch in Numbers								Numbers		Weight		
	Observed Harvest (A)	PSE	Reported Harvest (B1)	PSE	Released Alive (B2)	PSE	Total Catch A+B1+B2	PSE	Total Landings A+B1 (number)	Discards B2 (number)	Landings (A+B1) (mt)	Discards (B2) (mt)	Dead Discards (mt)
1981	5,943	49.1	591,300	52.1	118,440	31.3	715,683	43.4	597,243	118,440	1493	296	59
1982	12,460	38.6	15,712	45.5	139,730	21.4	167,902	18.5	28,172	139,730	70	349	70
1983	13,154	36.3	13,675	34.1	215,973	23.7	242,803	21.2	26,829	215,973	67	540	108
1984	9,606	48.1	26,918	45.1	169,574	35.1	206,099	29.6	36,524	169,574	91	424	85
1985	5,495	47.7	30,172	38.3	385,745	41.8	421,412	38.4	35,667	385,745	89	964	193
1986	11,598	26.5	61,688	22.8	474,930	17.7	548,216	15.6	73,286	474,930	183	1187	237
1987	14,286	44	108,171	28.9	422,387	21.6	544,844	17.8	122,457	422,387	306	1056	211
1988	46,068	30.6	98,002	19.8	350,410	24.4	494,480	18	144,070	350,410	360	876	175
1989	63,031	40.6	104,511	34.4	539,731	17.2	707,273	14.5	167,542	539,731	419	1349	270
1990	22,364	26.1	49,045	28.6	468,085	14.6	539,494	13	71,409	468,085	179	1170	234
1991	30,459	21.9	21,884	22.7	539,883	13.5	592,227	12.4	52,343	539,883	131	1350	270
1992	46,753	22.8	50,483	23.1	407,485	10.6	504,721	9.1	97,236	407,485	243	1019	204
1993	23,350	21.6	24,535	30.8	444,077	15.5	491,963	14.1	47,885	444,077	120	1110	222
1994	17,714	34	44,230	35.6	387,274	15.2	449,218	13.6	61,944	387,274	155	968	194
1995	15,447	31.2	11,583	37.2	261,465	11.5	288,496	10.7	27,030	261,465	68	654	131
1996	8,500	29.8	1,843	48.4	131,672	12.7	142,015	11.9	10,343	131,672	26	329	66
1997	21,017	24.4	5,582	54.9	337,431	12.1	364,030	11.3	26,599	337,431	66	844	169
1998	14,831	28.7	9,445	78.2	243,988	13.2	268,264	12.4	24,276	243,988	61	610	122
1999	11,995	52.5	9,710	68.2	214,974	11.5	236,679	11.1	21,705	214,974	54	537	107
2000	1,773	46.6	271	89.5	276,258	16.3	278,302	16.2	2,044	276,258	5	691	138
2001	7,771	39.7	3,459	44.6	842,583	9.1	853,812	9	11,230	842,583	28	2106	421
2002	2,281	32.3	79,691	43.8	669,469	10.6	751,440	10.5	81,972	669,469	205	1674	335
2003	8,314	36.2	7,560	33.9	1,199,490	8	1,215,364	7.9	15,874	1,199,490	40	2999	600
2004	19,328	44.7	28,761	38.9	1,315,796	14.1	1,363,885	13.6	48,089	1,315,796	120	3289	658
2005	6,894	33.5	7,230	37.9	1,339,412	19.9	1,353,536	19.7	14,124	1,339,412	35	3349	670
2006	7,592	40.1	24,221	65.7	1,420,564	11.6	1,452,377	11.4	31,813	1,420,564	80	3551	710
2007	2,134	44.2	32,352	67.3	1,557,079	12.7	1,591,565	12.5	34,486	1,557,079	86	3893	779
2008	10,930	35.3	34,701	38	1,078,307	12.6	1,123,938	12.2	45,631	1,078,307	114	2696	539
2009	6,155	40.3	10,929	31.9	1,031,866	13	1,048,951	12.8	17,084	1,031,866	43	2580	516

Table 2. Cont.

Year	Catch in Numbers								Numbers		Weight		
	Observed Harvest (A)	PSE	Reported Harvest (B1)	PSE	Released Alive (B2)	PSE	Total Catch A+B1+B2	PSE	Total Landings A+B1 (number)	Discards B2 (number)	Landings (A+B1) (mt)	Discards (B2) (mt)	Dead Discards (mt)
2010	2,270	34.4	4,158	60.3	790,412	20.7	796,840	20.6	6,428	790,412	16	1976	395
2011	5,742	42.6	7,063	48.6	924,891	14.8	937,696	14.6	12,805	924,891	32	2312	462
2012	3,413	65.7	4,103	63.6	549,820	18	557,336	17.7	7,516	549,820	19	1375	275
2013	7,381	48.1	7,294	56.9	1,061,125	11.9	1,075,800	11.8	14,675	1,061,125	37	2653	531
2014	2,200	40.2	10,470	28.5	1,900,700	52.4	1,913,370	52.0	12,670	1,900,700	32	4752	950
2015	10,130	63.5	5,629	55.3	488,943	16.3	504,701	15.9	15,758	488,943	39	1222	244
2016	11,135	67.3	18,123	73.4	1,250,842	17.3	1,280,100	17	29,258	1,250,842	73	3127	625

Table 3. Estimated total discards of spiny dogfish (mt) from commercial and recreational US fisheries, 1981-2016. The values for otter trawl and gill net from 1981-1989 are hindcast estimates (see SARC 43).

							Assumed Discard Mortality Rate					
							0.50	0.30	0.75	0.10	0.20	
Total Discards (mt)							Dead Discards					
Year	Otter Trawl	Sink Gill Net	Scallop Dredge	Line gear	Recreational	Total	Otter Trawl	Sink Gill Net	Scallop Dredge	Line gear	Recreational	Total Dead
1981	36,360	5,360	na	na	296	42,016	18,180	1,608	na	na	59	19,847
1982	42,910	4,454	na	na	349	47,713	21,455	1,336	na	na	70	22,861
1983	42,188	4,042	na	na	540	46,770	21,094	1,213	na	na	108	22,415
1984	39,625	4,918	na	na	424	44,967	19,813	1,475	na	na	85	21,373
1985	33,354	4,539	na	na	964	38,857	16,677	1,362	na	na	193	18,232
1986	31,745	4,883	na	na	1,187	37,815	15,873	1,465	na	na	237	17,575
1987	29,050	4,864	na	na	1,056	34,970	14,525	1,459	na	na	211	16,195
1988	28,951	5,132	na	na	876	34,959	14,476	1,540	na	na	175	16,190
1989	28,286	5,360	na	na	1,344	34,990	14,143	1,608	na	na	269	16,020
1990	34,242	6,062	na	na	1,170	41,474	17,121	1,819	na	na	234	19,174
1991	19,322	11,030	32	97	1,350	31,831	9,661	3,309	24	10	270	13,274
1992	32,617	5,953	827	650	1,019	41,066	16,309	1,786	620	65	204	18,983
1993	17,284	9,814	209	44	1,110	28,461	8,642	2,944	157	4	222	11,969
1994	13,908	2,887	723	na	968	18,486	6,954	866	542	na	194	8,556
1995	16,997	6,731	378	na	654	24,760	8,499	2,019	284	na	131	10,932
1996	9,402	3,890	121	na	329	13,742	4,701	1,167	91	na	66	6,025
1997	6,704	2,326	198	na	837	10,065	3,352	698	149	na	167	4,366
1998	5,268	1,965	120	na	610	7,963	2,634	590	90	na	122	3,435
1999	7,685	2,005	41	na	532	10,263	3,843	602	31	na	106	4,581
2000	2,728	4,684	14	na	685	8,111	1,364	1,405	11	na	137	2,917
2001	4,919	7,204	30	na	2,099	14,252	2,460	2,161	23	na	420	5,063
2002	5,540	4,997	58	4,015	1,673	16,283	2,770	1,499	44	402	335	5,049
2003	3,853	5,413	103	2	2,987	12,358	1,927	1,624	77	0	597	4,225
2004	8,299	4,031	53	497	3,490	16,370	4,150	1,209	40	50	698	6,146
2005	7,515	3,338	15	1,175	3,509	15,552	3,758	1,001	11	118	702	5,589
2006	7,773	3,369	14	131	3,840	15,126	3,886	1,011	10	13	768	5,688
2007	8,115	5,133	61	73	4,300	17,681	4,058	1,540	45	7	860	6,510
2008	5,604	4,864	237	260	3,115	14,080	2,802	1,459	178	26	623	5,088
2009	7,010	4,874	364	835	2,869	15,952	3,505	1,462	273	84	574	5,897
2010	5,564	2,385	196	509	1,930	10,584	2,782	716	147	51	386	4,081

Table 3 cont.

							Assumed Discard Mortality Rate					
							0.50	0.30	0.75	0.10	0.20	
Total Discards (mt)							Dead Discards					
Year	Otter Trawl	Sink Gill Net	Scallop Dredge	Line gear	Recreational	Total	Otter Trawl	Sink Gill Net	Scallop Dredge	Line gear	Recreational	Total Dead
2011	6,540	2,831	226	356	2,312	12,264	3,270	849	170	36	462	4,787
2012	6,687	2,959	432	172	1,375	11,626	3,344	888	324	17	275	4,848
2013	6,897	3,107	127	37	2,653	12,820	3,448	932	95	4	531	5,010
2014	8,070	2,388	108	17	4,752	15,335	4,035	716	81	2	950	5,785
2015	5,096	1,655	41	19	1,222	8,033	2,548	496	31	2	244	3,322
2016	5,084	1,941	120	165	3,127	10,437	2,542	582	90	17	625	3,856

Table 4. Total landings, discards and total catch for spiny dogfish, 1989-2016.

Year	Total Discard (mt)	Total Dead Discards (mt)	Total Landings (mt)	Dead Discard/ Landings	Total Discard / Landings	Total Catch (mt)
1989	34,990	16,020	5,333	3.00	6.56	21,353
1990	41,474	19,174	16,611	1.15	2.50	35,785
1991	31,831	13,274	13,848	0.96	2.30	27,122
1992	41,066	18,983	18,008	1.05	2.28	36,991
1993	28,461	11,969	22,225	0.54	1.28	34,194
1994	18,486	8,556	20,774	0.41	0.89	29,330
1995	24,760	10,932	23,615	0.46	1.05	34,547
1996	13,742	6,025	27,827	0.22	0.49	33,852
1997	10,065	4,366	19,078	0.23	0.53	23,443
1998	7,963	3,435	22,329	0.15	0.36	25,764
1999	10,263	4,581	17,552	0.26	0.58	22,134
2000	8,111	2,917	12,405	0.24	0.65	15,321
2001	14,252	5,063	6,819	0.74	2.09	11,882
2002	16,283	5,049	6,462	0.78	2.52	11,510
2003	12,358	4,225	3,155	1.34	3.92	7,380
2004	16,370	6,146	3,778	1.63	4.33	9,925
2005	15,552	5,589	3,792	1.47	4.10	9,382
2006	15,126	5,688	4,792	1.19	3.16	10,480
2007	17,681	6,510	6,002	1.08	2.95	12,512
2008	14,080	5,088	6,025	0.84	2.34	11,113
2009	15,952	5,897	5,606	1.05	2.85	11,503
2010	10,584	4,081	5,594	0.73	1.89	9,675
2011	12,264	4,787	9,779	0.49	1.25	14,566
2012	11,626	4,848	10,881	0.45	1.07	15,729
2013	12,820	5,010	7,410	0.68	1.73	12,420
2014	15,335	5,785	10,767	0.54	1.42	16,552
2015	8,033	3,322	8,726	0.38	0.92	12,048
2016	10,437	3,856	12,231	0.32	0.85	16,087

Table 5. Summary of estimated landings of US, Canadian and foreign fisheries by sex, 1982-2016. US recreational landings included. Estimated total weights based on sum of estimated weights from sampled length frequency distributions from port samples. Estimated weights computed for female as  $W = \exp(-15.025) \cdot L^{3.606935}$  and males as  $W = \exp(-13.002) \cdot L^{3.097787}$  with weight in kg and length in cm. "Samples" = number of measured dogfish.

Year	NMFS Biological Samples from Ports							Prorated Landings by Sex					
	Total Samples Males	Est Total Wt (kg) Males	Average Wt (kg) Males	Total Samples Females	Est Total Wt (kg) Females	Average Wt (kg) Females	Fraction Females by Weight	Total Landings (mt)	Est Landings (mt) of Males	Est Landings (mt) of Females	Number of Males Landed (000)	Number of Females Landed (000)	Total Numbers Landed (000)
1982	24	52.0	2.167	680	3015.7	4.435	0.9830	6,234	106	6,128	49	1,382	1,431
1983				610	2513.9	4.121	1.0000	5,428	0	5,428		1,317	1,317
1984	9	15.8	1.760	1,499	6626.0	4.420	0.9976	4,935	12	4,923	7	1,114	1,120
1985	21	35.2	1.678	1,657	6799.2	4.103	0.9948	5,142	27	5,116	16	1,247	1,263
1986	64	104.1	1.626	1,165	4669.0	4.008	0.9782	3,318	72	3,246	44	810	854
1987	31	52.7	1.700	2,000	7550.1	3.775	0.9931	3,429	24	3,406	14	902	916
1988	7	14.8	2.114	1,764	7560.7	4.286	0.9980	4,112	8	4,104	4	957	961
1989	35	67.5	1.927	1,375	5528.0	4.020	0.9879	5,333	64	5,269	33	1,311	1,344
1990	19	33.7	1.772	2,230	8916.6	3.998	0.9962	16,611	63	16,549	35	4,139	4,174
1991	161	379.2	2.356	1,518	5923.9	3.902	0.9398	13,848	833	13,015	354	3,335	3,689
1992	12	22.3	1.861	3,187	12180.6	3.822	0.9982	18,008	33	17,975	18	4,703	4,721
1993	42	78.4	1.866	2,773	9927.5	3.580	0.9922	22,225	174	22,051	93	6,159	6,253
1994	47	86.6	1.843	2,092	6639.9	3.174	0.9871	20,774	267	20,507	145	6,461	6,606
1995	25	38.9	1.555	2,266	6676.6	2.946	0.9942	23,615	137	23,479	88	7,969	8,056
1996	569	886.7	1.558	1,662	4397.6	2.646	0.8322	27,827	4,669	23,158	2,996	8,752	11,749
1997	303	449.1	1.482	382	780.9	2.044	0.6349	19,078	6,966	12,112	4,700	5,925	10,625
1998	68	85.4	1.257	683	1434.5	2.100	0.9438	22,329	1,255	21,073	999	10,034	11,033
1999	93	130.3	1.401	311	625.5	2.011	0.8276	17,552	3,026	14,527	2,160	7,223	9,382
2000	345	473.1	1.371	1,921	3921.2	2.041	0.8923	12,405	1,335	11,069	974	5,423	6,397
2001	12	17.1	1.422	215	456.5	2.123	0.9640	6,819	246	6,573	173	3,096	3,269
2002	1	1.3	1.279	278	752.5	2.707	0.9983	6,462	11	6,451	9	2,383	2,392
2003	34	48.3	1.421	966	2338.4	2.421	0.9798	3,155	64	3,091	45	1,277	1,322
2004	15	23.9	1.593	1,180	3296.9	2.794	0.9928	3,778	27	3,751	17	1,343	1,360
2005	745	1018.7	1.367	2,065	5196.0	2.516	0.8361	3,792	622	3,171	455	1,260	1,715
2006	646	924.4	1.431	4,211	10382.9	2.466	0.9182	4,792	392	4,400	274	1,785	2,058
2007	507	720.7	1.421	2,865	7514.8	2.623	0.9125	6,002	525	5,477	370	2,088	2,458
2008	236	342.0	1.449	2,925	7973.8	2.726	0.9589	6,025	248	5,777	171	2,119	2,290
2009	472	696.6	1.476	3,378	9161.6	2.712	0.9293	5,606	396	5,210	268	1,921	2,189
2010	821	1213.4	1.478	4,963	14217.4	2.865	0.9214	5,594	440	5,154	298	1,799	2,097
2011	868	1109.9	1.279	4,800	12786.8	2.664	0.9201	9,779	781	8,998	611	3,378	3,989
2012	213	371.8	1.746	3,763	10727.9	2.851	0.9665	10,881	365	10,516	209	3,689	3,898
2013	450	736.7	1.637	5,441	16258.3	2.988	0.9567	7,410	321	7,089	196	2,372	2,569
2014	546	830.6	1.521	4,505	13198.1	2.930	0.9408	10,715	634	10,081	417	3,441	3,858
2015	1164	1705.9	1.466	2,943	7782.9	2.645	0.8202	8,726	1,569	7,157	1,070	2,706	3,777
2016	628	971.9	1.548	4,792	13192.7	2.753	0.9314	12,231	839	11,392	542	4,138	4,680
<i>formula</i>	<i>A</i>	<i>B</i>	$C=B/A$	<i>D</i>	<i>E</i>	$F=E/D$	$G=E/(E+B)$	<i>H</i>	$I=(1-G)*H$	$J=G*H$	$K=I/C$	$L=J/F$	$M=K+L$

Table 6. Summary of estimated discards of combined US fleets by sex, 1991-2016. Estimated total weights based on summation of estimated weights from sampled length frequency distributions. Estimated weights computed from length-weight regressions. Female  $W = \exp(-15.025)L^3.606935$ . Male  $W = \exp(-13.002)L^3.097787$  with weight in kg and length in cm. "Samples" = number of measured dogfish that were discarded. 2010 estimates based on fishing year rather than calendar year.

Year	NMFS Biological Samples from Observers							Prorated Discards by Sex					
	Total Samples Males	Est Total Wt (kg) Males	Average Wt (kg) Males	Total Samples Females	Est Total Wt (kg) Females	Average Wt (kg) Females	Fraction Females by Weight	Total Dead Discards (mt)	Est Landings (mt) of Males	Est Discards (mt) of Females	Number of Males Discarded (000)	Number of Females Discarded (000)	Total Numbers Discarded (000)
1991	376	463	1.231	894	2,350	2.628	0.8355	13,274	2,184	11,090	1,775	4,219	5,994
1992	449	504	1.123	632	1,090	1.724	0.6836	18,983	6,007	12,976	5,347	7,526	12,873
1993	57	62	1.087	130	414	3.184	0.8697	11,969	1,559	10,410	1,434	3,270	4,704
1994	207	207	1.001	747	1,397	1.870	0.8708	8,556	1,105	7,451	1,104	3,985	5,090
1995	2,191	2,342	1.069	2,384	3,064	1.285	0.5668	10,932	4,735	6,197	4,431	4,821	9,251
1996	1,643	1,833	1.115	1,370	2,013	1.469	0.5234	6,025	2,871	3,153	2,574	2,147	4,721
1997	1,359	1,391	1.024	1,427	2,070	1.451	0.5980	4,366	1,755	2,611	1,714	1,800	3,514
1998	1,289	1,320	1.024	1,463	1,939	1.326	0.5951	3,435	1,391	2,044	1,359	1,542	2,901
1999	447	440	0.984	870	1,808	2.078	0.8044	4,581	896	3,685	911	1,773	2,684
2000	423	568	1.343	1,498	3,207	2.141	0.8495	2,917	439	2,478	327	1,157	1,484
2001	650	842	1.295	2,987	7,377	2.470	0.8976	5,063	518	4,545	400	1,840	2,241
2002	1,293	1,819	1.407	5,880	13,899	2.364	0.8843	5,049	584	4,464	415	1,889	2,304
2003	4,711	5,367	1.139	12,826	27,210	2.121	0.8353	4,225	696	3,529	611	1,664	2,275
2004	10,878	14,480	1.331	28,583	64,771	2.266	0.8173	6,146	1,123	5,023	844	2,217	3,060
2005	7,470	9,450	1.265	13,024	28,593	2.195	0.7516	5,589	1,388	4,201	1,098	1,914	3,011
2006	4,512	5,449	1.208	7,041	14,559	2.068	0.7277	5,688	1,549	4,139	1,283	2,002	3,284
2007	3,955	5,183	1.310	9,830	24,621	2.505	0.8261	6,510	1,132	5,378	864	2,147	3,011
2008	3,096	3,969	1.282	6,140	14,857	2.420	0.7892	5,088	1,073	4,015	837	1,659	2,496
2009	1,719	2,088	1.215	3,083	6,849	2.221	0.7664	5,897	1,378	4,519	1,134	2,034	3,169
2010	1,634	2,190	1.340	2,086	4,994	2.394	0.6952	4,081	1,244	2,837	928	1,185	2,113
2011	2,286	2,920	1.278	2,428	5,864	2.415	0.6675	4,787	1,591	3,196	1,246	1,323	2,569
2012	734	1,010	1.376	1,384	3,302	2.386	0.7660	4,848	1,136	3,712	825	1,556	2,381
2013	448	381	0.850	701	1,210	1.725	0.7610	5,010	1,200	3,810	1,411	2,208	3,620
2014	743	786	1.058	784	1,428	1.822	0.6450	5,785	2,054	3,731	1,941	2,048	3,989
2015	750	938	1.251	559	1,050	1.878	0.5280	3,322	1,568	1,754	1,253	934	2,187
2016	384	469	1.222	314	611	1.945	0.5655	3,856	1,676	2,181	1,371	1,121	2,492
<i>formula</i>	<i>A</i>	<i>B</i>	$C=B/A$	<i>D</i>	<i>E</i>	$F=E/D$	$G=E/(E+B)$	<i>H</i>	$I=(I-G)*H$	$J=G*H$	$K=I/C$	$L=J/F$	$M=K+L$



Table 7. Biomass estimates for spiny dogfish (thousands of metric tons) based on area swept by NEFSC bottom trawl during spring surveys, 1968-2017. Estimate for 2014 not included as survey coverage was incomplete.

	Lengths $\geq$ 80 cm			Lengths 36 to 79 cm			Length $\leq$ 35 cm			All Lengths	3-pt Average Female SSB
	Females	Males	Total	Females	Males	Total	Females	Males	Total		
1968			41.4			110.4			1.52	153.3	
1969			27.4			69.3			0.66	97.3	
1970			36.7			33.0			3.19	72.9	
1971			103.8			27.6			2.76	134.2	
1972			126.6			145.9			1.55	274.1	
1973			178.7			165.3			2.58	346.5	
1974			221.9			179.6			2.66	404.1	
1975			105.1			125.0			3.97	234.0	
1976			96.3			120.8			1.20	218.3	
1977			77.3			68.0			0.53	145.9	
1978			87.4			131.2			1.24	219.8	
1979			52.3			18.6			1.82	72.7	
1980	104.7	15.3	168.1	16.8	72.2	123.5	0.32	0.39	0.84	292.4	
1981	266.5	24.4	293.8	25.5	75.1	100.6	2.14	2.80	5.06	399.5	
1982	454.0	34.6	488.6	61.6	143.3	204.9	0.48	0.69	1.17	694.6	275.1
1983	77.7	30.1	107.8	36.7	98.5	135.3	3.09	3.95	7.03	250.1	266.1
1984	115.6	27.5	143.1	33.4	88.0	121.4	0.14	0.21	0.35	264.9	215.8
1985	317.0	125.5	442.6	102.5	502.5	605.0	4.01	5.10	9.10	1056.7	170.1
1986	191.3	3.5	194.8	51.9	29.6	81.5	0.84	1.11	1.96	278.2	208.0
1987	219.1	90.5	309.6	61.5	171.7	233.1	2.46	4.76	7.22	550.0	242.5
1988	433.1	26.2	459.4	93.3	153.6	247.0	0.89	1.09	1.98	708.4	281.2
1989	162.1	40.5	202.6	100.4	158.2	258.6	1.14	1.54	2.68	463.9	271.5
1990	400.3	70.7	471.0	163.5	303.1	466.6	0.68	1.03	1.71	939.3	331.8
1991	220.4	30.0	250.3	108.4	186.3	294.7	0.98	1.43	2.41	547.4	260.9
1992	280.5	41.9	322.4	179.9	231.9	411.8	0.73	1.00	1.73	735.9	300.4
1993	234.6	27.8	262.5	104.1	198.5	302.6	0.55	0.65	1.21	566.3	245.2
1994	105.3	37.1	142.4	108.3	254.2	362.5	4.28	5.54	9.82	514.8	206.8
1995	102.4	29.5	131.9	154.0	174.5	328.5	0.25	0.35	0.59	460.9	147.5
1996	196.5	33.4	229.9	201.7	334.8	536.4	0.98	1.14	2.12	768.5	134.7
1997	83.7	17.5	101.2	205.2	209.1	414.3	0.05	0.05	0.10	515.5	127.5
1998	26.7	22.9	49.7	69.0	236.4	305.4	0.05	0.08	0.13	355.2	102.3
1999	62.7	20.4	83.1	140.8	256.4	397.2	0.02	0.03	0.05	480.4	57.7
2000	85.8	11.7	97.5	91.5	166.2	257.7	0.07	0.09	0.16	355.4	58.4
2001	56.7	16.7	73.4	71.4	160.5	231.9	0.04	0.03	0.07	305.4	68.4
2002	75.2	19.0	94.2	131.5	246.3	377.8	0.06	0.06	0.12	472.1	72.5
2003	64.5	22.5	87.1	125.5	256.3	381.8	0.13	0.14	0.27	469.1	65.5
2004	40.4	10.0	50.3	46.9	126.2	173.1	0.66	0.91	1.56	225.0	60.0
2005	55.8	30.8	86.6	59.8	294.7	354.5	0.28	0.42	0.69	441.9	53.6
2006	253.4	29.0	282.5	141.6	406.5	548.1	0.10	0.17	0.27	830.8	116.6
2007	158.0	18.9	176.9	73.6	227.6	301.1	0.23	0.32	0.56	478.6	155.8
2008	241.7	29.6	271.4	91.2	293.7	385.0	0.47	0.59	1.05	657.4	217.7

Table 7. cont.

	Lengths >= 80 cm			Lengths 36 to 79 cm				Length <= 35 cm			All Lengths	3-pt Average Female SSB
	Females	Males	Total	Females	Males	Total		Females	Males	Total		
2009	148.3	21.9	170.2	54.9	326.1	381.0	2.95	3.76	6.71		557.9	182.7
2010	160.6	18.3	178.8	64.0	287.3	351.3	1.15	1.44	2.59		532.7	183.5
2011	213.9	26.7	240.6	60.0	408.6	468.6	0.99	2.48	3.47		712.6	174.2
2012	348.4	44.5	399.0	72.6	584.7	723.0	4.06	5.04	9.16		1131.1	241.0
2013	145.6	57.2	202.7	133.1	444.3	577.4	5.25	6.48	11.73		791.8	235.9
2014	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA	NA
2015	125.4	22.3	147.7	40.5	280.2	320.6	1.07	1.35	2.42		470.8	135.5
2016	184.9	29.5	214.4	119.9	429.4	549.3	1.30	1.81	3.11		766.8	181.0
2017	24.4	12.7	37.1	92.5	284.8	377.3	0.23	0.31	0.53		414.9	111.6

Notes: Total equals sum of males and females plus unsexed dogfish. Data for dogfish prior to 1980 are currently not available by sex. Data have been adjusted to AL IV equivalents using weight specific HB Bigelow calibration coefficients. Average SSB for 2015 is 2013 and 2015 only. Average for 2016 is 2015 and 2016 only. Average for 2017 is 2015-2017 as years prior to 2014.

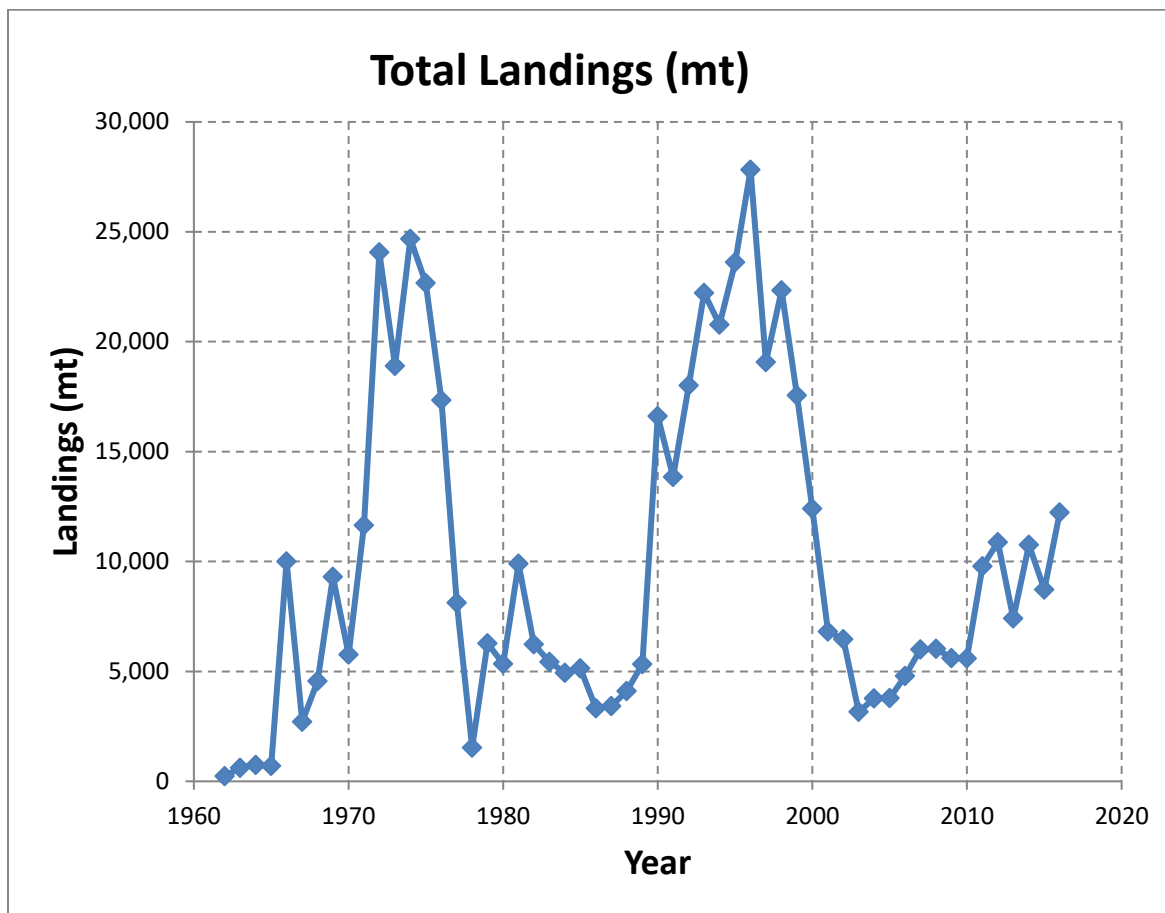


Figure 1. Estimated total landings (mt, live) of spiny dogfish in NAFO Areas 2 to 6, 1962-2016.

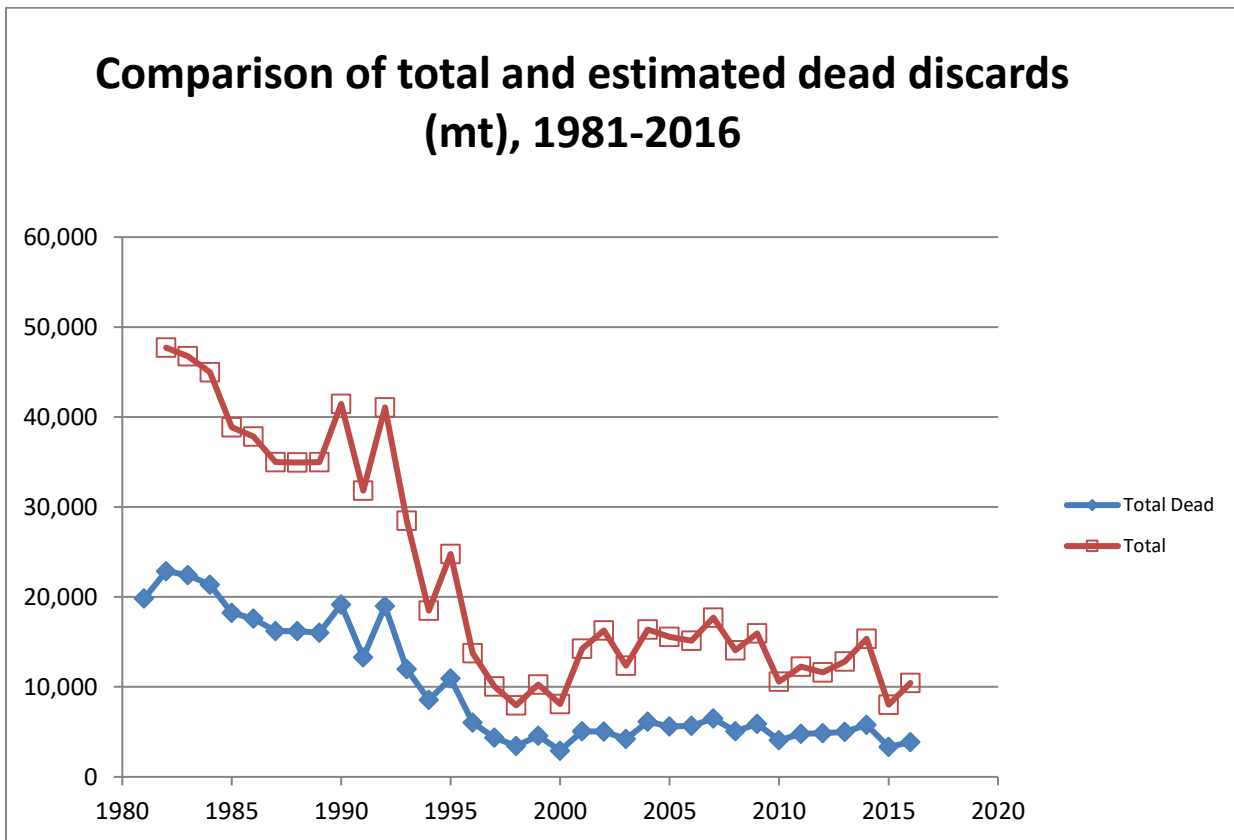


Figure 2. Estimated total and total dead discards in US, 1981-2016. Estimates for 1981 to 1989 are hindcast estimates rather than direct observations.

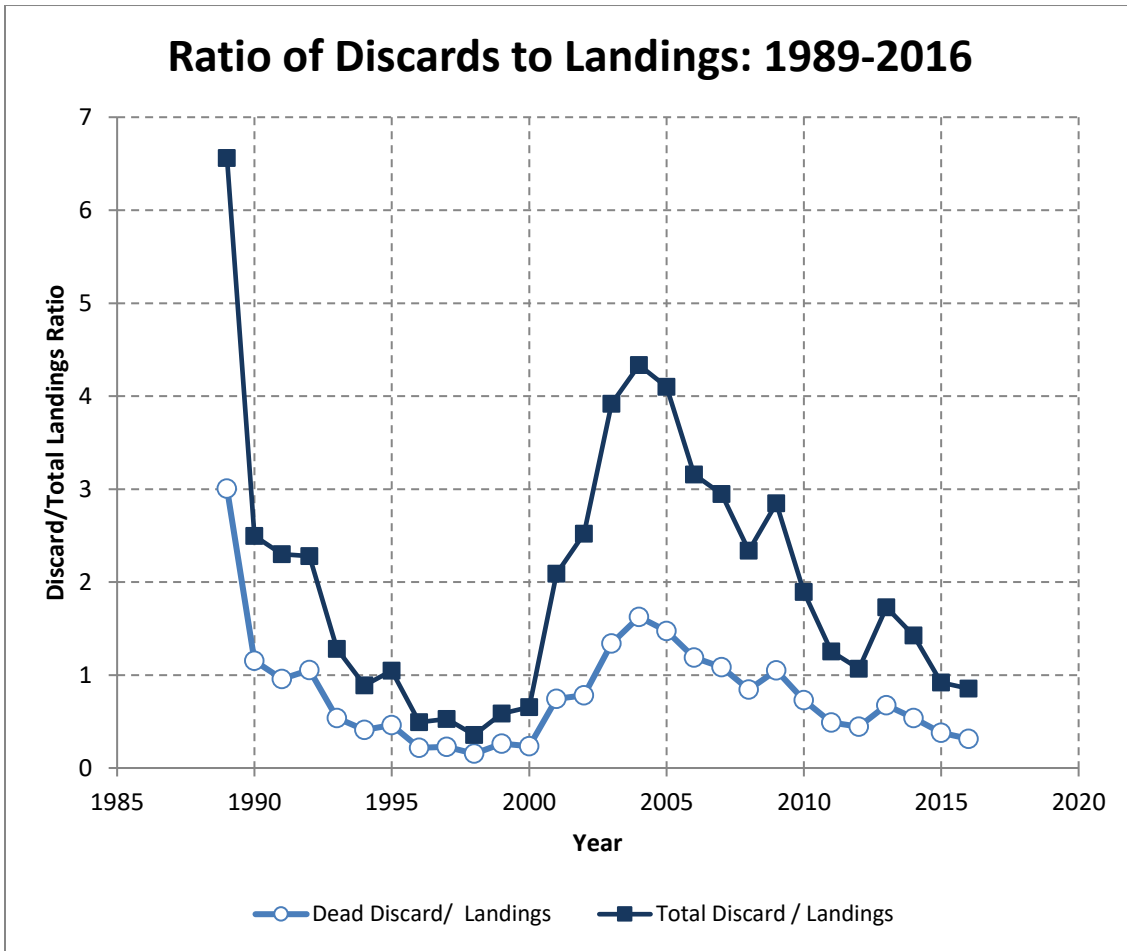


Figure 3. Trends in the ratio of total discards to landings and total dead discards to landings for spiny dogfish, 1989-2016.

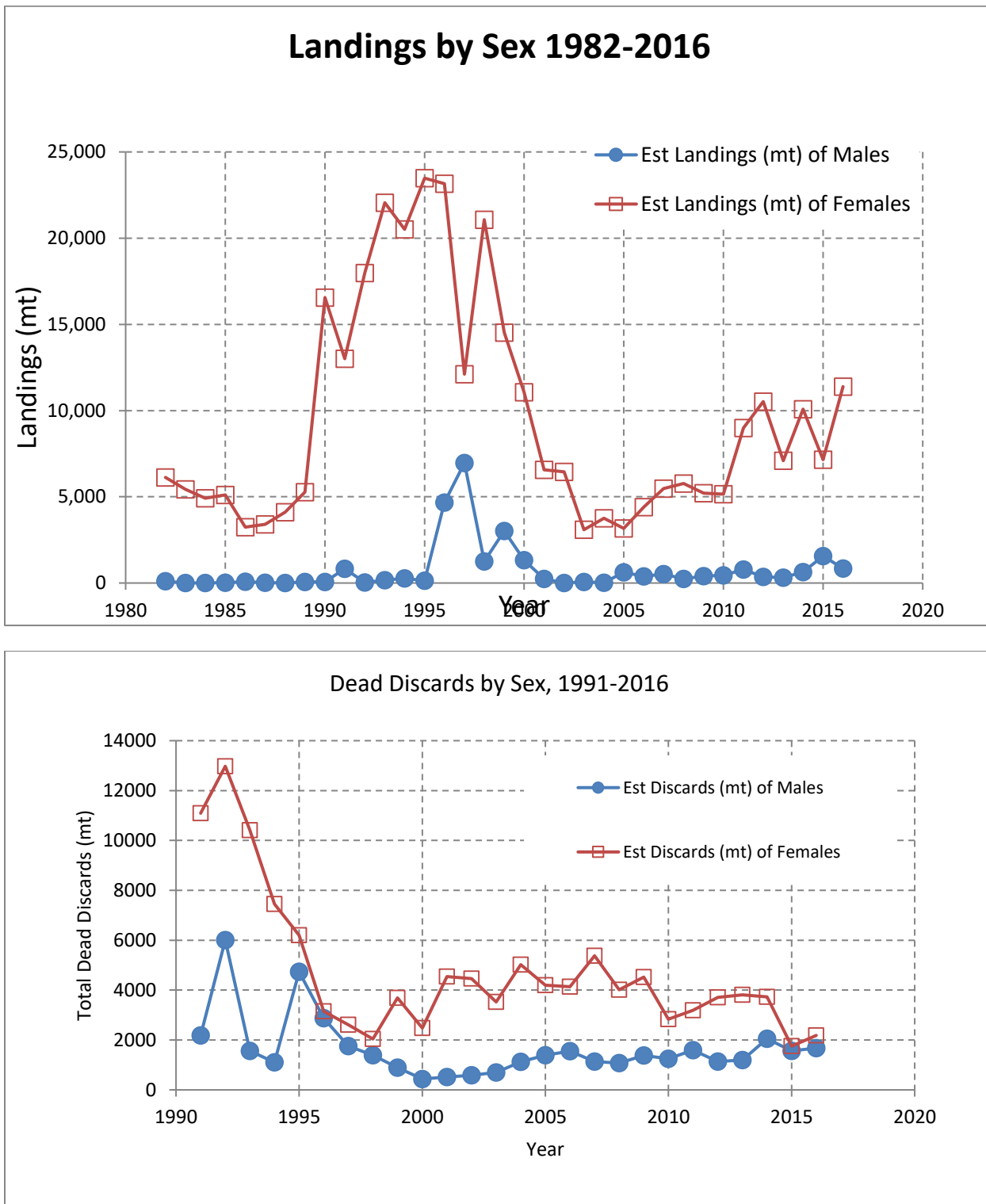


Figure 4. Estimated total landings, 1982-2016 (top) and total dead discards, 1991-2016 (bottom) in mt by sex.

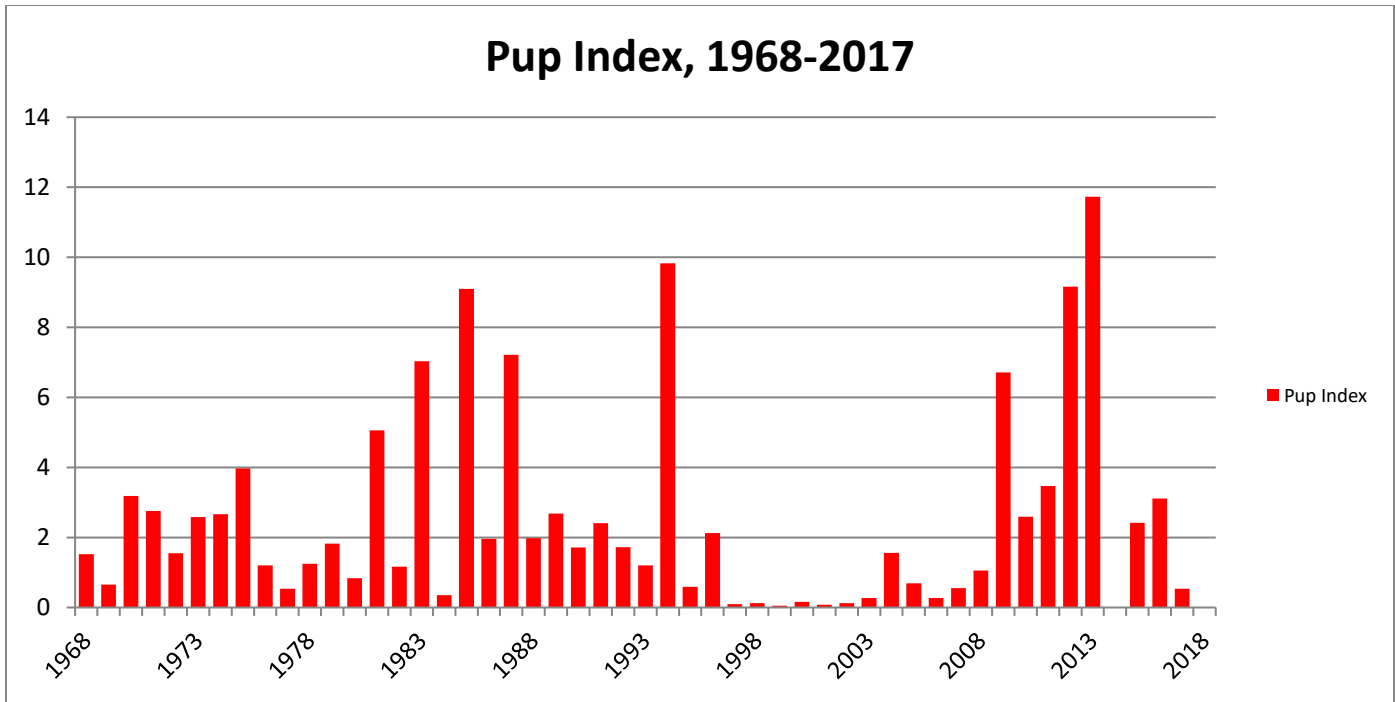


Figure 5. Estimated swept area biomass (mt) of total pups (spiny dogfish  $\leq 35$  cm) captured in the NEFSC spring bottom trawl survey, 1968-2017. Survey was incomplete in 2014; no estimate available.

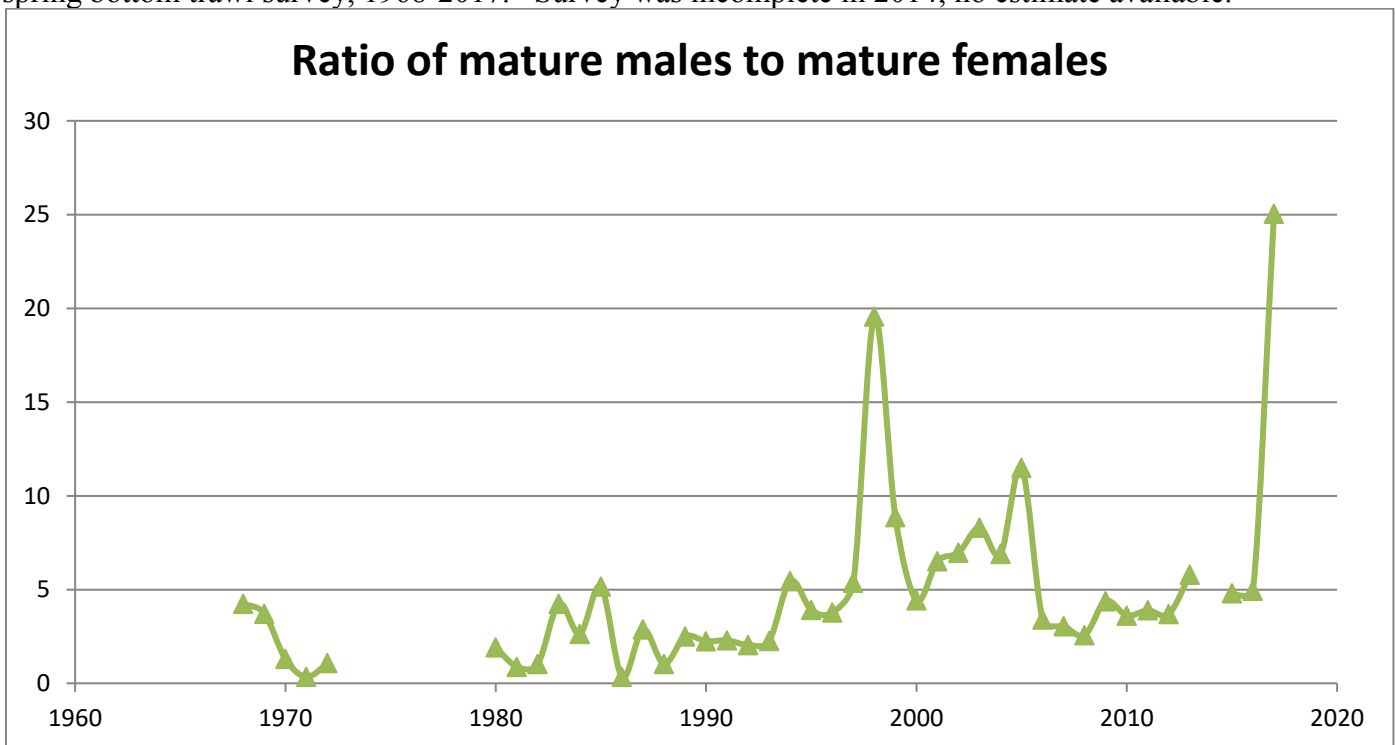


Figure 6. Annual ratios of mature males ( $\geq 60$  cm) to mature females ( $\geq 80$  cm) in NEFSC spring bottom trawl survey, 1968-1972, and 1980-2017. The 2014 survey was incomplete and no estimates were generated. Spiny dogfish sex was not recorded in the NEFSC database for 1973 to 1979.

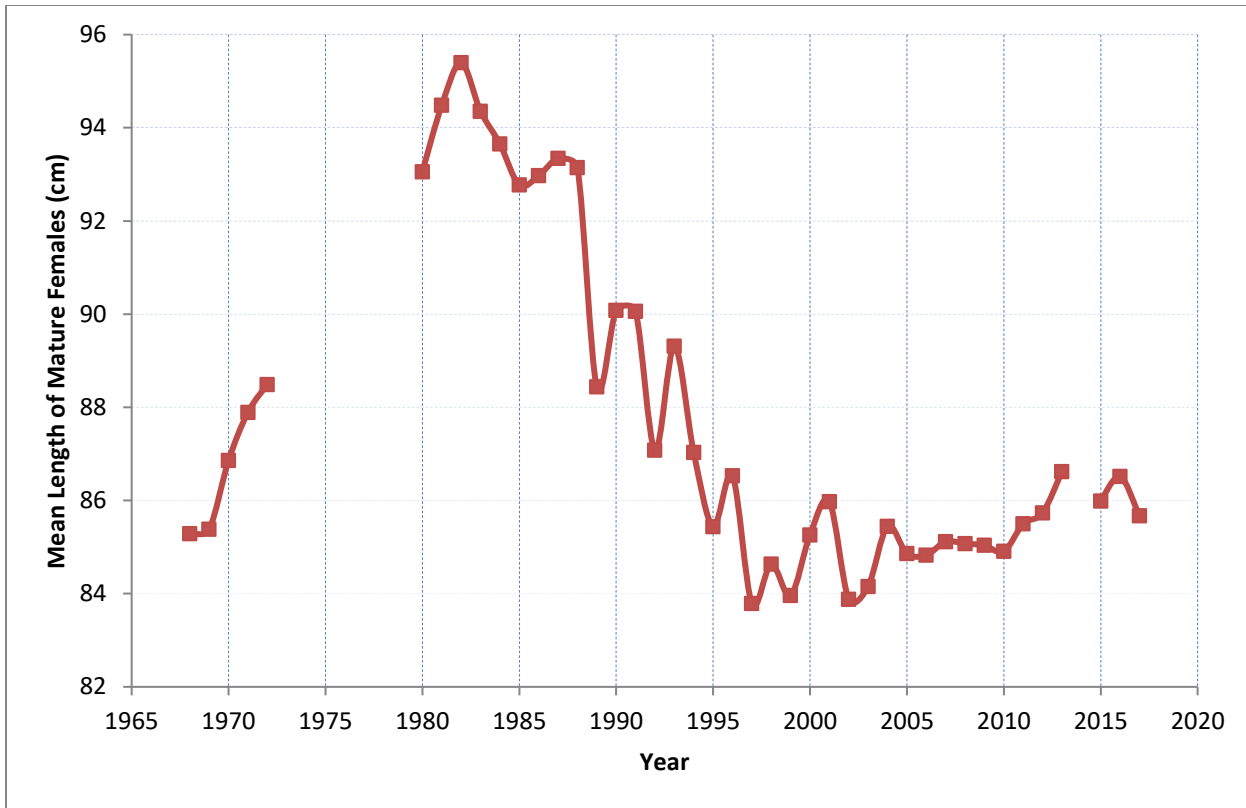


Figure 7. Mean Length of mature female spiny dogfish in NEFSC Spring bottom trawl survey, 1968-1972 and 1980-2017. Survey in 2014 was incomplete. Spiny dogfish sex was not recorded in the NEFSC database for 1973 to 1979.

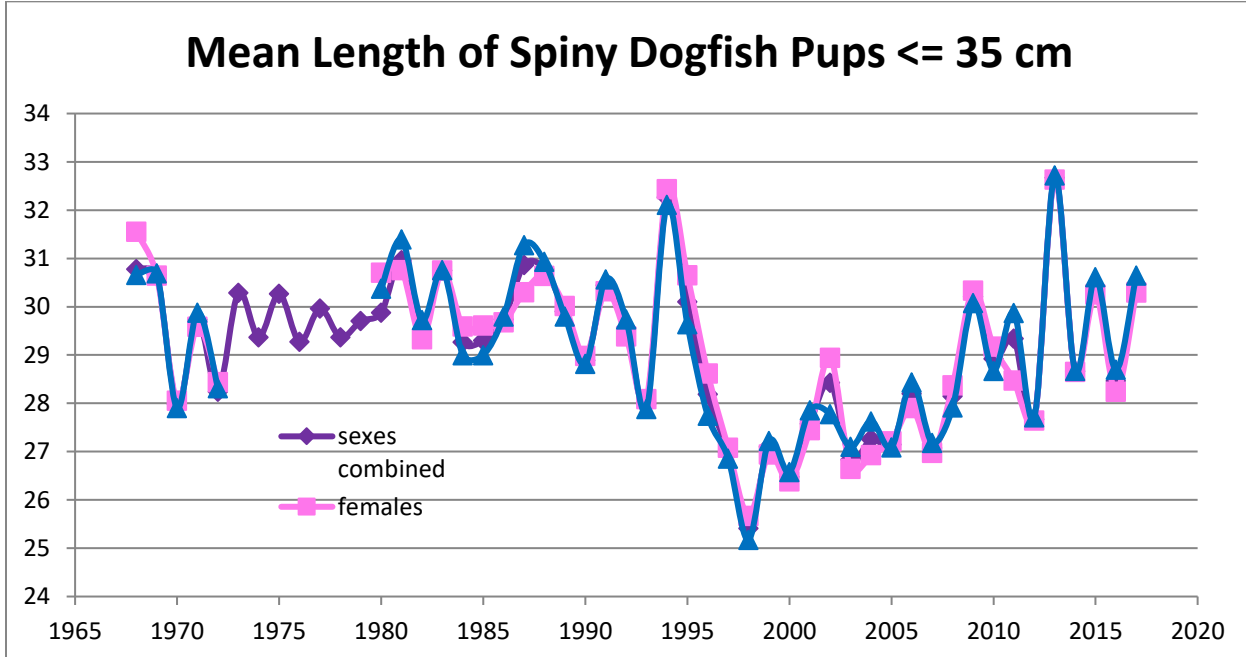


Figure 8. Mean length of male, female and sexes combined spiny dogfish pups ( $\leq 35$  cm) in spring bottom trawl survey 1968-2017. Survey in 2014 was incomplete. Spiny dogfish sex was not recorded in the NEFSC database for 1973 to 1979.



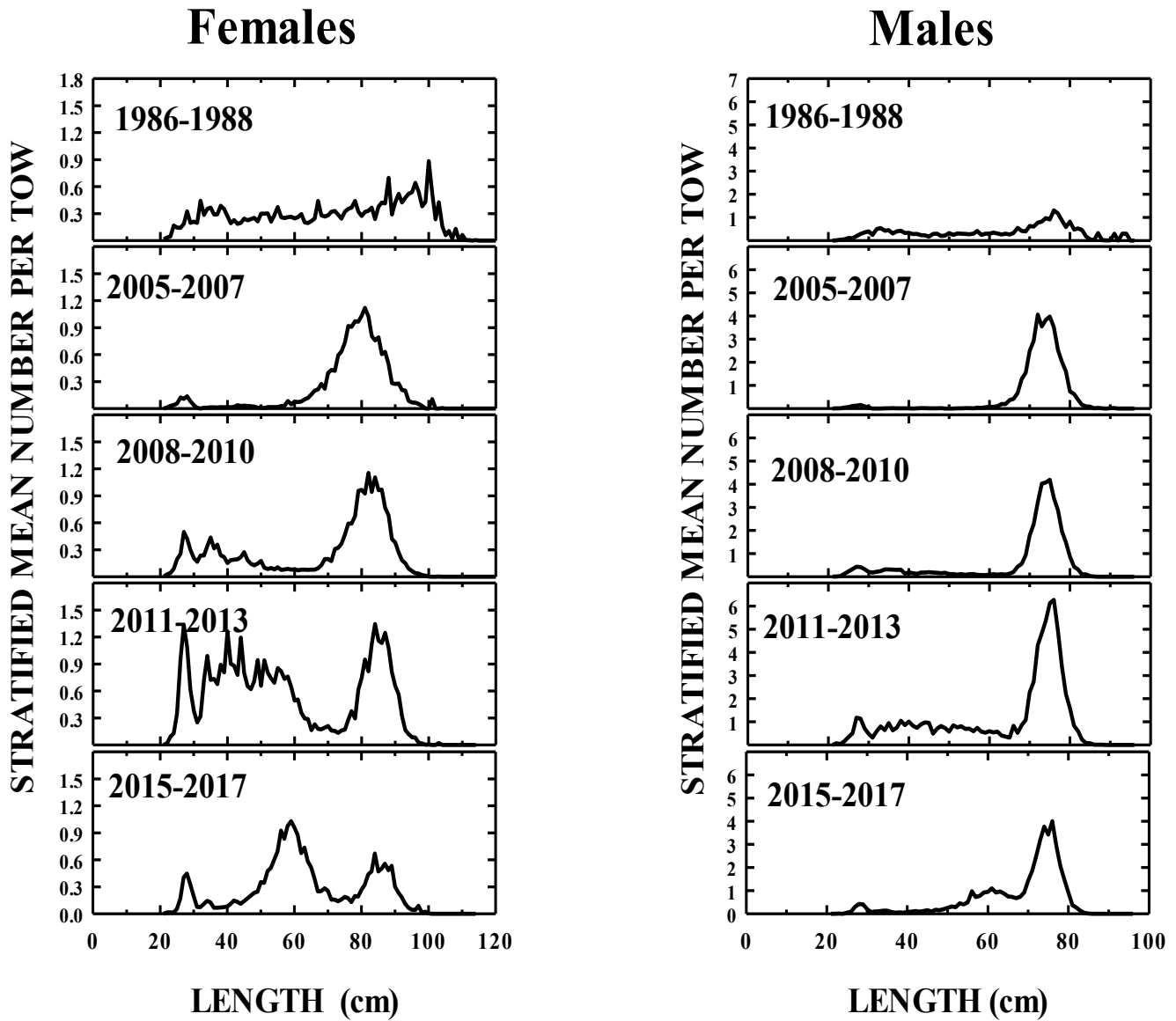


Figure 9. Composite size frequencies for female and male spiny dogfish in NEFSC spring bottom trawl survey. Survey was incomplete for 2014.

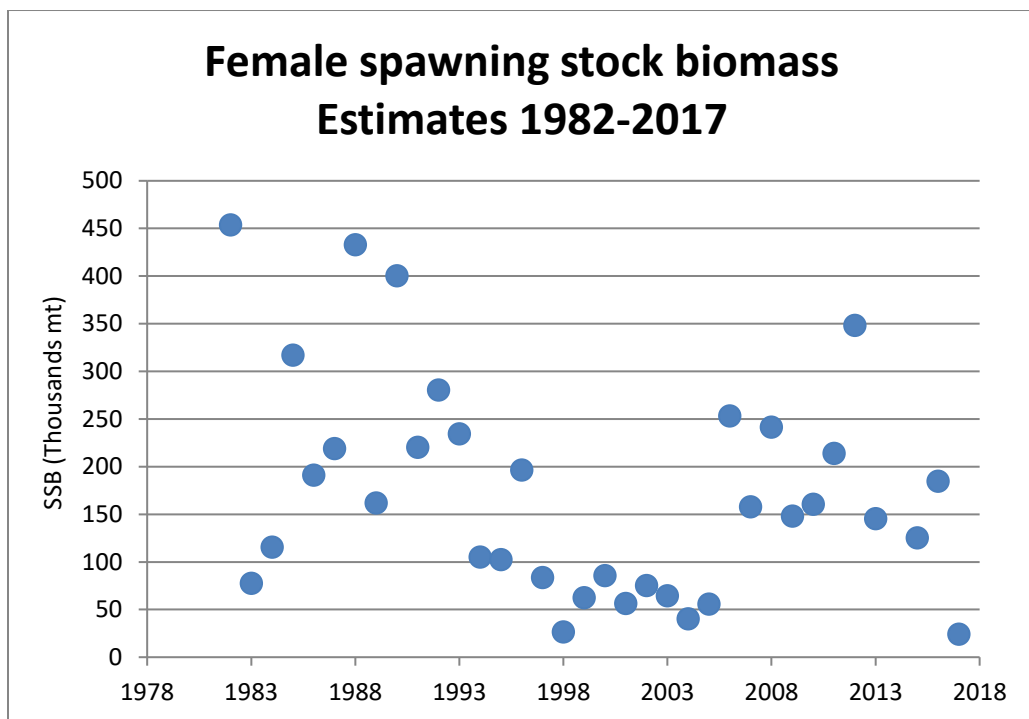


Figure 10. Swept area estimates of female mature biomass ( $\geq 80$  cm) from the NEFSC spring survey from 1980-2017.

**Appendix 1. Summary of total dead discards and standard errors for trawl, gill net and recreational discards for spiny dogfish by sex for 1990 to 2016.**

Year	Trawl Discards (mt)				Gill Net Discards (mt)				Recreational Discards (mt)			
	Male		Female		Male		Female		Male		Female	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
1990	7636.0	1918.5	9485.0	2382.9	256.0	65.1	1563.0	397.6	58.1	8.5	354.5	51.8
1991	4309.0	843.5	5352.0	1047.6	466.0	54.5	2843.0	332.9	56.4	7.6	344.4	46.5
1992	7274.0	1971.9	9034.0	2449.1	251.0	24.1	1535.0	147.1	58.9	6.2	359.5	38.1
1993	3855.0	993.1	4788.0	1233.5	414.0	78.2	2530.0	477.6	48.1	7.5	293.7	45.5
1994	3102.0	786.6	3852.0	976.9	122.0	36.7	744.0	224.3	49.0	7.4	299.0	45.4
1995	2275.0	444.9	6224.0	1217.3	957.0	314.9	1062.0	349.7	90.0	10.4	100.0	11.5
1996	1683.0	466.0	3018.0	835.9	599.0	181.6	568.0	172.4	53.4	6.8	50.7	6.5
1997	1716.0	566.4	1637.0	540.4	220.0	54.1	478.0	117.7	67.3	8.2	146.4	17.9
1998	1077.0	363.5	1558.0	525.9	239.0	69.7	351.0	102.5	65.1	8.6	95.8	12.6
1999	982.0	340.7	2860.0	992.3	117.0	31.2	485.0	129.4	30.9	3.6	128.3	14.9
2000	644.0	156.4	720.0	174.7	149.0	43.5	1256.0	367.4	13.3	2.2	112.1	18.5
2001	428.0	68.8	2031.0	326.2	185.0	55.8	1977.0	596.9	38.1	3.5	407.5	37.1
2002	533.0	168.9	2237.0	708.6	107.0	23.2	1392.0	301.1	40.5	4.3	524.5	55.6
2003	524.0	101.6	1402.0	272.0	172.0	22.4	1452.0	189.6	67.3	5.5	569.8	46.2
2004	1261.0	201.4	2888.0	461.3	127.0	11.9	1083.0	101.4	81.9	7.4	700.7	63.1
2005	994.5	111.8	2762.9	310.6	192.6	24.3	808.9	102.0	125.4	15.1	526.9	63.2
2006	790.8	88.9	2123.0	238.6	244.2	29.3	655.6	78.7	177.0	21.2	475.3	57.0
2007	704.2	84.5	3353.0	376.9	290.5	34.9	1383.3	166.0	155.9	18.7	742.1	89.1
2008	589.8	97.2	2212.2	364.6	307.1	55.1	1152.0	206.8	131.1	12.5	491.8	46.9
2009	883.0	90.4	2895.0	296.4	361.0	52.5	1185.0	172.3	134.0	16.5	439.7	54.1
2010	893.0	70.9	2036.0	161.6	234.0	23.2	533.0	52.9	118.0	13.1	268.7	30.0
2011	1143.0	110.5	2296.0	222.0	294.0	15.3	591.0	30.7	154.0	22.4	309.0	45.1
2012	859.0	77.8	2808.0	254.3	212.0	13.4	693.0	43.6	64.0	11.4	210.0	37.3
2013	825.9	59.2	2622.1	188.0	223.2	21.9	708.8	69.5	127.2	15.1	403.8	48.1
2014	1432.9	105.7	2602.3	192.0	254.4	24.0	462.1	43.6	336.8	176.8	611.8	321.2
2015	1202.7	106.7	1345.3	119.3	234.3	55.7	262.1	62.3	115.5	18.4	129.3	20.6
2016	1104.7	87.6	1437.6	114.0	253.0	58.1	329.2	75.7	271.8	47.0	353.7	61.2

## **Appendix 2. Spatial Distribution of Commercial Landings**

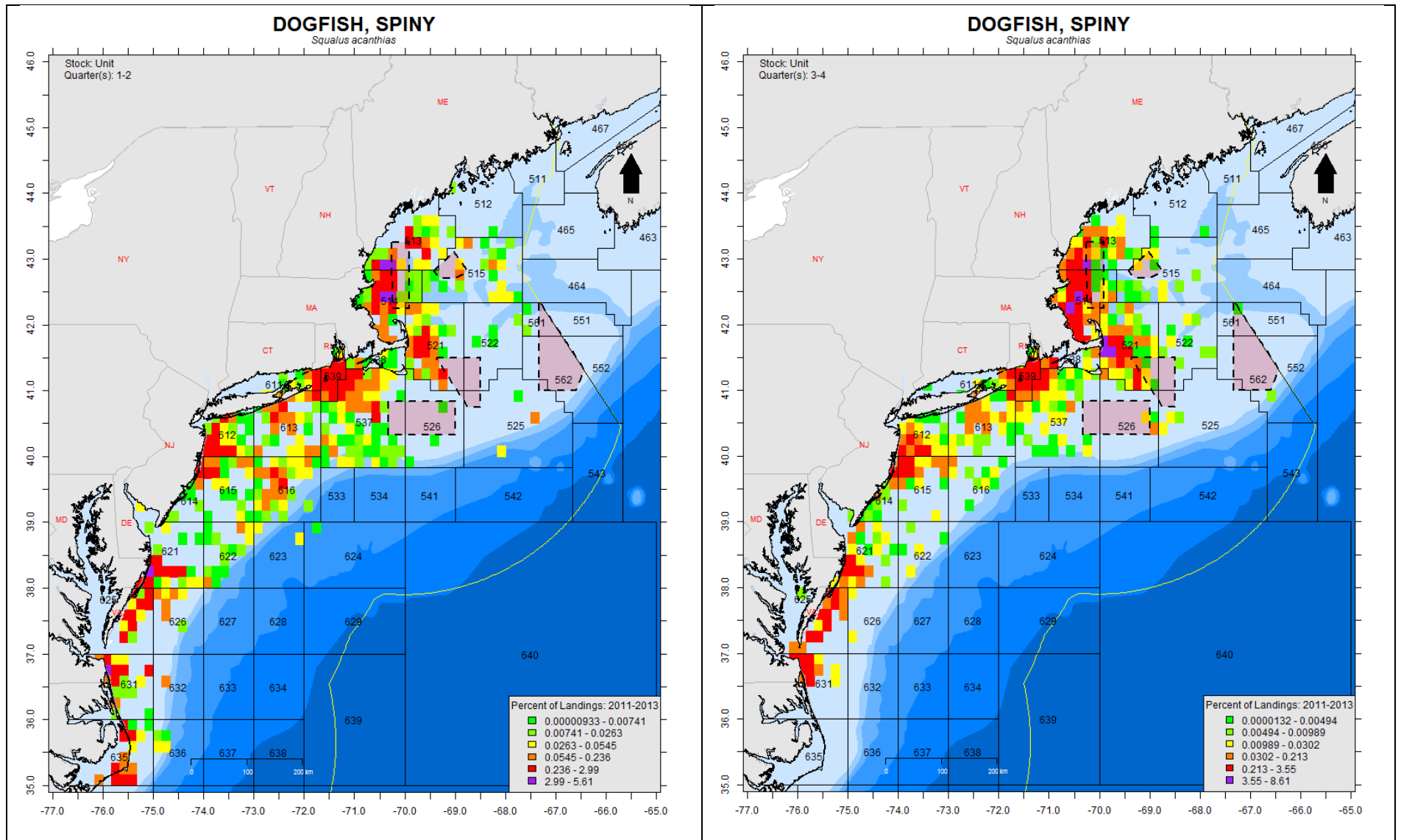


Fig 1. These maps represent commercial landings for DOGFISH, SPINY, *Squalus acanthias* from 2011-2013. Landings were reported via Dealer reports. Data have been restricted to dealer trips matched to a Vessel Trip Report (VTR) (ALEVEL=A) to ensure area information is as accurate as possible. Landings from quarters 1 and 2 are on the left (54.54% of total landings reported for these quarters) and landings from quarters 3 and 4 are in the right panel (71.36% of total landings reported for these quarters) Northeast Fisheries Science Center statistical areas are represented by numbered polygons and bathymetry is depicted in blue shading. Groundfish closed areas (dashed borders), and the Exclusive Economic Zone (yellow line) have been overlaid. Data queried on August 18, 2017.

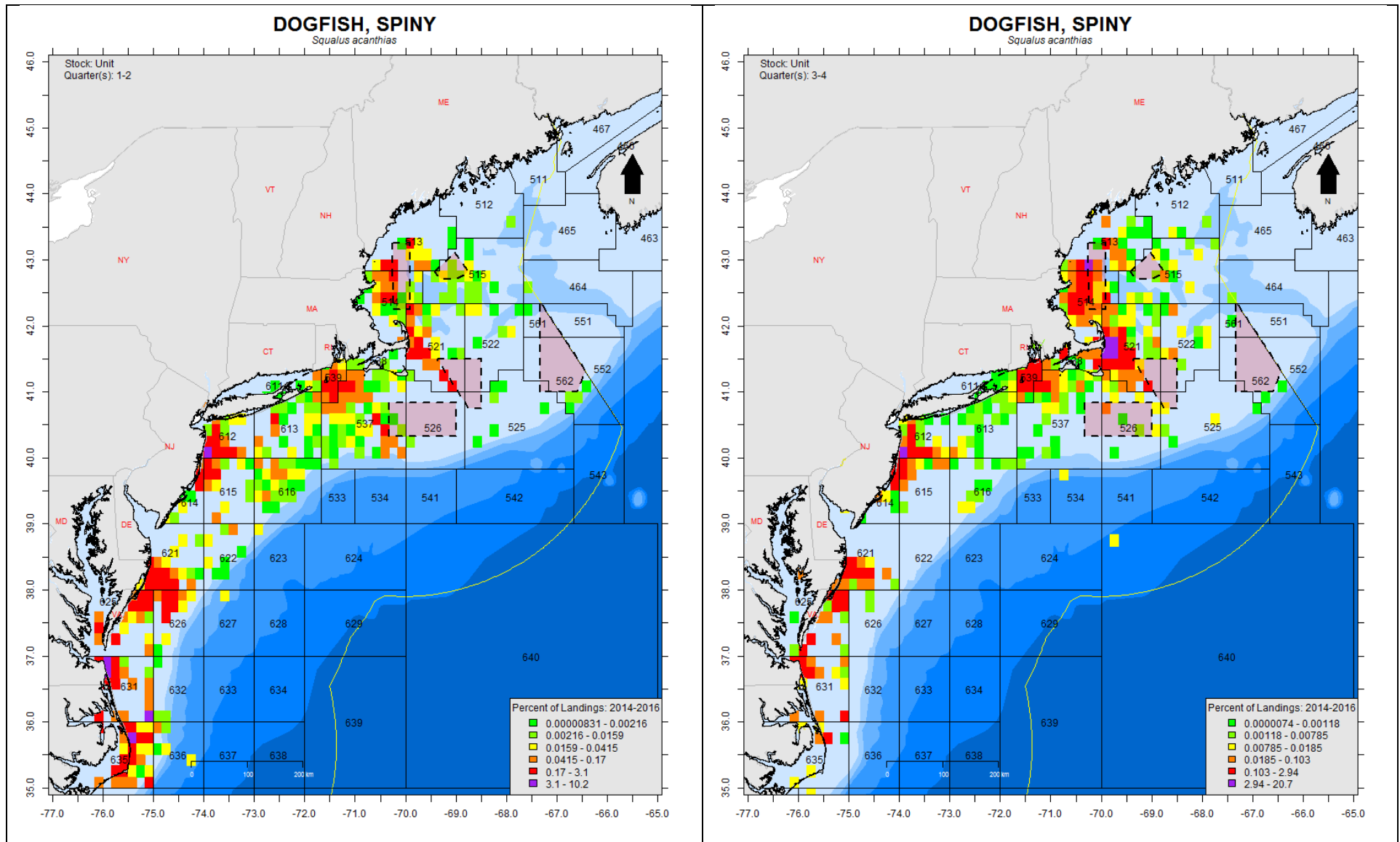
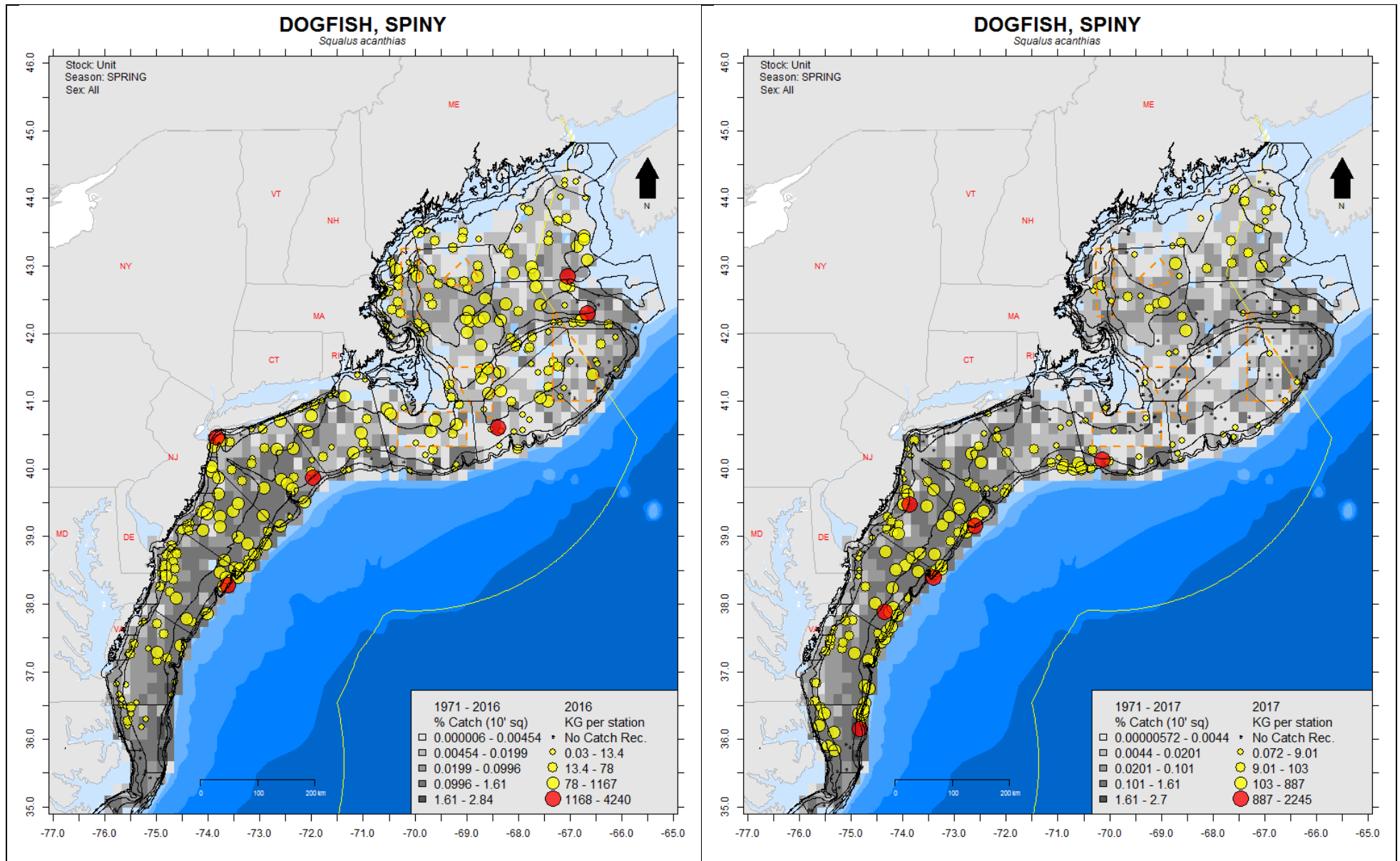


Fig 2. These maps represent commercial landings for DOGFISH, SPINY, *Squalus acanthias* from 2014-2016. Landings were reported via Dealer reports. Data have been restricted to dealer trips matched to a Vessel Trip Report (VTR) (ALEVEL=A) to ensure area information is as accurate as possible. Landings from quarters 1 and 2 are on the left (52.27% of total landings reported for these quarters) and landings from quarters 3 and 4 are in the right panel (84% of total landings reported for these quarters) Northeast Fisheries Science Center statistical areas are represented by numbered polygons and bathymetry is depicted in blue shading. Groundfish closed areas (dashed borders), and the Exclusive Economic Zone (yellow line) have been overlaid. Data queried on August 18, 2017.

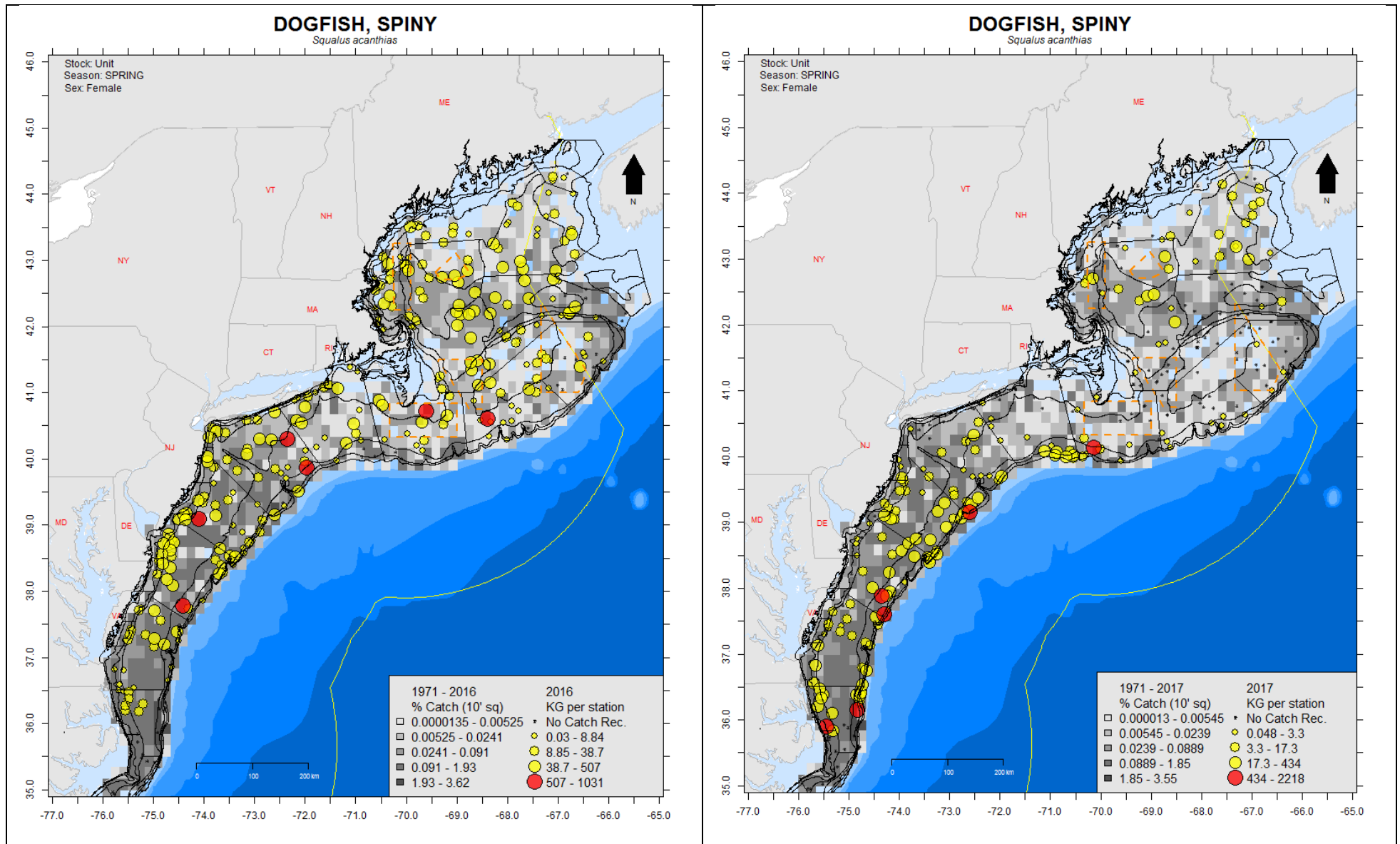
### **Appendix 3. Spatial Distribution of Survey Catches**



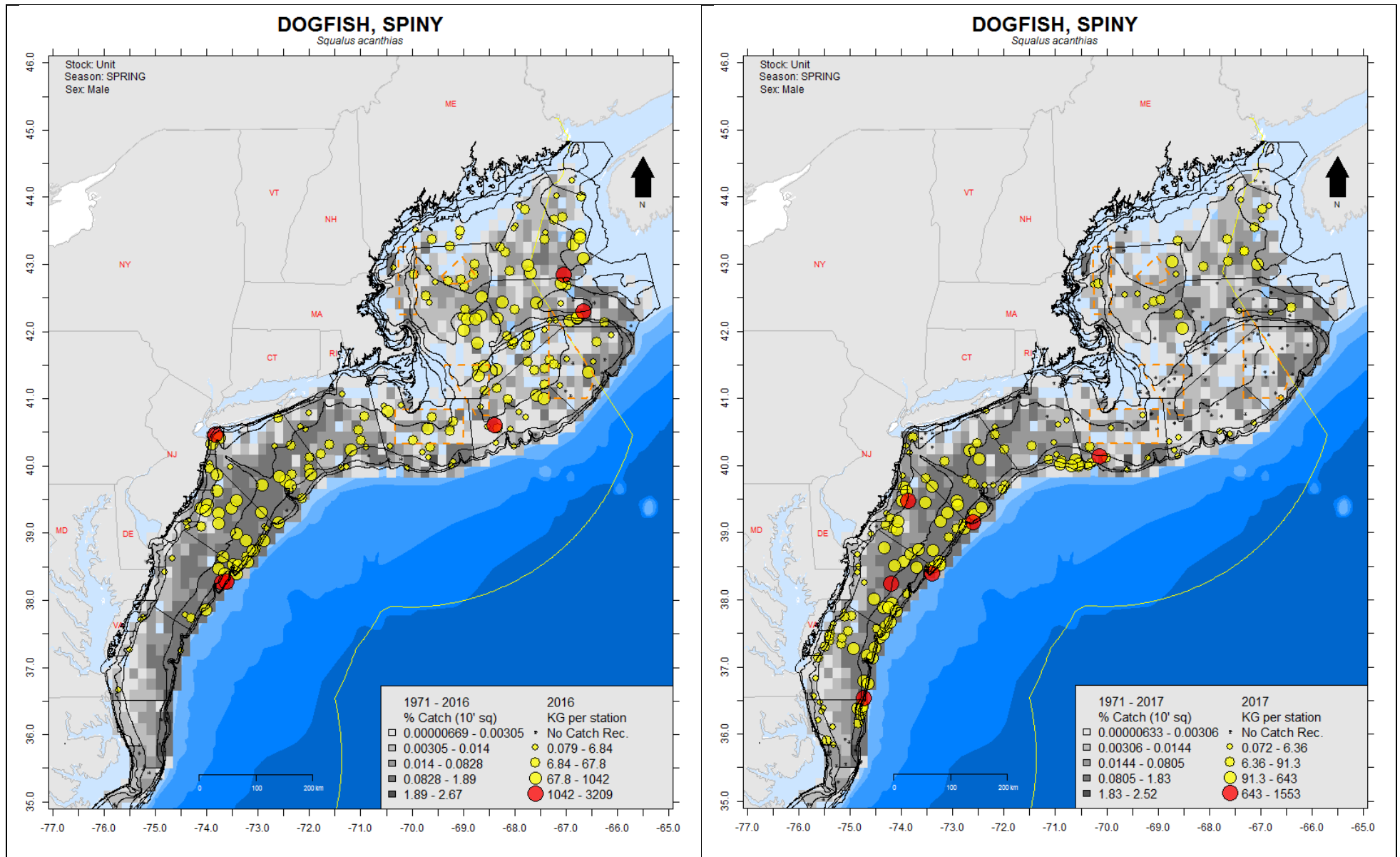
These maps represent survey catches for DOGFISH, SPINY, *Squalus acanthias*. Catch includes both sexes. The shaded cells represent the percentage of catch per ten minute square for the spring NMFS NEFSC BOTTOM TRAWL SURVEY time series, from 1971 - 2016. The points represent catch weights for 2016 (left panel) and 2017 (right panel) of the spring NMFS NEFSC BOTTOM TRAWL SURVEY. The RED points show the locations of the 6 largest tows in the set. Weights have not been calibrated. Bathymetry is depicted in blue shading. Groundfish closed areas (dashed borders), and the Exclusive Economic Zone (yellow line) have been overlaid. Data queried on August 08, 2017.

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These maps represent survey catches for DOGFISH, SPINY, *Squalus acanthias*. Only female catch is plotted. The shaded cells represent the percentage of catch per ten minute square for the spring NMFS NEFSC BOTTOM TRAWL SURVEY time series, from 1971 - 2016. The points represent catch weights for 2016 (left panel) and 2017 (right panel) of the spring NMFS NEFSC BOTTOM TRAWL SURVEY. The RED points show the locations of the 6 largest tows in the set. Weights have not been calibrated. Bathymetry is depicted in blue shading. Groundfish closed areas (dashed borders), and the Exclusive Economic Zone (yellow line) have been overlaid. Data queried on August 08, 2017.



These maps represent survey catches for DOGFISH, SPINY, *Squalus acanthias*. Only male catch is plotted. The shaded cells represent the percentage of catch per ten minute square for the spring NMFS NEFSC BOTTOM TRAWL SURVEY time series, from 1971 - 2016. The points represent catch weights for 2016 (left panel) and 2017 (right panel) of the spring NMFS NEFSC BOTTOM TRAWL SURVEY. The RED points show the locations of the 6 largest tows in the set. Weights have not been calibrated. Bathymetry is depicted in blue shading. Groundfish closed areas (dashed borders), and the Exclusive Economic Zone (yellow line) have been overlaid. Data queried on August 08, 2017.



## 2017 Spiny Dogfish Advisory Panel (AP) Fishery Performance Report (FPR)

The Spiny Dogfish Advisory Panel (AP) (<http://www.mafmc.org/advisory-panels/>) met August 24, 2017 to develop the Fishery Performance Report (FPR) below. The meeting was conducted via internet webinar and facilitated by Jason Didden, the Mid-Atlantic Fishery Management Council's Dogfish Fishery Management Plan (FMP) coordinator. The advisors who participated were:

James Fletcher  
Scott MacDonald  
Peter Moore

Jan McDowell  
Doug Feeney

Additional participants included:

Amanda Cousart  
John Boreman  
Katie Alemeida  
Fiona Hogan  
MJ DeBrosky  
Angel Willey

Cynthia (?)  
John Whiteside  
Kirby Rootes-Murdy  
Max Appleman  
Stew Michels

The fishery performance report's primary purpose is to contextualize catch histories for the Scientific and Statistical Committee (SSC) because of the potential importance of this and related information for determining Acceptable Biological Catches (ABCs). The goal is to allow comparing and contrasting of the most recent year's conditions and fishery characteristics with previous years. First an overview of recent fishery data was provided by Jason Didden, and then trigger questions were posed to the AP to generate discussion. The trigger questions were:

- \*What factors have influenced recent catch?
  - Markets/economy?      – Environment?
  - Fishery regulations?      – Other factors?
- \*Are the current fishery regulations appropriate? How could they be improved?
  - Gear regulations and exemptions?   -Trip Limits?   -Others?
- \*Where should the Council and Commission focus their research priorities?
- \*What else is important for the Council and Commission to know?
- \*Are there any recent major changes in this fishery?

The input from the AP begins on the following page. The information in this FPR does not represent a consensus, but rather a summary of the perspectives and ideas that were raised at the meeting.

## General

- Quality is critical for maintaining price and the existing market. Large trips may have trouble maintaining product quality.
- The regional differences in the fishery mean that any changes (e.g. trip limits) have the potential to differentially impact different areas.
- Flooding processors with lots of spiny dogfish will harm the market. The fishery has appeared stable up until recently, but there is currently (August 2017) a substantial drop in prices at least for some harvesters. See what happens with new rules (higher trip limits and rules allowing dual-targeting of monkfish and dogfish).
- A contrary, minority perspective was also voiced: Developing new markets (Asia/Africa, pet food) will require lower, not higher prices, and manipulating price (by limiting catch & trip limit) to address small boat concerns hinders the possibility of greater overseas markets.

## Factors Influencing Catch

- Markets are crucial to getting prices high enough to stimulate fishing activity. Low catches relative to the quota in recent years are due to low prices/effort. Some European markets constraints have been mitigated, others persist.
- Fishery needs help from other institutions (Council, NOAA, etc.) on building the market.
- A new processor entered the market in 2016, and their stocking of product and low prices selling into Europe is negatively impacting the market and current prices.
- There may be some spiny dogfish landings in Europe in the future related to retention rules, which may impact demand for imports.
- Abundance does not currently drive catches; boats have no problem obtaining their trip limits.
- There are relatively few boats willing to go out for dogfish at current prices, but a small price increase could change that (see Cape Cod info below)
- European markets are shifting away from sharks, limiting US dogfish exports to Europe.
  - o The Shark Alliance did not promote European boycotts of US spiny dogfish/other legally caught sharks (though other entities seek/have sought to do this).
  - o Europe seems to have the U.S. figured out in terms of pricing, while traditional European demand may be declining due to changing tastes.
- General sentiment about sharks and shark fins have hurt the market and created barriers to shipping (about 19 container lines have adopted internal policies to not carry any shark products and there are bans in several states). There is interest in purchasing spiny dogfish internationally but ENGO opposition as well, despite MSC certification and the sustainability of the U.S. East Coast spiny dogfish fishery.
- Market & regulatory issues discourage new processors. The one New York processor closed after Hurricane Sandy – market issues discouraged their re-entry.
- The web of federal, state, and international rules (on fishing and sales) discourage entry into the processing sector generally. The Council processes, and favoring of small boats and a few processors, have exacerbated and perpetuate these issues. A variety of factors are restricting development of the fishery in southern areas, including state regulations in

Virginia and North Carolina. The current regulations, especially trip limits, eliminate the possibility of developing an industrial (pet food applications) market.

- There is concern by others that large-scale landings could negatively impact the fresh market.
- Virginia had another mild winter and boats fished through the winter (including Jan & Feb), improving early 2017 landings (but possibility limiting N. Carolina landings)
- On Cape Cod:
  - 2015: 18-22 cents per pound; 2016: 20-24 cents, 30-34 cents if trucked to New Bedford. They have seen more vessels participating.
  - Prices are declining in mid-2017.

## Input on Regulations

- Some advisors would like to see a slow and steady approach that does not create large changes in catches and/or prices.
- Raising trip limits may collapse prices if additional markets are not developed.
- An occasional trip limit for trawlers (X/ month or quarter) around 20,000-40,000 pounds could help develop new markets and provide opportunity for different vessels
  - A double limit once a week was raised as an alternative possibility
  - Regarding different kinds of trip limits, enforcement/monitoring needs to be ensured.
  - In the past some in Massachusetts have been interested in a seasonal (October through December) trip limit increase that would not hurt smaller boats in the summer or crash the market.
  - There was concern that such adjustments could substantially hurt more southern ports, and more details would be needed to evaluate.
- At least one advisor is interested in allowances to harvest male dogfish in excess of the typical trip limit and possibly a separate quota (which is currently made up of mostly female dogfish). An advisor noted that males can be targeted currently. STAFF NOTE: A male only fishery would need an Amendment and/or benchmark assessment but recent research suggests it may be feasible.
- It would be useful to have a NE permit covering smooth dogfish to reduce regulatory burdens. The current process causes unnecessary frustration.

## Research Priority Ideas

- Domestic (human and/or animal food) and/or non-European markets.
  - o Lack of southern processor(s) is an issue restricting southern landings.
- Separation of spiny and smooth dogfish in NOAA trade database (buyers in particular may want to know) and ground-truthing of this database by NOAA Fisheries/Council, etc. NOAA cannot separate spiny and smooth dogfish – this is a code by another international trade agency – a petition could be made but may not be successful given the relatively low value of dogfish.
- Longer term tracking of export trends. <https://www.st.nmfs.noaa.gov/commercial-fisheries/foreign-trade/applications/trade-by-product>
- Better tracking of dogfish used/sold as fertilizer.
- Investigate ways to increase the quality of meat (i.e. how can it be processed on deck, etc.), which in turn would increase the price of the product. If we can get the price higher this would have a snow ball effect on the market.
- New benchmark assessment needed including:
  - o Exploration of how spiny dogfish recovered so much faster than predicted.
  - o Increased engagement with fishermen as part of scientific research.
  - o Better estimate of the population of male dogfish and availability of dogfish to the relevant surveys generally. Recent low datapoint not reflective of what AP members see on the water – the bottom survey is most likely missing most dogfish.
  - o Obtain reproductive and other biological information across the range of the species before the next assessment.
  - o Prioritize the biological information that needs updating before the next assessment.

## Other Issues Raised

- There needs to be a clear division of male and female dogfish in terms of the assessment, catch limits, and monitoring.
- Consider having NAFO manage the fishery outside the EEZ to facilitate the creation of a male-only fishery.
- There was a concern voiced over the process previously used to change the trip limit on the ASMFC side of things in terms of public notice – this was passed along to ASMFC staff.
- A name change for spiny dogfish (“chipfish” has been suggested in addition to “cape shark”) could help the market, and could allow access to a prison protein market (<http://www.wsj.com/articles/SB122290720439096481>).
  - o Other advisers noted that “Cape Shark” is an approved market name ([http://www.accessdata.fda.gov/scripts/fdcc/?set=seafoodlist&id=Squalus\\_ acanthias&sort=SLSN&order=ASC&startrow=1&type=basic&search=dogfish](http://www.accessdata.fda.gov/scripts/fdcc/?set=seafoodlist&id=Squalus_ acanthias&sort=SLSN&order=ASC&startrow=1&type=basic&search=dogfish))

2017 REVIEW OF THE  
ATLANTIC STATES MARINE FISHERIES COMMISSION  
FISHERY MANAGEMENT PLAN FOR

**SPINY DOGFISH**  
**(*Squalus acanthias*)**

2016 FISHING YEAR

(U.S. Commercial Season, May 1, 2016 – April 30, 2017)



**Spiny Dogfish Plan Review Team**

Max Appelman, Atlantic States Marine Fisheries Commission, Chair  
Peter Burns, Greater Atlantic Regional Fisheries Office  
Tina Moore, North Carolina Department of Environmental Quality  
Dr. Gregory Skomal, Massachusetts Department of Marine Fisheries

Developed September 2017



## Executive Summary

The Mid-Atlantic (MAFMC) and New England Fishery Management Councils (NEFMC) have managed spiny dogfish within the U.S. EEZ since 1999. The Atlantic States Marine Fisheries Commission (ASMFC) implemented a complementary Fishery Management Plan for state waters in 2002.

Spiny dogfish was declared rebuilt in 2008 when female SSB exceeded the target level for the first time since implementation of the Interstate FMP. Based on the results of the 2015 assessment update, spiny dogfish are not overfished and overfishing is not occurring (NEFSC 2015a and 2015b). Female SSB was estimated to be 168,207 metric tons (370.8 million pounds) in 2015. In 2015, F on exploitable females was estimated to be 0.210 and has remained below the target level since 2005.

In 2016, total spiny dogfish harvest (commercial landings and recreational harvest) along the Atlantic coast were estimated at 26.96 million pounds (12,231 metric tons). U.S. commercial landings were estimated at 26.67 million pounds (12,097 metric tons), landings from Canada were estimated at 81,571 pounds (37 metric tons), and landings from distant water fleets were estimated at 52,911 pounds (24 metric tons). U.S. recreational harvest (A + B1) on the Atlantic coast was estimated at 29,258 fish or an estimated 161,212 pounds (73 metric tons).

The U.S. commercial quota for the 2016/2017 season (May 1, 2016 – April 30, 2017) was 40,360,761 pounds (42,890,503 pounds after accounting for quota rollovers from the previous season). Commercial landings for the 2016/2017 season were estimated at 24,987,891 pounds. No regions or states exceeded their quota during the 2016/2017 season.

In 2016, all states implemented management programs consistent with the Interstate FMP for Spiny Dogfish and Addendum I-V. New York and Delaware requested and met the requirements for *de minimis* status for the 2017/2018 fishing season.

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**I. Status of the Fishery Management Plan**

<u>Date of FMP Approval:</u>	November 2002
<u>Amendments</u>	None
<u>Addenda</u>	Addendum I (November 2005) Addendum II (October 2008) Addendum III (April 2011) Addendum IV (August 2012) Addendum V (October 2014)
<u>Management Unit:</u>	Entire coastwide distribution of the resource from the estuaries eastward to the inshore boundary of the EEZ
<u>States with Declared Interest:</u>	Maine – North Carolina
<u>Active Boards/Committees:</u>	Spiny Dogfish Management Board, Advisory Panel, Technical Committee, and Plan Review Team

In 1998, NMFS declared spiny dogfish overfished and initiated the development of a joint fishery management plan (FMP) between the Mid-Atlantic (MAFMC) and New England Fishery Management Councils (NEFMC) in 1999. NMFS approved the Federal Fishery Management Plan (FMP) in September 1999, but implementation did not begin until May 2000 at the start of the 2000/2001 fishing year.

In August 2000, the Atlantic States Marine Fisheries Commission (Commission) took emergency action to close state waters to the commercial harvest, landing, and possession of spiny dogfish when the Federal waters closed in response to the quota being fully harvested. With the emergency action in place, the Commission had time to develop an interstate FMP, which prevented the undermining of the Federal FMP and further overharvest of the coastwide spiny dogfish population. Needing additional time to complete the interstate FMP, the Commission extended the emergency action twice through January 2003. During that time, the majority of spiny dogfish landings were from state waters because states had either no possession limits or less conservative possession limits than those of the Federal FMP.

The Commission approved the Interstate FMP for Spiny Dogfish in November 2002 (first implemented for the 2003-2004 fishing year). In general, the Interstate FMP (“FMP”) for spiny dogfish complements the Federal FMP. The goal of the FMP is “to promote stock rebuilding and management of the spiny dogfish fishery in a manner that is biologically, economically, socially, and ecologically sound.” In support of this goal, the FMP established the following objectives:

1. Reduce fishing mortality and rebuild the spawning stock biomass to prevent recruitment failure and support a more sustainable fishery.
2. Coordinate management activities between state, Federal and Canadian waters to ensure complementary regulations throughout the species range.
3. Minimize the regulatory discards and bycatch of spiny dogfish within state waters.
4. Allocate the available resource in [a] biologically sustainable manner that is equitable to all the fishers.
5. Obtain biological and fishery related data from state waters to improve the spiny dogfish stock assessment that currently depends upon data from the Federal bottom trawl survey.

The original Interstate and Federal FMPs established an annual quota that was allocated via fixed percentages between two seasonal periods; 57.9% to Period I (May 1<sup>st</sup> to October 31<sup>st</sup>) and 42.1% to Period II (November 1<sup>st</sup> to April 30<sup>th</sup>). When the quota allocated to a period is exceeded, the amount over the allocation is deducted from the same period in the subsequent fishing year. The periods could have separate possession limits that were specified on an annual basis. The FMPs also allowed for a five percent rollover of the annual coastwide quota once the stock is rebuilt, and allows each state to harvest up to 1,000 spiny dogfish for biomedical supply or scientific research.

In November 2005, the Spiny Dogfish and Coastal Sharks Management Board (Board) approved Addendum I to the Interstate FMP for Spiny Dogfish. Addendum I provides the Board with the flexibility to establish spiny dogfish specifications (quota and possession limits) for up to five years. The MAFMC and the NEFMC took similar action under Framework 1 (providing flexibility to adopt specifications for up to five years without the requirement of annual review and approval by NOAA Fisheries), which became effective February 2006.

In October 2008, the Board approved Addendum II which established regional quotas in place of the FMPs semi-annual period allocation<sup>1</sup>. Under the addendum, 58% of the annual quota was allocated to the states of Maine to Connecticut (Northern region), 26% was allocated to the states of New York to Virginia (Southern region), and the remaining 16% was allocated to North Carolina. The Board allocated a specific percentage to North Carolina because spiny dogfish are not available to their fishermen until late into the fishing season when most of the quota has already been harvested. The addendum also implemented accountability measures whereby any overage of a regional or state quota would be deducted from the corresponding region/state in the subsequent fishing year.

In March 2011, the Board approved Addendum III which was implemented prior to the 2011/2012 fishing year. The addendum divided the combined Southern region and the North Carolina quotas from Addendum II (i.e., 42% of the annual coastwide quota) into state-specific shares (Table 2) for those states of New York – North Carolina. Also, the addendum permits

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<sup>1</sup> The seasonal allocation scheme was eliminated from the Federal FMP in August, 2014.

those states to implement possession limits that best suits their needs, and allows for quota transfer (states in the Northern region continue to implement the Federal possession limit as well as continue to share 58% of the coastwide quota and thus do not have individual quotas necessary for transfers). Lastly, the addendum allows for rollovers of up to five percent of that state's or region's final allocation. The Board has continued to implement the allocation percentages described in Addendum III, and may revisit those allocations at any time through the adaptive management process (e.g., an addendum).

In August 2012, the Board approved Addendum IV. This Addendum addressed the differences in the definitions of overfishing between the NEFMC, MAFMC and the ASMFC. The Board adopted the fishing mortality (F) threshold to be consistent with the Federal plan. Overfishing is defined as an F rate that exceeds the  $F_{threshold}$ . The  $F_{threshold}$  is defined as  $F_{MSY}$  (or a reasonable proxy thereof) and based upon the best available science. The maximum fishing mortality threshold ( $F_{MSY}$ ) or a reasonable proxy may be defined as a function of (but not limited to): total stock biomass, spawning stock biomass (SSB), or total pup production, and may include males, females, both, or combinations and ratios thereof which provide the best measure of productive capacity for spiny dogfish. Currently  $F_{MSY} = 0.2439$  which is that level of F that allows for the production of 1.5 female pups per female that will recruit to the spawning stock biomass.

In October 2014, the Board<sup>2</sup> approved Addendum V. The addendum mandates that all spiny dogfish must be landed with fins-naturally-attached to the corresponding carcass (i.e., the removal of any fin of spiny dogfish at-sea in state waters is prohibited). The addendum modified the FMP to maintain consistency with the Shark Conservation Act of 2010, which prohibits the removal of all shark fins (except smooth dogfish) at-sea.

## II. Status of the Stocks

Stock size estimates (e.g., female SSB) for spiny dogfish rely heavily on fishery-independent data collected during the NEFSC spring bottom trawl survey. Due to mechanical problems, the 2014 survey was unable to sample strata in the mid-Atlantic region. As a result, the 2015 assessment update for spiny dogfish was unable to produce reliable estimates of stock size for 2014, as well as stock size projections utilized for annual specifications. Accordingly, at the direction of the MAFMC and the Science and Statistical Committee, the NEFSC examined alternative methods to smooth out the effects of the missing 2014 survey data on projected estimates of SSB, F, and other stock status indicators (NEFSC 2015b). A Kalman filter approach was ultimately chosen as the best method to smooth out the effects of the missing data, and to project SSB forward. In 2016, while all core survey strata were completed, the survey was

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<sup>2</sup> In May 2014, the Spiny Dogfish and Coastal Shark Management Board became two independent management boards. Accordingly, from this date forward, the "Board" only refers to the Spiny Dogfish Management Board. Also in 2014, the Board and Commission approved South Carolina's, Georgia's and Florida's request to be removed from the requirements of the FMP due to minimal reported catches of spiny dogfish and with the understanding that their interest in the FMP may be reconsidered if catch and/or landings increase.

delayed and the effects of the delay in survey timing on the abundance indices are unknown (NEFSC 2017). In 2017, the survey was completed on time and all core strata were surveyed.

Based on results of the most recent assessment, and in comparison to the biological reference points below, spiny dogfish are not overfished and overfishing is not occurring (NEFSC 2015a and 2015b). Spiny dogfish was declared rebuilt in 2008 when female SSB exceeded the target level for the first time since implementation of the Interstate FMP. Female SSB has remained above the target level and was estimated to be 168,207<sup>3</sup> metric tons (370.8 million pounds) in 2015 (Table 1 and Figure 1). In 2015, F on exploitable females was estimated to be 0.210 and has remained below the target level since 2005 (Table 1 and Figure 2).

	Female Spawning Stock Biomass (SSB)	Fishing Mortality (F)
Target	$B_{msy} Proxy = SSB_{max}$ (the biomass that results in the maximum projected recruitment) = 159,288 metric tons	There is no F target defined for management use at this time
Threshold	$\frac{1}{2}$ of $SSB_{max}$ = 79,644 metric tons	$F_{msy} Proxy = 0.244$

The next stock assessment for spiny dogfish is tentatively scheduled for 2018. In the interim, in order to inform fishery specifications, the NEFSC has conducted annual data updates to summarize the most recent information on the status of spiny dogfish. The 2017 data update utilizes catch and landings data from 1982-2016, and NEFSC spring survey data from 1968-2017 (as noted, the survey was incomplete in 2014 and the 2016 survey was delayed). From 2009-2015, female SSB estimates based on area swept by NEFSC bottom trawl during spring surveys were above the target-level (NEFSC 2017). The 2016 estimate increased, while the 2017 estimate decreased to the lowest in the time series. However, the data update report (2017) notes that all size and sex classes decreased also which likely indicates a year-specific availability effect rather than a decrease in abundance. The spatial distribution of spiny dogfish catches in the 2017 survey were very different than the 2016 survey (e.g., in 2017, there were almost no dogfish caught on Georges Bank), further supporting this hypothesis. Results from state-directed fishery-independent monitoring efforts support this as well (Table 5). It is important to note that these estimates are not based on outputs of the stochastic assessment model and cannot be directly compared to the SSB targets and thresholds.

### III. Status of the Fishery

In the U.S., the majority of spiny dogfish commercial fisheries operate in state waters targeting aggregations of large females. As a result, an estimated 94% of the commercial landings (2014) are comprised of females which is consistent with the long term pattern (NEFSC 2015a).

In 2016, total spiny dogfish harvest (commercial landings and recreational harvest) along the Atlantic coast was estimated at 26.96 million pounds (12,231 metric tons) which is a 40%

<sup>3</sup> 2015 female SSB estimated via a Kalman filter approach. The Kalman filter was not applied to pre-2015 estimates.

increase relative to 2015 and above average for the time series (Table 2). In 2016, U.S. commercial landings were estimated at 26.67 million pounds (12,097 metric tons). Atlantic coast landings from Canada were significant from the early 1990s to the mid-late 2000s (hovering around 4.5 million pounds or 2,000 metric tons). In 2016, landings from Canada were estimated at 81,571 pounds (37 metric tons) which is more in line with the short term trend (Table 2). In 2016, landings from distant water fleets were estimated at 52,911 pounds (24 metric tons). Recreational harvest is estimated via the Marine Recreational Information Program (MRIP). In 2016, recreational harvest (A + B1) of spiny dogfish on the Atlantic coast was estimated at 29,258 fish or an estimated 161,212 pounds<sup>4</sup> (73 metric tons) which is an 86% increase relative to 2015 (Table 2). Landings estimates for the U.S. commercial and recreational sectors, Canada, and distant water fleets are detailed in Table 2.

In 2016, total dead discards from the U.S. commercial and recreational sectors were estimated at 8.50 million pounds (3,856 metric tons) which is a 16% increase relative to 2015 (Table 3). Recreational releases (B2, or fish caught by recreational anglers and released back to the water) were estimated at 6.89 million pounds (3,127 metric tons). Applying a 20% post-release mortality rate (NEFSC 2015a), 2016 recreational dead discards were estimated at 1.38 million pounds (625 metric tons) which is a 1.5-fold increase relative to 2015 but is in line with the most recent 10-year average. Commercial dead discards for U.S. fisheries are estimated by multiplying total discards by gear-specific mortality rates (NEFSC 2017). In 2016, U.S. commercial dead discards were estimated at 7.12 million pounds (3,231 metric tons), with the largest proportion attributed to otter trawls (79%).

#### **IV. Status of Management Measures and Issues**

##### *Specifications*

The spiny dogfish commercial fishery runs from May 1-April 30. The coastwide quota for the 2016/2017 season was set at 40,360,761 pounds. For the northern region, the maximum possession limit was set at 5,000 pounds and increased to 6,000 pounds effective August 15, 2016. Most states in the northern region implemented the increased possession limit, however implementation dates varied by state. Possession limits for states of New York-North Carolina vary by state and are detailed in Table 6.

##### *Quotas*

Per Addendum III, 58% of the annual quota is allocated to the northern region (states from Maine-Connecticut), and the remaining 42% is allocated to the states of New York-North Carolina via fixed percentages. Table 4 details 2016/2017 commercial quotas by region and state. Addendum III also specifies that when the quota allocated to a region or state is exceeded in a fishing season, the amount over the allocation will be deducted from the corresponding region or state in the subsequent fishing season. All regions and states harvested within their quota the previous fishing year, therefore no deductions were applied to 2016/2017 quotas. Additionally, per Addendum III, all states and regions were able to roll over

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<sup>4</sup> Assuming the average weight of landed and discarded spiny dogfish is 5.12 pounds or 2.5 kilograms.

5% of its allocation from the previous fishing year for an effective coastwide quota of 42,890,503 pounds for the 2016/2017 fishing year (Table 4).

According to the Atlantic Coastal Cooperative Statistics Program's (ACCSP) Standard Atlantic Fishery Information System (SAFIS), commercial landings from the 2016/2017 fishing year were estimated at 24,987,891 pounds (11,334 metric tons) which is 58% of the coastwide quota and a 13.5% increase relative to the previous season (Table 4). Massachusetts (57%), Virginia (14%), New Jersey (11%) and Maryland (10%) accounted for the majority of commercial landings by weight (Table 4).

From 2000-2011, the U.S. spiny dogfish commercial fishery, for the most part, had fully utilized its quota (MAFMC 2017a). However, in recent years (2012-present), the commercial fishery has significantly underutilized its quota. The MAFMC Advisory Panel (2017b) noted that markets are critical for stimulating fishing activity and that the low level of harvest relative to the quota in recent years is primarily due to low prices and effort, not biomass. Vessels generally have no problem catching their limits. Being such a low value fishery (hovering around \$0.20/pound in most recent 10-years; MAFMC 2017a), even a small increase in price could stimulate fishing activity. Participation in the fishery has been further discouraged due to general public sentiment regarding sharks and shark fins which has created regulatory issues (e.g., foreign and domestic import and shipping bans) and other barriers to the market (e.g., the species common name dissuades many consumers).

## **V. Status of Research and Monitoring**

Under the Interstate FMP for Spiny Dogfish, the states are not required to conduct any fishery dependent or independent studies. The Interstate FMP requires an annual review of recruitment, spawning stock biomass, and fishing mortality which relies heavily on the NEFSC's spring trawl survey data. However, states are encouraged to submit any spiny dogfish information collected while surveying for other species. Table 5 details state implemented fishery-independent monitoring information relative to spiny dogfish compiled from annual state compliance reports. Please see individual reports for more information.

### *Exempted Fishing Permits (scientific/education permits)*

States may issue exempted fishing permits for the purpose of biomedical supply, educational, or other scientific purposes. In 2016, North Carolina issued 55 exempted fishing permits. Of these permits, six reported catches and two reported catches of spiny dogfish totaling 17 fish (all but one were released alive).

## **VI. Annual State Compliance**

The following lists the specific compliance criteria that a state or jurisdiction must implement in order to be in compliance with the Interstate FMP for Spiny Dogfish (*Section 5.1*):



1. States are required to close state waters to the commercial landing, harvest and possession of spiny dogfish for the duration of the seasonal period when the commercial quota is projected to be harvested in their state or region.
2. States are required to report landings weekly to NOAA Fisheries
3. Dealer permits issued pursuant to state regulations must submit weekly reports showing at least the quantity of spiny dogfish purchased (in pounds), the name, and permit number of the individuals from whom the spiny dogfish were purchased.
4. States in the northern region are required to implement possession limits as determined through the annual specification process.
5. States may issue exempted fishing permits for the purpose of biomedical supply not to exceed 1,000 spiny dogfish per year.
6. State regulations must prohibit “finning” as described in Addendum V.

Additionally, each state must submit a compliance report detailing its spiny dogfish fisheries and management program for the previous fishing year. Compliance reports are due annually on July 1<sup>st</sup> (Table 6) and must include at a minimum:

1. the previous fishing year’s fishery and management program including activity and results of monitoring, regulations that were in effect and harvest, including estimates of non-harvest losses;
2. the planned management program for the current fishing year summarizing regulations that will be in effect and monitoring programs that will be performed, highlighting any changes from the previous year; and
3. the number of spiny dogfish exempted fishing permits issued in the previous fishing year, the actual amount (in numbers of fish and pounds) collected under each exempted fishing permit, as well as any other pertinent information (i.e. sex, when and how the spiny dogfish were collected). The report should also indicate the number of exempted fishing permits issued for the current fishing year.

Under the Spiny Dogfish FMP, a state may request *de minimis* status if its commercial landings of spiny dogfish are less than 1% of the coastwide commercial total. If granted, the state is exempt from the monitoring requirements of the commercial spiny dogfish fishery for the following fishing year. However, all states, including those granted *de minimis* status, must continue to report any spiny dogfish commercial or recreational landings within their jurisdiction via annual state compliance reports. New York and Delaware have requested *de minimis* status for the 2017/2018 fishing season (Table 6).

## **VII. Plan Review Team Recommendations**

Based on annual state compliance reports, the PRT determined that all states have implemented regulations that meet the requirements of the Interstate FMP for Spiny Dogfish and Addenda I-V. Also, New York and Delaware meet the requirements for *de minimis* status in the 2017/2018 fishing year.

## VIII. Research Recommendations

The following research priorities pertaining to spiny dogfish were identified in Special Report No. 89 (2013):

### *Fishery-Dependent Priorities*

#### *High*

- Determine area, season, and gear specific discard mortality estimates coastwide in the recreational, commercial, and non-directed (bycatch) fisheries.
- Characterize and quantify bycatch of spiny dogfish in other fisheries.
- Increase the biological sampling of dogfish in the commercial fishery and on research trawl surveys.
- Further analyses of the commercial fisheries is also warranted, especially with respect to the effects of gear types, mesh sizes, and market acceptability on the mean size of landed spiny dogfish.

### *Fishery-Independent Priorities*

- Conduct experimental work on NEFSC trawl survey gear performance, with focus on video work to study the fish herding properties of the gear for species like dogfish and other demersal groundfish.
- Investigate the distribution of spiny dogfish beyond the depth range of current NEFSC trawl surveys, possibly using experimental research or supplemental surveys.
- Continue to analyze the effects of environmental conditions on survey catch rates.

### *Modeling / Quantitative Priorities*

- Continue work on the change-in-ratio estimators for mortality rates and suggest several options for analyses.
- Examine observer data to calculate a weighted average discard mortality rate based on an assumption that the rate increased with catch size.

### *Life History, Biological, and Habitat Priorities*

- Conduct a coastwide tagging study to explore stock structure, migration, and mixing rates.
- Standardize age determination along the entire East Coast. Conduct an ageing workshop for spiny dogfish, encouraging participation by NEFSC, NCDMF, Canada DFO, other interested agencies, academia, and other international investigators with an interest in dogfish ageing.
- Identify how spiny dogfish abundance and movement affect other organisms.

### *Management, Law Enforcement, and Socioeconomic Priorities*

- Monitor the changes to the foreign export markets for spiny dogfish, and evaluate the potential to recover lost markets or expand existing ones.
- Update on a regular basis the characterization of fishing communities involved in the spiny dogfish fishery, including the processing and harvesting sectors, based upon Hall-Arber et al. (2001) and McCay and Cieri (2000).

- Characterize the value and demand for spiny dogfish in the biomedical industry on a state by state basis.
- Characterize the spiny dogfish processing sector

**IX. References**

Mid-Atlantic Fisheries Management Council (MAFMC). 2017a. Spiny Dogfish Advisory Panel Information Document. Prepared by Jason Didden, Council Staff. 6 pages.

Mid-Atlantic Fisheries Management Council (MAFMC). 2017b. Spiny Dogfish Advisory Panel Fishery Performance Report. 4 pages.

Northeast Fisheries Science Center (NEFSC). 2015a. Update on the Status of Spiny Dogfish in 2015 and Projected Harvests at the Fmsy Proxy and Pstar of 40%. Report to the Mid Atlantic Fishery Management Council (MAFMC) Scientific and Statistical Committee (SSC) August 26, 2015. 65 pages.

Northeast Fisheries Science Center (NEFSC). 2015b. Evaluation of Alternative Smoothing Options for Spiny Dogfish Abundance Estimates. Report to MAFMC SSC November 22, 2015. 28 pages.

Northeast Fisheries Science Center (NEFSC). 2016. Update of Landings, Discards and Survey Indices for Spiny Dogfish in 2016. Report to the MAFMC SSC August 29, 2016. 31 pages.

Northeast Fisheries Science Center (NEFSC). 2017. Update of Landings, Discards and Survey Indices for Spiny Dogfish in 2016-2017. Report to the MAFMC SSC August 18, 2017. 30 pages.

Special Report No. 89 of the Atlantic States Marine Fisheries Commission. 2013. Research priorities and recommendations to support interjurisdictional fisheries management.

## X. Tables

**Table 1: Spiny dogfish female spawning stock biomass (SSB) in millions of pounds and fishing mortality (F) point estimates, 1991-2015.** A Kalman Filter was applied to the 2015 point-estimate. Point-estimates from 1991-2014 via the Kalman filter were not available at the time of this report. Although the absolute values will change after the Kalman filter is applied, the time series trend is similar. Source: NEFSC 2015a and 2015b.

Year	Female SSB	F
1991	516	0.082
1992	594	0.177
1993	485	0.327
1994	410	0.465
1995	294	0.418
1996	266	0.355
1997	252	0.234
1998	202	0.306
1999	114	0.289
2000	116	0.152
2001	136	0.109
2002	143	0.165
2003	129	0.168
2004	118	0.474
2005	105	0.128
2006	234	0.088
2007	312	0.090
2008	429	0.110
2009	360	0.113
2010	362	0.093
2011	373	0.114
2012	476	0.149
2013	466	NA
2014	NA	0.214
2015	371	0.210

**Table 2: Landings estimates (pounds) of spiny dogfish off the Atlantic coast by commercial fisheries of the United States, Canada, and foreign fleets, and U.S. recreational harvest, 1981-2016.** All values in pounds. Source: NEFSC 2017 and MRIP.

Year	Canada	Distant Water Fleets	U.S. Commercial	U.S. Recreational	Total Landings
1981	1,243,406	2,147,300	15,134,716	3,290,809	21,816,231
1982	857,597	802,482	11,928,240	155,228	13,743,546
1983		1,022,944	10,794,944	147,828	11,965,715
1984	4,409	862,006	9,811,419	201,247	10,879,082
1985	28,660	2,231,075	8,880,246	196,525	11,336,507
1986	44,092	811,300	6,057,436	403,806	7,316,634
1987	619,498	306,442	5,959,859	674,738	7,560,538
1988	2,205	1,426,389	6,845,658	793,826	9,068,078
1989	368,172	564,383	9,903,197	923,156	11,758,908
1990	2,885,848	866,416	32,475,331	393,464	36,621,058
1991	676,818	515,881	29,049,484	288,410	30,530,593
1992	1,913,610	147,710	37,165,286	535,770	39,762,376
1993	3,163,630	59,525	45,509,707	263,846	48,996,708
1994	4,012,408	4,409	41,441,357	341,311	45,799,486
1995	2,107,617	30,865	49,775,493	148,935	52,062,910
1996	950,191	520,290	59,823,640	56,990	61,351,111
1997	983,261	471,789	40,457,417	146,560	42,059,027
1998	2,325,874	1,338,204	45,476,080	133,761	49,273,919
1999	4,609,860	1,221,359	32,748,858	119,595	38,699,673
2000	6,042,863	886,257	20,407,500	11,262	27,347,883
2001	8,421,648	1,492,528	5,056,497	61,877	15,032,551
2002	7,901,358	1,044,990	4,847,674	451,666	14,245,687
2003	2,870,415	1,417,571	2,579,437	87,466	6,954,888
2004	5,207,312	727,525	2,164,011	264,970	8,363,819
2005	5,004,487	727,525	2,528,114	77,823	8,337,949
2006	5,377,068	22,046	4,957,360	175,290	10,531,764
2007	5,255,814	68,343	7,723,004	190,018	13,237,179
2008	3,466,368	288,805	9,057,020	251,427	13,063,620
2009	249,122	180,779	11,854,242	94,133	12,378,275
2010	13,228	279,987	11,993,133	35,418	12,321,766
2011	273,373	315,261	20,899,798	70,556	21,558,987
2012	143,300	302,033	23,501,249	41,413	23,987,996
2013		134,482	16,120,181	80,859	16,335,523
2014	119,049	68,343	23,481,408	68,996	23,737,797
2015	2,205	50,706	19,098,623	86,832	19,238,366
2016	81,571	52,911	26,669,288	161,212	26,964,982

**Table 3: Total dead discards estimates (pounds) from the U.S. Atlantic coast spiny dogfish fishery by sector, 1981-2016.** Commercial dead discards estimated via applying gear-specific mortality rates to discard estimates. Source: MRIP and NEFSC 2017.

Year	Commercial	Recreational (20% B2)	Total Dead Discards
1981	43,625,021	130,521	43,755,541
1982	50,245,935	153,982	50,399,918
1983	49,177,576	238,002	49,415,579
1984	46,931,730	186,871	47,118,601
1985	39,768,479	425,091	40,193,570
1986	38,222,379	523,373	38,745,752
1987	35,239,087	465,470	35,704,557
1988	35,307,210	386,152	35,693,362
1989	34,724,970	594,784	35,319,753
1990	41,754,621	515,830	42,270,451
1991	28,668,217	594,951	29,263,168
1992	41,401,992	449,048	41,851,040
1993	25,898,443	489,373	26,387,816
1994	18,435,804	426,776	18,862,580
1995	23,812,762	288,134	24,100,896
1996	13,136,779	145,103	13,281,882
1997	9,255,656	371,849	9,627,505
1998	7,305,008	268,875	7,573,883
1999	9,865,123	236,901	10,102,025
2000	6,128,182	304,436	6,432,619
2001	10,236,492	928,526	11,165,018
2002	10,392,799	737,755	11,130,554
2003	7,998,031	1,321,838	9,319,869
2004	12,011,321	1,450,007	13,461,328
2005	10,775,411	1,476,032	12,251,443
2006	10,847,557	1,565,462	12,413,019
2007	12,456,478	1,715,901	14,172,379
2008	9,843,805	1,188,294	11,032,099
2009	11,735,909	1,137,116	12,873,025
2010	8,146,291	871,034	9,017,325
2011	9,533,163	1,019,230	10,552,393
2012	10,081,275	605,902	10,687,177
2013	9,875,386	1,169,360	11,044,746
2014	10,657,861	2,090,825	12,748,685
2015	6,783,726	539,757	7,323,483
2016	7,122,686	1,378,769	8,501,456

**Table 4: Commercial quotas and landings estimates in pounds for May 1, 2016 - April 30, 2017 by region and state.** Adjusted quota reflects a 5% rollover from 2015/2016 season. Due to confidentiality, NY-NC landings estimates have been redacted. Source: ACCSP/SAFIS and validated by the states, August 15, 2017.

State	Fixed Percent Allocation	Preliminary Quota	Effective Quota (includes 5% roll over from previous season)	Estimated Landings
<b>Northern Region</b>	58.00%	23,409,241	24,876,989	15,756,920
<b>NY</b>	2.71%	1,092,566	1,161,069	
<b>NJ</b>	7.64%	3,085,177	3,278,616	
<b>DE</b>	0.90%	361,632	384,307	
<b>MD</b>	5.92%	2,389,357	2,539,169	
<b>VA</b>	10.80%	4,356,944	4,630,122	
<b>NC</b>	14.04%	5,665,036	6,020,231	
<b>Total</b>	<b>100%</b>	<b>40,360,761</b>	<b>42,890,503</b>	<b>24,987,891</b>
<b>% of quota harvested</b>				<b>58.3%</b>
<b>% diff. relative to previous fishing year (2015/2016 landings = 22,023,902 lbs.)</b>				<b>+13.5%</b>

**Table 5: State implemented fishery-independent monitoring programs that encounter spiny dogfish.** Source: annual state compliance reports, 2017. Note: this list is not comprehensive.

Fishery-Independent Monitoring Programs That Encounter Spiny Dogfish	Number of Spiny Dogfish Encountered	Comments
ME-NH Inshore Trawl survey	235 (spring), 479 (fall)	large increase from 2015
RI DFW, Monthly and seasonal trawl survey	2	down from 4 in 2015
CT Long Island Sound Trawl Survey	8	Spring; down from 2015
NJ Ocean Stock Assessment (trawl) Survey	13,463 lbs	> 1.5-fold increase from 2015
DE Bay Bottom Trawl (30- and 16-foot)	98 (30-ft)	down from 2015, majority caught in April
NC DMF Gill Net Survey	6	decrease from 2016

**Table 6: State-by-state compliance with the Interstate Fishery Management Plan for Spiny Dogfish, 2016 reporting period (2016/2017 commercial fishing season).** Source: annual state compliance reports, 2017. 'C' is compliant; 'NC' is noncompliant.

State	Report Submitted (Due July 1)	De Minimis Request	Biomedical <sup>^</sup> Permit Harvest	Finning Prohibition	Possession limit (pounds per trip)
Maine	C	No	No	C	5,000
New Hampshire	C	No	No	C	5,000 <sup>^</sup>
Massachusetts	C	No	No	C	5,000 <sup>^</sup>
Rhode Island	C	No	No	C	5,000 <sup>^</sup>
Connecticut	C	No	No	C	5,000 <sup>^</sup>
New York	C	Yes	No	C	5,000
New Jersey	C	No	No	C	6,000
Delaware	C	Yes	No	C	10,000
Maryland	C	No	No	C	up to 10,000 <sup>*</sup>
Virginia	C	No	No	C	5,250 <sup>^</sup>
North Carolina	C	No	Yes	C	20,000

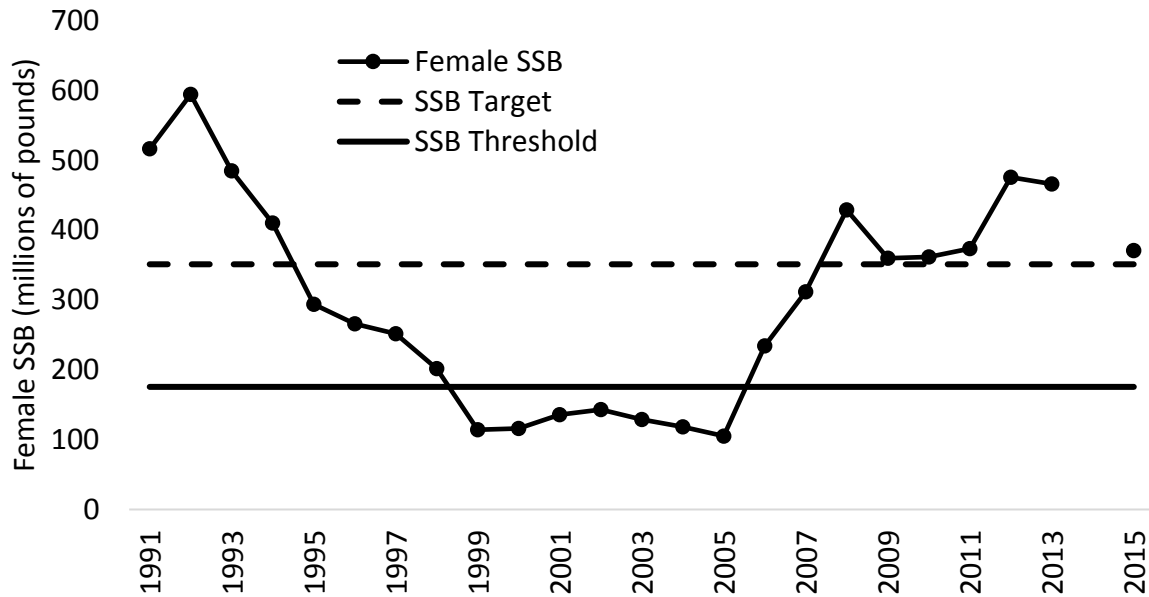
<sup>^</sup> Maximum trip limit increased to 6,000 lbs following notification of the Federal trip limit increase. Specific implementation dates vary by state.

<sup>\*</sup> MD – possession limits range from 1,000 lbs to 10,000 lbs depending on permit category; VA – the possession limit increased to 6,000 lbs on February 16th (VA)

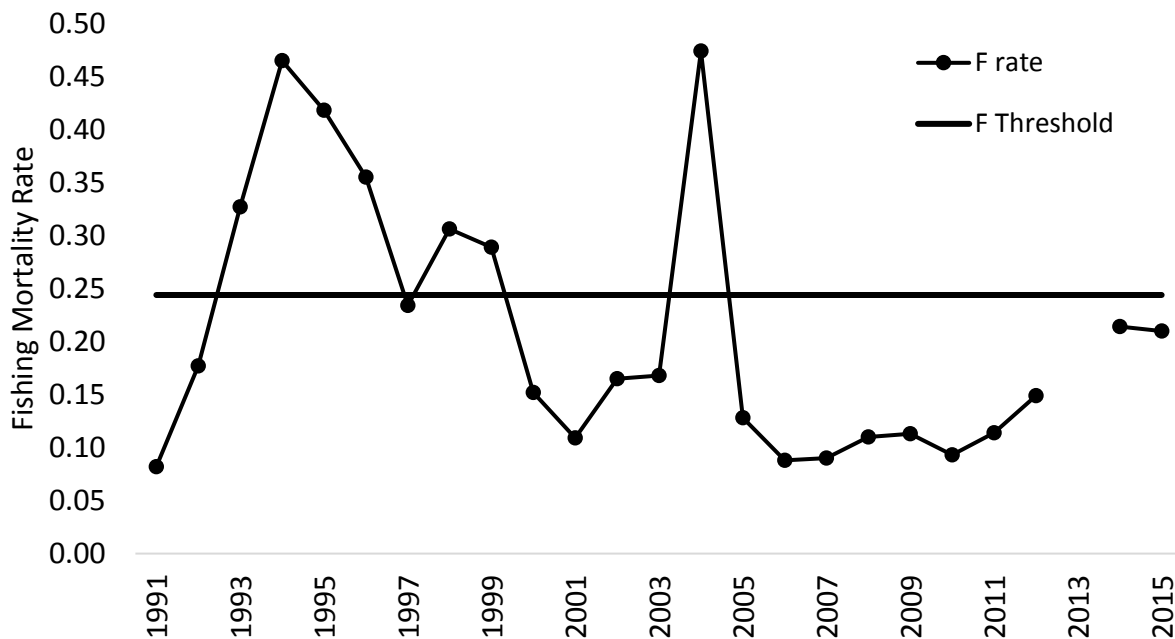


**XI. Figures**

**Figure 1: Spiny dogfish spawning stock biomass, 1990 – 2015.** Point-estimate for 2015 was derived via application of a Kalman filter. Estimates from 1991-2014 via the Kalman filter were not available at the time of this report. Although the absolute values will change after the Kalman filter is applied, the time series trend should be similar. NEFSC 2015a and 2015b.



**Figure 2: Fishing mortality rates in the spiny dogfish fishery, 1990 – 2015.** 2013 point-estimate not available at time of this report. Source: NEFSC 2015a and 2015b.



# Atlantic States Marine Fisheries Commission

## Atlantic Herring Section

*October 16, 2017*

*4:00-5:00 p.m.*

*Norfolk, Virginia*

## Draft Agenda

The times listed are approximate; the order in which these items will be taken is subject to change; other items may be added as necessary.

1. Welcome/Call to Order (*R. White*) 4:00 p.m.
2. Board Consent 4:00 p.m.
  - Approval of Agenda
  - Approval of Proceedings from May 2017
3. Public Comment 4:05 p.m.
4. Set 2018 Specifications for Area 1A **Final Action** (*T. Kerns*) 4:15 p.m.
5. Discuss Role of Section in Research Set Aside Process (*R. White*) 4:25 p.m.
6. Discuss New England Fishery Management Council Participation in ASMFC Herring Management (*T. Kerns*) **Possible Action** 4:40 p.m.
7. Other Business/Adjourn 5:00 p.m.

The meeting will be held at the Waterside Marriot Hotel, 235 East Main Street, Norfolk, Virginia; 757.627.4200

*Vision: Sustainably Managing Atlantic Coastal Fisheries*

# MEETING OVERVIEW

**Atlantic Herring Section Meeting**  
**October 16, 2017**  
**4:00-5:00 p.m.**  
**Norfolk, Virginia**

Chair: Ritchie White (NH) <i>Assumed Chairmanship 2/16</i>	Technical Committee Chair: Renee Zobel (NH)	Law Enforcement Committee Michael Eastman
Vice Chair: Mark Gibson	Advisory Panel Chair: Jeff Kaelin	Previous Section Meeting: May 8, 2017
Voting Members: ME, NH, MA, RI, CT, NY, NJ (7 votes)		

**2. Section Consent**

- Approval of Agenda
- Approval of Proceedings from May 2017

**3. Public Comment** – At the beginning of the meeting public comment will be taken on items not on the Agenda. Individuals that wish to speak at this time must sign in at the beginning of the meeting. For agenda items that have already gone out for public hearing and/or have had a public comment period that has closed, the Section Chair may determine that additional public comment will not provide additional information. In this circumstance the Chair will not allow additional public comment on an issue. For agenda items that the public has not had a chance to provide input, the Section Chair may allow limited opportunity for comment. The Section Chair has the discretion to limit the number of speakers and/or the length of each comment.

<b>4. Set 2017 Area 1A Sub-ACL Specifications (4:15 – 4:25 p.m.) Final Action</b>
<p><b>Background</b></p> <ul style="list-style-type: none"> <li>• At the 2015 Annual Meeting, the Section approved the Area 1A sub-ACL as part of the 2016-2018 Atlantic herring specifications. The Area 1A sub-ACL of 30,300 metric tons (mt) represents 28.9% of the stockwide ACL (104,800 mt).</li> <li>• Since 2009, the Section has split the Area 1A sub-ACL into trimesters, where 0% is allocated from January 1-May 31, 72.8% is allocated from June 1 – September 30 and 27.2% is allocated from October 1- December 31.</li> </ul>
<p><b>Board Actions for Consideration at this Meeting</b></p> <ul style="list-style-type: none"> <li>• Set the seasonal splitting of the Area 1A sub-ACL, quota rollovers and sub-ACL trigger.</li> </ul>

## **5. Discuss RSA Process and Role of Section (4:25-4:40 p.m.)**

### **Background**

- Research Set-Aside (RSA) programs are unique Federal grant programs established through Greater Atlantic Region fishery management plans (FMPs) that promote collaboration between fishermen and scientists to address high priority research issues. RSA programs support applied research projects that are intended to support management decisions, and to refine and improve stock assessments. Through each respective RSA program, pounds or days-at-sea are awarded through a competitive grant process to fund the research.
- Responsibility for the RSA programs is a joint effort between NOAA Fisheries and the Councils. NOAA Fisheries implements the RSA Programs, administering the proposal review and selection process, making sure that the research is technically sound and aligns with Council research priorities, oversees regulatory and vessel permitting needs, and monitors RSA harvest activities.
- Council members and staff provide critical support for the RSA programs. In addition to setting aside RSA quota and days-at-sea, the Councils develop research priorities, provide management expertise in reviewing proposals, and consider the research results to support their fishery management decisions.  
[https://www.nefsc.noaa.gov/coopresearch/rsa\\_faq.html](https://www.nefsc.noaa.gov/coopresearch/rsa_faq.html)

### **Presentations**

- **T. Kerns will present an overview of the RSA Process**

## **6. Discuss New England Fishery Management Council Participation in Atlantic Herring Management (4:40-5:00 p.m.) Possible Action**

### **Background**

- The NEFMC requested to participate on the Atlantic Herring Section.
- The Herring FMP is a complimentary FMP with the NEFMC.
- The Charter, as it is written, does not allow for Council participation by invitation on Sections. This is only a provision for Boards.
- In August the Policy Board requested a recommendation from the Section on how to involve NEFMC in Herring Management.

### **Presentations**

- T. Kerns will present an overview of options to include the NEFMC in Herring Management

### **Board actions for consideration at this meeting**

- Make a recommendation to the ISFMP Policy Board on how to include the NEFMC in ASMFC Herring Management.

## **7. Other Business/Adjourn**

**DRAFT PROCEEDINGS OF THE  
ATLANTIC STATES MARINE FISHERIES COMMISSION  
ATLANTIC HERRING SECTION**

**The Westin Alexandria  
Alexandria, Virginia  
May 8, 2017**

**These minutes are draft and subject to approval by the Atlantic Herring Section  
The Section will review the minutes during its next meeting**

**TABLE OF CONTENTS**

**Call to Order, Chairman G. Ritchie White .....ERROR! BOOKMARK NOT DEFINED.**

**Approval of Agenda .....ERROR! BOOKMARK NOT DEFINED.**

**Approval of Proceedings, January 2017 .....ERROR! BOOKMARK NOT DEFINED.**

**Public Comment.....ERROR! BOOKMARK NOT DEFINED.**

**Consider Addendum I for Final Approval.....ERROR! BOOKMARK NOT DEFINED.**

**Review Options .....ERROR! BOOKMARK NOT DEFINED.**

**Advisory Panel Report .....ERROR! BOOKMARK NOT DEFINED.**

**Law Enforcement Committee Report .....ERROR! BOOKMARK NOT DEFINED.**

**Consider Final Approval of Addendum I .....ERROR! BOOKMARK NOT DEFINED.**

**Review of the Scoping Comments on the Tiered Weekly Landing .....ERROR! BOOKMARK NOT DEFINED.**

**Discussion of the 2016 Spawning Closure.....ERROR! BOOKMARK NOT DEFINED.**

**Consider Approval of 2017 Fishery Management Plan Review and State Compliance .....ERROR!  
BOOKMARK NOT DEFINED.**

**Review and Populate the Atlantic Herring Advisory Panel .....ERROR! BOOKMARK NOT DEFINED.**

**Other Business..... 21**

**Adjournment ..... 22**

**INDEX OF MOTIONS**

1. **Motion to approve agenda** by Consent (Page 1).
2. **Motion to approve proceedings of January 2017** by Consent (Page 1).
3. **Main Motion**  
**Move that the Herring Section approves the following measures for Addendum I (Page 9):**
  - 3.1.1 Harvester Reporting Requirements**  
**Option B – Implement State landings Report as an alternative in the FMP toolbox in the event NMFS rescinds VMS access to the states**
  - 3.1.2 Prohibit Landings of Herring Caught in Area 1A During a Day Out of the Fishery**  
**Option C: Days out restrictions for vessels with a Category A permit**
  - 3.1.3 Weekly Landing Limit Per Vessel (Pounds)**  
**Option B: Weekly Harvester Landing Limit for Vessels with a Category A Permit. In 2017 vessels must opt into Area 1A by the May 23<sup>rd</sup> Days Out meeting in Portsmouth.**
  - 3.1.4 Landing Restriction on Transfers At-Sea with a reporting and permitting exception to states that have no carrier landings**  
**Options B and C: The Section members from Maine, New Hampshire, and Massachusetts will have a choice of both alternative options at the annual Days Out Meetings: Option B - No Herring Carrier Vessels or transfer at sea and Option C - Herring Carrier Vessels are Limited to Receiving At-Sea Transfers from One Harvester Vessel Per Week and Landing Once Per 24-Hour Period**
  - 3.1.5 Small Mesh Bottom Trawl (SMBT) Fleet Days Out**  
**Option B: Additional Days Out Program for Small Mesh Bottom Trawl Vessels with a Category C or D Permit. The small mesh bottom trawl fishery must opt into the area 1A by June 1<sup>st</sup> annually**
  - 3.1.6 Clarification of Days Out Procedure**  
**Options B: Type of Agreement (consensus) and Option C2: Default Landing Day Scenario (zero landing days)**  
Motion by Terry Stockwell; second by Dennis Abbott.
4. **Motion to Amend**  
**Move to amend section 3.1.6, option B2 replaces B1, Maine, New Hampshire, and Massachusetts will vote on parameters of the days out program (Page 12).**  
Motion by David Pierce; second by Dennis Abbott. Motion fails (3 in favor, 3 opposed, 1 abstentions) (Page 14).

**INDEX OF MOTIONS (continued)**

**Main Motion**

**Move that the Herring Section approve Addendum I including the following measures:**

**3.1.1 Harvester Reporting Requirements**

**Option B – Implement State landings Report as an alternative in the FMP toolbox in the event NMFS rescinds VMS access to the states**

**3.1.2 Prohibit Landings of Herring Caught in Area 1A During a Day Out of the Fishery**

**Option C: Days out restrictions for vessels with a Category A permit**

**3.1.3 Weekly Landing Limit Per Vessel (Pounds)**

**Option B: Weekly Harvester Landing Limit for Vessels with a Category A Permit. In 2017 vessels must opt into Area 1A by the May 23<sup>rd</sup> Days Out meeting in Portsmouth.**

**3.1.4 Landing Restriction on Transfers At-Sea with a reporting and permitting exception to states that have no carrier landings**

**Options B and C: The Section members from Maine, New Hampshire, and Massachusetts will have a choice of both alternative options at the annual Days Out Meetings: Option B - No Herring Carrier Vessels or transfer at sea and Option C - Herring Carrier Vessels are Limited to Receiving At-Sea Transfers from One Harvester Vessel Per Week and Landing Once Per 24-Hour Period**

**3.1.5 Small Mesh Bottom Trawl (SMBT) Fleet Days Out**

**Option B: Additional Days Out Program for Small Mesh Bottom Trawl Vessels with a Category C or D Permit. The small mesh bottom trawl fishery must opt into the area 1A by June 1<sup>st</sup> annually**

**3.1.6 Clarification of Days Out Procedure**

**Options B: Type of Agreement (consensus) and Option C2: Default Landing Day Scenario (zero landing days)**

Motion by Terry Stockwell; second by Dennis Abbott. Motion passes (Roll Call Vote: In favor – ME, NH, MA, RI, CT, NY; Opposed – NJ) (Page 14).

**5. Main Motion**

**Move that the Section permanently implement the GSI<sub>30</sub> Based Forecast System for spawning closures in Area 1A** (Page 18). Motion by David Pierce; second by Dennis Abbott

**6. Motion to Substitute**

**Move to substitute implement second year of the pilot program for the spawning closure in Area 1A** (Page 19). Motion by Adam Nowalsky; second by Steve Train. Motion fails (2 in favor, 3 opposed, 1 null vote) (Page 20).

**7. Main Motion**

**Move that the Section permanently implement the GSI<sub>30</sub> Based Forecast System for spawning closures in Area 1A.** Motion carried (Page 20).



**INDEX OF MOTIONS (continued)**

8. **Move to approve the Atlantic Herring FMP Review and state compliance reports and grant *de minimis* request from New York** (Page 21). Motion by James Gilmore; second by Terry Stockwell. Motion carried unanimously (Page 21).
9. **Motion to adjourn** by consent (Page 22).

**ATTENDANCE**

**Section Members**

Terry Stockwell, ME, proxy for P. Keliher (AA)	Mark Gibson, RI, proxy for J. Coit (AA)
Steve Train, ME (GA)	David Borden, RI (GA)
Sen. Joyce Maker, ME, proxy for Sen. Langley (LA)	Colleen Giannini, CT, proxy for M. Alexander (AA)
Doug Grout, NH (AA)	Sen. Craig Miner, CT (LA)
G. Ritchie White, NH (GA)	Jim Gilmore, NY (AA)
Dennis Abbott, NH, proxy for Sen. Watters (LA)	Emerson Hasbrouck, NY (GA)
Sarah Ferrara, MA, proxy for Rep. Peake (LA)	John McMurray, NY, proxy for Sen. Boyle (LA)
David Pierce, MA (AA)	Adam Nowalsky, NJ, proxy for Asm. Andrzejczak (LA)
Raymond Kane, MA (GA)	Tom Baum, NJ, proxy for L. Herrighty (AA)
Eric Reid, RI, proxy for Sen. Sosnowski (LA)	Tom Fote, NJ (GA)

**(AA = Administrative Appointee; GA = Governor Appointee; LA = Legislative Appointee)**

**Ex-Officio Members**

Renee Zobel, Technical Committee Chair	Jeff Kaelin, Advisory Panel Chair
Michael Eastman, Law Enforcement Representative	

**Staff**

Robert Beal	Shanna Madsen
Toni Kerns	Kirby Rootes-Murdy
Ashton Harp	

**Guests**

Ed O'Brien, MD Leg. Proxy	Peter Kendall, NEFMC
Glenn Robbins, ME	

The Atlantic Herring Section of the Atlantic States Marine Fisheries Commission convened in the Edison Ballroom of the Westin Hotel, Alexandria, Virginia, May 11, 2017, and was called to order at 1:00 o'clock p.m. by Chairman G. Ritchie White.

#### **CALL TO ORDER**

CHAIRMAN G. RITCHIE WHITE: I'll call the Atlantic Herring Section meeting to order. Before we get started, a couple of introductions. First, Terry Stockwell has an announcement.

MR. TERRY STOCKWELL: It is my great pleasure to introduce the Section to Senator Joyce Maker; she is here for her first time, a proxy for Senator Langley.

CHAIRMAN WHITE: Thank you, Terry, and welcome Senator. Secondly, the seat on this Section that the Council sends a representative today, at the last meeting we had a premiere fisherman from the state of Maine. Today we have the Committee Chair on the Council and a premiere fisherman from the state of New Hampshire, Peter Kendall; better known as P.K. Welcome, P.K.

#### **APPROVAL OF AGENDA**

CHAIRMAN WHITE: Next on the agenda, approval of the agenda, are there any changes, additions to the agenda? Terry.

MR. STOCKWELL: Under other business I would like to add a short discussion on the RSA Program.

CHAIRMAN WHITE: Okay, we will do that thank you, Terry.

#### **APPROVAL OF PROCEEDINGS**

CHAIRMAN WHITE: Next is approval of the proceedings from the February, 2017 meeting. Are there any changes or additions to those proceedings? Seeing none; motion passes.

#### **PUBLIC COMMENT**

CHAIRMAN WHITE: Public comment, is there any public comment on issues that are not on the agenda? I think we have a sign-in sheet. Did you raise your hand? Glen, you can come up to the public microphone?

MR. GLEN ROBBINS: Yes, Glen Robbins; fishing vessel Western Sea, a purse seiner for herring out of Maine. I just want to give you a little update on what I see has been going on in our fishery in the last 20 years; since the trawlers came in. I don't know if everybody knows what has been going on in the population of herring on Georges, but it has been dwindling rapidly in the last couple years.

I tried several times to get somebody to listen to, maybe we should have a spawning closure to protect these fish and stretch this out a little longer. But all I got was no, there is plenty of fish over on Georges; we don't need it at this time. Well, I think time has elapsed now and we're at crunch time. There is hardly anything left on Georges.

The trawler guys will tell you that there is haddock out there too many, but they don't bring them in with the herring. They don't even try. We've got a big problem out there. Maybe we should have a moratorium on it, or maybe we should, like many other countries outlaw or ban the trawl altogether. It is not a good way to go, it is too deadly. It cleans up too much and it doesn't come back fast. With purse seine in 1A, we seem to keep our fish pretty good, and we always catch our quota. Thank you.

CHAIRMAN WHITE: Ryan Raber. You pass, okay. Shawn. Pass, okay thank you.

#### **CONSIDER ADDENDUM I FOR FINAL APPROVAL**

CHAIRMAN WHITE: Okay next on the agenda is Consider Addendum I for Final Approval. Ashton. Terry.

MR. STOCKWELL: Yes, thank you Mr. Chairman, real briefly. In my introduction of Senator Maker, I neglected to mention that she is a Co-Chair of the Marine Resource Committee. We're here, I'm sitting next to an esteemed colleague.

CHAIRMAN WHITE: Thank you very much for that Terry.

MS. ASHTON HARP: I'm going to present the public comment summary for Draft Addendum I to the Interstate Atlantic Herring Fisheries Management Plan. As shown on the agenda, I am going to present this in two parts. It is very similar to how I did it at the public hearings. The first part is the six options within the addendum; followed by the LEC and Advisory Panel comment.

The second part is the scoping questions on a tiered weekly landing system; and I'll go over the public comment summary for that as well.

A brief overview of the addendum timeline. The Section initiated this addendum last year in October. This was following the 2015 and 2016 fishery performance.

There was a working group meeting in New Hampshire at the beginning of the year to discuss all of the options that would be in the document. Originally there were nine options, as you saw in the document now it is six. This draft addendum as you see it now, with some alterations, was presented at the end of January to the Section.

It was approved for public comment in January, and then it went out for public comment in four states. I did public hearings along the coast and received written comments as well, and now we're here today where we're going to review all the public comment and potentially approve Draft Addendum I to the Atlantic herring fisheries management plan.

Please note, if approved, the implementation will need to be established. Keeping in mind that

the fishing year starts on June 1, for Area 1A. A brief background about the statement of the problem; in recent years the Area 1A Trimester 2 fishery, which is June through September, has harvested herring at a rate that if left unrestricted would exceed the seasonal quota in weeks, not months.

There has been an increase in fishing effort and vessel capacity combined with a decrease of readily available herring in Area 3. Traditionally Area 1A and Area 3 are taken together in the summer months, and both support the lobster bait market. If one area is not providing enough herring then there is going to automatically be a shortage.

Attempts to spread the Trimester 2 quota have proven to be ineffective. As we saw last year, Maine implemented measures that were more restrictive than those of the Commission to curtail effort. The purpose of this addendum is to develop additional management measures to ensure the seasonal quota is spread out through the entirety of Trimester 2, are consistent between the states; and address any excessive capacity in this fishery. A lot of the alternative measures are geared towards the days out program.

An overview of the public comment summary, hearings were held in Maine, New Hampshire, Massachusetts, and New Jersey. I also received written comment from 18 different entities that are listed on the board as well. I should note that there were some Maine participants that were at the New Hampshire and the Massachusetts hearing; so you just should note that when looking at the public comment vote totals.

#### **REVIEW OPTIONS AND PUBLIC COMMENT**

MS. HARP: I should note that the PDT said that to improve the stability of the fishery and stabilize the rate of harvest during the fishing season, the adoption of all six options is not necessary. One or two could be adopted, all six could be adopted. It is up to the Section at this meeting.

The first option is the state vessel landing reports. Option A is status quo, given the majority of the vessels in this fishery are federally permitted vessels they will continue to submit federal VTRs. Option B says that the vessels in this fishery would also submit state landing reports. These landing reports would give the Commission and the states access to real-time data that they currently do not have.

Usually managers look to the GARFO weekly monitoring reports for an update on the rate of catch in this fishery. But weekly access data is not enough for some of the options in here, such as weekly landings limit. We would need access to real-time data for proper execution of some measures.

I should note that the Commission did send a letter to NMFS, requesting access to daily-catch data for select state staff. NMFS has approved the Commission's request. There were three individuals, one from Maine, New Hampshire, and Massachusetts that were included in that letter; to garner access to this data. NMFS is actively working with those individuals to obtain access.

Keeping in mind the states now have access to real time data from GARFO, I will present the public comment summary on this issue.

In the table the columns are Maine, New Hampshire, Massachusetts, New Jersey and WC is written comment. As you can see the majority of people, well actually there are some caveats. Some that were in favor of Option B, implementing a state landing report, said they would do so reluctantly. They wanted the fishermen to have access to the data they needed to manage the fishery. However, submitting a duplicate report was seen as a burden on them, and something that they didn't want to do. They really wanted the Commission to work with National Marine Fisheries Service to get access to this data, which happened.

Moving on to Issue 2, modify the days-out program. Option A is status quo. Right now harvesters are prohibited from landing herring on a day out of the fishery. For example, if there are seven days in a fishery, managers can come together and say that Monday and Tuesday are open for a vessel to land herring. There is nothing to say that the vessel can't still fish or they can't be in possession of fish during the days out.

Option B and C specifically restrict a vessel from doing that. It says harvesters are prohibited from landing or possessing herring caught from Area 1A during a day out of the fishery. Option B applies this as a blanket statement to all harvesters, whereas Option C implements this only for Category A vessels; which make up the majority of the landings in this fishery.

MS. HARP: When looking at the public comment on this, the majority were in favor of status quo; meaning no restriction on landing if fish were caught during a day out. Those opposed to Options B and C voiced concerns about weather, safety and economic constraints, if the measures were implemented. Options B and C were also voiced as being inconsistent with the federal plan.

At some of the public hearings there was a request for the days out program to be reevaluated; in terms of whether it was necessary if a weekly landing limit was implemented. If there was a weekly landing limit and there was a preference for the available landing days to be set at seven days.

Moving on to Issue 3; weekly landing limit; so this would be a blanket limit for all vessels in the fishery, and it would be for each vessel.

Option A is status quo, there is no weekly landing limit in this fishery set forth by the Commission. We know that Maine implemented one last year, but from the Commission's point of view in the fisheries management plan; there is no weekly landing limit. Option B and C implement one.

Option B is only for Category A permits. Option C is for Category A and C permits. There is also a note in the document that said that vessels must notify states with their intent to fish in Area 1A, and the gear type, 45 days prior to the start of the fishing season.

This was to be used by the Technical Committee to determine the initial weekly landing limit. We would need to know this to set the Trimester 2 weekly landing limit which is based the seasonal quota, the number of vessels in the fishery, and number of weeks available for harvest.

The public comment summary on this issue was in favor of Option C; which would apply the weekly landing limit to Categories A and C permitted vessels. Over and over again I heard the term equal restrictions for all vessels in the fishery were a preferred management approach.

There was some support for Option B, because C vessels already have a landing limit of 25 metric tons due to their federal permit. It was voiced that the majority of C vessels can't hold anywhere near a 25 metric ton capacity; and it is very unlikely that these vessels would fish seven days a week at that level.

Applying these measures to Category C was another burden on them that is not necessary given they account for less than 1% of overall landings.

Two questions came up on this issue frequently. One was can a vessel leave Area 1A if it is declared into the fishery. The answer is yes. This is just a requirement to declare into the fishery. There is no actual requirement to fish in Area 1A as the sole management area where you fish. A vessel could come into Area 1A, leave and go to Area 3, and come back to Area 1A.

Of course that could affect the weekly landing limit scenario; which goes to the second question. Is the weekly landing limit fixed over time? No, it's not. If a vessel leaves to go into Area 3 then the TC would have to adjust the

weekly landing limit over time; to make sure that the Trimester 2 quota is being fully utilized.

There is no reason to believe that a weekly landing limit would diminish or limit catch in such a manner that the seasonal quota would not be harvested.

Issue 4 is landing restrictions on transfers at sea. Option A is status quo. A vessel with proper permits can transfer or receive Atlantic herring at sea. Option B is herring caught in Area 1A can only be landed by the respective harvester vessel, which frankly just means that there will be no carrier vessels. The vessel that caught the fish will then land the fish; there will be no transfers at sea.

Option C is herring carrier vessels are limited to receiving at-sea transfers from one harvester vessel per week; and there can be one landing per 24 hour period. Maine did implement this in 2016. If implemented then New Hampshire and Massachusetts would have to develop some kind of reporting mechanism to monitor transfers at sea.

The carrier vessels don't have to report on federal VTRs any more, only the harvester vessels do; so there needs to be some way that the states can monitor if these vessels are actually transferring at sea and if they're actually landing once per day.

When looking at the public comment summary. There was support for Option C, if it could reduce fishing pressure. Although some didn't support it because it could put smaller carriers out of business, similar to what Option B is explicitly doing. For example, if a harvester vessel can only choose one carrier vessel per week, the size of the vessel will likely be an important factor; and a bigger carrier vessel that could hold more fish would be more attractive to the harvester vessels, thereby putting the small vessels out of business if they can only choose one carrier vessel per week.

There was also a fair amount of concern that limiting carriers could increase slippage. If a harvester can only transfer to one carrier vessel, and they have more than what their vessel can hold, more than what the carrier can hold, then the additional fish would have to be dumped. Concern that dumping the fish goes against the goals and objectives of the state FMP, which was voiced by participants, and the state and federal FMP would also be inconsistent on this matter.

For the small-mesh-bottom trawl days out, Option A is status quo. Right now the days out program applies to all harvesters, regardless of gear type. Option B is a small-mesh-bottom trawl days out program for Category C and D permits that opt into the program. There would also be a notification period of 45 days prior to the start of the fishing season. I just want to touch on why this was initiated. Small-mesh-bottom-trawl vessels traditionally target whiting, and they would like to target whiting during the week; so that's Monday through Friday, and then they want to target herring over the weekend.

But the landing day's program has traditionally allowed landings at the beginning of the week, generally on Monday, Tuesday, Wednesday is when a vessel can land herring. But these small-mesh-bottom trawl vessels are landing whiting at that time. Rarely are landing days available on weekends.

This was initiated to apply more flexibility for the small-mesh-bottom trawl fishing vessels in this fishery. For the public comment summary, you can see that most people were in favor of Option B. There is actually a petition that was given to me at the New Hampshire and Massachusetts public hearings to support Option B.

I paraphrased it and I'll read it right now. It says we, the Massachusetts and New Hampshire fishermen and lobstermen are very concerned with the unavailability of herring to our area of southern Area 1A during July through September. There is a small but important

traditional whiting fishery that takes place in our area from July through October that only catches 1 percent of the sub-ACL due to the more restrictive landing days being proposed, we support Option B.

There are also some comments that voiced how dependent some lobstermen are on herring from these small-mesh-bottom trawl vessels and they have been affected last year and the year before when there was a shortage of herring in their area. A lot of the herring was landed in Maine, but it wasn't making its way down south. It is harder for that bait to come down into the New Hampshire and Massachusetts area, so there was less and less bait.

They would like to have measures that allow these small-mesh-bottom trawl vessels to land herring; so that they can have more access to bait. Given a good number of the small-mesh-bottom trawl vessels do not start fishing until the mid-July, there was also a preference to shorten the declaration period or abolish it in general. For example, it would start on June 1st instead of 45 days out, since they usually don't start fishing until mid-July.

The last issue was a clarification of the days-out program. Currently the FMP says that if states cannot come to a days-out decision then the matter will come before the Section at the next scheduled meeting. The alternative text clarifies how states would agree on Days Out measures.

It can be Option B1 voting, B2, consensus, and what is the default landing days if the states cannot come to an agreement? Is it seven available landing days, which is Option C1? Also included in C1, is the ability to carry over the previously agreed upon landing days should state not agree on a new landing day scenario, provided the previous agreement was made in the current fishing year. Option C2 says that if they can't come to an agreement then zero landing days would be implemented until an agreement is reached.

The public comment summary on this was a little bit mixed. There were a fair number of people that were in favor of Option B1 as voting, as just the fairest way to make a decision. Each state should have to just make a vote, and we'll see where it lands; since there are only three states, clearly there is going to be a decision made. Those in favor of Option B2, a consensus, said that this could force the parties to talk it out, and make sure that everyone stated their opinion on the matter and talked through why X number of days might be better or worse than an alternative.

People also said they didn't want voting, they thought that voting might result in one state just constantly being overpowered by the other two. There were a number of people in favor of Option C1, so that would rollover the existing days out landings days, or implement seven days. There were some people that were in favor of Option C2, which is zero days; mainly saying this could force a decision.

Clearly no one wants to have zero landing days available in this fishery that would effectively shut it down. Some people also opposed C2, because it could shut down this fishery. Given it is a federal fishery they didn't think that it should be shut down by the Commission; just because three states couldn't come to an agreement. With that I'll take questions.

#### **ADVISORY PANEL REPORT**

CHAIRMAN WHITE: That's making a complicated report fairly simple, any questions for Ashton? Seeing none; I'll go to the Advisory Panel report, Jeff.

MR. JEFF KAELIN: Members of the Section, good afternoon. I'm Jeff Kaelin; with Lund's Fisheries out of Cape May, New Jersey, and privileged to Chair of the AP. There is a copy of our brief report in your packet. We didn't have a quorum, but we proceeded to operate by consensus where we could, Mr. Chairman, and that is reflected in the discussion. Also as you know on

the agenda later today there is an opportunity to begin the process of refreshing the AP.

We met by conference call on April 10. We discussed the management alternatives that you just heard reviewed by Ashton, and also the comments from the various public hearings. Relative to management alternatives, on the first issue, State Vessel Landing Reports, the discussion focused on the applicability of VMS as an avenue for the states to monitor the rate of catch. That is on the agenda for later, for your consideration I think.

I think the feeling was that since the fleet was making pre-trip landing reports daily that if the Commission had that information you would have a better idea where you are relative to the 1A quota in more of a real-time sense. One member noted however, they would reluctantly comply with the additional reporting requirements if Option B were to be implemented.

One member commented that boats with federal permits are already reporting, I just made that point, and don't want to report the same information twice. That discussion will occur later in your agenda. In Issue 2, Prohibit Landings of Herring Caught in 1A During a Day Out of the Fishery. Three members were in favor of Option A, the status quo.

There was opposition to restricting the possession of herring on a day out, because the majority of fishing takes place in federal waters. Two of the three members believe the days out should be a tool for managers as needed. But if weekly landing limits are implemented, then harvesters should be allowed to land seven days per week.

On the weekly landing limit, the AP supported using a weekly landing limit; but was opposed to the requirement that harvesters declare into the fishery 45 days prior to the start of the fishing season. There was no preferred declaration period offered, and the AP was questioning the



purpose of this lengthy declaration for the following reasons.

It doesn't restrict vessels to fishing in 1A; it is easy to know the number of vessels fishing per week, because the Area 1A fishery is small. Not a good indicator of future effort, as it was anticipated that all vessels would simply declare into the fishery. The weekly landing limit will fluctuate based on the number of vessels fishing each week; in any case.

Issue 4, Landing Restriction on Transfers at Sea there was support for status quo, Option A, because the other options could lead to discards; and the members on the call think a weekly landing is a sufficient effort control, and restrictions on carriers aren't necessary. There was one advisor that asked if Option C would put smaller carriers out of business.

Others commented that it likely would, because the preference would shift to larger carriers. One member voiced that he didn't want harvesters with the additional capacity of carriers targeting and taking entire schools of herring. Other members voiced that it is not the goal of the harvester to take the entire school, but if there is extra fish that are caught they should be transferred to a carrier rather than being dumped.

Any option that has a chance of increasing discards should be avoided. That was a consensus statement. On the Small Mesh Bottom Trawl Days Out, members supported Option B; as long as the vessels were required to report their landings. For example, if the state vessel landing reports are implemented then they should be required for the small-mesh-bottom trawl fleet as well.

On the Clarification of the Days Out Procedure, two members preferred Option B2, the consensus option; because it required managers to discuss the issues in detail. Some members questioned Option C2, zero days, because it has the potential to shut down the federal fishery;

whereas two members viewed it as an incentive for managers to come to an agreement and force a consensus. We didn't have consensus on that.

Section 4, Scoping Questions, there was two members of the AP opposed to tiered weekly landing limits; because it is not consistent with the federal FMP. If this effort was to be considered, it should be initiated by the Council. We all know that there is a letter from the Council to the Section on those issues. That ends my report, Mr. Chairman. I would be happy to take any questions.

#### **LAW ENFORCEMENT COMMITTEE REPORT**

CHAIRMAN WHITE: Are there any questions for Jeff? Seeing none; thank you again. Law Enforcement, Lieutenant.

LIEUTENANT MICHAEL EASTMAN: Good afternoon; I'm Lieutenant Michael Eastman, I'm the Chairman of the Law Enforcement Committee and also Law Enforcement Advisor to the Herring Board. On reference to Addendum 1 on March 17, 2017, the Law Enforcement Committee had a teleconference call, in which we discussed Addendum 1. On the attendance of that teleconference on this matter were North Carolina, Rhode Island, Florida, Maine, New Hampshire, Pennsylvania, New York, Virginia, Maryland, Georgia, New Jersey, Delaware, U.S. Coast Guard, and NOAA OLE. I'll reference Issue 1, Harvester Report Requirements. We the LEC recommended the most timely and accurate reporting possible to enhance enforcement efforts. State access to federal reports is important for timeliness. Maine reported success in implementing state reports, and was able to regularly review e-mail reports for carrier vessels.

Issue 2, Days Out, the LEC did not offer any comments or recommendations on the options in this draft. Issue 3, Weekly Landing Limits, we recommended establishing weekly landing limits in pounds and truckloads. Maine reported no significant problems in implementing a weekly landing limit. They're officer's typically

monitored landings by truckloads rather than by poundage, a more efficient process.

They are using the estimate of approximately 40,000 pounds per truckload. With timely access to reports, weekly landing limits can be enforced. Issue 4, Restrictions on Transfers at Sea. The LEC believes that Option B is more enforceable than Option C, but recognizes this may place a hardship on carrier vessels that have operated for many years.

Issue 5, Days-Out for Small-Mesh Bottom Trawl Vessels, we are comfortable with Option B, and did not believe an additional program for small-mesh-bottom trawl vessels would be overly confusing from an enforcement perspective. Issue 6, Clarification on Days-Out Procedure. The LEC did not have any comments regarding this issue. The LEC appreciates the opportunity to provide enforcement advice to the Atlantic Herring Management Section regarding Draft Addendum I. That is all I have Mr. Chairman, are there any questions?

CHAIRMAN WHITE: Any questions for Lieutenant Eastman? Seeing none; I know you have a letter from the Council, but I would like to recognize P.K. to see if he has any additions to that.

MR. PETER KENDALL: Yes, I'll be brief. I would like to thank the Commission for allowing the New England Council to have a seat, and thank the Commission for allowing the Council to comment after the deadline. The Council met as a Whole after the deadline, and we were able to comment after the deadline; so we appreciate that.

Our Executive Director summed up any concerns the Council has in a letter to the Commission. It should be in your correspondence. I'll just go through it briefly, a couple of bullet points; what the Council thought. Under the harvesting reports the Council was not clear about the sharing request that the Commission made to GARFO, and confidential data needs to be

carefully considered when asking about that; because there are so few vessels in the fleet.

As far as prohibiting landings for herring caught in Area 1, using the days-out, both Options B and C have the potential to affect herring fishing activity by federal herring permit holders. The federal FMP does not limit fishing activity using the days-out; therefore this might be inconsistent with the federal FMP; so the Council had a little concern about that.

As far as the weekly landing limit per vessel, the Council just had concern that this might increase slippage and discards using the weekly landing limits. As far as landing restrictions on transfers-at-sea, the Council was still unclear whether or not the Commission would be able to restrict carrier vessels at all. The small-mesh-bottom trawl, again as reported by Ashton and I think Jeff as well, the 45 day comment period is probably too long; especially if the Addendum I doesn't go into effect until June. It could affect the opening of the herring industry in July. With that; as far as clarification on the days-out procedure, the Council doesn't have any concerns other than it supports defining the procedure a little bit better, which I think you will end up doing.

CHAIRMAN WHITE: Any questions for P.K.? Okay seeing none; it is time to consider final action. Oops sorry, Dr. Pierce.

DR. DAVID PIERCE: Not a question of P.K., but I've got a comment regarding the letter, if I may. P.K. you did a good job summarizing the New England Council's perspective; but it is obvious that there are other New England Council members present here, as voting members of the sea herring Section that would be myself and Terry and well of course New Hampshire, and Rhode Island and Connecticut.

We're all part of the New England Council as well, and we wear a few hats. I am very sympathetic, of course, to the points that were made by the Council, specific to this proposed

addendum. But I feel it's necessary to at least make a couple of points regarding a few of the comments made that this proposed addendum may substantially and adversely affect the federal Atlantic herring fishery management plan, very specific language has great meaning of course and great significance.

I still say, and I said this at the New England Council meeting where we discussed what would be said to this particular Section; that this Section has done a lot over the years to help the New England Council achieve the objectives of the federal fisheries management plan by virtue of the way in which we have controlled, managed, regulated the effort of federal permit holders who land in our states.

As a consequence of that I find it hard to believe that we are in any way substantially and adversely affecting the federal FMP. I would also highlight that the comments are made, I understand why the comments were made; but I have to reflect on other things that states are doing that we've been doing for many, many years.

With sea herring for example, our spawning closures, we affect federal fishing. We affect the fishing of federal permit holders in federal waters by virtue of our spawning closures. They cannot fish. I note that some states actually have, in the Mid-Atlantic area specifically; they actually have some federal quotas that were allocated to federal permit holders, using the state individual transferable quota approach.

The federal government never objected to that. To me that is a rather interesting way for states to deal with federal permit holders; some states anyways. I'll stop there. There are many other examples that can be provided regarding how states are attempting to assist the councils better manage these fisheries.

That involves impacting the efforts of federal permit holders who obviously have permits to land in our various states. Again, I appreciate the

issues and the comments made by the Council, but I am very confident that we in no way have put the federal plan at risk; that we have substantially or adversely affected the federal FMP.

#### **CONSIDER FINAL APPROVAL OF ADDENDUM I**

CHAIRMAN WHITE: Thank you, David, I think that's an important clarification. Are there any other questions or comments? Seeing none; we're up for considering final approval for Addendum I. Unless there is an objection, I'm going to take a motion that includes everything in the Addendum, and try that to see if we can get through this quickly. Terry, I'll recognize you.

MR. STOCKWELL: Kirby, I sent you the motion. **I'm going to move that the Herring Section approve the following measures for the Herring Addendum I. When he gets them up on the board I'll go through them section by section. Section 3.1.1 the Harvester Reporting Requirements, Option B, implement the state landings reporting as an alternative in the FMP, in the event that NMFS rescinds VMS access to the states.**

**Section 3.1.2 Prohibit the landings of herring caught in Area 1A during the day-out of the fishery; Option C, days-out restrictions for vessels with a Category A permit. Section 3.1.3 Weekly Landing Limit per Vessel (pounds) Option B, weekly harvester land limits for vessels with a Category A permit. In 2017, vessels must opt into Area 1A by the May 23 rd days-out meeting.**

**Section 3.1.4 Landing restrictions on Transfers At-Sea with reporting exemptions to states that have no carrier landings, Options both B and C, the Section members from Maine, New Hampshire, and Mass will have a choice of both options at their annual days-out meetings. Option B is no herring carrier vessels or transfer at sea, and Option C is herring carrier vessels are limited to receiving at-sea transfers from one vessel per week, and landing once per 24 hour period.**

**Section 3.1.5; Small Mesh Bottom Trawl Fleet Days Out, Option B, additional days-out program for small-mesh-bottom-trawl vessels with a Category C or D permit. Finally, Section 3.1.6 Clarification of Days-Out Procedure, Options B, type of agreement (consensus) coupled with Option C2, default landing day scenario would be zero landing days. I've got a little rationale if I get a second.**

CHAIRMAN WHITE: Is there a second, Dennis Abbott second. Go ahead, Terry.

MR. STOCKWELL: It is my belief that these combined alternatives will add some new tools to the Herring Section of members from Maine, New Hampshire and Mass for potential implementation in Area 1A this coming year. These measures were pilot tested by the state of Maine this last year, to ensure an even playing field will happen between the vessels and the different states.

These measures will ensure that the Area 1A fishery landings will be spread out into September, providing bait for all three states lobster fisheries. It will allow for the necessary flexibility and accountability for the Category C and small-mesh trawlers that have traditionally only harvested about 1 percent of the overall quota.

These small-mesh trawler provisions will allow for weather and market safety issues and the number of days can be modified in mid-season if landings exceed the TCs projections. Proving both alternatives to the landing restrictions on Transfers-at-Sea will allow the Section to annually determine the most appropriate option dependent upon the number of vessels opting into the fishery. Finally, we've operated under voting by consensus for a long time. We have a pretty good cooperation between the three states. My sense is that consensus ensures that continued cooperative management. Should consensus not be agreed upon, which we haven't yet now, no landings would, rather than

wide open landings, from my perspective would further enable some sort of a resolution. That is my rationale, Mr. Chairman, thank you.

CHAIRMAN WHITE: Any other input? Doug.

MR. DOUGLAS E. GROUT: Thank you, Terry for this motion. I do have a couple questions, one specifically to 3.1.4 where you mention that we're selecting options B and C. The Section will have the choice of both alternative options at the annual days-out meeting. Do you mean the Section members from Massachusetts, Maine and New Hampshire?

MR. STOCKWELL: Thank you for the question, Doug, yes that is correct. It is just those three states that annually determine the days-out measures.

MR. GROUT: Would you like to have a friendly amendment to make that clear, Mr. Chair?

CHAIRMAN WHITE: Sure, is the seconder okay with that?

MR. GROUT: **The wording would be; The Section members from Maine, New Hampshire and Massachusetts.** Okay thank you for that friendly. On this particular issue and I'll wait.

CHAIRMAN WHITE: Also, is there any objection to that friendly amendment? Seeing none.

MR. GROUT: My question is for Mr. Stockwell. One of the things that I had concerns with this is that this would require states to implement both a permit system for the carrier vessels, and a monitoring system for the carrier vessels. At least one and probably two states don't have carrier vessels that are landing in our state.

I'm concerned about the implementing this for something that we don't have. I understand your desire and the need to have something like this, but to have to implement it in a state that doesn't have carrier vessels concerned me. I am

concerned about supporting it, if I'm going to have to implement that.

CHAIRMAN WHITE: Terry, respond.

MR. STOCKWELL: Doug, would it give you comfort if it was modified to add permitting and reporting? I mean under 3.1.4 there is a reporting exemption. Do you want reporting and permitting exemption to states that have no carrier landings work for you?

MR. GROUT: That would, thank you.

CHAIRMAN WHITE: Any objections for the seconder making that change? Dennis. Any objections from the Section?

MR. STOCKWELL: Kirby that is Section 3.1.4. It would be with exemption states, Landing Restrictions on Transfer At-Sea with a reporting and permitting exception to states that have no carrier landings. First line after with, oh wait a second.

MR. ERIC REID: I have to ask the question, because I'm not totally clear.

CHAIRMAN WHITE: Hang on a minute. Is the change as you suggested?

MR. GROUT: Yes I am, and I have one other question.

CHAIRMAN WHITE: Go ahead, Doug.

MR. GROUT: I know we had, under 3.1.3 we have a modified period when we have to declare into the fishery. One of the things for the small-mesh-bottom-trawl fleet days-out is we need to have the small-mesh-bottom trawls declare their intent to fish in 1A too, so that we have at least according to the addendum, we have a list of the small-mesh-bottom trawls that are fishing.

I'm wondering if we need to have a modified declaration date for this year also. Now it is probably not as critical right now, because those

boats, at least in the, I believe the fishery doesn't start until July 15th. We may still be in good shape if we pass this amendment now or this addendum now.

I just want to make sure that we don't have to have a modified date at this point. But it will be okay with not getting that with requiring that that be in by, it would probably be June 1. I asked that of the PDT and then the TC is going to have to monitor these vessels.

MS. HARP: I just have a question. Just given the public comment that I received, would the Section be interested in having the June 1st date be the date in perpetuity? Just given that 45 days from the start of the fishing season of June 1st really isn't the start of their fishing season. It is quite far out for them. I wanted to know if that was up for consideration or if the TC, Renee, if you had any qualms against that.

MR. GROUT: I'm okay with it being done at least by that time.

CHAIRMAN WHITE: Hang on Terry, I left Eric waiting here a bit, so let me go to Eric; back to Terry.

MR. STOCKWELL: I'm a little confused by the question there; is it the reference to all access to Area 1A or just small mesh?

MS. HARP: Just small-mesh-bottom trawl would have a June 1<sup>st</sup> declaration every year.

MR. GROUT: That sounds good to me. \*We ought to put something in to reflect that.

***(\*Whereupon the recorder lost power.)***

MR. STOCKWELL: No objections.

MR. GROUT: All small mesh bottom trawls must declare into the fishery by June 1st every year into Area 1A fishery.

CHAIRMAN WHITE: Is the seconder okay?

MR. DENNIS ABBOTT: Well, Mr. Chairman you've repeatedly violated all our training in parliamentary procedure. But that's fine.

MR. GROUT: I could make a motion.

CHAIRMAN WHITE: I know that. I am asking if there is any objection though. Eric.

MR. REID: It has to be explained to me what the impact is on foreign carriers. There are Canadian boats that come down that are carriers. I don't know their involvement, how many of them there are, and what affect this has on them. I appreciate the motion, but I would like to get some clarification on what that means.

CHAIRMAN WHITE: Terry.

MR. STOCKWELL: Good question, Eric. There is a 4,000 ton boarder transfer that is in place regardless of this.

MR. REID: So essentially this would have no ramifications there or on the U.S. fleet and the landings of the states, so we're good with that.

MR. STOCKWELL: The herring goes both ways.

MR. REID: All right, thank you.

CHAIRMAN WHITE: Steve.

MR. STEPHEN R. TRAIN: I believe I'm on board with all this, I just need one clarification and I don't know if it's going to come from Terry or someone on staff. But the declaration in on May 23rd, what does that mean? I mean I thought when we asked people to declare it was so we could plan our days out. I heard a lot of different things said during the readings of all the comments. Does declaring in mean nothing more than you might be one of the boats in it, and you can come and go at will?

CHAIRMAN WHITE: Correct. It doesn't bind a boat to do anything. My guess is anybody that

has any thought at all about fishing is just going to declare. David.

DR. PIERCE: Terry's done a good job addressing the Addendum and the statement of the problem. I appreciate every aspect of the motion that has been made, except one part of it. We have a serious problem with how we control the landings of sea herring in our different states relative to the quotas that we have to live with.

There is a desperate need to slow this fishery down, in order to provide a more steady supply of lobster bait. I'll support the motion as presented just with one exception; **and I would like to move to amend and that would be to change 3.1.6 Option B2, and make that Option B1, which would be that the states of Maine, New Hampshire, and Massachusetts will vote on the parameters of the days out program.** Instead of seeking consensus, I appreciate the merits of that. But in this particular case, reflecting on the many years of working with the other two states, New Hampshire and Maine, and debating whether we should vote or whether there should be a consensus. I'm convinced that we should just do it as a formal vote, make it far simpler. That's my motion to amend; to change it from Option B2 to B1.

CHAIRMAN WHITE: Thank you, David, is there a second to that motion? You seconded that Dennis? Okay. Discussion. Okay, are we ready to vote on the amendment? Ashton.

MS. HARP: I just had a quick question for the state landing reports, just so I understand for the final write up of the document. This would just say that if for some reason National Marine Fisheries Service rescinded the access to the three states that then the state landing reports would go be instated. The states don't have to develop the criteria or anything to implement such a system. That would come at a later date.

MR. STOCKWELL: That's correct.

CHAIRMAN WHITE: Any other questions or discussion? P.K.

MR. KENDALL: Not necessarily on the motion to amend, but maybe the main motion as amended. I have a question on the timing of everything. If you take final action today, I mean you're expecting everybody to declare in by May 23rd, for this fishing year, and for all the small-mesh-bottom trawls to declare in by June 1st. Is that correct?

MS. HARP: That is how the motion has outlined the dates, yes.

MR. KENDALL: Okay, my concern is just the timing of it. That is pretty fast, so as long as everybody gets notice to make sure, especially small-mesh-bottom trawls who might not be, the bigger fleets, most of the guys are here or the word will get out pretty fast. As long as the small-mesh-bottom trawls know that they have to declare-in in the next few weeks here, then I'll be comfortable with it.

CHAIRMAN WHITE: The three states, Maine, New Hampshire and Massachusetts are comfortable that they're going to be able to notify their small-mesh-bottom trawl fleets. I see nodding, thank you. Dennis.

MR. ABBOTT: Would it be permissible at this time for me to comment on the motion?

CHAIRMAN WHITE: On the amendment?

MR. ABBOTT: Yes. I seconded this motion for several reasons, one of them being, I'll backtrack and say that I've been involved in this three state affair in setting our days out for a long time. In many instances we ended up convincing Dr. Pierce to go along with the other two states, and he's always been pliable in whatever.

The very fact is that if you insist on consensus, it really allows the minority a bit more power than they deserve. Although we seek ultimately for consensus if the situation comes up where we're

unable to achieve consensus, I think that it should be majority rule; and that is the reason I seconded Dr. Pierce's motion.

MR. STOCKWELL: That's too good an opportunity to let go. I feel quite opposite. I feel that as a state with 95 plus percent of the fishery in one trimester that we work very closely with the other two states to pull together a program that works for everyone; as much as Dr. Pierce and the Commonwealth bends to the wishes of Maine and New Hampshire for Trimester 2.

We bend to the wishes of the Commonwealth for Trimester 3. It is a very collaborative spirit. I think if we get into voting on a very important fishery, both to the state of Maine and to all three states lobster fisheries. I think we'll be doing the industry and there resource a disservice. I prefer the collaborative approach.

CHAIRMAN WHITE: Anybody else? Okay, are we ready to vote, do we need a caucus? Not seeing any heads nodding, **so all in favor of the amendment, please raise your right hand, all opposed, null votes, abstentions. The amendment fails in a tie vote**, so now we're on to the main motion. Doug.

MR. GROUT: I would like to make an amendment to the default landing day scenario. I agree with Terry that consensus has worked before, although what our previous default was if we couldn't come to a consensus there would be seven landing days. This is not a resource issue, but this is about trying to protect the resource.

This is about trying to constrain the landings so that there is a supply of bait throughout the Trimester 2 period. I think the default landing day scenario, if we can't come to a consensus should be seven days, or if it is in season, whatever the previously agreed to landings day. **I would make a motion to change Option C2 to C1.**

CHAIRMAN WHITE: **Is there a second? Seeing none; motion fails.** Any further discussion on

the main motion? Seeing none; this is a final action so this will be a roll call vote. Ashton.

MS. HARP: Maine.

MR. STOCKWELL: Yes.

MS. HARP: New Hampshire.

MR. ABBOTT: Yes.

MS. HARP: Massachusetts.

DR. PIERCE: Yes.

MS. HARP: Rhode Island.

MR. MARK GIBSON: Yes.

MS. HARP: Connecticut.

MS. COLLEEN GIANNINI: Yes.

MS. HARP: New York.

MR. JAMES J. GILMORE, JR.: Yes.

MS. HARP: New Jersey.

MR. TOM BAUM: No.

CHAIRMAN WHITE: **Motion passes 6, 1.**

**REVIEW THE SCOPING COMMENTS ON THE  
TIERED WEEKLY LANDING**

CHAIRMAN WHITE: Next item, Review the Scoping Comments on the Tiered Weekly Landing. Ashton.

MS. HARP: I'll just start with a brief overview. There were nine scoping questions in Draft Addendum I, whereby we were trying to gauge the public's interest in a tiered weekly landing limit system. The Area 1A herring vessels would be associated to a tier. The tiers are undetermined at this point.

Everything is just very theoretical, just trying to gauge interest in it. But if tiers were established then vessels would be assigned to a tier, which would be associated with a different weekly landing limit for each tier. This was the initial question, which is the most important question, because some participants at public hearings refused to answer any further questions if they were against a tiered system.

It was: are you in favor of a tiered weekly landing-limit system? As you can see in Maine, the majority were in favor. In New Hampshire they just found it very hard to comment on the topic, where there were no details. They basically said the devil is in the details and there are no details here, so we can't give adequate comment on it; although one person was opposed and one person was in favor. Both were from Maine.

Two other participants spoke generally about how the system could be tiered. In Massachusetts, participants were not in favor, except for one Maine fisherman. In New Jersey, no participants were in favor. They actually refused to answer any further questions about it. For the written comment there were four individuals in favor, and six were opposed.

I pulled some comments because they reflect the general comments for in favor and opposed. If people were in favor there was a preference for a three-tiered system, whereby Tier 1 would include those Category a vessels that fished in the last ten years. There was a preference for a three-tiered system based on permit category and harvester landing history.

For those that were opposed, some of the comments included that it will not only limit or eliminate competition for a public resource that will cause price increases, the quota, and therefore the resource is not and will not be affected by the number of boats in the fishery.

There was also a comment that said any future consideration of tiered access, should go



through the Council, and the Council should take any future initiation on this matter. I didn't receive much more comment than that. I think that in general people just felt like it was difficult to comment on a theoretical system.

CHAIRMAN WHITE: Any questions or discussion? Seeing none, oops sorry, Terry.

MR. STOCKWELL: Just for the Board's information. The Maine Marine Resource Committee considered a tiered license bill this past session, and many members of the Committee attended the public hearing we had on Draft Addendum I. Ultimately the Committee decided to hold this bill over until next year and that is the current status of it.

#### **DISCUSSION OF THE 2016 SPAWNING CLOSURE**

CHAIRMAN WHITE: Thank you for that update. You'll keep us apprised next year. Next agenda is Discussion of the 2016 Spawning Closure, the Technical Committee Chair; Rene.

MS. RENEE ZOBEL: Thank you, Mr. Chairman, thank you Section members. I'm here to go over the Spawning Area Closure monitoring system that was piloted this past year. Just a reminder of what was passed last year at the February meeting; it was on approval of Amendment 3, the Atlantic Herring Section granted a one-year pilot of the new method known as the GSI30 Based Forecasting System to be tested in the 2016 fishing season.

The Section can permanently implement the forecast system. Just a very quick refresher on the forecast system; for those in the room who didn't work with this or weren't familiar with it throughout the year. It's basically a relationship was made between the spawning condition of fish and day, and we found that there is a linear relationship.

What that allowed us to do is collect samples throughout the season, and as spawning progressed it developed a really nice linear relationship that allowed us to predict a date at

which those fish would go over a certain threshold. In a few moments I'm going to show you the results of that which was put through to a website that we all monitor. I'll give background on that as well.

That is the forecast system. The Section also has the option to revert back to the length-based closure system from prior years. The forecasting system is proactive, the length-based system is reactive; a reminder of what that looks like. That was based on two 100 fish samples taken within seven days; defaults if there was inadequate sampling.

They basically were based on a percentage of gonadal stages 3-5, that had reached certain thresholds based on their length. That was reactive, we waited until those fish hit us that reached that spawning threshold, and then we put in a closure. We had a wonderful partnership with ACCSP to implement this. We had a need to house the data somewhere we all had access to it.

ACCSP had conveniently a biological module that was already in place that we were able to utilize, and it allowed for formal coordination, the centralized database for all spawning samples. All states have access to it, and it allowed us to standardize our methods and results, which is extremely helpful when you're trying to coordinate \*three states, samplers and staff. This is just a snapshot of what that biological module looks like, for anybody's curiosity. Basically, it just collects the information that we need to do the analysis with various coding.

If there are any questions on that feel free to ask me later. How is this implemented? The data housed by ACCSP are run through our scripts, and are refreshed every two hours. This website that we have it displays the results of this. The script is refreshed every two hours and therefore what we see on that website is refreshed every two hours. It is extremely real-time. As data are put in there, we are able to see them; and it can change the forecasting closure date, based on

real-time samples that we're getting as soon as they get entered into the system. The results are then displayed on that web page. We rely upon three samples, each containing at least 25 female herring in gonadal stages 3-5, to trigger a spawning closure. There were in two of the areas significantly more than that number of samples.

Once the three samples are collected, closure dates are forecasted. You'll see when I display what the web page looks like; we had provided there is no date that shows up as an image in this website until we have at least three samples. In both areas that were closed based on this system, we had more than three samples.

Closure dates are set and notifications are made five days prior to the closure. Closures occur on default days if three samples are unavailable. This is a timeline of what 2016 looked like. Eastern Maine was closed on the default dates, because we were not able to get any sampling. My understanding was there was minimal if no fishing occurring.

That was August 28 through September 24. Western Maine was closed via the forecasting system. That was closed on September 18 through October 15. Mass/New Hampshire was also closed based on the forecasting system. It was closed on October 2 through October 29. This is an example of what the website looks like for us, when those samples were run through the code and then displayed.

You can see there is a graph here of the GSIs, so the spawning condition and dates. This isn't very helpful, because there is nothing on it, because we do not have any samples. You can see there is a closure threshold, and then the red line that's the default closure. This is a little bit more informative.

This shows a little bit more of what it looks like. Sampling in the western Maine spawning area began on August 7. Live samples, totaling 216 female herring were collected to evaluate

spawning condition. Based on the analysis of those samples the western Maine spawning area was closed from September 18 through October 15.

You can see here each of those vertical lines of gray dots indicates a spawning sample. Those are each individual fish, where you can see the GSI for those fish. Then you can see over time there is clearly a linear relationship, and then that allows us to use the actual fish that year to determine when it's going to reach that threshold.

You can see that the closure occurred well before the defaults, because the fish we've seen had pretty broad interannual variability in the herring fishery, so they are different every year. We want to make sure that we're closing and protecting the spawning fish when those fish are spawning that year, not next year.

This is what was displayed for Mass/New Hampshire, sampling in Massachusetts, New Hampshire spawning area began on August 8; nine samples totaling 654 female herring were collected to evaluate spawning condition. Based on the analysis of the samples, the Massachusetts, New Hampshire spawning area was closed from October 2, through October 29.

You can see here there are clearly a much larger number of samples, and this one closed just before the default date; so very close to what the default would have been. Evaluation, when the TC looked at this there are some things to take into consideration; 92 percent of the Area 1A of allocation was taken and that area was closed effective October 18, prior to the opening of the spawning closure in Mass/New Hampshire. Due to the 1A closure the ability to get samples after the spawning closure was limited.

However, RSA samples were obtained that showed very few fish in spawning condition. That is exactly what we expected to see, and what we hoped to see. Samples after the closures indicated that fish had spawned,

meaning that we had done our jobs, so we protected spawning fish. You can see there that 6 percent were in spawning condition; which is well below the 25 percent threshold.

We also heard from a number of people on the water that is what they were seeing; that fish seemed to be spawning when the samples said they were going to be spawning. We considered that and not hearing of spawning fish hitting the dock like we had in previous years, also good corroboration to what we were doing.

Next steps, so the TC is comfortable sharing the link with managers and public in 2017 to those graphs that I had shown, based on the date and spawning condition; pending the inclusion of some caveats. The data are refreshed every two hours, so this is as real-time as we can get. It is constantly updating.

The fewer the samples the greater the changes in the forecasted dates will be as new samples are added. That is extremely important; if we have three samples that is enough for us to forecast a date. However, as we get more samples and get closer to that date that date is going to change and get refined.

The more samples there are the closer that date is going to be. The fewer samples there are the more variability there could be in that date. That date is not fixed until five days prior to the closure. That is something that is very, very important to understand; that that date will move around until five days prior, then it is locked in. That is the date we'll notify, five days prior.

That is the date we set the closure. TC recommendation, the TC believes the forecast system was successfully tested, and recommends the Section permanently implement the GSI30 Base Forecast System for the spawning closures in Area 1A. I am happy to take any questions from Section members at this time.

CHAIRMAN WHITE: Any questions for Rene? Terry.

MR. STOCKWELL: Not necessarily a question, but more of a comment. While I strongly support protecting the spawning fish and the new process and using the additional sampling. The five-day notice process last fall came close to impacting that goal. With a five-day notice that we got from the TC the New Hampshire/Mass area, would not have closed until the 2nd of October, which would have potentially allowed one full day of fishing on what really were spawned fish.

There is a little bit of a dance around that. I think for the future the Section, particularly Section Chair needs to be in close touch with the TC to prevent similar occasions, because I'm sure every year as they are different, we want to ensure that goal.

CHAIRMAN WHITE: I am not sure what action you are suggesting that we take.

MR. STOCKWELL: Thanks for the question. I'm not proposing an action. I'm just raising an issue that we came very close to not fulfilling our goal of protecting spawning fish. If we strictly follow the TC's recommendation of five days, we would, with the exception of the last minute scramble, have allowed for one day of fishing on spawning on spawning fish. I think we just need to have that caveat we need to keep our eyes on, and its management discretion. The TC is providing us with the best updated data that they have. We may need some management discretion.

CHAIRMAN WHITE: Any other questions? Yes, David.

DR. PIERCE: I'll follow Terry's lead. It's not a question, I just wanted to support what Terry said regarding the possibility of our not having complete protection because of a one-day, maybe even two days. I'll echo his suggestion, Mr. Chairman as to the close communication; so

we don't end up with that situation in coming years.

I would say however that we do well that you've vetted to the Technical Committee for the very hard work that they did to develop this particular approach, and then to get it in place and to make it work, in 2016. It is a lot of work, and now they have very clearly demonstrated that it was quite effective that it was successful. With that said, I would like to make a motion if it is appropriate, Mr. Chairman, regarding the TC recommendation.

CHAIRMAN WHITE: You can make a motion. I want to let you know I'm going to allow a little bit of public input, because there was concern; even though it was not written in as part of this process for this to go to the AP. Some members of the public wanted to comment on this, so allowing the motion and the second and discussion from the Section. Then I'm going to allow very limited public input, so go ahead, David.

**DR. PIERCE: I would move that we permanently implement the GSI30 Based Forecast System for spawning closures in Area 1A.**

CHAIRMAN WHITE: Second, Dennis. Do we have any people that want to comment, any members. Okay, so no Section members, I'll go to the public. Glen, and then I believe Jeff wants to.

MR. ROBBINS: Yes, Glen Robbins; fishing vessel Western Sea. These spawning closures are very important to me. We put these through in the eighties, back when Brennan was Commissioner in Maine. Out of the last five years, only last year did we hit it, and that was because they took some samples right to the end.

I would recommend that you think about two to four days rather than five days. The previous four years we didn't either close it first early enough or open it on time. When we opened it the fish were still spawning. You've got to watch

this. It happens too often. Out of five years we blew it four years. I would recommend two to four days. There are not very many of us that you have to notify, you can notify us real easy, and we won't go fishing on them. Thank you.

CHAIRMAN WHITE: Thank you, Glen. Jeff, did you want to speak?

MR. KAELIN: Jeff Kaelin, Lund's Fisheries. I am the AP Chair, I'm not speaking for the AP, but I came to the microphone because I did hear from one AP member, Mary Beth Tooley, who is a Council member from Maine; surprised that you were going to be taking final action on the pilot program today. I know myself I was too.

In the January/February Fisheries Focus this was slated as review the Pilot Program, the March 7 e-mail that I have on the preliminary agenda also said discuss. I think we were surprised that this final action is being taken today, with just one year of experience. It may or may not be a good thing to do in the future.

But the lack of opportunity for the AP to consider this and raise some of the issues like Glen just did, about the notification period. What is the appropriate notification time period? What is the projected impact on the fishery and so forth? It wasn't able to be discussed, even though we had an April 10 AP call.

I think what was suggested to me was that maybe you just run the Pilot Program another year, take a look at it a year from now, when you have 100 percent more information a second year. That is why I came to the table, Mr. Chairman. We'll live either way. I have learned how to read a room in my political life. I think whatever I have to say probably isn't going to dissuade the Section from supporting the motion on the board. But I just wanted to raise that process issue.

CHAIRMAN WHITE: Anybody else from the public? Not seeing anybody we did have another

AP member, as Jeff said, said an e-mail on that. Ashton will read that.

MS. HARP: This is a public comment from Mary Beth Tooley. It says, I am writing to express my concern about the final action you have on the agenda for herring spawning closures. While we have had an opportunity to provide public comment through hearings and an AP meeting on the Addendum, there was no mention of this final action of the Pilot Program for spawning measures.

Additionally, while there was a Power Point presentation on this topic, there was no document that provides the details of the program. I would like to request the Section to continue the Pilot Program in 2017 and seek input from the AP and fishery prior to final action.

CHAIRMAN WHITE: I also would just remind the Section that the AP did take this issue up and report it to the Board prior to the beginning of this one-year Pilot Project. We did hear from the AP concerning this issue, any other...Adam.

MR. ADAM NOWALSKY: To that end, let me ask, what would be the harm in continuing this for a second year as the pilot?

MS. HARP: How it was written in the motion when it was passed in February, 2016, was there would be a one-year pilot program; upon that there would be a decision made prior to the 2017 fishing year.

CHAIRMAN WHITE: Any other questions or comment? Dennis.

MR. ABBOTT: Yes, I'm in favor of the motion, obviously. But I think that going down the line; we always have the opportunity to change anything that we've implemented. If we at a further date decided this isn't correct or needs any changes, modifications, et cetera, the board could take action at that time.

CHAIRMAN WHITE: Anybody else? Steve.

MR. TRAIN: While I somewhat agree with Dennis, I find it's a lot harder to change direction then it is to delay a start. I like this system, but I don't see any problem with considering a second pilot year or a second test year before we make it permanent. We're still going to use it this year if we did it that way.

**MR. NOWALSKY: To that end, Mr. Chairman I'm going to move to substitute to implement a second year of the pilot program.**

CHAIRMAN WHITE: Is there a second? Steve Train second. Discussion. Doug.

MR. GROUT: Well, I'm opposed to this motion, because I was in support of implementing this with the original amendment. But I agreed at that point, because I did see some value in having a trial year to see how it worked. My read of the how it did work, including the report, is even better than what Terry had said.

I didn't see that much of a problem with the five-day notice in getting it out there, because we were so close to the default anyways. Things worked out very well, and it did a better job of predicting than what our old system did by far. I've been hearing for years from fishermen that we were missing with our old system the spawning time.

People were catching spawning fish before the closure would happen, and sometimes it was the other way around. I think this is a good system. I think it is a very rigorous system that was developed by our Technical Committee, and it has proven to be an effective tool and a much more effective tool than the other in our old system. I'm ready to move forward with it, Mr. Chairman.

CHAIRMAN WHITE: Any other input? Adam.

MR. NOWALSKY: Just speaking in support of my motion. I have no doubt that it has had good

effects in last year, but for the three samples, one of them we didn't have any samples to see what it would have indicated. I would like to see a second year of it, and hopefully we'll have all three samples for a second year; to confirm what we believe.

Appreciate all the effort that has gone into it, but it just seems to make sense, especially hearing some of the comments; that we go through that second year. I'm a big fan of doing it right the first time, and I think this gives us the opportunity to do so.

CHAIRMAN WHITE: Rene, would you like to clarify?

MS. ZOBEL: Sure. Just a clarification that in eastern Maine, it is very common for us to have no samples or one sample, it is very, very challenging to get samples in eastern Maine. That closes on the default every year as a result.

MR. STOCKWELL: Rene covered my issue. Adam, there is essentially, some years there is just plain no fishing down there.

CHAIRMAN WHITE: Any other comments? Are we ready to vote, do you need a caucus time? Seeing no heads nodding, are we set to vote? **Okay we are voting on move to substitute, implement second year of the pilot program for spawning closures in Area 1A. Motion by Mr. Nowalsky, seconded by Mr. Train, all in favor raise your right hand, opposed same, null votes, abstentions; motion fails, 2,3,1,1.** Okay, we're back to the main motion.

MR. NOWALSKY: Point of order, Mr. Chairman.

CHAIRMAN WHITE: Go ahead.

MR. NOWALSKY: Three, 2, 1, 1, doesn't that pass?

CHAIRMAN WHITE: I'm sorry, 2,3,1; sorry. Okay main motion, do you need that read, Dennis? **All in favor of the main motion, please raise your**

**right hand, opposed, null votes, abstentions; 6,0,0, it passes.**

### **CONSIDER APPROVAL OF 2017 FISHERY MANAGEMENT PLAN REVIEW AND STATE COMPLIANCE**

CHAIRMAN WHITE: Now, review and populate the Atlantic Herring Advisory Panel. Sorry, I jumped down one. Consider Approval of 2017 Fishery Management Plan Review and State Compliance, Ashton.

MS. HARP: This will be very quick. This is the FMP Review and State Compliance for the 2015 and 2016 Atlantic herring fishing years. A quick review of spawning stock biomass, the 2015 stock assessment update indicated Atlantic herring is not overfished and overfishing is not occurring.

The next assessment will be next year, and that will be to inform the next specification package coming from the Council. Just an overview of the Atlantic herring commercial landings, I know I've gone into this in far more detail in Draft Addendum I. But just as an overview of the stock wide ACL for the 2016 through 2018 fishing years is 104,800 metric tons or 230 million pounds. The Area 1A Sub-ACL is 30,300 metric tons, which is adjusted for underages or overages in the prior fishing years.

For the fishing effort, in terms of landings, as you can see here the purse seine and mid-water trawl vessels account for on average 99 percent of Atlantic herring landings in Area 1A. Depending on the season the gear ratio will be different. In the Trimester 2, June through September, it is primarily purse seine vessels accounting for 99 percent of the landings, whereas in Trimester 3 it is a little bit more weighted out; where it's 55 percent of the landings are from mid-water trawl vessels.

Just an overview of management up to 2017, as you can see the variety of the fisheries management plan in 1993 all the way up to

Amendment 3, which was passed last year. Now this year it is no longer Draft Addendum I, is now Addendum I that has modified the days-out program moving forward. The Plan Review Team reviewed all of the compliance reports from every state within the management unit from Maine down to New Jersey. The focus was to make sure the states implemented Amendment 3 last year. The Plan Review Team found that all states have regulations in place that meet or exceed the fisheries management plan. There was one request for de minimis status from New York.

The PRT found that they did meet the de minimis requirement that the landings have averaged 0.6 percent of the coastwide landings since 2014. With that being said, the PRT recommends approving the fisheries management plan and approving New York's de minimis request. That's it.

CHAIRMAN WHITE: Any questions for Ashton? Is there a motion? Jim Gilmore.

MR. GILMORE: **Yes, Mr. Chairman, I would like to move that we accept the FMP Review and grant de minimis status for New York.**

CHAIRMAN WHITE: Second, Terry Stockwell. **Is there any objection to the motion? Seeing none; it passes unanimously.**

#### **REVIEW AND POPULATE THE ATLANTIC HERRING ADVISORY PANEL**

CHAIRMAN WHITE: Ashton, on repopulating the Atlantic Herring Advisory Panel; oops sorry, Tina.

MS. TINA L. BERGER: Hi there, I'll be quick as well. Just letting you know that we have had very poor attendance in the Atlantic Herring AP the past couple of years. As you'll see from the memo that is in your briefing materials, we have 5 out of 12 active members. We would ask you to look at those materials.

Look at the attendance records for those folks that we provided you some recommendations about who might be replaced. Of course it's up to you whether you want to keep them on, but we really would like to have a fully functional AP at some point. Thank you.

CHAIRMAN WHITE: Hope the states will work on this, because we definitely need a full advisory panel working on these issues.

#### **OTHER BUSINESS**

CHAIRMAN WHITE: Other business, Terry Stockwell.

MR. STOCKWELL: With P.K. at the table today, I thought it would be helpful to have some section discussion on the RSA Program, in the spirit of co-management with the Council; particularly concerning the notification process that the states received concerning when and where the RSA fishing is going to occur.

Speaking for the state of Maine, and I think as well for New Hampshire. We're not getting a lot of collaboration. When the Council sits again to renew its annual specs and discusses the RSA Program, I'm hoping that there will be some additional ASMFC input into it as well.

CHAIRMAN WHITE: Would you suggest a letter coming from the Commission?

MR. STOCKWELL: Thank you for your generous offer to write it.

CHAIRMAN WHITE: Any objection of the Section sending a letter to the Council, or actually, does that go to the Policy Board? Recommend the Policy Board a letter. Any objection to that? Seeing none; we will do that. Is there anything else under other business? David.

DR. PIERCE: I just wanted to highlight the use of the RSA fish, how we put it to good use. Port sampling, monitoring spawning condition, move along strategies, to avoid bycatch of river herring and the like. We've had some great cooperation

for the sea herring fishing industry to accomplish all those very important objectives; so the research set-aside has been of great benefit to assist all of us with better management of the fishery.

**ADJOURNMENT**

CHAIRMAN WHITE: Anything else under other business? Seeing none; any objection to adjourning? Seeing none; we're adjourned.

(Whereupon, the meeting was adjourned at 2:30 o'clock p.m., May 8, 2017.)



# Atlantic States Marine Fisheries Commission

## Shad and River Herring Management Board

*October 17, 2017*

*8:00 – 9:30 a.m.*

*Norfolk, Virginia*

### Draft Agenda

The times listed are approximate; the order in which these items will be taken is subject to change; other items may be added as necessary.

1. Welcome/Call to Order (*J. Clark*) 8:00 a.m.
2. Board Consent 8:00 a.m.
  - Approval of Agenda
  - Approval of Proceedings from August 2017
3. Public Comment 8:05 a.m.
4. Discuss Shad Stock Assessment Process Recommendations (*J. Kipp*) 8:15 a.m.
5. Consider Approval of Shad and River Herring Sustainable Fishery Management Plans (SFMPs) **Final Action** 8:25 a.m.
  - Review SFMPs and Technical Committee Memo (*B. Chase*)
    - Connecticut – Updated Shad SFMP
    - Potomac River Fisheries Commission – Updated Shad SFMP
    - North Carolina – Updated Shad SFMP
    - South Carolina – Updated Shad SFMP
    - Georgia – Updated Shad SFMP
    - Virginia – Bycatch Plan
6. Consider Approval of 2017 FMP Review and State Compliance Reports (*C. Starks*) **Action** 9:15 a.m.
7. Other Business/Adjourn 9:30 a.m.

The meeting will be held at the Waterside Marriot Hotel, 235 East Main Street, Norfolk, Virginia; 757.627.4200

*Vision: Sustainably Managing Atlantic Coastal Fisheries*

# MEETING OVERVIEW

## Shad and River Herring Management Board Meeting

Tuesday October 17, 2017

8:00 – 9:30 a.m.

Norfolk, Virginia

Chair: John Clark (DE) Assumed Chairmanship: 2/17	Technical Committee Chair: Brad Chase (MA)	Law Enforcement Committee Representative: L. Furlong (PA)
Vice Chair: Mike Armstrong	Advisory Panel Chair: Pam Lyons Gromen	Previous Board Meeting: August 2, 2017
Voting Members: ME, NH, MA, RI, CT, NY, NJ, PA, DE, MD, DC, PRFC, VA, NC, SC, GA, FL, NMFS, USFWS (19 votes)		

### 2. Board Consent

- Approval of Agenda
- Approval of Proceedings from August 2017

3. Public Comment – At the beginning of the meeting public comment will be taken on items not on the agenda. Individuals that wish to speak at this time must sign-in at the beginning of the meeting. For agenda items that have already gone out for public hearing and/or have had a public comment period that has closed, the Board Chair may determine that additional public comment will not provide additional information. In this circumstance the Chair will not allow additional public comment on an issue. For agenda items that the public has not had a chance to provide input, the Board Chair may allow limited opportunity for comment. The Board Chair has the discretion to limit the number of speakers and/or the length of each comment.

### 4. Discuss Shad Stock Assessment Process Recommendations

#### Background

- The 2007 Benchmark Stock Assessment was scheduled to be updated in 2018. The Assessment Science Committee recommended performing a benchmark assessment due to differences in data and methods from the 2007 Benchmark Stock Assessment.

#### Presentations

- Shad Stock Assessment Process Recommendations by J. Kipp

### 5. Consider Approval of Sustainable Fishery Management Plans (Final Action)

#### Background

- The Connecticut Department of Energy and Environmental Protection submitted an updated SFMP for recreational and commercial harvest of American shad in the Connecticut River. The plan includes recent data and requests to maintain the existing management measures from the 2012 SFMP. Commercial shad fishing will remain prohibited in all other rivers in the state. **(Briefing Materials)**
- The Potomac River Fisheries Commission submitted an updated SFMP for a continued limited commercial bycatch allowance of American shad. The plan includes recent data

and requests to maintain the existing management measures from the 2012 SFMP. **(Briefing Materials)**

- The North Carolina Division of Marine Fisheries submitted an updated SFMP for commercial and recreational harvest of American shad. The plan includes updated sustainable management measures from the 2012 SFMP and requests to maintain fisheries in all coastal rivers. **(Briefing Materials)**
- The South Carolina Department of Natural Resources submitted an updated SFMP for commercial and recreational harvest of American shad. The plan includes recent data and requests to maintain the fisheries at current or reduced levels from the 2011 SFMP. **(Briefing Materials)**
- The Georgia Department of Natural Resources submitted an updated SFMP for commercial and recreational harvest of American shad, with the revisions requested by the Board at the May 2017 meeting. **(Briefing Materials)**
- The Technical Committee reviewed the documents and provided recommendations to the Board. **(Supplemental Materials)**

#### **Presentations**

- Overview of the SFMPs and Technical Committee Recommendations by B. Chase

#### **Board actions for consideration at this meeting**

- Approval of the Sustainable Fishery Management Plans

### **6. Consider Approval of 2017 Shad and River Herring FMP Review**

#### **Background**

- State Compliance Reports were due on July 1, 2014
- The Plan Review Team reviewed each state report and compiled the annual FMP Review **(Briefing Materials)**

#### **Presentations**

- Overview of the FMP Review Report by C. Starks

#### **Board actions for consideration at this meeting**

- Approve 2017 FMP Review and *de minimis* requests

### **7. Other Business/Adjourn**

**DRAFT PROCEEDINGS OF THE  
ATLANTIC STATES MARINE FISHERIES COMMISSION  
SHAD AND RIVER HERRING MANAGEMENT BOARD**

**The Westin Alexandria  
Alexandria, Virginia  
August 2, 2017**

**These minutes are draft and subject to approval by the Shad and River Herring Management Board.  
The Board will review the minutes during its next meeting.**

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## INDEX OF MOTIONS

1. **Approval of Agenda** by Consent (Page 1).
2. **Approval of Proceedings of February, 2017** by Consent (Page 1).
3. **Move to approve the South Carolina Sustainable Fishery Management Plan (SFMP) for river herring and the Florida SFMP for shad inclusive of the Technical Committee recommendations** (Page 12). Motion by Jim Estes; second by Malcolm Rhodes. Motion passes unanimously (Page 12).
4. **Move to approve the 2016 FMP Review of the 2015 fishing year and approve *de minimis* requests for Maine, New Hampshire, Massachusetts, and Florida for shad; and *de minimis* requests for New Hampshire and Florida for river herring** (Page 14). Motion by Michael Armstrong; second by Cheri Patterson. Motion passes unanimously (Page 14).
5. **Move to adjourn** by Consent (Page 14).

**ATTENDANCE**

**Board Members**

Pat Keliher, ME (AA)	Craig Pugh, DE, proxy for Rep. Carson (LA)
Cheri Patterson, NH, proxy for D. Grout (AA)	Roy Miller, DE (GA)
Dennis Abbott, NH, proxy for Sen. Watters (LA)	Lynn Fegley, MD, proxy for D. Blazer (AA)
Ritchie White, NH (GA)	Rachel Dean, MD (GA)
Mike Armstrong, MA, proxy for D. Pierce (AA)	Allison Colden, MD, proxy for Del. Stein (LA)
Raymond Kane, MA (GA)	Kyle Schick, VA, proxy for Sen. Stuart (LA)
Sarah Ferrara, MA, proxy for Rep. Peake (LA)	Cathy Davenport, VA (GA)
Mark Gibson, RI, proxy for J. Coit (AA)	Rob O'Reilly, VA, proxy for J. Bull (AA)
David Borden, RI (GA)	Michelle Duval, NC, proxy for B. Davis (AA)
Eric Reid, RI, proxy for Sen. Sosnowski (LA)	David Bush, NC, proxy for Rep. Steinburg (LA)
Justin Davis, CT, proxy for M. Alexander (AA)	Sen. Ronnie Cromer, SC (LA)
Sen. Craig Miner, Ct (LA)	Malcolm Rhodes, SC (GA)
John McMurray, NY, proxy for Sen. Boyle (LA)	Ross Self, SC, proxy for R. Boyles (AA)
Jim Gilmore, NY (AA)	Pat Geer, GA, proxy for Rep. Nimmer (LA)
Emerson Hasbrouck, NY (GA)	Rep. Thad Altman, FL (LA)
Heather Corbett, NJ, proxy for L. Herrighty (AA)	Spud Woodward, GA (AA)
Tom Fote, NJ (GA)	Jim Estes, FL, proxy for J. McCawley (AA)
Adam Nowalsky, NJ, proxy for Asm. Andrzejczak (LA)	Martin Gary, PRFC
Andy Shiels, PA, proxy for J. Arway (AA)	Sherry White, USFWS
Loren Lustig, PA (GA)	Derek Orner, NMFS
John Clark, DE, proxy for D. Saveikis (AA)	

**(AA = Administrative Appointee; GA = Governor Appointee; LA = Legislative Appointee)**

**Ex-Officio Members**

Brad Chase, Technical Committee Chair

**Staff**

Bob Beal	Jeff Kipp
Toni Kerns	Katie Drew
Kirby Rootes-Murdy	

**Guests**

Arnold Leo, E. Hampton, NY

The Shad and River Herring Management Board of the Atlantic States Marine Fisheries Commission convened in the Edison Ballroom of the Westin Hotel, Alexandria, Virginia, August 2, 2017, and was called to order at 8:00 o'clock a.m. by Chairman John Clark.

#### **CALL TO ORDER**

CHAIRMAN JOHN CLARK: This is the first part of our diadromous double header here. We're going to start with Shad and River Herring; and welcome to the meeting. I'll just give everybody a second to settle in here.

#### **APPROVAL OF AGENDA**

CHAIRMAN CLARK: Do we have any changes to the agenda? Seeing none; the agenda is approved.

#### **APPROVAL OF PROCEEDINGS**

CHAIRMAN CLARK: Do we have any changes or questions about the minutes from the previous meeting? Seeing none; the minutes are approved.

#### **PUBLIC COMMENT**

CHAIRMAN CLARK: We're on to Item 3, which is Public Comment, and we have been asked by Jeff Pierce to give a comment here; so Jeff, do you want to go up to the public microphone?

MR. JEFFREY PIERCE: Good morning, Chairman Clark, distinguished members of the Shad and River Herring Board. My name is Jeff Pierce. I'm the founder and Executive Director of the Alewife Harvesters of Maine. My comments today are just a few for consideration for both this Board and the Technical Committee. Maine over the last decade has opened up thousands of acres of rivers and stream habitat through the removal of several large dams.

There are many river restoration projects going on in different communities to restore fish passage. Citizen scientists, conservation

committees, local select boards and universities are working with like associations, Maine's Department of Marine Resources and other stakeholders to get many alewife and blueback herring collectively known as river herring, back into their native spawning ground.

Maine Department of Transportation has also been working diligently on stream passage, with a culvert replacement program; which recently gained approval for additional funding from the Maine State Legislature. These are just a few examples of the positive conservation restoration efforts going on in Maine and Massachusetts.

There are similar restoration efforts going on with citizen scientists and the other local community efforts. Many of us hope that the Technical Committee will take into consideration the social and economic effects of the community effort on river herring restoration; when they bring proposals to harvest river herring, and consider all the benefits and the aspects of this culturally important fishery, including basing their decisions on hard scientific data.

Allowing small scale commercial and education harvest builds good will when it comes time for municipal leaders to allocate funding for critical restoration work in their communities. Thank you for this opportunity to make public comment; and I would be happy to answer any questions you may have at this time.

CHAIRMAN CLARK: Thank you, Jeff. I'm sure Commissioners can talk to you after the meeting here; and get up with you on that. Thanks.

#### **REVIEW OF RIVER HERRING STOCK ASSESSMENT UPDATE**

CHAIRMAN CLARK: Okay, we're going to move on to Agenda Item 4; which is to Review the River Herring Stock Assessment Update, and for



that I'll turn it over to Technical Committee Chair, Brad Chase.

MR. BRAD CHASE: Good morning. I'm going to run through the river herring stock assessment update. I would like to start by thanking the Stock Assessment Subcommittee for all their good work to put this together. It was really a challenging endeavor; given all the different data sources they had to look at, and also a difficult time of the year.

I want to thank the staffers as well, for helping out; Jeff Kip, Kirby, and Ashton Harp for all the work they did to shepherd us through the SAS, as well as the TC review. I'll go through the background. It presents some of the data results, focusing on the abundance data, the biological metrics, and total mortality estimates; and then will finish up with a conclusion.

The SAS had recommended that trend analysis were updated after five years beyond the stock assessment in 2012, and that a newer benchmark assessment would be conducted in ten years from now in 2022. The feeling was that a full assessment really wasn't warranted at this point in time, because the variability in the indices from the previous assessment, and also there has been a number of changes that have occurred.

A number of states have put in harvest bans. There has been a fair amount of restoration activity to restore access to historic spawning grounds, and we've had a number of sustainable fishery management plans that have been enacted; so it was felt that it would be too soon to conduct the assessment after just five years with all this activity; and given the life history of river herring.

River herring management should really ideally be conducted on a river specific basis. This is difficult because there are so many individual systems, and also these stocks do mix in the

marine environment; so you have a diadromous life history, which is complicated to produce a coastwide stock assessment.

You also have challenges in that you have different data quality among the river systems; and some systems have no data at all. Then again, you have limited information coming from the mixed stock ocean bycatch; where it is difficult to relate what happens at sea to back to the river specific stocks.

Instead of a coastwide model approach, it is more of a trend analysis. The most common trend analysis used is Mann-Kendall. The benchmark also produced reference points of total mortality; and this was repeated. There were several catch-at-age-population models conducted, one for Monument River in Massachusetts, and the Chowan River in North Carolina; and these were updated, but they did not factor heavily into the update.

They will be continued, and there was also a depletion-based stock reduction analysis that was conducted for the benchmark; but this was not endorsed by the Peer Review Panel, so it was not updated. So 57 river systems were evaluated on the east coast, of these 26 percent had complete or useable data. The SAS looked at nine categories of fishery independent and fishery dependent data by species; both blueback and alewife, harvest data, age, length, weight, repeat spawner ratios, and then adult juvenile and catch-per-unit effort fishery independent and dependent indices. A large majority of these did occur in New England states.

I'll run through like I guess the next slide, sorry about that. The benchmark was updated through 2015, so the update period was 2011 to 2015; and datasets that were reviewed for the benchmark that were found to be too brief, but had reached ten years by 2015, were included this time around. But in effect that was just the addition of one data series.

Overall the update lost data series as several datasets were discontinued, due to management actions, unreliability in the data sources, or lack of returning fish. To briefly mention commercial landings. Coastwide landings have been stable since the benchmark. The upper graph shows historical landings going back to about 1880.

I think we're all familiar with that large peak that occurred in the '50s, '60s, and '70s as domestic fleets went offshore fishing for sea herring and mackerel, and caught river herring as bycatch; and also foreign fleets came in as well, and led to really high landings in that period. Those landings declined sharply in the 1980s and you can see that red circle in the far right; that is where we are today.

Fairly stable landings since 2006, at about 1.4 million pounds, and the SAS felt that this information might have reduced utility, because we've had a number of harvest moratoria in place since then. Either way it does show stability in the benchmark period. Most of those commercial landings are occurring in Maine spawning run fisheries, or bycatch in offshore fisheries.

The incidental ocean bycatch has been stable, well I wouldn't say stable, but has been reduced since the benchmark. For the most recent period it's been 227 metric tons has been the average; which is about half of what it was in 2005 to 2010, where it was near 500 metric tons. Again, the impact of this catch on stock status is largely unknown; because we can't relate the mixing at sea very well back to river specific stocks.

I think it is good news to see that graph declining. A lot of folks have worked hard to try to gain more information on ocean bycatch; and we are seeing that reduction in recent years. Following a framework that was established during the benchmark, which was a consensus-

base-expert-opinion framework to evaluate trends.

Trends were updated for abundance and total mortality. The terminal five-year trends that were determined during the benchmark were updated, and evaluated for the final ten years of the data series; which is 2006 to 2015. We'll go through those trends now. These trends are also summarized in Table 1 of the assessment update report.

I'll start with commercial catch-per-unit effort data. This shows the series that are presently active in dark lettering. The ones that have been discontinued are crossed out in red. For commercial CPUE there are just three series that are present. There were ten series before, and these have been discontinued for various reasons. What I'll do is show the trends; and you can see the arrow here. The SAS assigned trends of increasing, decreasing, stable, no trend due to high variability, or unknown. The symbols next to the trends, symbol RH means both alewife and blueback combined. A for alewife, B for blueback, and so these are the three commercial series, and you can see the Hudson River is increasing and the other two are stable. For run size data, quite a few states have counts on spawning run counts.

You can see that four series have been discontinued since the benchmark. You can also see there are very few south of New England. Here are the trends. It's a fairly mixed bag; but what you can see is there are none of these that are declining in this period of 2006 to 2015. For blueback, one is increasing, four have no trends. For alewife, six are increasing, eight have no trends.

Then combined series four increasing, two are stable. For this ten year period we have a general increasing trend with spawning run counts. Young of the year fishery independent survey data, nine states have these data surveys. Here are the trends. Again, it's mixed.

For blueback two are increasing, six have no trend.

For alewife, one is decreasing and six have no trend; and for combined species there is one with no trend. Fishery independent trawl survey data, there are five states that have these trawl surveys; then you have the New England Fisheries Science Center Bottom Trawl Survey that covers that large area in blue.

These are showing a fairly stable picture. A few of these are increasing. Three alewife are increasing, three with no trend for alewife. Blueback has one decreasing, one increasing, and four with no trend; fishery independent and fishery dependent length data, so we have quite a few series here. In this case mean length has either declined or is showing no significant trends for all rivers examined.

None of these mean length series are increasing. You have significant declines for alewife by sex in four of the nine river systems and the trawl survey, and significant declines for the blueback by sex in six of the nine systems examined. These results are fairly consistent with the benchmark period, and somewhat lower in some cases than historic data. A similar pattern is seen for max length data as well.

The fishery independent and fishery dependent age data, we have fewer data series. There are six states that have this information, with one series dropping out since the benchmark. If you combine these data there is 112 river specific age and species combinations; and 26 of these have reversed their significance from the benchmark analysis.

But the pattern is similar to mean length. In most cases mean length at age is declining; and each river has at least one age where there is decline in a mean length at age. Although there is this modest declining pattern; the coastwide pattern shows little change since the

benchmark. Fishery independent and fishery dependent repeat spawner data, six states have these. Two of these have dropped out since the benchmark.

Repeat spawner data is very similar to mean length. These have all declined or showed no significant trend in all rivers examined. Significant declines have occurred for alewives by sex in four of the ten rivers examined for blueback; it is significant declines in two of the five rivers, and again the results are similar to the benchmark and it's a declining trend relative to historic data in some of these systems. These biological indicators that reflect on total mortality are showing a general decline; whereas the empirical estimates for total mortality have a little different story. These states either age otolith or scales for river herring. One of these series has dropped out since the benchmark. Here we have a fairly stable picture with three of these series declining in this period. Three have no trend, alewife has three decreasing, and seven have no trend.

Again, a slight decline in some of the series for the empirical total mortality estimates; whereas it is the opposite view for some of the biological indicators for total mortality. The SAS also produced Z benchmarks, and they used the spawning potential ratio; which looks at the total mortality rate that would reduce a spawning stock biomass to a specified percent of a virgin or unfished spawning stock biomass.

The SAS for the benchmark assessment picked a Z of 20 percent SPR, and a Z of 40 percent SPR to develop these reference points. The Peer Review looked at this and they recommended using the natural mortality rate of 0.7, and the preferred the Z at SPR 40 percent. This was repeated for the update. For the update Z continued to be high for most of the stocks.

They looked at the three-year-terminal average for observed Z values, and they looked at the 40

percent SPR value. For 12 of the 14 stocks that had available data, they were above that benchmark. During the benchmark assessment with the three-year average, there were 18 stocks that had available data; and all these were above the Z at 40 percent benchmark.

Recent Z values are not available for three stocks; due to lack of returning fish or aging errors. There are fewer series to look at. The picture improves slightly, but overall the mortality estimates were well above the reference point in most cases. To conclude, most data evaluated reflected conditions that were similar to the benchmark stock assessment.

Most of the fishery independent indices indicate inter-annual variation below stock size, and that more time is needed to reflect large scale changes in abundance. There were some positive trends; particularly in the spawning run counts in trends of abundance, particularly in the northeast. It's also interesting to point to trends in total mortality estimates and biological indicators of mortality were often in conflict.

Given the conflicting results for mortality estimates, conclusions about mortality remain uncertain. However, in comparison to reference points, some rivers have total mortality in recent years that may be unsustainable. Overall there were 16 of the 54 stocks that were reviewed for 2006 to 2015 that had increasing abundance trends.

Two were decreasing, 8 were stable, 10 experienced no discernible trend due to high variability, and 18 did not have enough data to assess recent trends. The coastwide status was determined to be depleted. There were positive signs that were apparent, but the information indicates the status of the river herring meta-complex population being depleted to near historic low remains

unchanged since the benchmark stock assessment.

The depleted status indicates that there was evidence for declines in abundance due to numbers of factors such as predation, river mortality, fishing; but the relative importance of these factors in reducing river herring stocks could not be determined. I just wanted to mention that we have now in the river herring management there are five states that have approved sustainable fishery management plans. Maine has the largest number at 20. New Hampshire has several rivers in Great Bay. Massachusetts and New York have one each; and South Carolina has two, which we'll review shortly today. I would be happy to take any questions.

CHAIRMAN CLARK: Thank you, Brad. Do we have any questions for Brad about this presentation; first up, Emerson then Jim?

MR. EMERSON C. HASBROUCK: Thank you, Brad, for your presentation. I have two questions, Mr. Chairman. Can I ask them both? I have two questions, is that okay?

CHAIRMAN CLARK: Yes, sure.

MR. HASBROUCK: One is, and you went by it pretty quickly. It was towards the end of your presentation. Did you say that some rivers have total mortality? Did you say that some river systems have total mortality?

MR. CHASE: Yes, do you want to go back to that slide? There are several rivers that have estimates of total mortality.

MR. HASBROUCK: There have got to be some fish that return though, right?

MR. CHASE: No, the total mortality estimate is based on age structure of scales, otoliths that produce an estimate of the total mortality for that population, for that river specific

population. It's an estimate of the percent that would survive or die for that population.

MR. HASBROUCK: That's interesting. My other question is I noticed in the trawl surveys you didn't mention the NEMAP Survey. Do they not encounter any river herring?

MR. CHASE: I can't speak for if they do or they don't; but all data series that were available for the east coast were evaluated by the SAS, and they selected ones that were suitable for the update. I can't comment on that particular survey.

CHAIRMAN CLARK: Next up, Jim.

MR. JAMES J. GILMORE, JR.: Brad that was a great presentation. What happened in the Mid-Atlantic when we lost all those surveys is kind of interesting. I'm just wondering if there are other surveys, particularly like in New York we have I know at least three other surveys that are going on, on Long Island; the Peconics, we've gotten after Hurricane Sandy there was a breach.

Now the Clemons River is being monitored, and there have been fish ladders put into all that place, so there is like a whole new set of data; and I would be assuming up and down the coast. It doesn't look like that got incorporated; but is there may be a plan to get that in the future; because that seems to be a broader dataset that maybe we're not tapping at this point.

MR. CHASE: Yes, I think that is the intention of the SAS. There are many rivers on the east coast that are monitored presently; and the SAS looked at all the data available. The rule of thumb they're using is they want to see ten years of data. When a data series reaches that point, it will be considered. I think that as these data collection efforts mature, we'll see a number of series come to use; which will benefit the assessment.

CHAIRMAN CLARK: Next question is Roy Miller.

MR. ROY W. MILLER: Brad, you stated that the estimates of Z, total mortality, exceeded the benchmark in a number of cases. Do you have any feeling for how much of that Z is caused by offshore fisheries as opposed to inshore environmental factors and/or inshore harvest?

MR. CHASE: It's an excellent question, and it is a source of a lot of uncertainty with the assessment. You really can't separate those sources of mortality from those estimates. We just don't have that information. I think it's a good reference point to look at and to monitor going forward; and I think there are studies that are underway to try to get at that question of how to separate mortality sources. But presently it is not possible.

CHAIRMAN CLARK: Do we have any further questions for Brad? Seeing none; thank you very much for the excellent presentation, Brad.

#### **TIMELINE FOR THE SHAD STOCK ASSESSMENT UPDATE**

CHAIRMAN CLARK: Our next agenda item is the Timeline for the Shad Stock Assessment Update; which will be given by Jeff Kipp.

MR. JEFF KIPP: I just have a brief update on the next assessment for American shad, which was determined to be an update for 2018. The TC met, and they initially recommended an update of the most recent benchmark stock assessment, which was conducted in 2007. The reason cited for remaining with an update versus a benchmark stock assessment.

The primary reasons were, the short time series of new monitoring efforts that have come online since Amendment 3 was implemented are probably still too short to be used in a benchmark; similar to what we just discussed for river herring at this time. Also another primary reason was the need to develop robust

stock specific ocean bycatch estimates of these mixed stocks out in the ocean interacting with other fisheries.

The proposed timeline is the completion of the assessment for the 2018 August meeting. We just wanted to communicate some challenges experienced while going through the river herring assessment update. There was some committee turnover on the River Herring Stock Assessment Subcommittee; and we expect much more significant committee turnover, pretty much a complete turnover since the shad benchmark assessment.

There is some institutional knowledge lost during that benchmark assessment process. This type of assessment was a lot of consensus building, a lot of expert opinion. Some of that information is lost, and that is what we're trying to update for 2018. Also, there is some change in recommendations on the datasets to be used; based on the change in committee membership. That is another thing that we experienced during the river herring assessment update.

As we went over for river herring, there were several datasets that have been discontinued due to various reasons. We expect to experience that same thing with American shad. Another challenge that we anticipate that is unique to American shad are there are several publications that have come out since the benchmark stock assessment that have questioned the reliability of aging techniques that are used, and have been used historically to age shad with scales. The next steps are that we would like to, now that we've experienced these issues going through the river herring assessment update, and have discussed more internally these issues that we expect to come up with American shad being aging. We feel the need to go back to the Technical Committee and Stock Assessment Subcommittee, and discuss these challenges, and identify how we anticipate to approach this assessment update.

If there are any recommendations for a change to this assessment process, or suggestions of what this assessment update will look like, we plan to bring those forward at the annual meeting and update this Board on those recommendations. That's all I have, and if there are any questions on that.

CHAIRMAN CLARK: Thanks, Jeff. Do we have any questions for Jeff on the shad stock? We have one over there, Rob O'Reilly.

MR. ROB O'REILLY: I've got two questions. The first is the initial slide. You showed the ocean bycatch, so I'm wondering what that's all about. The second question has to do with the peer review of the previous benchmark; and I don't recall how either glowing or what that review was. But I'm wondering about an update, if there were any problems with the peer review from the last benchmark.

MR. KIPP: The ocean bycatch, it's similar to the issue with river herring. There is ocean bycatch of shad and river herring, and those are mixed stocks; these river specific stocks that go out and mix, and are captured by these fisheries. I think we're getting better information on the magnitude of what that ocean bycatch is in more recent years.

But there is also the need to partition that bycatch amongst the river specific stocks. There is recent information and work on doing that for river herring, and partitioning that out by the genetic analyses. But that is a major hurdle to moving to more complex techniques for assessing both shad and river herring.

That's a major hurdle to moving on to a benchmark of American shad; and one of the reasons we decided to stick with an update of the previous assessment. The previous assessment was approved by peer review, and subsequently by this Board. There were probably some recommendations coming out of that by the peer review.

But given that this would be an update assessment, the Stock Assessment Subcommittee would pretty much follow the techniques and use the datasets that were used during that benchmark assessment process; given the process of an assessment update. The opportunity to improve on some of those recommendations from the peer review of the 2007 assessment would likely be implemented in a future benchmark assessment.

CHAIRMAN CLARK: Yes, Rob.

MR. O'REILLY: Just to follow up on the intercept fishery. Do the previous studies assist at all with this delineation of river specific stocks? I realize the study by Bonnie Brown, back maybe around 1990, was a mitochondrial DNA study. There was also a tagging study by Jess Ian from Maryland, and several others back around '91, '92. Is that too far back, or is that any use at all, given that most of the genetic work is now just not mitochondrial DNA alone, but is supplemented by nuclear DNA? How does that all work?

MR. KIPP: I'm not as familiar with those studies, so I would just speak to the primary issue; being we do have some snapshot information on what that ocean bycatch looks like. I think the challenge is developing a time series of that ocean bycatch, partitioned out amongst the stocks and how that changes by year. I think that is one of the bigger challenges for using that information in a more standard or traditional stock assessment model.

CHAIRMAN CLARK: Are there any other questions for Jeff? Loren.

MR. LOREN W. LUSTIG: I appreciate that sir, thank you for your report. My question relates to the hickory shad that runs up the rivers just before the American shad. I have personal experience at the Conowingo Dam at the mouth of the Susquehanna River; and it seems to me their run is at a peak around April 20, the white

shad or American shad around April 30. My question is can we extrapolate any trends for the hickory shad based upon the American shad numbers?

MR. KIPP: I don't believe that is something the SAS looked at in depth during the benchmark assessment back in 2007. That would be kind of a new endeavor. I just don't know at this point whether that is something that could be considered to provide information on the American shad trends.

### **CONSIDER APPROVAL OF SHAD AND RIVER HERRING SUSTAINABLE FISHERY MANAGEMENT PLANS**

CHAIRMAN CLARK: Any further questions? Seeing none; thank you, Jeff and we'll move on to our next agenda item, which is Consider Approval of Shad and River Herring Sustainable Fishery Management Plans. This is a final action. We'll start with Brad Chase reviewing the SFMPs and Technical Committee Memo for the South Carolina and the Florida Plans.

### **UPDATE ON SOUTH CAROLINA SFMP**

MR. CHASE: I'll start with the blueback herring sustainable fishery plan update for South Carolina; prepared by Bill Post and Chad Holbrook, and reviewed by the TC in March. This plan was first approved in 2011, and it really focused on the commercial fishery in the Santee-Cooper River Complex, as well as small commercial fishery in the Pee Dee River.

The plan 2011 also closed all of the fisheries, and it developed sustainability targets for those two fisheries to remain open; and this was implemented in the 2012 season. It is basically a five-year update. Here is a view of the Rediversion Canal in the Santee-Cooper Complex. Most of the fishing occurs with cast nets. There is a ten bushel daily limit per boat. It occurs in March and April.

It's a fairly focused, traditional fishery that has been going on here for a long time. Here are graphs that show the catch-per-unit effort, and the lower graph shows the man days as well as the landings over time. You can see there have been a few peaks, but a fair amount of fluctuation in recent years.

The sustainability benchmarks are really focused on an exploitation rate that was developed between 1986 and 1990, during a mark and recapture study that looked at total harvest in the mark and recapture estimates for the total numbers of fish in the river. They applied a scaled exploitation rate of 0.05 to present management.

They are proposing to do the same for this update, use that exploitation rate of 0.05. It's a three-year-running average. The graph shows the relative exploitation rate over time, and you can see the metric; and all these years they have been below that. They are proposing to have no change to this benchmark. For the Pee Dee River it is a small commercial fishery with gillnets. It's executed by a small number of permit holders. They have catch limits of 500 kilograms, and they also have a benchmark with a three-year-running average. They are proposing no change to their metrics for this plan update.

I should say in recent years landings have not exceeded a thousand kilograms, so it's a very small fishery. Here is the Pee Dee River harvest in the three-year-running average. You can see there have been a couple years they have exceeded that; again by a small margin, with slightly increasing landings in recent years.

They are collecting fishery dependent biological data as well. They have fork length as well as repeat spawning marks from 2011 to the present. The plans, there is very little change. The catch limits remain the same. They are both using the three-year-running average as

their metrics; and they are requesting to have this approved with the same plan as before.

The TC reviewed this and they had a couple comments that I'll share with you. Again, the relative exploitation rate of 0.052 was derived from this 1986 to 1990 mark and recapture estimate. They picked four years and used the lower confidence interval estimates for the total population estimate, and divided that by the harvest; and that produced the relative exploitation rate.

The TC had questions about the data quality using the older data, prior to the present day, and asked if there were conditions that might have changed the applicability of this scalar metric to the present day. The response was that it was really the best available proxy for exploitation rates, and that it was selected to be the lower confidence intervals; so therefore it was quite low and conservative.

Secondly, the TC expressed concerns over the absence of biological metrics; as well as the absence of a secondary sustainability benchmark. They asked for more detail on management responses if they did in fact exceed one of the benchmarks. This was discussed; and the recommendation was that these things would be developed and included in the next update. The TC did approve this plan to move on to the Boards consideration and approval; with the inclusions of the recommendations number too.

CHAIRMAN CLARK: Maybe it would be better to take questions after each review of these plans. Are there any questions about the South Carolina SFMP? Mike Armstrong.

MR. MIKE ARMSTRONG: I guess my only question is based on the TC recommendation, how would we physically approve it and include a mandated recommendation? I don't know how that's done or if we can.



MR. CHASE: Well, in discussion with South Carolina, they were willing to explore adding those features. It really is a question of just having the data developed. I think they have all they need to develop biological metrics; and so I think this can be done. One of the themes that the TC discussed was some of these plans that were approved in that first round, 2010, 2011, was they had management responses listed if a benchmark was exceeded. But they didn't have very much detail to what that response was. That was something the TC was interested in seeing a little more detail in that; maybe some standardization to how these actions occur. Instead of just stating there will be a management response, explicitly outlining what that would be.

CHAIRMAN CLARK: Do we have another question? Andy Shiels.

MR. ANDREW L. SHIELS: I think it was the first graph that showed the catch-per-unit effort was stable but landings were increasing. Is that because there are more people entered the fishery?

MR. CHASE: That is a good question. I would have to defer from somebody from South Carolina who might have that information. I don't know the answer to that.

CHAIRMAN CLARK: Ross, do you have that information?

MR. ROSS SELF: Could you repeat the question?

MR. SHIELS: Sure. I think it was the very first graphic. It showed that catch-per-unit effort was stable, but then landings were increasing. I was just wondering why.

MR. SELF: That's a good question. We've seen some response to environmental conditions. We went through a period of drought. These recent years our runs have increased. I guess

we feel like there may be more fish available to that same amount of effort that's being applied.

CHAIRMAN CLARK: Any further questions? Dr. Rhodes.

DR. MALCOLM RHODES: Yes, I can just speak anecdotally. When we've had meetings with the shad river herring fishermen in the area, and they will be the first to admit, when we've had these areas or times of drought there has been very low fish recruitment. Then when we've had years of good-river flow; and you know this is going again anecdotally from the fishermen.

But they will talk for these 20, 30 years; most of these are elderly fishermen. They say when the flows up the fish are in. I think that's where we're getting some of this variation. I bet it correlates very closely, as Ross said with the river flow conditions and times of drought or high water.

MR. SELF: Our folks back home are monitoring our discussion, and they agreed with what I said, by the way that with increased flows we are seeing more fish in the rivers; which is providing more opportunity for that same number of anglers to harvest more fish.

CHAIRMAN CLARK: Given some of the comments we've heard, would the Board prefer to hear both plans and then take motions on approval or do each of these separately? It sounded like there might be some interest in putting some conditions in the motion. Okay, it doesn't look like anybody has got a strong opinion on this.

#### **UPDATE ON FLORIDA SFMP**

CHAIRMAN CLARK: Why don't we get the update on the Florida SFMP and then we'll take motions on both.

MR. CHASE: I did just read up on the notes from the last TC meeting that reviewed this.

**These minutes are draft and subject to approval by the Shad and River Herring Management Board.  
The Board will review the minutes during its next meeting.**

There was discussion on how flow diversions in that canal can affect catchability; so it does seem to be a factor. Let me run through the American shad sustainable fishery plan with the Florida Fish and Wildlife Conservation Commission for the St. John River. This plan was also first approved by the Board in 2011, and so this is the five-year update. This is strictly for recreational fishing in the St. John River. The 2011 plan used both recreational angler catch-per-unit effort information of 1993 to 2005, it also had a spawning-stock-biomass-abundance estimate they used, and thirdly they had a juvenile abundance index that was used in that fishery management plan.

They proposed in the update to include those data series with a few changes. The present fishery has no commercial harvest, strictly recreational. Pound nets and haul seines were prohibited in the St. John River, and gillnet were prohibited in all state waters in 1995. It is a hook and line recreational fishery only.

Anglers must possess a saltwater fishing license. There is a bag limit of ten *Alosa* species per person per day, and voluntary catch and release really is the common activity in this fishery. For stock monitoring they have the juvenile abundance index; it's a bow mounted push net. It's been conducted since 2007.

They sample biweekly, April through July between river kilometer 210 and 250, and in tidal and freshwater stretches between river kilometer 125 and 165, so there are two separate sections that they sample for juveniles. Then secondly they have a spawning stock relative index of abundance, its electrofishing survey. It has been conducted since 2003, and it provides a catch-per-unit-effort index, as well as biological samples of length, sex ratio, and age.

Here is the St. John River Complex. You can see there are two highlighted sections in dark blue, above and below this large lake where the

sampling occurs for juveniles. Here is where the electrofishing occurs in three river stretches. These are highlighted in blue, and they are separated by quite a large distance.

The creel survey was conducted from 1993 to 2005; it was a roving creel survey in a specific stretch from river kilometer 285 to 298. It was redone in 2011, and I do not believe it is ongoing presently. The two benchmarks are based on the juvenile index as well as the adult index. What they have is a benchmark value; it is based on the 25th percentile, and the management triggers if there are three consecutive years below this benchmark there will be a management response.

Here is a graph showing the juvenile abundance index with that benchmark as the hash line moving across. You can see most of these data points are above that. In recent years several data points are well above that mark, and this is an ongoing series that it will be one of the two benchmarks in the present update. The spawning stock CPUE benchmark, here is a graph depicting the same concept.

The benchmark is shown running across the graph. The data points for the most part are above that. There was discussion on high water impacts of this data series change in catchability; and there was discussion at the TC level of having Florida use a GLM to try to tease out some of these influences of flow, as well as catchability changes along the different locations where they're sampling.

These photos portray what they can find in the St. John River. They have years of extremely low water, where sampling is confined to a very relatively narrow river channel; and then other years at very high water they can have a very wide channel at which they could sample. It certainly can affect catchability in these surveys. The recreational fishery, here is the creel survey results. I think I was mistaken. You can see that it does continue after 2011, so there was a gap

after 2005 to 2010, and it has been resumed, and Florida does seem to want to commit to keeping this series going.

This was reviewed also in March, and the TC again discussed the possibility of looking at it using a GLM to try to gain more information to standardize the data, and to see if we can get at some of these questions on flow influences on catchability in the data series. Florida was interested in exploring that for the next update.

The similar theme came up about having benchmark responses, but without detail as to what those management responses would be. The TC was interested in seeing greater detail and specificity to what would happen if the benchmarks were exceeded. The TC went on to recommend that the Board approve the sustainable fishery management plan with consideration for the improvements discussed in Items 1 and 2 on this slide.

CHAIRMAN CLARK: Any questions about the Florida SFMP? Seeing none; oh, I'm sorry, Rob O'Reilly.

MR. O'REILLY: I guess I was just curious about the push net sampling; because that occurred in some Virginia rivers. Is that a nighttime sampling?

MR. CHASE: It typically is. In this case I don't think I have that information if it is or not, so I would have to ask Florida if it is in fact nighttime sampling.

MR. CLARK: Jim, do you want to answer that?

MR. JIM ESTES: Yes, it typically is.

MR. CLARK: Any further questions? Seeing none; would somebody like to put forth a motion to approve these plans? Mr. Estes.

**MR. ESTES: I move to approve South Carolina's sustainable fishery management**

**plan for river herring and the Florida sustainable fishery management plan for shad; inclusive of TC recommendations.**

MR. CLARK: We have a second by Dr. Rhodes. Let's wait until we have the modified motion up there. The motion is to move to approve the South Carolina sustainable fishery management plan for river herring, and the Florida sustainable fishery management plan for shad; inclusive of the Technical Committee recommendations. Do we have any discussion on this motion? Rob O'Reilly.

MR. O'REILLY: Given Mike Armstrong's comments earlier. Can we see what the second item was for South Carolina that was coming from the Technical Committee, and make sure it's a recommendation?

CHAIRMAN CLARK: Can we get that back up? Do you want to amend the motion, Rob?

MR. O'REILLY: No that's fine; I just needed to see that again. Thank you.

**CHAIRMAN CLARK: Any further discussion of the motion? Seeing none; are there any objections to the motion? Seeing none; the motion is approved by unanimous consent and that concludes Item Number 6.**

#### **REVIEW OF THE FMP REVIEW AND STATE COMPLIANCE REPORTS FOR 2017**

CHAIRMAN CLARK: And we move on to Item 7, and Kirby will be giving us a review of the FMP review and state compliance reports for 2017. This is also an action item.

MR. KIRBY ROOTES-MURDY: I'm subbing back in on shad and river herring and trying to get up to speed as much as possible; so please bear with me as I go through the fishery management plan review. We have landings information here. As you all are aware there has been a steady increase in landings over

time; in part due to the moratoria implemented through Amendments 2 and 3.

States with shad commercial landings are New Jersey, Virginia, North Carolina, South Carolina and Georgia and states with river herring commercial landings are Maine, New Hampshire, New York, Maryland, North Carolina and South Carolina. In 2015 a total of 478,688 pounds of American shad were landed; which was about a 38 percent decrease from 2014 levels.

In 2015 about two million pounds of river herring were landed, which is a 9 percent increase from 2014 levels, and 153,000 pounds of hickory shad were landed, which is an approximate 29 percent increase from 2014 levels. States with the largest shares of shad landing are North Carolina and South Carolina, and the state with the largest share of river herring landings is Maine.

Moving on to river herring passage counts, Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, Pennsylvania, Maryland and South Carolina all have projects in place. Coastwide 3.82 million river herring passed through and were counted this year. Coastwide total of 611,000 American shad were counted as having passed through.

In terms of how these fare relative to 2014 numbers, it is about a 26 percent increase for river herring, and it's about a 43 percent increase for shad. There are also coastwide stocking projects occurring in Maine, Massachusetts, Rhode Island, Pennsylvania, Maryland, the District of Columbia, Virginia, North Carolina and South Carolina.

In total 21 million hatcheries Alosine were reintroduced in 2015. River herring is stocked in lakes and river basins in Maine, but they are wild caught, so they are not hatchery raised; and that's why we don't have any specific information included in the FMP review on that.

Brad went through earlier the sustainable fishery management plans that this board has reviewed at the beginning of the year.

I wanted to give you all just kind of an outline of what to expect for the annual meeting. Today this Board approved the South Carolina river herring and the Florida shad SFMPs. There will be a number of SFMPs that the Technical Committee is going to need to review over the next month or so.

I know that Ashton had sent out before a request for states to submit that information by August 30, and I would request that you try to do that sooner if possible, because as you can see we have five that the TC is going to need to review and provide recommendations to the Board on at the ASMFC annual meeting. Another component of the FMP review is reporting out sturgeon interactions. In 2015, 196 interactions were reported, 176 of those were Atlantic sturgeon, and 20 were short-nosed sturgeon. These took place in Rhode Island, Connecticut, New Jersey, Virginia, North Carolina, South Carolina and Georgia.

All were released alive with the exception of 15 fatalities that took place in North Carolina. Last, there were de minimis requests from the states of Maine, New Hampshire, Massachusetts, and Florida for American shad and for New Hampshire and Florida regarding river herring; and all these states meet the requirements for de minimis. With that I will take any questions.

CHAIRMAN CLARK: Thanks, Kirby. Do we have any questions for Kirby? Lynn Fegley.

MS. LYNN FEGLEY: Just a couple things for the record. I just wanted to correct that the state of Maryland is closed for the commercial harvest of river herring. I think that might have been PRFC, and also I do not believe that we're doing any run counts in the state of Maryland; so just for the record.

CHAIRMAN CLARK: Thanks, Lynn, also Delaware does have a shad stocking program. Are there any other questions or comments on the FMP review? Seeing none; do we have a motion, or do we need a motion for this? Okay, we have a motion, Mike Armstrong.

**MR. ARMSTRONG: Move to approve the 2016 FMP Review of the 2015 fishing year, and approve de minimis requests from Maine, New Hampshire, Massachusetts, and Florida for shad, and de minimis requests for New Hampshire and Florida for river herring.**

CHAIRMAN CLARK: Do we have a second? Cheri Patterson. Okay, do we have any discussion of this motion? Seeing none; do we have any objection to the motion? Seeing none; let me read it into the record. It is move to approve the 2016 RMP Review of the 2015 fishing year, and approve de minimis requests for Maine, New Hampshire, Massachusetts, and Florida for shad, and de minimis requests for New Hampshire and Florida for river herring.

**Motion by Mr. Armstrong, second by Ms. Patterson, and seeing no objections the motion is passed by unanimous consent.**

#### **ADJOURNMENT**

CHAIRMAN CLARK: Okay that brings us up to Item Number 8, Other Business. Is there any other business to come before this Board? Seeing none; we are adjourned, and we finished an hour early, so Eel will be starting before ten o'clock, so don't go too far. Thank you.

(Whereupon the meeting was adjourned at 9:00 o'clock a.m. on August 2, 2017.)

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# Atlantic States Marine Fisheries Commission

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## MEMORANDUM

**TO:** Shad and River Herring Management Board  
**FROM:** Caitlin Starks, FMP Coordinator  
**DATE:** September 27, 2017  
**SUBJECT:** Summary of Shad and River Herring Advisory Panel Conference Call

This memorandum summarizes the topics and discussions during the Shad and River Herring Advisory Panel (AP) call on Wednesday, September 27th 2017 at 9:00 am. The meeting took place via conference call and webinar and provided the AP to review and discuss several items including the recent 2017 stock assessment update for river herring, NOAA's status review for river herring to consider ESA listing, continued state efforts in alosine monitoring and restoration, and updated sustainable fishery management plans (SFMPs) that will be reviewed by the Board at the annual meeting.

**AP Members in attendance:** Pam Lyons Gromen (Chair), Byron Young, Allison Bowden, Jeff Kaelin

**ASMFC Staff:** Caitlin Starks, Kirby Rootes-Murdy

**Public:** Erika Fuller (Earthjustice), Ansley Samson (NRDC), Shaun Gehan

### 1) Review the 2017 River Herring Assessment Update

An overview of the 2017 River Herring Assessment Update was presented by Jeff Kipp. The presentation included background information, updated trends, and concluding thoughts. The following key points that were highlighted:

- The update used a trend analysis approach incorporating data through 2015
- 26% of 57 total rivers systems had sufficient data to use in the analysis
- There was high variability in trends across the Atlantic coast
- River specific abundance showed 16 increasing trends, 2 decreasing, 8 with no significant trend and 18 without sufficient data
- The increasing trends seem to be more prevalent in the Northeast, with more variability in the mid and south Atlantic.

Questions were raised regarding the absence of known Hudson River data sets from the assessment update, the method by which abundance trends were determined, the reason behind changes in the sex composition of repeat spawners, and whether the long-term coast wide trends in length composition and length at age are cause for concern. Given that many of the data sets come from runs in the Northeast, does this potentially mask problems in Mid and South Atlantic runs when reporting trends on a coast wide basis? Climate change studies regarding changes in fish distribution have concluded that the center of biomass for many east coast fish stocks is shifting north. How or does this affect river herring abundance trends?

The AP members commented on the data limitations of the update, and while recognizing that the update was constrained to using data sets included in the benchmark assessment, see the potential to incorporate new data in future assessments and the upcoming NOAA status review for river herring. The group also discussed the challenge of gathering more information given that moratoria resulted in the loss of much fishery dependent data.

## **2) Update on NOAA's status review of river herring**

ASMFC Staff provided a brief overview of the process and timeline of the NOAA status review to consider ESA listing for river herring, including the following points:

- NOAA announced the status review for alewife and blueback herring in a federal register notice on August 15, 2017
- At that time, NOAA opened a 60-day public comment period to solicit information to support our status review. The information solicitation period ends on October 16, 2017.
- NOAA plans to use the recent ASMFC Alewife and Blueback Herring Stock Assessment Update from August 2017 as part of the status review.
- Timeline:
  - Status Review- present to early 2018
  - Extinction Risk Assessment- Spring 2018
  - Peer Review of Status Review and Extinction Risk Assessment- Summer 2018
  - Listing Determination- published by January 31, 2019

The AP was in agreement that the usefulness of the stock assessment update for the status review was limited since a number of research studies and data sets were excluded from the update because they did not fit within the original framework of the last benchmark assessment. The group mentioned a number of initiatives they hoped would be part of the status review, including portside and electronic monitoring of at-sea catch, the Northeast Fisheries Science Center Climate Vulnerability Assessment and research stemming from the Technical Expert Working Group and the River Herring Conservation Plan. –

The AP members asked if the River Herring Technical Expert Working Group (TEWG) will be submitting information for the review. Allison Bowden, who is a TEWG member, commented that much of the research that has been done by the TEWG has been directed at this status review, and is submitted to NOAA. Independent research will also be submitted by various other members.

Pam Lyons Gromen commented that it seems there is still a lot of uncertainty about at-sea catch of river herring and how this impacts the stocks given very low levels of observer coverage in federal mid-water trawl fisheries for herring and mackerel in recent years; this should be considered in the review as well. Jeff Kaelin and Alison added that data from portside and electronic monitoring studies are currently not considered in incidental catch analyses reported to managers and that these studies should not be overlooked for the status review.

The AP agrees it would be good for ASMFC to encourage TC members to submit data pertaining to shad and river herring to NOAA for the status review. The ASMFC should keep an inventory of information that TC members contribute.

### **3) Discussion on recent observations and experiences with state river herring & shad runs and restoration efforts**

Byron Young updated the AP on the voluntary program in Long Island, coordinated and supported by the Seatuck Environmental Association in Islip, which looks for remnant river herring runs in small coastal streams. This has been an ongoing program for almost a decade. The program has identified 26 streams around Long Island and New York City that support some alewife runs, and these runs could be improved through dam removal or implementing fish passages. 17 fish passage efforts have been completed so far. Where larger runs are occurring, spawning fish are moved upstream.

Brad Schondelmeier was on the agenda to give a presentation on the Portside Sampling Program in Massachusetts, but was unable to attend the call. His presentation will be shared with the AP.

### **4) Discuss Shad SFMPs up for approval**

ASMFC Staff gave a short overview of the Sustainable Fishery Management plans for American Shad that the board will review for approval in October 2017. Connecticut, the Potomac River Fisheries Commission, North Carolina, South Carolina, and Georgia have all submitted updated SFMPs for approval. Virginia has submitted a proposal for a limited bycatch allowance.

The TC has reviewed all of these plans except for South Carolina and Georgia, which they will review in an upcoming call. There is a concern that a few plans include several rivers for which there is no monitoring but recreational fisheries are permitted to occur. The recreational fisheries are believed to be insignificant, but there are no data to support this claim in the SFMPs. The AP agrees that all rivers with any directed fishery for shad or river herring should have required monitoring to verify that significant harvest is not occurring or that harvest meets the IFMP criteria for sustainability. More information on the type of recreational fishing that is occurring on these rivers (e.g. type of gear or size of tackle) could be beneficial to understand whether shad and river herring would be caught in the fishery.

### **5) Future meeting schedule and goals**

The AP discussed a timeline for meeting, and agreed that the group would benefit from meeting at least once per year. September or October is a good time to meet because the AP will be able to receive new information through compliance reports and the FMP review and provide any comments to the Board for the annual meeting. The AP would like to be brought into any discussions on important changes in the fishery, and notified of upcoming Board meetings. The AP noted the low turnout and response to the webinar invitation and is hopeful that more regular communication will reinvigorate AP membership.



MARYLAND - VIRGINIA  
*"Potomac River Compact of 1958"*

**Potomac River Fisheries Commission**

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**Potomac River Fisheries Commission's  
American Shad  
Sustainable Fishery Management Plan**

Submitted to the  
Atlantic States Marine Fisheries Commission

August 11, 2017

## **1. Sustainable Fishery Plan**

In accordance with the guidelines provided in Amendment 3 to the Interstate Fishery Management Plan (IFMP) for Shad and River Herring, the Potomac River Fisheries Commission (PRFC) submits the following American Shad Sustainable Fishery Plan.

### **1a. Request for Fishery**

The PRFC requests that the Shad and River Herring Management Board consider this request to continue a limited commercial by-catch allowance of American shad in the portion of the Potomac River under PRFC jurisdiction (Figure 1). Accordingly, the PRFC justifies this request based on the fact that the Board accepted the 2007 Shad Stock Assessment which established a benchmark goal for American shad recovery in the Potomac River and required the PRFC to continue monitoring the pound net fishery's by-catch allowance of American shad, including discards. The Stock Assessment stated "to continue stock rebuilding, there should be no new expansion of the fishery until the benchmark is reached". The benchmark goal identified in the 2007 Stock Assessment was approved as a restoration target and has been exceeded each year since 2011 (Figure 2).

### **1b. Definition of Sustainability**

Amendment 3 to the IFMP for Shad and River Herring defines a sustainable fishery as one that will not diminish potential future stock reproduction and recruitment. The PRFC proposes to continue with the mandatory daily harvest reporting program with the fishermen on the Potomac River, in which they record daily harvest, effort and discard data. The continuation of this data collection enhances the long term data set that the PRFC maintains, updates and utilizes to monitor the progress of the American shad stock rebuilding and recovery in the Potomac River. The long-term American shad juvenile abundance index (JAI) for the Potomac River is provided by Maryland Department of Natural Resources (MD DNR) and will continue on an annual basis (Figure 3).

### **1c. Summary of current stock status**

The Potomac River has been closed to the commercial and recreational directed harvest of American shad since March 1, 1982. The only allowable commercial harvest since then has been via a pound net by-catch provision that allowed up to two percent by volume of the total catch in possession to be American shad. Starting in 1996, the pound net by-catch provision was further limited to two percent by volume, but could not exceed one bushel per day per licensee. In 2004, a one-bushel limit of American shad by-catch for the gill net fishery was approved by the ASMFC Shad and River Herring Technical Committee and Board, and established by the PRFC. In 2012, ASMFC approval was obtained to increase the by-catch limits from one bushel to two bushels per day per licensee for pound nets and gill nets. Currently in the Potomac River, all directed commercial, recreational and charter boat fisheries for American shad remain closed.

### **1d. Benchmark goals and objectives or restoration goals/targets**

In the 2007 ASMFC Shad Stock Assessment, a benchmark for American shad in the Potomac River was defined as the geometric mean (GM) CPUE of pound net landings reported in Walburg and Sykes (1957) for the years 1944 to 1952, or 31.1 pounds per net-day. It was concluded in the assessment that among Chesapeake Bay stocks of American shad, the Potomac River

population showed the most promising signs of recovery. The gill net index, the pound net index, and the JAI depicted strongly increasing trends in relative abundance. To continue stock rebuilding in the Potomac River, it was recommended that there should be no new expansion of the fishery until the benchmark goal is reached, and that this requires continued monitoring of the pound net fishery, including discards.

The ASMFC Shad and River Herring Management Board accepted the 2007 Shad Stock Assessment Report, which included the Potomac River benchmark. This benchmark goal of 31.1 became the restoration target for the Potomac River and was approved by the ASMFC Shad and River Herring Technical Committee. The GM was calculated for CPUEs of total pound net data (catch + discards) and the GM exceeded the benchmark goal and restoration target in 2011 with a value of 32.0 pounds per net-day (Figure 2). The GM has increased every year since 2002, so achieving the target in 2011 was not unexpected; however, we have continued to exceed the restoration target each year. The PRFC has reported this information in their annual compliance report.

### **1e. Proposed time frame for achievement**

The benchmark goal identified in the 2007 Stock Assessment and approved as a restoration target was first exceeded in 2011, and continues to be exceeded each following year.

### **1f. Discussion of management measure(s) to be taken if sustainable target is not achieved within indicated timeframe**

The restoration target in the Potomac River was achieved in 2011, and continues to be exceeded during each of the following years. The PRFC will continue monitoring the total pound net CPUE data as well as the MD DNR survey data.

If the GM for CPUEs of the total pound net data (catch + discards) drops below the restoration target for three consecutive years, then the PRFC will consider potential restrictions including: reducing or eliminating the two bushel by-catch allowance for pound nets and gill nets; and limiting or restricting the take of broodstock / egg collections by other agencies for shad restoration projects.

## **2. Stock Monitoring Programs**

### **2a. Fishery Independent**

American shad have been taken from the Potomac River as brood stock for hatchery production by several agencies under special collection permits issued by the PRFC since 1995. The Interstate Commission on the Potomac River Basin (ICPRB), participated in the Potomac Restoration Stocking Program for American shad from 1995 – 2002, at which time recovery was considered sufficient for natural reproduction. In 2003, restoration stocking of the Rappahannock River started using Potomac River origin eggs through a partnership between ICPRB, the Virginia Department of Game and Inland Fisheries (VDGIF), and the U. S. Fish & Wildlife Service (USFWS) Harrison Lake National Fish Hatchery. Stocking of the Potomac River continues, but now as “replacement stocking” to account for the Potomac shad sacrificed for another river system. Since 1995, the ICPRB has released over 22 million fry into the Potomac. ICPRB continues to collect some American shad each year from the Potomac River for their schools and educational components, and incorporates significant public involvement into this project with a “Schools-in-Schools” partnership. In 2017, volunteers helped over 1,300 students from 28

Washington metropolitan area schools hatch shad in their classrooms and stock them in the Potomac and Anacostia Rivers. The students' efforts to help replenish American shad populations are notable, but more important is the link between students, volunteers, the river, watermen, biologists and our shared fishery heritage.

The Maryland Department of Natural Resources (MD DNR) (since 2001), VDGIF (2003 – 2009, and 2017), the USFWS (since 2004) and the District of Columbia's Fisheries and Wildlife Division of the Department of Energy and Environment (DOEE) (since 2005) have all collected American shad for brood stock under special collection permits issued by this Commission. The PRFC's Scientific Collection Permits require data reports, and scale/otolith samples of ten percent of the "kept" American shad for analysis, together with their length, weight and sex. In addition, ten to fifteen percent of all shad fry resulting from the use of this permit are to be restocked in the Potomac River as close to the capture site as is feasible.

The MD DNR began replacement stocking in 2007, and has released about 1.4 million fry into the Anacostia River, a tributary of the Potomac River in Washington D.C. and 1.2 million fry into the Potomac River. The DOEE has released approximately 8.6 million fry into the Anacostia River. The VDGIF reported a total of 4.6 million fry stocked in the Potomac, and the USFWS reported 902,000 fry stocked in the Potomac River as mitigation for egg collections. In addition, the USFWS released approximately 2.2 million viable eggs back into the Potomac River for mitigation. The Potomac River has been the egg source for all of Maryland's shad restoration projects, Virginia's shad restoration program in the Rappahannock River, as well as the Susquehanna River (MD/PA) and some of Delaware's rivers since 2002.

#### **i. Juvenile abundance indices**

Maryland is required to provide an American shad juvenile index for the Potomac River and several other river systems throughout its portion of the Chesapeake Bay. The annual juvenile abundance survey has been conducted since 1954, with American shad data collected from 1959 to present. Fixed stations and some auxiliary stations are used each year for a beach haul seine survey in which the juveniles of all species encountered are identified and recorded. The American shad juvenile index for the Potomac River is derived from the Maryland DNR state wide annual young of the year survey as geometric mean CPUEs (Figure 3). The 2016 value of 3.84 was significantly lower than the 2015 value of 19.81, which was a record high value. <http://www.dnr.state.md.us/fisheries/juvinde/index.html>

#### **ii. Adult stock monitoring**

Durell and Weedon (2015) report that Maryland DNR has conducted a Striped Bass Spawning Stock Survey since 1985, using multi-panel drift gill nets in the Potomac River. Since 1997, adult American shad that were incidentally caught were processed to obtain length, sex and age (scale samples) and repeat spawning determination (Figure 4).

### **2b. Fishery Dependent**

#### **i. Commercial Fishery**

The non-directed Potomac River pound net by-catch harvest in 2016 consisted of 1,145 pounds of American shad (Table 1). The PRFC's mandatory commercial daily harvest reporting system is the source of these data, collecting harvest as well as discards or released fish. The 2016 discards/released by-catch of American shad in excess of the daily landing limit from pound nets was 3,500 pounds. The 2016 pound net harvest data was combined with the 2016 pound net discard data to identify the total CPUE. There were 4 pounds of American shad reported as

harvested by gill nets and 2 pounds of gill net discards in 2016.

Pound net effort is expressed as “pound net fishing day” which is one net fished one time. During 2016, one hundred pound nets were licensed in the Potomac River; however only a few of them were set during the early spring months (the shad run). The pound net fishery is a ‘limited entry’ fishery capped at 100 licenses (each net is licensed separately). Effort included 50 pound net fishing days for the American shad by-catch harvest.

**Regulation effective January 1, 2011** – all pound nets in the Potomac River must have at least six PRFC approved fish cull panels properly installed in each pound net to help release undersize fish. This regulation will have a beneficial impact on the release of river herring, but will not be effective in the release of adult shad. These fish cull panels were being used for by-catch reduction by some pound netters on a voluntary basis prior to 2011; they are now mandatory.

## **ii. Recreational Fishery**

The Potomac River, under PRFC jurisdiction, recreational and charter boat fisheries for American shad remained closed in 2016. The American shad fishery has been closed since 1982 in this portion of the Potomac River. We are unaware of any historical or current recreational activity within the PRFC’s jurisdiction. A historical recreational fishery existed in the D.C. portion of the Potomac River, but that fishery is now closed.

## **Literature Cited**

Durell, E. Q. and C. Weedon. 2015. Striped Bass Seine Survey Juvenile Index Web Page. <http://dnr2.maryland.gov/fisheries/Pages/juvenile-index.aspx>. Maryland Department of Natural Resources, Fisheries Service.

Walburg, C. H. and J. E. Sykes. 1957. Shad fishery of Chesapeake Bay with special emphasis on the fishery of Virginia. U.S. Fish Wildlife Service, Research Report 48, 26 p.

**Figure 1.** Potomac River – PRFC jurisdiction is the main stem of the Potomac River downstream of Washington, DC

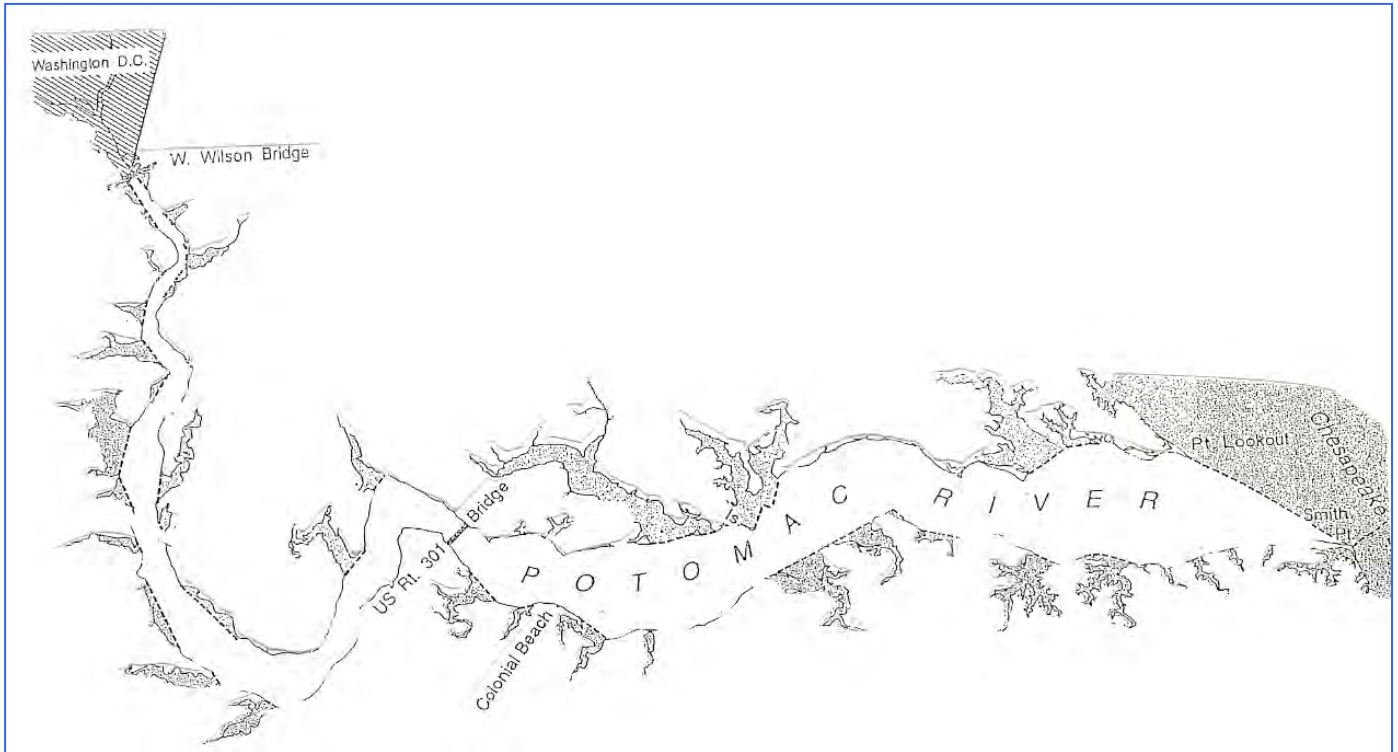
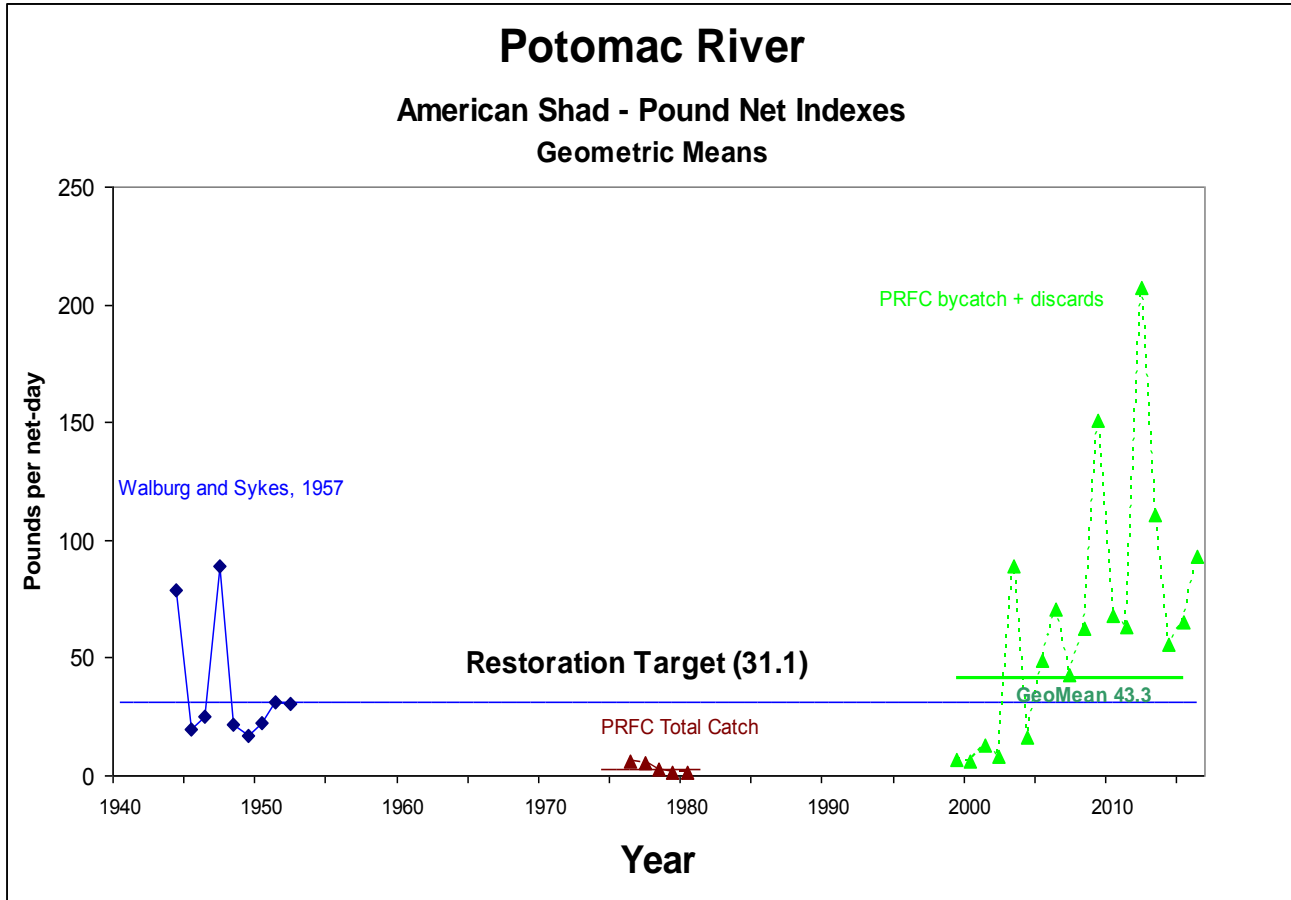


Figure 2

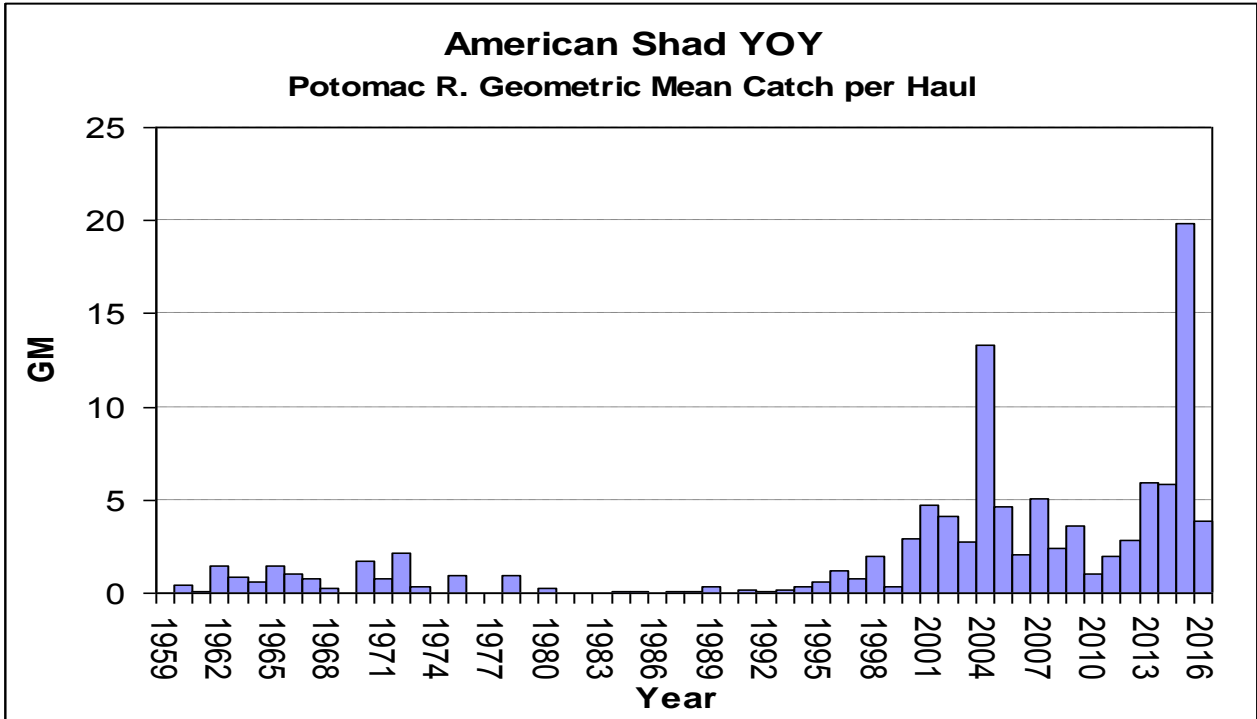


Source: PRFC

Geometric Mean (GM) of Pound Net CPUE Data												
Time Series	1944-1952	1976-1980	1999-2002	1999-2003	1999-2004	1999-2005	1999-2006	1999-2007	1999-2008	1999-2009	1999-2010	1999-2011
GM	31.1	3.0	8.1	13.1	13.6	16.3	19.6	21.3	23.8	28.1	30.2	32.0

Geometric Mean (GM) of Pound Net CPUE Data												
Time Series	1999-2012	1999-2013	1999-2014	1999-2015	1999-2016							
GM	36.6	39.4	40.3	41.4	43.3							

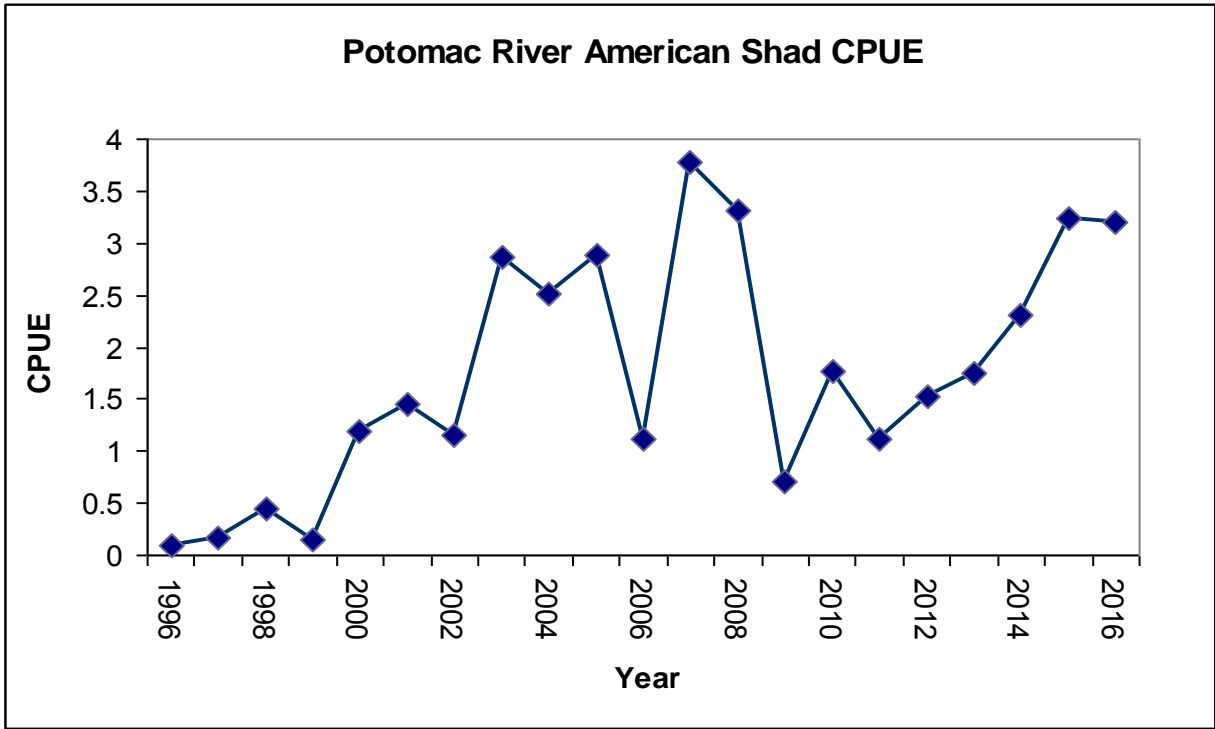
Figure 3



Source: <http://dnr2.maryland.gov/fisheries/Pages/striped-bass/juvenile-index.aspx>

Figure 4





Effort corrected catch of American shad on the Potomac River during the MD DNR striped bass spawning stock survey. CPUE is standardized as the number of fish caught per 1000 square yards of drift gill net per hour. Source: MD DNR

Table 1 POTOMAC RIVER FISHERIES COMMISSION  
 AMERICAN SHAD  
 Commercial Harvest (pounds) and Discard (pounds)

Year	HARVEST					DISCARD						PN CPUE C+D	
	Pound Net				Gill Net	Pound Net		Gill Net		Other Gear			Total
	Roe	Buck	Total	Net-days	Total	Roe	Buck	Roe	Buck	Roe	Buck		
-													
1988	766	1,128	1,894	2,021									
1989	543	525	1,068	1,574									
1990	1,299	983	2,282	1,361									
1991	1,062	856	1,918	1,208									
1992	939	526	1,465	703									
1993	1,480	1,447	2,927	611									
1994	677	628	1,305	758									
1995	1,458	1,180	2,638	743									
1996	1,357	935	2,292	553									
1997	2,773	2,310	5,083	737									
1998	1,680	571	2,251	335									
1999	1,049	917	1,966	388		376	213	14	10			613	6.59
2000	897	611	1,508	258		28	56	55				139	6.17
2001	3,347	1,492	4,839	433		800	56	53		25		934	13.15
2002	1,727	1,035	2,762	348			59	25	2			86	8.11
2003	6,971	1,170	8,141	547		22,790	17,566	9,393	670	204	73	50,696	88.66
2004	4,408	643	5,051	493	293	1,800	1,100	1,053	54			4,007	16.13
2005	5,255	764	6,019	493	801	15,171	3,008	170	0			18,349	49.08
2006	3,847	409	4,256	260	413	10,178	4,000	17	4			14,199	70.90
2007	5,662	942	6,604	388	2,310	8,622	1,323	90		4		10,039	42.65
2008	6,310	505	6,815	274	160	8,282	2,000					10,282	62.40
2009	4,402	603	5,005	197	209	19,150	5,500			2		24,652	150.53
2010	3,790	95	3,885	117	31	3,907	131					4,038	67.72
2011	2,167	252	2,419	77	0	2,015	450					2,465	63.43
2012	2,478	1,641	4,119	177	623	21,515	11,040			4		32,559	207.20
2013	2,943	853	3,796	110	3	4,150	4,250	3				8,403	110.87
2014	2,822	1,181	4,003	80	10	320	106	13		24	10	473	55.95
2015	1,135	754	1,889	58	12	1,700	200			86	3	1,989	65.12
2016	556	589	1,145	50	4	3,500		2				3,500	92.90

Source: PRFC

Table 2. USFWS - Summary of American Shad collected and Eggs Produced from the Potomac River

	2004	2005	2006*	2007*	2008*	2009*	2010*	2011*	2012*	2013*	2014*	2015*	2016*	Totals
# Females Caught			673	1,110	1,291	451	1,569	1,021	1,611	1,732	2,277	2,456	1,637	15,828
# Males Caught			117	272	284	510	1,196	404	475	266	758	284	331	4,897
Ripe Females	50			515	501	451	955	368	712	539	1090	793	702	6,676
Ripe Males	39			271	284	510								1,104
# Shad Released	125		395	596	790	787	614	652	899	1,193	1,187	1,663	935	9,836
Total Shad Kept	89		382	786	785	771	2,151	772	1,187	805	1,848	1,077	1,033	11,686
Total Shad Caught	214	296	777	1,382	1,575	1,558	2,765	1,425	2,086	1,998	3,035	2,740	1,968	21,819
Avg. CPUE (shad/hr/ft <sup>2</sup> )			0.001	0.002										
Volume(L) of Eggs			99.3	183.9	194.4	132.2	375.0	137.4	258.0	118.1	316.7	170.5	165.6	2,151
# of Eggs			4,511,426	7,488,716	8,503,709	6,380,784	17,843,432	6,216,484	11,183,457	7,512,761	14,407,614	8,850,523	8,385,914	101,284,820
Viable Eggs			2,003,222	2,875,455	3,491,069	1,885,500	6,874,612	2,714,435	5,664,920	1,603,498	5,671,992	2,044,013	2,138,510	36,967,226
Viability (%)			44%	42%	41%	30%	39%	44%	51%	21%	39%	23%	25%	
# Fry stocked				259,119	188,739		365,000	90,000						902,858
Viable Eggs stocked									670,292	277,864	555,650	298,476	155,125	1,957,407

\* Scales & otoliths taken on 5% of fish

<b>American Shad Age, Length, and Weight Potomac River - 2015 (USFWS)</b>					
Year Class	2008	2009	2010	2011	Total
Age	7	6	5	4	
<b>Males</b>					
Number	4	2	4	0	10
% by year class	40%	20%	40%	0%	
Av. TL (mm)	489	484	475		
Av. Wt. (kg)	1.02	0.94	0.96		
<b>Females</b>					
Number	5	17	16	2	40
% by year class	12%	42%	40%	5%	
Av. TL (mm)	512	499	495	470	
Av. Wt. (kg)	1.43	1.27	1.20	0.98	
<b>Sexes Combined</b>					
Number	9	19	20	2	50
% by year class	18%	38%	40%	4%	
Av. TL (mm)	502	497	494	470	
Av. Wt. (kg)	1.25	1.24	1.15	0.98	

<b>American Shad Age, Length, and Weight Potomac River - 2014 (USFWS)</b>					
Year Class	2007	2008	2009	2010	Total
Age	7	6	5	4	
<b>Males</b>					
Number	7	21	12	1	41
% by year class	17%	51%	29%	2%	
Av. TL (mm)	490	482	404	478	
Av. Wt. (kg)	1.04	1.02	0.97	0.85	
<b>Females</b>					
Number	11	18	12		41
% by year class	27%	44%	29%		
Av. TL (mm)	519	516	502		
Av. Wt. (kg)	1.21	1.26	1.24		
<b>Sexes Combined</b>					
Number	18	39	24	1	82
% by year class	22%	48%	29%	1%	
Av. TL (mm)	508	498	453	478	
Av. Wt. (kg)	1.14	1.13	1.10	0.85	

**American Shad Age, Length, and Weight  
Potomac River - 2016 (USFWS)**

<b>Year Class</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>Total</b>
<b>Age</b>	<b>8</b>	<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	
<b>Males</b>						
Number		1	1	2	1	5
% by year class		20%	20%	40%	20%	
Av. TL (mm)		514	479	462	382	
Av. Wt. (kg)		1.04	0.88	0.52	0.46	
<b>Females</b>						
Number	1	5	11	17	1	35
% by year class	2.8%	14.3%	31.4%	48.6%	2.8%	
Av. TL (mm)	540	532	507	451	470	
Av. Wt. (kg)	1.34	1.23	1.18	1.02	0.96	
<b>Sexes Combined</b>						
Number	1	6	12	19	2	40
% by year class	2.5%	15%	30%	47.5%	5%	
Av. TL (mm)	540	529	505	452	426	
Av. Wt. (kg)	1.34	1.20	1.15	0.97	0.71	

Table 3. MD DNR AMERICAN SHAD MITIGATION REPORT - POTOMAC RIVER

<b>Species</b>	<b>Year</b>	<b>Date</b>	<b>River</b>	<b>Stocking site</b>	<b>Number</b>	<b>Cultured By:</b>	<b>Stocked For:</b>
American Shad	2007	5/15/07	Potomac	Anacotia	200,000	DC Fisheries	MD DNR mitigation
American Shad	2008	4/24/08	Potomac	Anacotia	170,000	DC Fisheries	MD DNR mitigation
American Shad	2008	5/12/08	Potomac	Anacotia	30,000	DC Fisheries	MD DNR mitigation
American Shad	2009	5/6/09	Potomac	Anacotia	200,000	DC Fisheries	MD DNR mitigation
American Shad	2010	n/a	Potomac	Anacotia	400,000	DC Fisheries	MD DNR mitigation
American Shad	2011		Potomac	Marshal Hall	263,000	MD DNR	MD DNR mitigation
American Shad	2012	4/16/12	Potomac	Marshal Hall	165,000	MD DNR	MD DNR mitigation
American Shad	2012	4/5/12	Potomac	Anacostia	200,000	DC Fisheries	MD DNR mitigation
American Shad	2013	5/1/13	Potomac	Anacostia	200,000	DC Fisheries	MD DNR mitigation
American Shad	2013	4/29/13	Potomac	Marshall Hall	3,000	MD DNR	MD DNR mitigation
American Shad	2013	5/10/13	Potomac	Marshall Hall	220,000	MD DNR	MD DNR mitigation
American Shad	2013	5/21/13	Potomac	Marshall Hall	57,400	MD DNR	MD DNR mitigation
American Shad	2014	4/14/14	Potomac	Marshall Hall	10,300	MD DNR	MD DNR mitigation
American Shad	2014	4/16/14	Potomac	Marshall Hall	20,700	MD DNR	MD DNR mitigation
American Shad	2014	4/23/14	Potomac	Marshall Hall	10,300	MD DNR	MD DNR mitigation
American Shad	2014	5/8/14	Potomac	Marshall Hall	31,000	MD DNR	MD DNR mitigation
American Shad	2014	5/16/14	Potomac	Marshall Hall	20,700	MD DNR	MD DNR mitigation
American Shad	2014	4/29/14	Potomac	Marshall Hall	166,000	DC Fisheries	MD DNR mitigation
American Shad	2015	4/24/15	Potomac	Marshall Hall	10,800	MD DNR	MD DNR mitigation
American Shad	2015	5/7/15	Potomac	Marshall Hall	172,700	MD DNR	MD DNR mitigation
American Shad	2016	4/13/16	Potomac	Marshall Hall	30,800	MD DNR	MD DNR mitigation
American Shad	2016	4/26/16	Potomac	Marshall Hall	30,800	MD DNR	MD DNR mitigation
					<u>2,612,500</u>		

Table 4. Summary of American Shad Collected from the Potomac River by MD DNR and Eggs Obtained

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
# Ripe Females	298	568	458	231	561	472	567	401	425	599
# Green Females		205	351	276	446	314	438	405	277	288
# Spent Females		147	60	183	192	98	178	141	144	150
# Males	143	1083	490	286	385	223	213	476	467	604
Total Shad	441	2,003	1,359	976	1,584	1,107	1,396	1,423	1,313	1,641
Liters of Eggs	101.8	309.6	222.6	137.5	246.0	249.0	294.7	213.5	205.5	299.0
Total # of Eggs	3,906,375	11,501,975	8,337,225	5,742,950	9,514,400	9,350,900	10,222,090	7,918,150	7,557,855	11,463,350
Total Fertile Eggs	1,687,629	5,898,446	3,260,799	3,268,708	4,466,611	3,207,860	3,508,795	3,921,239	4,554,483	7,882,600
# Re-stocked Fry							200,000	200,000	200,000	400,000

Table 4. Continued Summary of American Shad Collected from the Potomac River by MD DNR and Eggs Obtained

	2011	2012	2013	2014	2015	2016	Totals
# Ripe Females	304	1,828	1,168	579	569	947	9,975
# Green Females	355	1,744	1,199	1,065	1,482	907	9,752
# Spent Females	80	223	146	34	126	152	2,054
# Males	417	1,250	354	1,543	585	340	8,859
Total Shad	1,156	5,045	2,867	3,221	2,762	2,346	30,640
Liters of Eggs	168.5	619.5	441	180	174		3,862
Total # of Eggs	5,957,600	25,540,150	15,834,815	6,564,000	7,126,200		
Total Fertile Eggs	3,964,097	11,294,187	8,306,826	3,346,406	3,199,264		
# Re-stocked Fry	263,000	365,000	480,400	259,000	183,500	61,600	2,612,500

**American Shad Age, Length, and Weight  
Potomac River - 2016 (MD DNR)**

Year Class Age	2007	2008	2009	2010	2011	2012	Total
	9	8	7	6	5	4	
<b>Males</b>							
Number			4	9	14	3	30
% by year class			13%	30%	47%	10%	100%
Av. TL (mm)			502	497	463	420	
Av. Wt. (kg)			1.01	0.98	0.84	0.64	
<b>Females</b>							
Number	1	4	7	59	18	1	90
% by year class	1%	4%	8%	66%	20%	1%	100%
Av. TL (mm)	535	535	523	502	477	455	
Av. Wt. (kg)	1.42	1.43	1.13	1.09	1.02	0.79	
<b>Sexes Combined</b>							
Number	1	5	11	68	32	4	120
% by year class	0.8%	4%	9%	57%	27%	3%	100%
Av. TL (mm)	535	535	516	501	470	429	
Av. Wt. (kg)	1.42	1.43	1.09	1.07	0.94	0.68	

**American Shad Age, Length, and Weight  
Potomac River - 2015 (MD DNR)**

Year Class Age	2007	2008	2009	2010	2011	2012	Total
	8	7	6	5	4	3	
<b>Males</b>							
Number	4	9	30	28	8		79
% by year class	5%	11%	38%	35%	10%		100%
Av. TL (mm)	479	485	479	477	476		
Av. Wt. (kg)	1.19	1.13	1.13	1.12	1.13		
<b>Females</b>							
Number			7	22	11	2	42
% by year class			17%	52%	26%	5%	100%
Av. TL (mm)			515	507	494	447	
Av. Wt. (kg)			1.53	1.42	1.31	1.08	
<b>Sexes Combined</b>							
Number	4	9	37	50	19	2	121
% by year class	3%	7%	31%	41%	16%	2%	100%
Av. TL (mm)	479	485	486	490	487	447	
Av. Wt. (kg)	1.19	1.13	1.20	1.25	1.23	1.08	

**American Shad Age, Length, and Weight  
Potomac River - 2014 (MD DNR)**

<b>Year Class Age</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>Total</b>
	<b>8</b>	<b>7</b>	<b>6</b>	<b>5</b>	
<b>Males</b>					
Number	3	14	32	12	61
% by year class	5%	23%	52%	20%	100%
Av. TL (mm)	502	477	471	477	
Av. Wt. (kg)	1.17	1.09	1.04	1.03	
<b>Females</b>					
Number	5	4	20	12	41
% by year class	12%	10%	49%	29%	100%
Av. TL (mm)	543	502	499	510	
Av. Wt. (kg)	1.48	1.07	1.16	1.25	
<b>Sexes Combined</b>					
Number	8	18	52	24	102
% by year class	8%	18%	51%	24%	100%
Av. TL (mm)	528	483	482	493	
Av. Wt. (kg)	1.36	1.08	1.08	1.14	

**American Shad Age, Length, and Weight  
Potomac River - 2013 (MD DNR)**

<b>Year Class Age</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>Total</b>
	<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	
<b>Males</b>						
Number	0	8	17	22	1	48
% by Year class	0.00%	16.67%	35.42%	45.83%	2.08%	
Av.TL (mm)	0.00	488.75	476.94	475.05	469.00	
Av. Wt. (kg)	0.00	1.07	1.00	1.02	1.08	
<b>Females</b>						
Number	2	16	34	25	0	77
% by Year class	2.60%	20.78%	44.16%	32.47%	0.00%	
Av.TL (mm)	495.00	511.56	502.71	509.28	0	
Av. Wt. (kg)	1.12	1.29	1.22	1.27	0	
<b>Sexes Combined</b>						
Number	2	24	51	47	1	125
% by Year class	1.60%	19.20%	40.80%	37.60%	0.80%	
Av. TL (mm)	495.00	503.96	494.12	493.26	469.00	
Av. Wt. (kg)	1.12	1.22	1.14	1.15	1.08	



Table 5. Summary of American Shad collected and Eggs Produced by DDOE from the Potomac River

	2006	2007	2008	2009	2010	2012	2013	2014	2015	2016	Totals
# Ripe Females	19	148	65	151	158	177	203	103	71	244	1,339
# Green Females	8	348	80	158	170	337	189	160	115	213	1,778
# Spent Females	4	55	28	56	30	21	44	34	27	78	377
# Males	1	43	18	115	128	185	85	218	51	55	899
Total Shad	32	594	191	480	486	720	521	515	213	590	4,342
Liters of Eggs	4.3	64.8	34.8	81.0	87.5	102.2	94.5	42.8	0	33.0	544.8
Liters of Viable Eggs	3.4	46.2	14.8	41.1	60.3	64.9	59.8	27.4	0	0	317.9
Viable Eggs/Female	3,831	9,355	8,550	12,334	15,058	13,252	7,143	10,003	0	0	79,526
# Stocked Fry	114,920	963,600	461,710	1,122,650	2,072,411	1,920,612	1,216,443	796,787	0	0	8,669,133

in Anacostia River

Source: DDOE

Filtration system failure

American Shad Age, Length, and Weight Potomac River - 2015 (DDOE)						
Year Class	2008	2009	2010	2011	2012	Total
Age	7	6	5	4	3	
<b>Males</b>						
Number	1	7	4	3	1	16
% by year class	6%	44%	25%	19%	6%	100%
Av. TL (mm)	473	485	480	467	430	
Av. Wt. (kg)	1.05	1.09	1.05	1.03	1.03	
<b>Females</b>						
Number	1	0	11	6	0	18
% by year class	6%	0%	61%	33%	0%	100%
Av. TL (mm)	495		492	499		
Av. Wt. (kg)	1.42		1.33	1.29		
<b>Sexes Combined</b>						
Number	2	7	15	9	1	34
% by year class	6%	21%	44%	26%	3%	100%
Av. TL (mm)	484	485	489	488	430	
Av. Wt. (kg)	1.24	1.09	1.25	1.20	1.03	

American Shad Age, Length, and Weight Potomac River - 2016 (DDOE)						
Year Class	2009	2010	2011	2012	2013	Total
Age	7	6	5	4	3	
<b>Males</b>						
Number	0	1	3	5	4	13
% by year class	0%	8%	23%	38%	31%	100%
Av. TL (mm)		495	493	481	428	
Av. Wt. (kg)		1.00	0.96	0.89	0.70	
<b>Females</b>						
Number	2	11	15	15	4	47
% by year class	4%	23%	32%	32%	9%	100%
Av. TL (mm)	528	511	488	482	461	
Av. Wt. (kg)	1.27	1.18	1.10	0.95	0.96	
<b>Sexes Combined</b>						
Number	2	12	18	20	8	60
% by year class	3%	20%	30%	33%	13%	100%
Av. TL (mm)	528	510	489	482	444	
Av. Wt. (kg)	1.27	1.17	1.08	0.94	0.83	

# **North Carolina American Shad Sustainable Fishery Plan**

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## EXECUTIVE SUMMARY

In accordance with the guidelines provided in Amendment 3 to the Interstate Fishery Management Plan for Shad and River Herring, North Carolina submits the following American Shad Sustainable Fishery Plan (SFP) for consideration by the Shad and River Herring Management Board (Board) to continue commercial and recreational fisheries in North Carolina. North Carolina's first Sustainable Fishery Plan for American Shad was approved by the Board in May 2012 for 2013 through 2017. The purpose of this plan is to update and modify sustainable management measures for 2018 through 2022 that will allow for maintenance and rebuilding of American Shad populations in North Carolina. The proposed plan includes the same sustainability parameters of relative fishing mortality (relative  $F$ ) and abundance indices, but relative  $F$  will now be computed by dividing commercial landings by a hind cast 3-year average of a survey index whereas the previous plan used a centered 3-year average. Indices of relative abundance and estimates of relative  $F$  were calculated for each system using data from the previous plan, updated through 2017. Proposed thresholds (75<sup>th</sup> and 25<sup>th</sup> percentiles) for sustainability parameters have now been set using available survey data through 2017 and will remain fixed during the next 5-year management period. North Carolina requests recreational and commercial fisheries in all coastal rivers, and will use the management measures to ensure sustainability of these fisheries.

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## 1 INTRODUCTION

American Shad (*Alosa sapidissima*) are currently managed under Amendment 3 to the Atlantic States Marine Fisheries Commission (ASMFC) Interstate Fishery Management Plan for Shad and River Herring. The Amendment contains coastwide information on biology, stock status and management of American Shad and can be found on the ASMFC website at [www.asmfc.org](http://www.asmfc.org). Amendment 3 required states and jurisdictions to develop sustainable fishery plans (SFP) by January 2013, which were to be reviewed by the ASMFC Shad and River Herring Technical Committee and approved by their Board, in order to maintain commercial and recreational fisheries (with the exception of catch and release fisheries) for American Shad by (ASMFC 2010). A sustainable fishery is defined in Amendment 3 as “those that demonstrate their stock could support a commercial and/or recreational fishery that will not diminish future stock reproduction and recruitment”. North Carolina’s first SFP for American Shad was approved by the ASMFC Shad and River Herring Management Board in May 2012 for 2013 through 2017 (NCDMF and NCWRC 2012). The purpose of this plan is to update and modify sustainable management measures for 2018 through 2022 that will allow for the continued maintenance and rebuilding of American Shad populations in North Carolina.

The most recent stock assessment of American Shad stated that populations in the Albemarle Sound and Roanoke River are stable and low, whereas a determination of stock status could not definitively be assigned for the Tar-Pamlico, Neuse and Cape Fear rivers due to limited information (ASMFC 2007a). It should be noted that areas south of Albemarle Sound are in a zone where stocks transition from iteroparity (spawn multiple times over a lifetime) to semelparity (spawn only once followed by death), which can also impact the ability to determine stock status.

Sustainable fishery parameters are being submitted for consideration for the following areas: Albemarle Sound/Roanoke River, Tar-Pamlico River, Neuse River, and Cape Fear River.

## 2 REQUEST FOR FISHERIES

A sustainable fishery is defined in Amendment 3 as one that demonstrates shad stocks could support a commercial and/or recreational fishery that will not diminish future stock reproduction and recruitment. In the first American Shad SFP for North Carolina, a suite of potential sustainability parameters was considered, and it was decided to develop sustainability parameters for each river system based on relative abundance and relative fishing mortality rate (relative  $F$ ). Relative abundance was calculated using available fisheries-independent survey data that were considered appropriate for measuring the abundance of American Shad and were expressed in terms of catch-per-unit-effort (CPUE). The standard deviations of the annual CPUE index values were also calculated to demonstrate the variability of these values. Environmental conditions on the spawning grounds, especially flow rates, are a major source of the variability associated with these indices. However, sample protocols accommodate variations in stream flow and fish distribution within the survey areas.

Relative  $F$  is calculated by dividing landings by a fisheries-independent index of relative abundance (Sinclair 1998). Imprecision in the survey index can cause estimates of relative  $F$  to be noisy. The noise can be dampened by using an average of the survey index over adjacent years in place of point estimates in the denominator. Herein, relative  $F$  was computed by dividing commercial landings by a hind cast 3-year average of a survey index. Note that in the previous SFP relative  $F$  was computed by using a centered 3-year average, resulting in the first and last year of

the time series based only on two years of data. The centered average was considered the best option to calculate relative  $F$  with the short time series of survey data available. However, with an additional five years of data the hind cast 3-year average is determined to be more appropriate, as it ensures the value of the final year in the time series (which can trigger management action) remains unchanged once calculated. In the Albemarle Sound/Roanoke River system, the survey data used in the calculations of relative  $F$  were subset to reflect the applicable season and gear restrictions for mesh size in the commercial fishery. For the other systems, it is not possible to subset the independent survey data to gear or months of the commercial fishery, due to available survey data for months and the electrofishing survey design. Therefore, relative  $F$  calculations for the Tar-Pamlico, Neuse, and Cape Fear River were subset to fishery-dependent commercial landings and fishery-independent survey data for March through April.

Indices of relative abundance and estimates of relative  $F$  were calculated for each system using data from the previous plan, updated through 2017. Thresholds (75<sup>th</sup> and 25<sup>th</sup> percentiles) for sustainability parameters will now be computed for set years in all systems. In the previous plan, thresholds were recalculated annually with the addition of another year of data, and there were concerns that the thresholds could slowly decline to extremely low levels without ever being exceeded. The thresholds for this plan will be fixed using the time series for the available survey data through 2017, for all surveys. Thresholds will be reevaluated during the next 5-year review of the plan.

The objective of this SFP update is to refine the calculations of the abundance indices and relative  $F$  estimates that currently serve as sustainability parameters in each system. Sustainability parameters are based on the female segment of the stock because the commercial fishery targets roe American Shad; roe landings can account for as much as 90% of the total American Shad landings in a year.

While scales have been collected for aging from both fisheries-dependent and fisheries-independent programs since 1972, there was concern regarding the reliability of scales for determining age for the following reasons: first, the scouring that allows for identification of spawning marks could result in loss of annuli and therefore inconsistent scale readings; and second, although increases in average age and percent of older individuals were observed, these were also associated with decreases in average length and weight. Because of these concerns and continued discrepancies between North Carolina Division of Marine Fisheries (DMF) and North Carolina Wildlife Resources Commission (WRC) in the determination of age and spawning marks, age data were not considered for sustainability parameters in any of the systems (See Appendix 1 of the 2012 SFP for additional detail).

The updated sustainability parameters are described below for each system and summarized in Table 1. The selected sustainability parameters will be reported in annual compliance reports and any management actions will be noted. Potential management actions are included in a separate section to eliminate repetition within each of the river system sections, although any action or suite of actions could be specific to and independent of each system.

## **2.1 Albemarle Sound/Roanoke River**

### Stock Status

The 2007 ASMFC stock assessment stated American Shad stocks in the Albemarle Sound and Roanoke River were low but stable and suggested a benchmark total mortality rate ( $Z_{30}$ ) of 1.01

(ASMFC 2007b). Annual estimates of mortality ( $Z$ ) from the assessment indicate that values have fluctuated around the benchmark since 2000.

### Commercial Fisheries

The Albemarle Sound area has traditionally accounted for the largest proportion of the state's commercial harvest (Figure 2). Since 2001, American Shad landings from the Albemarle Sound area accounted for over 50% of the total American Shad harvest in North Carolina. Landings from gill nets comprised over 90% of the overall harvest across the same time period.

### Recreational Fisheries

Recreational fisheries for Striped Bass (*Morone saxatilis*) and Hickory Shad (*Alosa mediocris*) have existed on the Roanoke River for many years, but little effort, catch or harvest of American Shad have been documented in annual creel surveys. However, creel surveys conducted by the WRC have traditionally focused on Striped Bass effort and harvest; therefore, estimates of American Shad harvest could be underestimated. The spring 2006 Roanoke River creel report estimated a directed harvest of 103 American Shad and release of 541 fish, but the harvest estimate was expanded from only seven observations (McCargo et al. 2007). Annual estimates of American Shad harvest have not been calculated for the Roanoke River fishery since 2006 when the ASMFC suspended the recreational harvest reporting requirements. Additionally, little to no focused recreational effort for American Shad occurs in the Albemarle Sound or tributaries, including the Roanoke River, as most effort is focused on Striped Bass. American Shad are most likely targeted by bank anglers in the Roanoke River, however anecdotal evidence from WRC biologists and enforcement officers indicates American Shad catch and harvest on the Roanoke River is minimal. WRC has not been able to expand the Roanoke River creel survey to include bank anglers due to limited staff availability and funding. The existing creel survey conducted by DMF in the Albemarle Sound and tributaries other than the Roanoke River also targets Striped Bass anglers, but recreational American Shad harvest is rarely documented. Despite the shortcomings of North Carolina creel surveys for estimating American Shad effort and harvest, directed recreational effort for American Shad is minimal because most recreational fisheries occur on the spawning grounds, most of which occur in Virginia portions of Chowan River tributaries. Recreational harvest from these tributaries, including Virginia portions of the Meherrin, Nottaway, and Blackwater rivers, that drain into the Chowan River is unknown. Through recent tagging data (see Section 5.1.2 for additional detail) we know that a large portion of American Shad are ascending the Chowan River, instead of the Roanoke River, to reach spawning grounds located in these Virginia systems. Additional cooperation between both Virginia and North Carolina is needed to properly evaluate the impact of the recreational fishery to the Chowan River spawning stock.

### Sustainability Parameters

Data used in the development of sustainability parameters include independent gill net survey (IGNS) data collected by DMF, electrofishing data collected on the Roanoke River spawning grounds by WRC, and commercial landings data collected through the DMF Trip Ticket Program (see Section 5 for complete descriptions of these surveys).

A mortality benchmark of  $Z = 1.01$  was calculated for the Albemarle Sound from the 2007 stock assessment, but there was concern that the total mortality estimate for a population in which the age distribution is contracting will not necessarily show an increase if there is no change in the slope that the  $Z$  estimate is based upon. As noted above, concerns regarding the reliability of scales for

determining age highly influenced the workgroup's decision not to use age data and the  $Z$  benchmark for sustainability parameters.

The following sustainability parameters and thresholds were evaluated for the Albemarle Sound area:

*Female CPUE (electrofishing survey)*: The female CPUE index based on the WRC electrofishing survey was calculated as the number of fish per minute using data collected from March through May (Figure 3).

- Time series: 2001–2017.
- Threshold: Three consecutive years of values below the 25<sup>th</sup> percentile (where 75% of all values are greater) from the fixed time series 2001-2017.

*Female CPUE (IGNS)*: The female CPUE index based on the DMF IGNS was calculated as the number of fish per haul using data collected during January through May (Figure 4).

- Time series: 2000–2017. Although the IGNS has been conducted since 1991, use of the 2000–2017 time series will allow for more consistent comparison with the female CPUE index from the Roanoke River electrofishing survey, which has been conducted annually since 2000.
- Threshold: Three consecutive years of values below the 25<sup>th</sup> percentile (where 75% of all values are greater) from the fixed time series 2001-2017.

*Female Relative  $F$  (IGNS)*: Female relative  $F$  based on the DMF IGNS was calculated using commercial gill net landings of roe shad in Albemarle Sound (February through April, 2000-2013; March, 2014-2017) and a female index derived from data collected in the 5.0, 5.5 and 6.0-inch mesh sizes of the IGNS (February through April, 2000-2013; March, 2014-2017; Figure 5). The mesh sizes selected most accurately reflect those used by the commercial fleet. In the development of the 2012 SFP, the fishery independent index for the Albemarle Sound/Roanoke River was truncated to represent the commercial season, February through April. When the commercial season was reduced to March 3 through March 24, the IGNS was subset to the month of March for female relative  $F$  calculation from 2014 to 2017. This has increased the variability in the point estimates for relative  $F$  and reduced the sample size used in the IGNS index.

- Time series: 2002–2017. See description of time series for female CPUE based on the DMF IGNS.
- Threshold: Three consecutive years of values above the 75<sup>th</sup> percentile (where 25% of all values are greater) from the fixed time series 2002-2017.

The sustainability parameters selected for Albemarle Sound/Roanoke River were female CPUE based on the IGNS, female CPUE based on the electrofishing survey and female relative  $F$  based on the IGNS. Relative  $F$  based on the IGNS was chosen over relative  $F$  based on the electrofishing survey because the electrofishing survey is limited to the Roanoke River and so was not considered representative of Albemarle Sound as a whole. The commercial fishery only occurs in Albemarle Sound and its tributaries, except for the Roanoke River. From 1994 to 2017 only 68 pounds of American Shad were landed from the Roanoke River. The IGNS occurs in the same areas of the Albemarle Sound as the commercial fishery, so the calculation of relative  $F$  based on the IGNS rather than the electrofishing index was determined to be more appropriate. Exceeding the threshold for Female CPUE (IGNS) or Female Relative  $F$  (IGNS) will trigger management action.

Female CPUE (electrofishing survey) will be used in conjunction with a second index for triggering management action (see Section 3 for additional detail).

Results from recent telemetry studies indicate a substantial portion of American Shad tagged in the Albemarle Sound migrate up the Chowan River and into the Meherrin and Nottaway rivers, to date, there have been no tag detections in the Blackwater River. More research into the contribution from these systems is needed, but it appears the Chowan River tributaries are important spawning areas for American Shad entering the Albemarle Sound (See Section 5.1.2 for additional detail). Additionally, electrofishing surveys in the Meherrin, Blackwater and Nottaway rivers are conducted infrequently by the Virginia Department of Game and Inland Fisheries and cannot be used in the development of sustainability parameters.

The IGNS index of female relative abundance for Albemarle Sound has shown slight variation over time (Figure 4) and was below the threshold starting in 2011 for three consecutive years, triggering management action in 2014. The female abundance index derived from the electrofishing survey was above the threshold throughout most of the time series, except for 2006, 2010, and 2016 (Figure 3). This index demonstrated an increase from 2006 to 2008 but decreased in 2009 and dropped below the threshold in 2010. The index increased through 2014 to the highest value of the time series, before declining to below the threshold in 2016, and increasing again in 2017.

Estimates of female relative  $F$  derived from the IGNS also varied with time. The index exceeded the threshold in 2011 through 2014 and remained below the threshold for the past three years (Figure 5).

#### Additional Considerations

In 2005, state and federal fisheries management agencies in North Carolina and Virginia reached a Settlement Agreement with Dominion North Carolina Power regarding Federal Energy Regulatory Commission (FERC) relicensing of the Gaston and Roanoke Rapids lakes hydroelectric dams in the Roanoke River basin. Among the mitigation measures required by relicensing was a long-term, well-funded, and coordinated program to restore American Shad in the Roanoke basin. Measures outlined in this effort included improvements in hatchery production of fry, continued intensive monitoring of fry stocking success upstream and downstream of the mainstem reservoirs, development of techniques to estimate American Shad population size, and prescriptions for diadromous fish passage. This restoration effort is coordinated by the Diadromous Fish Restoration Technical Advisory Committee (DFRTAC), which includes representatives from U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Virginia Department of Game and Inland Fisheries (VDGIF), WRC, DMF and Dominion Power. The license states that Dominion is required to design and implement upstream passage for American Shad when population estimates of 20,000 fish have been observed in two years. The target was developed based on a combination of 10% of the projected run size using the 50 shad per acre rule of thumb for riverine habitat between the dam and the river mouth (St. Pierre 1979) and very limited historic landings information. Multiple hydroacoustics research projects have attempted to estimate American Shad populations in the Roanoke River. The average run size estimate during 2006–2011 was 39,000 American Shad, suggesting the American Shad population had reached the target to begin fish passage efforts at Roanoke Rapids Dam (Hightower et al. 2013). Population estimation using the hydroacoustics techniques developed during this research is expensive and labor intensive; the estimates are also imprecise due to the uncertainty involved with assigning species to run count estimates and the difficulty conducting drift gill net studies in the lower Roanoke River. Additionally, evaluations of fry stockings upstream of dams indicate fish spawned upstream would

have little contribution to the population because of low downstream passage rates. Consequently, Dominion Power (with support of state and federal partners) has annually petitioned the FERC for a delay of the design of a fish passage program at Roanoke Rapids Dam. The DFRTAC continues to meet and evaluate the status of the Roanoke Rapids Dam FERC license agreement, including provisions for passage of American Shad.

The previous plan recommended development of creel survey methods to better estimate effort, catch, and harvest of American Shad in the Roanoke River. The existing creel survey conducted each spring on the Roanoke River targets Striped Bass effort and only estimates effort, catch, and harvest for anglers fishing from boats. Few American Shad are encountered each year during the existing Roanoke River creel survey. American Shad are most likely targeted by bank anglers; however, due to inadequate funding and staff availability, WRC has not been able to expand the Roanoke River creel survey to include bank anglers. Anecdotal evidence from WRC biologists and enforcement officers indicates American Shad catch and harvest on the Roanoke River is minimal.

Finally, DMF conducts an annual review of research priorities for all managed species. A top priority has consistently been expansion of existing surveys to meet the need for more accurate JAIs for species of importance. However, lack of funding and staff resources has delayed sufficient expansion of the alosine seine survey.

## **2.2 Tar-Pamlico River**

### Stock Status

Stock status could not be determined for the Tar-Pamlico River based on the 2007 ASFMC stock assessment (ASMFC 2007b). There were no definitive trends in abundance, although it was noted that the electrofishing CPUE for the Tar River was higher than in other North Carolina rivers since 2000. A  $Z_{30}$  of 1.01 is suggested (ASMFC 2007a).

### Commercial Fisheries

Commercial landings of American Shad have declined significantly since the mid-1980s and have remained low and variable without trend since 1994 (Figure 2). Almost all harvest occurs in gill nets.

### Recreational Fisheries

A recreational fishery does exist, and estimates of angler effort and catch are calculated using creel surveys. Previously, these surveys rotated among the Tar, Neuse, and Cape Fear rivers. Annual creel surveys coordinated between both DMF and WRC jurisdictions began in 2012 on the Tar-Pamlico and Neuse rivers, and on the Cape Fear River in 2013. Estimates of angler effort and catch are calculated through creel surveys noted in the fishery dependent section of this plan. A confounding factor in the creel survey is that anglers often indicate they targeted “shad” because American and Hickory Shad co-occur in the Tar-Pamlico River. The 2016 Tar-Pamlico creel survey determined recreational anglers caught 4,237 American Shad during 5,115 trips targeting American Shad, Hickory Shad, and non-specific shad species. Of the total catch, 1,417 American Shad were harvested (Table 2). The recreational daily creel limit is 10 American and Hickory Shad in the aggregate.

### Sustainability Parameters

Data used in the development of sustainability parameters for the Tar-Pamlico system include electrofishing data collected by WRC and commercial landings data collected through the DMF

Trip Ticket Program (see Section 7 for complete descriptions of these surveys). There is no directed long-term JAI survey for the Tar-Pamlico system. An IGNS has been conducted consistently in the Tar-Pamlico, Pungo, and Neuse river tributaries of Pamlico Sound since 2004, but additional analysis is needed.

The following sustainability parameters and thresholds were evaluated for the Tar-Pamlico River system:

*Female CPUE (electrofishing survey)*: The female CPUE index based on the WRC electrofishing survey was calculated as the number of fish per minute using data collected from March through May (Figure 6).

- Time series: 2000–2017. The electrofishing survey has been conducted annually since 2000 on the Tar River.
- Threshold: Three consecutive years of values below the 25<sup>th</sup> percentile (where 75% of all values are greater) from the fixed time series 2000-2017.

*Female Relative F (electrofishing survey)*: Female relative  $F$  based on the WRC electrofishing survey was calculated using commercial landings of roes by all gear types from the Pamlico River and the female CPUE index from the Tar River electrofishing survey (Figure 7). Because the electrofishing survey primarily occurs during March through April, only commercial landings from those months were used in the calculations.

- Time series: 2002–2017. The electrofishing survey has been conducted on the Tar River annually during these years.
- Threshold: Three consecutive years of values above the 75<sup>th</sup> percentile (where 25% of all values are greater) from the fixed time series 2002-2017.

The sustainability parameters selected for the Tar-Pamlico River were the female CPUE index and female relative  $F$ , both derived from the WRC electrofishing survey. Exceeding the threshold for any of the selected parameters will trigger management action (see Section 3).

Female relative abundance of American Shad derived from the electrofishing survey in the Tar River has been relatively stable over the time series except for two notably high years in 2003 and 2004 (Figure 6). The index was below the threshold in 2006, 2007 and 2009 but above the threshold in all other years.

Estimates of relative  $F$  for female American Shad derived from the electrofishing survey were below the threshold during 2003 to 2006 (Figure 7). These estimates of female relative  $F$  exceeded the threshold in 2002, 2007, 2009, and 2012. The 2017 estimate is well below the threshold.

#### Additional Considerations

There is potential to improve upstream passage in this system. The WRC, USFWS, Pamlico-Tar River Foundation, and the Albemarle Pamlico National Estuary Partnership have engaged in conversations with the Rocky Mount Mills Dam owner and hydroelectric operator. In addition to interest in providing American Shad access to potential spawning habitat upstream of Rocky Mount Mills Dam, concern exists that hydropeaking operations (periodic spikes in flow) at Rocky Mount Mills Dam compromise the quality of existing spawning habitat. The dam owners agreed to cease hydropeaking during the anadromous spawning season, and the powerhouse has been out of operation for several years. The current owners of the dam have intentions to resume hydroelectric operation, and they are considering fish passage improvements as well.



A cooperative effort between DMF and WRC to improve the frequency and design of recreational creel surveys on the Tar-Pamlico and Neuse rivers began in spring 2012. Creel surveys have occurred annually since that time and include increased coverage on both rivers, which has improved estimates of recreational harvest.

As noted previously, DMF conducts an annual research prioritization exercise for all managed species. One of the top priorities has consistently been expansion of existing surveys to provide accurate juvenile abundance indices (JAI) for all commercially and recreationally important species. Meeting this priority is unlikely, due to the lack of funding available to the DMF to expand current monitoring programs.

### **2.3 Neuse River**

#### Status of Stocks

Stock status could not be determined for the Neuse River based on the 2007 ASFMC stock assessment (ASMFC 2007b). There were no definitive trends in abundance over the most recent five to ten years of the assessment. A  $Z_{30}$  of 1.01 was suggested (ASMFC 2007a).

#### Commercial Fisheries

Commercial landings of American Shad have declined since 1972. There have been several peaks throughout the time series, but landings have remained low and variable without trend since the early 2000s (Figure 2). Harvest occurs almost entirely from gill nets.

#### Recreational Fisheries

Estimates of angler effort and catch are calculated through creel surveys noted for previous systems in the fishery-dependent section of this plan. The 2016 Neuse River creel survey determined total recreational catch to be 1,641 American Shad out of a total of 9,574 trips targeting American Shad, Hickory Shad, and non-specific shad species (Table 3). The majority of American Shad catch is released, as harvest was estimated to be only 252 American Shad in 2016. Additionally, as mentioned above a confounding factor in the creel survey is that anglers often indicate they targeted “shad” because American and Hickory Shad co-occur in the Neuse River system. A 1-fish daily limit on American Shad within the aggregate 10-fish recreational creel limit for American and Hickory Shad has been implemented in Coastal, Joint, and Inland Waters of the Neuse River.

#### Sustainability Parameters

Data used in the development of sustainability parameters for the Neuse River system include electrofishing data collected by WRC and commercial landings data collected through the DMF Trip Ticket Program (see Section 7 for complete descriptions of these surveys). There is no directed JAI survey for the Neuse River. As noted previously, there is an IGNS in the tributaries of Pamlico Sound. While the IGNS for the Neuse River area of the survey has been conducted since 2004, additional time is needed to properly evaluate this survey as an index for American Shad because effort is calculated differently than the Albemarle Sound IGNS. The following sustainability parameters and thresholds were evaluated for the Neuse River system:

*Female CPUE (electrofishing survey)*: The female CPUE index based on the WRC electrofishing survey was calculated as the number of fish per minute using data collected from March through May (Figure 8).

- Time series: 2000–2017. The electrofishing survey has been conducted consistently since 2000 on the Neuse River.

- Threshold: Three consecutive years of values below the 25<sup>th</sup> percentile (where 75% of all values are greater) from a fixed time series of 2000-2017.

*Female Relative F (electrofishing survey)*: Female relative  $F$  based on the WRC electrofishing survey was calculated using commercial landings of roes by all gear types from the Neuse River and the female CPUE index from the Neuse River electrofishing survey (Figure 9). Because the electrofishing survey primarily occurs during March through April, only commercial landings from those months were used in the calculations.

- Time series: 2002–2017. This time period reflects the years the electrofishing survey has been conducted on the Neuse River.
- Threshold: Three consecutive years of values above the 75<sup>th</sup> percentile (where 25% of all values are greater) from a fixed time series of 2002-2017.

The sustainability parameters selected for the Neuse River were the female CPUE index and female relative  $F$ , both derived from the WRC electrofishing survey. Exceeding the threshold for any of the selected parameters will trigger management action (see Section 3).

The electrofishing index of relative abundance for female American Shad in the Neuse River has been variable and remained above the threshold for the past seven years. The index was below the threshold in 2000, 2002, 2006, 2007, and 2010 (Figure 8). Relative  $F$  estimates for female shad derived from the electrofishing survey have been below the threshold since 2008 (Figure 9).

#### Future Considerations

Access to American Shad spawning habitat is affected by streamflow conditions on the Neuse River, and the variability in timing and strength of streamflow can determine where American Shad spawn. During high flow events, many American Shad migrate upstream to Milburnie Dam (rkm 352), which is the first mainstem dam on the Neuse River. Milburnie Dam is scheduled to be removed in 2017, and the removal will open approximately 25 km of additional spawning habitat to American Shad in the mainstem Neuse River. Future monitoring will determine if American Shad alter their migratory behavior in response to the dam removal. Additionally, further research is needed to determine how spawning success might be related to streamflow. The removal of Milburnie Dam, however, is expected to improve anadromous fish spawning habitat in the Neuse River, especially during high streamflow events.

As noted in the previous section, an annual creel survey rotation prior to 2012 as well as efforts by DMF to expand creel surveys upstream have improved recreational effort and catch/harvest estimates. Annual creel surveys in the Neuse River are anticipated to continue. Expansion of existing surveys to provide accurate JAIs for all commercially and recreationally important species is a DMF priority. Meeting this priority is unlikely, due to the lack of funding available to the DMF to expand current monitoring programs.

Similarly, a representative JAI for American Shad may be a future possibility depending on resources available to expand or reconfigure existing independent surveys.

## **2.4 Cape Fear River**

### Stock Status

Similar to the Tar-Pamlico and Neuse rivers, the stock status on the Cape Fear River is unknown, although a  $Z_{30}$  of 1.01 was recommended in the latest assessment (ASMFC 2007a, 2007b). Of all

the river systems in North Carolina, the Cape Fear is likely to have the highest proportion of fish that are semelparous (spawn once followed by death).

### Commercial Fishery

Commercial landings have displayed several cyclical peaks since 1972, although each successive peak has been slightly lower than the previous. Landings were somewhat low throughout the 2000s (Figure 2). As with the other river systems, the vast majority of landings are from gill nets. There has been very little harvest from other gears.

### Recreational Fishery

Like the other systems mentioned, a comprehensive creel survey was initiated in 2013 to identify and estimate recreational American and Hickory Shad effort and catch within the Cape Fear River system. In 2016, the estimate of total recreational catch was 21,011 American Shad from a total of 5,132 trips targeting American Shad, Hickory Shad, and non-specific shad species. Approximately 50% of the American Shad catch was harvested (Table 4). In 2013, the daily creel limit was reduced to a maximum of five American Shad within the 10-fish shad aggregate daily limit. It is important to note that Hickory Shad are encountered infrequently in the Cape Fear River and most of the recreational effort is focused on American Shad.

### Sustainability Parameters

Data used in the development of sustainability parameters for the Cape Fear system include electrofishing data collected by WRC and commercial landings data collected through the DMF Trip Ticket Program (see Section 7 for complete descriptions of these surveys). There is no directed JAI survey for the Cape Fear River. While there was an IGNS from 2003–2007, it was a fixed-station survey rather than a stratified random design and was therefore not used in any sustainability parameter calculations.

The following sustainability parameters and thresholds were evaluated for the Cape Fear River system:

*Female CPUE (electrofishing survey)*: The female CPUE index based on the WRC electrofishing survey was calculated as the number of fish per minute using data collected from March through May (Figure 10).

- Time series: 2001–2017. The electrofishing survey has been conducted annually since 2001 on the Cape Fear River.
- Threshold: Three consecutive years of values below the 25<sup>th</sup> percentile (where 75% of all values are greater) from the fixed time series 2001-2017.

*Female Relative F (electrofishing survey)*: Female relative  $F$  based on the WRC electrofishing survey was calculated using commercial landings of roes by all gear types from the Cape Fear River and the female index from the Cape Fear River electrofishing survey (Figure 11). Because the electrofishing survey primarily occurs during March through April, only commercial landings from those months were used in the calculations.

- Time series: 2003–2017. This time period reflects the years the electrofishing survey has been conducted on the Cape Fear River.
- Threshold: Three consecutive years of values above the 75<sup>th</sup> percentile (where 25% of all values are greater) from the fixed time series 2003-2017.

The sustainability parameters selected for the Cape Fear River were the female CPUE index and female relative  $F$ , both derived from the WRC electrofishing survey. Exceeding the threshold for any of the selected parameters will trigger management action (see “Potential Management Measures”).

Relative abundance of female American Shad from the electrofishing survey in the Cape Fear River was low from 2005 through 2011, and values were below the threshold from 2006 to 2011 (Figure 10). Since 2011, relative abundance of female American Shad has been above the threshold and continued to increase through 2015. Estimates of female relative  $F$  have remained below the threshold since 2012 (Figure 11).

### Additional Considerations

Collaborative habitat enhancement projects that focus on fish passage and increasing spawning habitat have been implemented on the Cape Fear River in recent years. Each year, WRC recommends a locking schedule to the USACE to pass anadromous fishes upstream of locks and dams during the spring spawning run. In 2012, a rock arch fishway was constructed below Lock and Dam 1 (LD-1) to facilitate volitional, upstream fish passage. Telemetry studies conducted to evaluate American Shad usage of the rock arch fishway indicate American Shad passage efficiency at the LD-1 fishway ranged 53–65% and was consistent with prior estimates from locking procedures (Raabe et al. 2016). Electrofishing surveys corroborate the telemetry studies, as electrofishing catch rates have increased at the upper two locks and dams and decreased at LD-1 over the last five years. These results indicate American Shad are readily passing LD-1. With presumed historic spawning grounds, upstream of Lock and Dam 3 (LD-3), substrate was strategically placed below Lock and Dam 2 (LD-2) in 2013 to increase the potential spawning habitat for anadromous fish that pass the rock arch fishway but fail to navigate the lockage system. Locking at LD-1 has ceased at this point but continues for LD-2 and LD-3 to facilitate fish passage. American Shad spawning activity has been observed by Commission staff (Bennett Wynne, WRC retired, personal communication), and American Shad eggs have been collected just downstream of LD-2 (Dawn York, Cape Fear River Partnership, personal communication). Therefore, fish that migrated to LD-2 but failed to migrate farther upstream could reproduce and benefit from the habitat enhancement efforts. In recent years, 2016 and 2017, WRC staff have encountered eggs below LD-3 (Clinton Morgeson, WRC, personal communication). The Cape Fear River Partnership, including local, state, and federal agencies, as well as private groups, continues to plan fish passage enhancement projects on the remaining locks and dams on the main stem Cape Fear River.

Based on the construction efforts and changing conditions, DMF and WRC recommended a two-year review of the 75<sup>th</sup> percentile threshold for female relative  $F$  in the 2012 SFP as calculation of this parameter was likely to be heavily influenced by drought, floods, and changes in fish passage. There was also concern that restoration efforts might influence electrofishing catch rates due to improvements in fish passage with completion of the rock arch fishway. After review in 2015, no changes were recommended for the Cape Fear system. North Carolina will continue to evaluate American Shad relative abundance and sustainability metrics in the context of improvements in habitat and passage benefiting anadromous fishes in the Cape Fear River.

## **2.5 Pee-Dee River**

The Pee-Dee River originates in North Carolina before flowing into South Carolina and emptying into Winyah Bay. Although approximately 25 km of American Shad spawning habitat is located in

the North Carolina portion of the Pee-Dee River, neither NCWRC nor NCDMF have the resources to conduct monitoring activities in this system. However, South Carolina Department of Natural Resources maintains dependent and independent survey programs in the South Carolina portion of the Pee-Dee River. Commercial and recreational fisheries were approved in the South Carolina SFP issued in 2012. Commercial harvest of American Shad is prohibited in the North Carolina portion of the Pee-Dee River, but recreational harvest is allowed under the statewide recreational creel limit of 10 American and Hickory Shad in combination per day. This recreational creel limit is consistent with the creel limit in South Carolina. We propose maintaining the recreational fishery in the North Carolina portion of the Pee Dee River and defer American Shad management and determination of sustainability to South Carolina. NCWRC will complement management actions in North Carolina waters to maintain consistency with South Carolina when appropriate.

## **2.6 Other Areas**

The areas included in the sustainability parameters submitted for consideration above contain the known American Shad spawning populations in North Carolina, and those systems support the only directed recreational and commercial fisheries in the state. However, American Shad are incidentally encountered in commercial fisheries prosecuted within other non-spawning rivers and coastal sounds. Commercial harvest from these areas is a very small proportion of annual American Shad harvest (Figure 2) and is primarily considered incidental bycatch. For example, commercial harvest from the New and White Oak rivers (two coastal, blackwater rivers) combined averaged only 140 pounds per year between 1994 and 2016. Recreational effort and harvest in areas outside of spawning rivers is most likely non-existent. In the New and White Oak rivers, recreational creel survey intercepts from 2004 to present have not indicated American or Hickory Shad as target species and no American or Hickory Shad have been reported in the catch. While there are currently no independent surveys for American Shad outside of spawning rivers, surveys for other species rarely encounter American Shad. We propose to maintain current harvest seasons (February 15-April 14) to allow commercial harvest of incidental bycatch because these fish will most likely be dead discards and the amount of harvest is minimal. The areas without specified sustainability parameters will fall under default management measures listed in tables 8 and 9. North Carolina will continue to monitor commercial landings through the North Carolina Trip Ticket Program to ensure landings remain low. Dedicated monitoring programs or area closures will be implemented if sudden increases in landings, indicating targeted effort, occur.

## **3 MANAGEMENT MEASURES**

### **3.1 Potential Management Measures**

The environmental circumstances under which a sustainability threshold may be reached can vary among systems. Therefore, different management measures may be used for each system in addressing the triggers. One or more potential management measures presented here and may be used singly or in combination:

- Restrictions on length of season to reduce effort (e.g., March 1–April 14) not to extend beyond the estuarine striped bass quotas being filled (avoids waste of striped bass and shad)
- Trip limits (this may result in discards)
- Reduce allowable number of yards (the 1,000-yard limit in Albemarle Sound could be considered in other areas)
- Area/season closure (e.g., area closure at mouth of Roanoke River from February–mid-November since 1988)

- Only allow fishing certain days of the week (lift days)
- Recreational creel reduction
- Commercial harvest quota (although possible, this could be difficult to implement given existing resources)

If two years of sustainability parameters exceeding thresholds are observed, a suite of management measures could be proactively developed and presented to Finfish and Regional Advisory Committees.

### **3.2 Management Measures implemented 2013-2017**

Changes in management (season lengths, creel limits) since implementation of the SFP in 2013 have been noted in Section 6 and are summarized for convenience in Tables 8 and 9.

Although harvest is an obvious potential contributor to population declines, significant habitat degradation has also occurred in all the river systems. It is unlikely that American Shad populations in North Carolina will recover and expand without considerable resources being dedicated to habitat restoration for this species. Our management goals, however, are intended to sustain population levels as additional habitat is protected or improved through aquatic habitat conservation measures and increased passage opportunities of American Shad beyond impediments that block migration to historic spawning grounds.

#### Cape Fear River

At the request of the ASMFC Shad and River Herring Technical Committee during development of the 2012 SFP, additional analysis was conducted for the Cape Fear River. This was based on the female relative  $F$  parameter being over the 75<sup>th</sup> percentile threshold for two consecutive years, as well as the female CPUE from the electrofishing survey being very close to the threshold for six consecutive years. An 11% percent reduction in commercial harvest was required to bring female relative  $F$  down to the threshold.

Additional analyses (see Appendix 2 of the 2012 SFP) were conducted to determine the commercial and recreational reductions in harvest that would provide an additional conservation buffer. It was determined that equivalent reductions in harvest for both commercial and recreational sectors would provide the greatest benefit given that commercial and recreational harvest in 2011 were roughly equivalent. Management options that resulted in a 25% reduction in harvest for each sector were calculated, and it was determined that a shortened commercial season and a reduction in the recreational creel limit would best meet the required reductions in harvest. While commercial and recreational harvests have fluctuated somewhat since regulatory changes were implemented, both the electrofishing index and relative  $F$  index have remained above and below their respective thresholds since 2012. A commercial season from February 20 through April 11 and a recreational creel limit of five fish within the 10-fish aggregate resulted in the necessary 25% reduction.

### **3.3 Proposed Management Measures for 2018**

The following management measures are proposed to be effective January 1, 2018.

#### Recreational

*Albemarle Sound/Roanoke River, Neuse River*

- Recreational creel limit of 1-fish for American Shad in Joint and Coastal Waters to complement the WRC 1-fish limit in Inland Waters of these systems (no change to existing DMF and WRC rules).

*Tar-Pamlico River*

- Recreational creel limit of 10-fish for American Shad in the Joint, Coastal and Inland Waters (no change to existing DMF and WRC rules).

*Cape Fear River*

- Recreational creel limits of 5-fish for American Shad in the Joint and Coastal Waters of the Cape Fear River to complement the WRC 5-fish limit in the Inland Waters of this river (no change to existing DMF and WRC rules).

Commercial

*Albemarle Sound*

- Commercial season of March 3-24.

*Tar-Pamlico River, Neuse River*

- Commercial season of February 15-April 14.

*Cape Fear River*

- Commercial season of February 20-April 11.

While none of the selected sustainability parameters for any of the river systems have exceeded the triggers for management since 2013, the above measures are considered prudent given the results of the 2007 stock assessment as they pertain to North Carolina. Future changes to creel limits for American Shad in the Inland Waters of the other river systems will also be complemented by DMF for Joint and Coastal Waters.

**4 ANCILLARY INFORMATION AND FUTURE CONSIDERATIONS**

The focus on female indices for the sustainability parameters in all systems is based on the conclusion that changes in female abundance combined with impacts from various environmental parameters could prove challenging to stock improvement given that the commercial fishery targets roe shad. Major fluctuations in female abundance could potentially impact future recruitment and landings. The use of sex ratios as a sustainability parameter was considered, but it was determined that the sex ratios from both the IGNS (in the Albemarle system and potentially the other systems) and the electrofishing surveys were more suitable for use as long-term trends rather than short-term (i.e., three year) indicators of stock health due to the impact of environmental variability on the data. The intent of the agencies is to monitor the sex ratios from each of the surveys for trends and use this information to help inform future management.

An IGNS has been conducted consistently in the Tar-Pamlico, Pungo, and Neuse Rivers and tributaries of the Pamlico Sound since 2004. Unlike the Albemarle Sound IGNS, American Shad captured in this IGNS program do not have sex assigned in the program data for effort, if age structures are collected sex is assigned and reported in a separate aging program. Only a proportional estimate of sex can be applied to the small sample size. Additionally, effort is calculated differently, by gang of nets, compared to the Albemarle Sound IGNS which calculates effort per individual net. Additional analysis into the data caveats is needed to properly evaluate this survey as a new index of abundance for this plan.

The use of repeat spawning data was also considered as a potential sustainability parameter. However, inconsistencies in determination of repeat spawning marks made it difficult to set a target or threshold. Because repeat spawning continues to be tracked annually as part of the required monitoring program, it will also be used as ancillary information for determining future management. Should greater confidence in repeat spawning data be attained in the future, they may be considered for developing a formal sustainability parameter.

Sustainability parameters have been updated annually in compliance reports, as well as via annual appendices to the SFP detailing changes in management measures. DMF and WRC also jointly review the performance of the plan on an annual basis to determine management measures for the following season.

Finally, during the preparation of this update, both DMF and WRC discussed exploring several additional sustainability parameters, as well as potential future modifications to existing sustainability parameters:

- Consider alternate means of calculating effort from the IGNS and possible incorporation of IGNS from Tar-Pamlico and Neuse as parameters;
- Consider incorporating uncertainty in relative  $F$  estimates;
- Consider use of alternative modeling approaches that can incorporate environmental parameters as model factors;
- Consider alternative ways to calculate relative  $F$  including using recreational catch estimates and total catch from the IGNS.

If appropriate, North Carolina would submit a revised SFP for Technical Committee review to allow for inclusions or modifications described above.

## **5 STOCK MONITORING PROGRAMS**

The following descriptions represent the entirety of stock monitoring programs used to assess the health of American Shad in North Carolina. All programs are included in annual compliance reports and as noted in the program descriptions, specific details can be found in past compliance reports.

### **5.1 Fishery-Independent Monitoring**

#### **5.1.1 Juvenile Abundance**

A juvenile abundance index is calculated for Albemarle Sound area using data from the alosine seine survey that has been conducted annually since 1972. Eleven core seine stations are sampled monthly in the western Albemarle Sound area during June–October of each year. During September, thirteen additional seine samples are taken to determine distribution and annual variations of alosines in the nursery area. All stations are sampled with an 18.5-m (60-ft) bag seine. Relative abundance data are collected for Blueback Herring, Alewife, American Shad and Hickory Shad from the 11 core stations.

Samples are sorted by species and 30 randomly selected individuals of each alosine species present are measured. Other species present are also noted. Water temperature, salinity, and other environmental characteristics are counted, measured, and recorded. As noted previously, this survey was designed specifically for blueback herring and is not considered a reliable indicator of juvenile American Shad abundance.

No juvenile abundance indices exist for the Tar-Pamlico, Neuse and Cape Fear River systems.



## 5.1.2 Adult Stock Monitoring

### *Spawning Area Survey*

An annual spawning stock survey and representative sampling for biological data is required from Albemarle Sound and its tributaries, Tar-Pamlico, Neuse, and Cape Fear Rivers for American Shad. Sampling in these areas was initiated in 2000.

WRC personnel collect American Shad from the Roanoke, Tar, Neuse and Cape Fear systems annually during February–June. A boat-mounted electrofishing unit (Smith-Root 7.5 GPP) is used (1 or 2 dip netters) to capture fish during daylight hours, and electrofishing times are recorded in seconds. To minimize size selection during sampling in all river systems, shad are netted as they are encountered regardless of size. Relative abundance of each year-class is indexed by CPUE expressed as the number of fish captured per hour of electrofishing. However, CPUE is converted to fish per minute for sustainability indices described above. American Shad broodstock collections are usually excluded from calculations of CPUE unless collections occur during regular sampling activities. Because broodstock are sacrificed when hatchery spawning is complete, otoliths from broodstock are aged and used to develop age length keys in most years. Total length (mm), weight (g), and sex are recorded for all captured fish. Sampling protocols are unique to each river system and have been refined throughout the survey period. River-specific descriptions of spawning area surveys are provided in the following sections.

#### Roanoke River

American Shad surveys have been conducted in the Roanoke River from 2001 through 2017. The surveys occur in the mainstem Roanoke River near the Gaston Boating Access Area at river kilometer (rkm) 225. The survey area encompasses the most upstream American Shad spawning habitat in the Roanoke River, and further migration beyond the survey area is blocked by Roanoke Rapids Dam at rkm 227 (approximately 2 km upstream of the survey area). In 2000–2007, sampling was concurrent with Striped Bass surveys in the same sample area and was restricted to April and May. Beginning in 2008, sampling was started earlier in March when water temperatures approach 10°C and continued weekly until low-flow conditions restrict boat navigation or until spawning appears complete (typically end of May or first of June). One dip netter was used 2000–2004 and 2010–2011, whereas two dip netters were used 2005–2009 and 2012–2017. Also in earlier years (2000–2012), two or three shoreline sample sites approximately 1 km each were sampled per week. In 2013–2017, however, samples were conducted at nine sampling sites once per week during the survey period. Electrofishing commenced at the upstream portion of each 500-m site and continued downstream the entire transect. Sites were randomly selected from shoreline and mid-channel habitats along the 3-km stretch downstream of the Hwy 48 bridge. Total electrofishing effort increased from previous years, but the new sample protocol still occurs in the same area as previous years.

#### Tar River

American Shad spawning area surveys have been conducted on the mainstem Tar River from 2000 through 2017, and survey protocols have changed relatively little throughout the survey period. One dip netter is used to capture fish during daylight hours. Electrofishing samples are conducted weekly during March–May. Sampling begins when water temperatures approach 10°C. Sample sites are located within one of three approximately 15-km segments that encompass most of the American Shad spawning habitat in the Tar River. Segment 1 contains the river stretch from Rocky Mount Mill Dam downstream to the Dunbar Boating Access Area (BAA). Segment 2 includes the

river stretch from Dunbar BAA downstream to the Bell's Bridge BAA. Segment 3 continues from the Bell's Bridge BAA downstream to the Tarboro town ramp. Normally, one sample of approximately 30 minutes of electrofishing time is conducted within a segment during a sample day. Typically, only one 30-minute sample is conducted per week, yet, depending on flows, attempts are made to conduct another 30-minute sample in a different segment, or at least in a different site of the same segment, during that same week. Sample sites within a segment vary from week to week and are selected from areas that appear to have preferred American Shad habitat. Angling activity is avoided. Flows and water temperature determine which segment is sampled on a particular day. Moderate to high flows and warmer water temperatures tend to cause American Shad to move further upstream into segment 1. There are certain minimum river levels required to allow access to the river for electrofishing, yet the majority of American Shad sampling is concentrated in segment 1 when flows are greater than 300 cfs. Flooding often prevents access to the river for sampling, but high water subsides quickly in the Tar River and at least one sample site per week is usually possible.

### Neuse River

American Shad electrofishing surveys have been conducted in the Neuse River from 2000 through 2017 and one dip netter is used to capture fish during daylight hours. Electrofishing samples are conducted weekly during March–May. Sampling begins when water temperatures approach 10°C and ends when spawning appears to be complete. Sampling is conducted near known spawning areas at Goldsboro, NC (rkm 240) and Raleigh, NC (rkm 350). Sampling begins at the downstream Goldsboro location in March, and the Raleigh location is added to the weekly sampling regime once 30–40 American Shad are collected in one day at the Goldsboro location. Weekly sampling locations are contingent upon water levels because low flows limit navigability. The Raleigh location is only accessible at moderate to high flows and is dropped from weekly sampling when flows are not adequate for safe and effective sampling. When conditions improve, sampling is resumed at the Raleigh location. Sampling locations have been consistent throughout the survey period, but sampling protocols at each location have varied over time. In early years of the survey, two sample sites were sampled at each location. The sample sites were 2–3 km long and took over one hour of electrofishing time to complete. Since 2015, two or three sample sites are sampled at each location, but the sites have been shortened to around 1 km and electrofishing effort has been reduced. Nevertheless, the same areas have been consistently sampled throughout the survey.

### Cape Fear River

Sampling for American Shad has occurred in the Cape Fear River from 2001 through 2017. In most years, one dip netter was used to collect American Shad, but two dip netters have been used 2015–2017 to avoid gear saturation caused by increases in American Shad abundance. In all survey years, sampling occurred at three fixed sample sites adjacent to the base of each of three locks and dams found on the river. Since 2010, sampling efforts have been standardized by electrofishing for 30 minutes downstream of each lock and dam—15 minutes from the middle of each dam down each shoreline. Sampling at each site is attempted weekly when water temperatures approach 10°C and is ended when spawning appears complete. Prior to 2010, however, sampling was more sporadic and did not always occur at each site every week. Other areas in the Cape Fear River upstream of the locks and dams (Buckhorn Dam and Smiley's Falls) are also sampled, but data from sites other than the locks and dams are not included in annual relative abundance analyses. Sampling at the locks and dams is possible under most flow conditions, but flood events can periodically prevent sampling.

### *Independent Gill Net Survey (IGNS)*

Since 1991, DMF has been conducting an independent gill net survey throughout the Albemarle Sound area. The survey was designed for Striped Bass data collection and occurs November through May each year. However, American Shad are captured during the survey and size, age and sex data are collected. Forty-yard segments of gill net from 2.5- through 7.0-inch stretched mesh, in half-inch increments, as well as 8.0, and 10.0-inch stretched mesh are utilized. The sound is divided into zones and grids and random sites are selected within these areas. Lines of float and sink nets are set in both shallow and deep strata if they are present in the grid.

The IGNS in the Pamlico Sound area began 2001, while the rivers (including Pamlico, Pungo and Neuse rivers) began in 2003. The Cape Fear River was added in 2007 and the Core Sound area will begin fully in 2018. The survey runs from February through mid-December and utilizes a different methodology than that conducted in the Albemarle Sound. Thirty-yard segments of gill net are used, ranging from 3.0-inch stretched mesh through 6.5-inch stretched mesh in half-inch increments. The catch from the gang of nets comprises a single sample, unlike the Albemarle where each mesh net is tallied for effort. Each gang of nets is fished in both shallow and deep strata, and sites are preselected at random from within strata-grids.

### *Albemarle Sound American Shad Movement Study*

The Roanoke River and Chowan River tributaries are known spawning rivers for American Shad entering Albemarle Sound. Despite the restoration efforts and research that has occurred in the Roanoke River, the proportion of American Shad migrating up the Chowan River or Roanoke River is largely uncertain. The NMFS and DMF have been conducting an acoustic telemetry study to determine migratory patterns of Albemarle Sound American Shad. The objective of this study was to determine which river basins are used by adult American Shad during the spawning run in 2013, 2014, 2016, and 2017. The study used an existing array of acoustic receivers placed at inlets and throughout Albemarle Sound and the Roanoke River. DMF, WRC, and NCSU maintain and operate these receivers to track movement of Atlantic Sturgeon, Striped Bass, and Largemouth Bass. The study area encompassed the Albemarle Sound, and its associated sounds (Croatan and Currituck) and rivers: North, Pasquotank, Little, Perquimans, Chowan, Roanoke, Scuppernong, and Alligator in northeastern North Carolina and the Meherrin, Nottaway, and Blackwater in southeastern Virginia. Adult American Shad were captured in gill nets with mesh sizes ranging from 4.5 to 6 inches at locations north and south of North Carolina Highway 32 bridge. This area is a funneling point for American Shad that have entered the Albemarle sound to reach spawning grounds on either the Chowan River (north) or the Roanoke River (south). American Shad were implanted with VEMCO V9-2x-A69-1601 coded acoustic transmitter and a PIT tag (only in 2013). Tagged fish were measured and assigned sex if possible. Fish were tagged by inserting the tag through the esophagus into the stomach. Fin clips were taken in 2016 and 2017 to determine hatchery contribution from Roanoke River stocked fish. The acoustic transmitter released a frequency every 90 seconds and tag life was expected to be around two years.

Since 2013, a total of 191 American Shad have been tagged. Table 7 shows the numbers of fish tagged, detected, and that made spawning runs up the Roanoke or Chowan Rivers. The fish that were detected but did not make spawning runs either demonstrated strong fall back behavior and presumably left the sound or are thought to have died.

Shad movement data gathered by this study suggest that a large portion of the spawning stock entering the Albemarle Sound is ascending the Chowan River to spawn. Future studies are needed to

determine potential genetic differences between Chowan River and Roanoke River spawning stocks. Any genetic differentiation between the two rivers can be used to further evaluate spawning stock contribution within the Albemarle Sound population and can allow for more refined management and restoration efforts. Fin clips have been collected from the commercial fishery for future genetic analysis.

### **5.1.3 Size, Age and Sex Determination**

#### *Spawning Area Survey*

Sex is determined for each captured fish by applying directional pressure to the abdomen toward the vent and observing the presence of milt or eggs. Each fish is measured for total length in millimeters. Scales are removed from the left side of each fish between the lateral line and the dorsal fin. To estimate age, scales are examined at 33X magnification on a microfiche reader and annuli are counted. Spawning marks are recorded separately. Shad that cannot be aged are assigned ages based on the gender specific age-length key developed for each river and included in CPUE and size-distribution analyses. Beginning in 2011, American Shad have been aged using otoliths, or age distributions have been calculated by applying age-length keys from years when otolith ages were aged up to 10 fish per 10-mm size bin (by sex) are sacrificed for otolith extraction. Broodfish were used to develop age-length keys in addition to spawning area survey fish.

#### *Independent Gill Net Survey*

Each fish is measured for fork length and total length. Sex is always determined for fish captured in the Albemarle Sound IGNS. Each fish is sexed by applying directional pressure to the abdomen toward the vent and observing the presence of milt or eggs. Scales are collected from the left side of each fish between the lateral line and the dorsal fin. Scales are prepared and aged according to the Cating (1953) method.

### **5.1.4 Total Mortality Estimates**

Survival estimates are calculated using the Robson and Chapman (1961) method. Robson and Chapman showed that estimates of annual rates of survival can be made from the catch curve of a single season if the population is exposed to unbiased fishing gear beyond the age of recruitment and if year-class strength and survival rate remain constant from year to year. Annual mortality rates are calculated based on observed samples of individuals at age. Only age groups that are fully recruited to the gear are included in the calculations and the resulting estimates only apply to the fully recruited individuals.

## **5.2 Hatchery Evaluation**

### **5.2.1 Roanoke River American Shad Restoration Project**

Since 1998, over 72 million American Shad fry have been stocked in the Roanoke River downstream of Kerr (US Army Corps of Engineers), Gaston (Dominion Power) and Roanoke Rapids (Dominion Power) reservoirs at Weldon, NC. Since 2003, American Shad fry have also been stocked upstream of Kerr Reservoirs at Altavista, Clover Landing, VA; in Gaston Reservoir at Bracey, VA; and Roanoke Rapids Lake near Roanoke Rapids, NC (Table 5). These stocking activities serve as migratory obstruction mitigation required by Federal Energy Regulatory Commission (FERC) relicensing of the Gaston and Roanoke Rapids hydropower dams. The stockings upstream of dams are experimental to evaluate escapement of American Shad and determine the benefits of future fish passage efforts.

In the early years of the restoration project, WRC followed protocols of other states involved in American Shad restoration efforts and obtained broodfish for fry production from nearby rivers having adequate shad stocks. American Shad broodfish were collected by electrofishing from the Tar, Neuse, Cape Fear, and Roanoke rivers from 1998–2010. Hormone injection was used to initiate spawning in the hatchery from 1998 to 2008, but in 2009, for the first time, broodfish were not injected with hormone (LHRHa or sGnRHa pellets) upon arrival at the hatcheries and prior to being transferred to circular spawning tanks. In 2011, only broodfish collected from the Roanoke River were utilized for production. Upon collection, broodfish are placed in circular tanks with oxygen and continuously circulating water onboard the electrofishing boats and are then transferred to large circular, trailer-mounted tanks for transport to the hatcheries.

Annual contribution of hatchery-origin American Shad to the Roanoke River population is evaluated for multiple cohorts of returning adults during the spring spawning run and for out-migrating juveniles during fall of the stocking year. Evaluation of hatchery contribution to the Roanoke River American Shad population was conducted using oxytetracycline (OTC) marks from 1998–2009. Subsequent testing proved OTC marking procedures and analyses were unreliable, and the WRC initiated use of genetic microsatellite markers for parentage-based tagging (PBT) methods in 2010. With the PBT method, each spawning tank contains a genetically discrete batch of broodfish, from which the progeny can be uniquely identified. Fin clips from all American Shad broodfish were stored in numbered vials containing non-denatured, spectrophotometric grade ethanol to later be referenced for determining hatchery origin of at-large fish produced in a given year. All PBT analyses were conducted by the genetics laboratory at the North Carolina Museum of Natural Sciences (NCMNS). Daily OTC marking techniques have not been used since the switch was made to PBT analysis. Fin clips from adult American Shad are collected during spawning stock surveys, and broodfish are also cross-referenced for potential hatchery contribution of stockings from previous years. Broodfish fin clips combined with fin clips collected during weekly samples are collectively referred to as at-large adults

Parentage-based-tagging efforts were initiated in 2010, and the early results (i.e., 2010–2014) cannot capture potential hatchery contribution from year classes before 2010. Thus, percent contribution of hatchery fish is underestimated and should be considered a minimum prior to 2015. Hatchery contribution from these early years should not be used to make inferences regarding the overall hatchery contribution of the spawning stock but can be used to assess hatchery contribution for specific year classes.

In 2012, a total of 289 fin clips was assessed using PBT techniques. Only one fish was determined to be of hatchery origin and was matched with broodfish from the 2010-year class. In 2013, a total of 26 out of 527 at-large adults was found to be of hatchery origin; 25 were matched to the 2010-year class and one to the 2011-year class. In 2014, a total of 708 fin clips was processed, and 90 were determined to be of hatchery origin (12.7%). Of the total, 54 were matched with broodfish from the 2010-year class, 34 from the 2011-year class, and 2 from the 2012-year class. In 2015, 233 of 543 processed fin clips were found to be of hatchery origin (42.9%); 66 were matched with the 2010-year class, 141 with the 2011-year class, 23 with the 2012-year class, and 3 with the 2013-year class. In 2016, 522 fin clips were processed, and 293 were determined to be of hatchery origin (56.1%); 33 were matched with broodfish from 2010, 191 matched with the 2011 broodfish, 38 matched with the 2012 broodfish, and 31 matched with the 2013 broodfish. Between 2010 and 2014, all hatchery-origin fish were stocked at Weldon (below Roanoke Rapids Dam). In 2016, one of the hatchery identified fish was stocked into the Staunton River, upstream of Kerr Reservoir.

This is the first conclusive evidence of a fish being stocked above Kerr Reservoir being captured as an adult on the spawning grounds.

In 2016, a sample of fin clips was obtained from shad intercepted in the Albemarle Sound. A total of 4 out of 117 (3.4%) Albemarle Sound fish was determined to be of hatchery origin; the hatchery fish were from the 2011 and 2012 year classes. In 2017, 5 of 126 (4.0%) fin clips from Albemarle Sound American Shad were determined to be stocked fish. The 2011, 2012 and 2013 year classes were represented in the 2017 stocked fish. In both years, the hatchery contribution in the Albemarle Sound sample was lower when compared with hatchery contribution on the spawning grounds, indicating that Roanoke River spawning fish do not make up the majority of the Albemarle stock. Subsequent years of sampling will continue to investigate this relationship by obtaining fin clips from the Chowan River (when possible), Roanoke River, and Albemarle Sound.

Out-migrating juvenile American Shad are typically collected at night in the lower Roanoke River near Plymouth, NC from September to November using boat-mounted electrofishing gear. Since 2010, hatchery contribution of the out-migration has been assessed using PBT methods and has ranged from 2.7% (2012) to 44.8% (2014); average hatchery contribution was 21% over the survey period. To identify bottlenecks in passage in the Roanoke River, genetically distinct batches of fry were systematically stocked in the Staunton River upstream of Kerr Reservoir, Gaston Reservoir, Roanoke Rapids Lake, and Weldon. Hatchery fish identified in the out-migration can be conclusively matched to their stocking location; from 2010 through 2015 only hatchery-origin juveniles stocked at Weldon were collected. In 2016, however, six hatchery origin juveniles from the out-migrating sample were determined to be stocked in Roanoke Rapids Lake. Results from experimental fry stockings suggest fry spawned upstream of the reservoirs would contribute to the out-migrating juvenile population at a much lower rate than fry spawned downstream of the reservoirs. Thus, it may not be prudent to pass spawning adults upstream of the reservoirs until methods to improve downstream passage are developed.

### **5.2.2 Neuse River American Shad Restoration Project**

The WRC began an American Shad restoration stocking program in the Neuse River in 2012. The goal of the Neuse River American Shad stocking program is to supplement the wild population by stocking fry produced from one spawning tank of approximately 100 broodfish each year. American Shad broodfish are collected from the Neuse River near Goldsboro, NC and are transported to Edenton National Fish Hatchery where they can spawn and fry are reared for approximately 7 days. American Shad fry are stocked in the Neuse River near Goldsboro, NC. Evaluation of hatchery contribution to the Neuse River American Shad population is conducted using the same PBT methods as described for the Roanoke River restoration program. A total of 4,893,186 American Shad fry have been stocked in the Neuse River at the NC Hwy 117 bridge near Goldsboro, NC since 2012, and hatchery contribution to out-migrating juvenile samples has been low (0–13%; Table 6). Hatchery contribution to returning adults has also been low. In 2016, which was the first-year hatchery fish were potentially available as age-4 adults, only 9 of 411 (4%) adults tested with PBT analysis were of hatchery-origin. Contribution of stocked fish may increase slightly in the future as more hatchery cohorts will move into the spawning population, but it appears the stocking program is contributing very little to the overall American Shad population in the Neuse River.

## **5.3 FISHERY-DEPENDENT MONITORING**

### **5.3.1 Commercial Fishery**

#### *Total Catch, Landings and Effort*

American Shad landings data are collected through the North Carolina Trip Ticket Program. The number of participants by gear utilized and the total number of positive trips can be determined. For the Albemarle Sound area, the following assumptions are made: (1) trips landing over 100 pounds of shad are considered directed trips, and (2) the maximum yardage used in directed trips is 1,000 yards. The total yardage for each area is determined by multiplying the number of participants by the maximum yardage per area. The catch-per-yard (CPY) is determined by dividing the number of pounds harvested by the total yardage estimate of gill nets fished and multiplied by 1,000 yards. This will result in the pounds landed per 1,000 yards. Catch estimates for other areas are determined similarly.

#### *Size, Age and Sex Composition of Catch*

Commercial landings from all four systems (Albemarle Sound, Tar-Pamlico River, Neuse River and Cape Fear River) are sampled to obtain size, age, sex and repeat spawning information. A target of 200 samples from each system has been in place since 1999. For specific information regarding exact number of samples collected per area, please see previous compliance reports.

### **5.3.2 Recreational Fishery**

#### *Total Catch, Landings and Effort*

The North Carolina Fisheries Reform Act of 1997 required the MFC to establish limits on recreational use of commercial fishing gear. An individual holding a Recreational Commercial Gear License (RCGL) can use limited amounts of specified commercial gear to catch seafood for personal consumption or recreational purposes. The holder of the RCGL must comply with the recreational size and creel limits, and RCGL catch cannot be sold. During 2002, DMF began a RCGL survey to estimate the harvest by these license holders. The survey was discontinued in 2009 due to budget reductions.

An annual creel survey occurs on the Roanoke River each year. The survey targets Striped Bass catch and effort but also collects information on American Shad and other species, although American Shad catch is low due to the fishing method.

#### **5.3.2.1 Central Southern Management Area Catch, Landings, and Effort**

A rotating creel survey occurred on the Tar, Neuse and Cape Fear rivers prior to 2012. A comprehensive creel survey was initiated in 2012 to identify and estimate recreational American and Hickory Shad effort and catch within these systems, which are collectively known as the Central Southern Management Area (CSMA). The CSMA was originally established for purposes of estuarine striped bass management and includes all Internal Coastal, Joint, and contiguous Inland waters of North Carolina south of a line from Roanoke Marshes Point across to Eagle Nest Bay to the South Carolina state line. The areas surveyed in the CSMA include the Neuse, Trent, Tar/Pamlico, Cape Fear and Pungo rivers. The Neuse River basin drains over 6,200 square miles of land with over 3,000 miles of streams and rivers. The mouth of the main channel is six miles across – the widest in the United States. Over 1.3 million residents reside within this river basin. Major tributaries include Crabtree, Swift, and Contentnea creeks, along with the Eno, Little, and Trent rivers. Survey points included 45 boat ramps and fishing access points from Millburnie Park in East Raleigh to Lee's Landing on Broad Creek. The river was divided in three segments, with all

access points in Goldsboro and above classified as the upper zone, sites on Contentnea Creek and downstream from Goldsboro to Core Creek were considered the middle zone, and those downstream from Core Creek, the lower zone. Prior to 2012, the Neuse River was comprised of only two zones with all sites above Contentnea Creek considered the upper.

The Tar/Pamlico River watershed drains over 5,500 square miles with over 2,400 miles of streams and rivers. Major tributaries include Cokey Swamp, Swift, Fishing, and Tranters creeks, and the 30-mile Pungo River near Belhaven, North Carolina – the main tributary in the lower basin. Access points surveyed on the Tar/Pamlico River include 19 boat ramps and access sites from Battle Park in Rocky Mount to the Quarterdeck Marina in Bath, NC. This system was divided into upper and lower zones, with sites upstream of Greenville, North Carolina considered the upper zone. The Pungo River was surveyed at the Leechville ramp (NC-264 bridge), the Belhaven WRC ramp, Wrights Creek WRC ramp, and Cee Bee Marina on Pungo Creek.

The Cape Fear River is the southernmost river within the CSMA and was included to target shad (American and hickory) beginning in 2013.

#### 5.3.2.1.1 Sampling Procedures

Recreational fishing statistics from the CSMA were calculated through a non-uniform stratified access-point creel survey (Pollock et al. 1994). Site probabilities were set in proportion to the likely use of the site according to time of day, day of the week, and season. Probabilities for this survey were assigned based on observed effort from past years and direct observation by creel clerks. Morning and afternoon periods were assigned unequal probabilities of conducting interviews, with each period representing half a fishing day. A fishing day was defined as the period from one hour after sunrise until one hour after sunset. Monthly sampling periods for each river and zone were stratified accordingly, and all weekend and holiday dates along with two randomly selected weekdays were chosen from each week for sampling.

Tar/Pamlico River anglers in the upper zone were interviewed throughout the spring months (January-May), while anglers in the lower zone were interviewed year-round based on the evidence of a year-round fishery and no seasonal closures. Two creel clerks were assigned to this river, with one surveying the upper zone January through May and one clerk surveying the lower zone from January through December. The three zones within the Neuse River were covered with one creel clerk per zone. The lower zone was surveyed from January to December while middle zone surveys were conducted January-May and the upper zone surveys from February-May. The Pungo River was surveyed throughout the year with one creel clerk.

Returning fishing parties were interviewed by a creel clerk at the selected access point to obtain information regarding party size, effort, total number of fish harvested and/or released, primary fishing method, and location. Harvested fish were identified, counted, measured nearest mm fork length (converted to centerline length and total length for appropriate species), and weighed to the nearest 0.1 kg, while information on discarded fish was obtained from the angler to acquire the number and status of discarded individuals. The age structures were given to the Fisheries Management section of DMF for age determination. Creel clerks also obtained socioeconomic information from the angler, including age, state and county of residence, sex, ethnic background, marital status, number of individuals within household, and trip information and expenditures

#### 5.3.2.1.2 Analysis

##### *Effort and Catch Estimations*



Samples were reduced to shad species effort and catch only. Results were stratified by river, access point, and time of day. Catch was defined as the sum of harvested fish and discarded fish. Discarded fish equaled the sum of fish caught in excess of creel limits (over-creel), legal-sized fish caught and released, and sub-legal fish returned to the water. Daily effort and catch for each river were calculated by expanding observed numbers by the sample unit probability (time of day probability divided by access area probability). Total catch estimates for the CSMA and catch estimates for each zone and type of day were calculated based on the Horvitz-Thompson estimator for non-uniform probability sampling as such:

$$C = \sum_{i=1}^n (c_i / p_i)$$

where a sample of number (n) units is taken, and the probability of the *i*th unit being in the sample is denoted by  $P_i$  (Pollock et al. 1994). Total effort over the CSMA and each individual zone and type of day were estimated in the same fashion, as were other extrapolated data. Approximate standard errors (SE) of the catch and effort estimates within zone and type of day were calculated according to:

$$SE = \sqrt{N^2 \left( \frac{s^2}{n} \right)}$$

where  $s^2$  is the variance of the observations, n is the number of days sampled, and N is the number of days of that type available for sampling (Pollock et al. 1994). Estimated catch per unit effort (CPUE) values were obtained by dividing estimated catch by estimated shad spp. trips as well as angler hours (angler-h) in order to identify trends in fishing pressure and angler success. Size structure of shad spp. in harvests was described for each zone using length-frequency distributions of observed samples. Fishing party characteristics and methods used during shad spp. trips reported by anglers were documented by river and day type. The database was created using Access© and statistical analyses were performed with SAS 9.1©. Beginning in 2012, the Wildlife Resources Commission (WRC) Portal Access To Wildlife Systems (PAWS) was used to house these data and estimate effort and catch. DMF and WRC staff have been verifying calculations to ensure consistency with the previous work.

#### *Angler Demographics and Economic Analysis*

The CSMA Creel Survey socioeconomic questionnaire included questions to identify characteristics of the shad spp. angling population. Demographics of anglers were reported according to age, residency, gender, ethnic background, marital status, and expressed as a percentage of the total angling population throughout the CSMA. Mean values were calculated. Results were further grouped by river and day type. Anglers were considered to be local, regional, or out-of-state residents. Local anglers resided within the county, while regional anglers resided elsewhere in North Carolina. The socioeconomic questionnaire also included questions regarding trip length, distance traveled, party size, and expenses on lodging, food, ice, bait, equipment rental, and boat fuel and oil. Mean weighted expenditures per trip were reported by river and day type. Lodging and rental expenses were rarely encountered and therefore are not included within this report. The weighted mean of each expenditure was totaled to provide an average trip cost.

For specific information regarding catch and harvest of American Shad, please see previous compliance reports.

## **5.4 Bycatch and Discards**

Bycatch and discard information are not currently collected on commercial trip tickets. The only mechanism that exists to capture commercial bycatch and discards of American Shad in other fisheries is an observer program conducted by DMF to monitor sea turtle and sturgeon interactions in gill nets, as required under the Incidental Take Permits (ITP) for both. The state-wide sea turtle ITP was approved first in September 2013 followed by the Atlantic Surgeon ITP in July 2014. Prior to the approval of the Sturgeon ITP there was little observer coverage in the Western Albemarle Sound and the rivers when the directed American Shad fishing season occurs because there are very few encounters with sea turtles in these areas during that time of year. Observer coverage has increased in recent years, under the Sturgeon ITP because there have been encounters with sturgeon in these areas and times of year where directed American Shad fishing occurs. Even though observer coverage in the area have increased, gear, area, and seasonal restrictions are thought to have kept shad discards relatively low.

Recreational creel surveys capture discard and release information of American Shad and non-target species, but hook-and-line discard mortality is not estimated. Please see previous compliance reports for this information.

## **6 FISHERY MANAGEMENT PROGRAM**

American Shad are jointly managed by the North Carolina Marine Fisheries Commission (MFC) and the North Carolina Wildlife Resources Commission (WRC). The Division of Marine Fisheries (DMF) implements MFC rules for American Shad in the Atlantic Ocean as well as the Coastal and Joint waters of North Carolina, while the WRC Inland Fisheries Division manages American Shad in the state's recreational fishery in Inland Waters. The known extent of American Shad in North Carolina river systems is shown in Figure 1. This Plan is developed by the American Shad Working Group (ASWG) which consists of biologists from both DMF and WRC. The ASWG meets annually to review sustainability parameters and develop associated actions for the management of American Shad in North Carolina's Inland, Joint, and Coastal waters.

### **6.1 Commercial Seasonal Restrictions (statewide)**

From the 1950s to 1965, a January 1 through May 1 commercial season existed in Coastal Waters, while a January 1 through June 1 season existed in Inland Waters throughout the state. From 1966 through 1994, no seasonal restrictions existed for the commercial fishery. Since 1995, a commercial season of January 1 through April 14 has been in place in Coastal and Joint waters although the fishery is rarely opened prior to February 1 each year. Implementation of this seasonal restriction reduced harvest, as a large portion of the commercial American Shad harvest historically occurred after April 14 and into May.

In 2013, under the first year of the North Carolina American Shad SFP, the commercial seasons were restricted to February 15 through April 14 in all systems except for the Cape Fear River (Table 8). In the Cape Fear River, the commercial season was restricted to February 20 through April 11. Following the 2013 season, thresholds in the Albemarle Sound/Roanoke River system were exceeded for three consecutive years (2011, 2012, and 2013) triggering further management action; as a result, the commercial season was reduced to March 3 through March 24 to constrain harvest. This season has remained in place for the Albemarle Sound/Roanoke River system since 2013.

## **6.2 Commercial Gear Restrictions**

### *Albemarle Sound/Roanoke River*

Beginning in 1987, western Albemarle Sound (also referred to as Batchelor Bay) has been closed to the use of gill nets from February through mid-November. While the purpose of the closure is Striped Bass conservation, this measure has also afforded protection for American Shad. From 1988 through 1990, limits of 1,000 to 2,000 yards were implemented for 5.25-inch stretched mesh and larger gill nets in Albemarle Sound, and nets could only be set 5 days per week. In April 2016, the MFC adopted a permanent rule implementing yardage restriction for nets with a mesh length of 4.0-inch stretched mesh or greater, the maximum length of gill net shall not exceed 2,000 yards per vessel in all Internal Coastal Waters regardless of the number of individuals involved.

Since 1998, commercial restrictions in Albemarle Sound have been consistent and include a prohibition on the use of gill nets with a mesh size of 3.5–5.0 inches stretched mesh and a limit of 1,000 yards on the use of 5.25-inch and greater (floating) stretched mesh during the open shad season. When the season closes, these nets are removed from the water. The Albemarle Sound is the only system for which mesh size restrictions and yardage limits exist during the shad season.

The Roanoke River has been closed to the use of anchored gill nets since 1991 and drift gill nets since 1993 which greatly reduced harvest of American Shad.

### *Tar-Pamlico River, Neuse River*

Since 2016 a statewide rule limits the amount of large mesh (4.0-inch and greater) gill net set in internal Coastal waters to no more than 2,000 yards per vessel. Prior to 2016 a former rule was suspended in the majority of internal Coastal waters as a result of sea turtle conservation measures to institute no more than 2,000 yards per vessel of 4.0–6.5-inch gill net in the Tar-Pamlico and Neuse systems. Additionally, in certain sections of the Tar-Pamlico and Neuse rivers, gill nets with a mesh size less than five inches must be attended at all times.

Also, it is unlawful to use gill nets of any mesh size in Joint Fishing Waters from midnight on Friday to midnight on Sunday each week (except for portions of Albemarle and Currituck sounds). These existing gill net measures have likely reduced American Shad harvest since they have remained in effect since the spring 2012 fishing season and will remain in effect indefinitely.

### *Cape Fear River*

There are different gill net restrictions then described above for the Tar-Pamlico and Neuse systems (i.e. mesh lengths, spacing, set/retrieval days and times) for the Cape Fear system. Nets can be set in lengths no greater than 100 yards and must have at least a 25-yard space between each individual length of net. Only single overnight sets are allowed; nets can be set one hour prior to sunset and must be retrieved within one hour of sunrise, with no sets allowed Friday, Saturday or Sunday evenings, and the maximum yardage allowed is a 1,000-yard limit per vessel.

It is unlawful to use gill nets of any mesh size on weekends in the Cape Fear system. This measure will remain in effect indefinitely.

## **6.3 Recreational Restrictions**

Prior to 1995, no recreational restrictions existed. Beginning in 1995, it became unlawful to take American Shad and Hickory Shad by any method except hook-and-line from April 15– December 31 in Coastal Waters. Additionally, from 1995 through 1998, there was a recreational season

during January 1 through April 14. Beginning in 1999, it became unlawful to possess more than 10 American Shad and Hickory Shad in the aggregate in both Coastal and Inland Waters.

In 2013, under the first year of the North Carolina American Shad SFP, a 1-fish American Shad limit within the 10-fish aggregate creel limit was implemented in the Joint and Coastal waters of both the Albemarle Sound/Roanoke River and the Neuse River to complement the existing 1-fish limits implemented by the WRC in the Inland Waters of those systems (Table 9). In the Cape Fear system, both the WRC and DMF implemented a 5-fish American Shad limit within the aggregate 10-fish creel limit in their respective jurisdictional waters to meet the requested Technical Committee reductions. All recreational limits have remained unchanged since 2013. The changes noted here have been implemented via rule in Inland Waters by the WRC and via proclamation in Coastal and Joint Waters by DMF.

#### *Albemarle Sound/Roanoke River*

In 2010, the WRC implemented a 1-fish American Shad limit within the 10-fish aggregate creel limit for American and Hickory Shad in the Inland Waters of the Roanoke River. DMF complemented the 1-fish limit in Joint and Coastal Waters in 2013. Due to the size of the Albemarle Sound there is no recreational effort for American Shad in the sound itself, and little to no effort is concentrated in the tributaries of the Albemarle Sound. Recreational effort mainly occurs in the Roanoke River where the focus of angler effort is on Striped Bass and American Shad catch is primarily incidental. In Virginia, the Meherrin, Nottaway, and Blackwater Rivers drain into the Chowan River, which a substantial portion of the spawning stock entering the Albemarle Sound ascend to spawn at the head waters of these rivers. Recreational effort in these Virginia systems is not taken into consideration under this plan. While the impact of recreational harvest in Virginia waters is unknown to the spawning stock entering the Albemarle Sound, it is important to note the creel limit in these rivers remains a 10-fish aggregate for American and Hickory Shad.

#### *Neuse River*

A WRC rule implementing a 1-fish limit for American Shad in the Inland Waters of the Neuse River became effective in August 2012. DMF complemented the 1-fish limit in Joint and Coastal Waters in 2013.

#### *Tar-Pamlico River*

The 10 American and Hickory Shad aggregate creel limit applies throughout the waters of the Tar-Pamlico River and its tributaries.

#### *Cape Fear River*

In November 2013, the WRC implemented a 5-fish limit for American Shad within the 10-fish aggregate creel limit in the Inland Waters of the Cape Fear River. DMF complemented the 5-fish limit in Coastal and Joint Waters in 2013.

#### *Atlantic Ocean*

Possession of American Shad is prohibited.

#### *All other internal waters*

Recreational harvest of American Shad is very rare in internal waters other than those described above. Current regulations, however, allow for a daily harvest of up to 10 American and Hickory Shad, in the aggregate. This regulation includes North Carolina portions of the Pee Dee River.

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## 7 TABLES

Table 1. North Carolina Sustainable Fishery Plan for American Shad summary of management thresholds and triggers for 2018-2022.

<b>System</b>	<b>Index</b>	<b>Threshold Value</b>	<b>Time Series</b>	<b>Threshold Level</b>	<b>Management Trigger</b>
Albemarle/ Roanoke	Roanoke River Female CPUE	0.131	2001-2017	25 <sup>th</sup> percentile	3 consecutive years below the threshold; does not trigger management by itself
Albemarle/ Roanoke	Albemarle Sound Female CPUE	0.0277	2000-2017	25 <sup>th</sup> percentile	3 consecutive years below the threshold
Albemarle/ Roanoke	Female Relative <i>F</i>	1,740,876	2002-2017	75 <sup>th</sup> percentile	3 consecutive years above the threshold
Tar/Pamlico River	Female CPUE	0.384	2000-2017	25 <sup>th</sup> percentile	3 consecutive years below the threshold
Tar/Pamlico River	Female Relative <i>F</i>	20,243	2002-2017	75 <sup>th</sup> percentile	3 consecutive years above the threshold
Neuse River	Female CPUE	0.1275	2000-2017	25 <sup>th</sup> percentile	3 consecutive years below the threshold
Neuse River	Female Relative <i>F</i>	198,625	2002-2017	75 <sup>th</sup> percentile	3 consecutive years above the threshold
Cape Fear River	Female CPUE	0.112	2001-2017	25 <sup>th</sup> percentile	3 consecutive years below the threshold
Cape Fear River	Female Relative <i>F</i>	186,354	2003-2017	75 <sup>th</sup> percentile	3 consecutive years above the threshold

Table 2. Tar-Pamlico River recreational creel survey estimates for trips targeting Shad species (including hickory and American Shad) in numbers and pounds of fish, 2012-2016.

		Effort				Catch					
		Trips (#) PSE		Hours PSE		Harvest (#) PSE		Pounds (lb) PSE		Discard (#) PSE	
American	2012	490	37.2	1,399	47.6	899	41.9	1,711	41.9	4,257	33.5
	2013	106	78.4	125	85.1	2,484	23.6	6,841	24.1	7,057	41.4
	2014	20	100.0	3	100.0	162	66.6	0	0.0	1,302	74.6
	2015	54	100.0	54	100.0	1,006	47.7	3,262	47.7	2,784	78.7
	2016	1,347	31.1	5,806	51.4	1,417	37.2	807	0.0	2,820	34.0
Hickory	2012	321	47.0	486	46.6	403	61.0	0	0.0	7,286	38.0
	2013	0	0.0	0	0.0	2,250	58.2	2,970	58.3	5,490	55.3
	2014	190	66.2	248	73.1	341	70.1	0	0.0	2,052	56.6
	2015	107	73.7	398	75.3	864	64.4	1,009	65.1	3,848	57.9
	2016	295	52.5	2,086	68.9	1,409	70.9	0	0.0	11,590	67.2
Shad Species	2012	321	47.0	486	46.6	403	61.0	0	0.0	7,286	38.0
	2013	7,314	17.9	16,455	19.9	234	100.0	0	0.0	6,079	34.0
	2014	2,420	22.9	5,701	35.5	0	0.0	0	0.0	17	100.0
	2015	3,521	24.9	9,200	34.5	0	0.0	0	0.0	2,105	88.2
	2016	3,473	27.1	10,160	38.9	0	0.0	0	0.0	0	0.0



Table 3. Neuse River recreational creel survey estimates for trips targeting Shad species (including hickory and American Shad) in numbers and pounds of fish, 2012-2016.

		Effort				Catch					
		Trips (#) PSE		Hours PSE		Harvest (#) PSE		Pounds (lb) PSE		Discard (#) PSE	
American	2012	8,268	34.7	17,528	29.0	354	104.2	2,141	38.2	511	47.0
	2013	395	28.4	869	27.2	1,384	47.2	3,197	48.7	2,699	62.2
	2014	426	70.1	1,181	82.1	416	51.3	0	0.0	964	61.4
	2015	344	42.5	1,135	43.4	94	76.1	0	0.0	132	46.3
	2016	451	56.2	1,481	35.1	252	47.3	0	0.0	1,389	60.6
Hickory	2012	11,659	28.3	23,157	26.1	10,672	27.4	11,998	28.5	29,041	39.8
	2013	570	39.8	1,517	43.4	12,810	28.4	13,030	26.2	14,138	29.6
	2014	181	65.6	886	60.7	14,557	44.3	16,492	47.0	27,100	39.4
	2015	300	50.7	1,259	48.8	10,418	28.5	10,213	31.5	12,186	42.6
	2016	225	68.7	415	78.4	10,851	36.6	11,140	36.4	29,276	58.0
Shad Species	2012	11,659	28.3	23,157	26.1	10,672	27.4	11,998	28.5	29,041	39.8
	2013	14,840	14.9	31,249	19.1	0	0.0	0	0.0	765	57.7
	2014	12,779	22.0	30,532	30.5	0	0.0	0	0.0	136	100.0
	2015	6,775	21.2	15,393	30.2	0	0.0	0	0.0	136	75.3
	2016	8,898	18.3	25,741	28.1	0	0.0	0	0.0	899	61.8

Table 4. Cape Fear River recreational creel survey estimates for trips targeting Shad species (including hickory and American Shad) in numbers and pounds of fish, 2013-2016.

		Effort				Catch					
		Trips (#) PSE		Hours PSE		Harvest (#) PSE		Pounds (lb) PSE		Discard (#) PSE	
American	2013	0	0.0	0	0.0	20,243	21.1	46,522	21.0	6,438	73.7
	2014	114	84.5	188	88.0	7,234	25.3	23,027	25.6	0	0.0
	2015	0	0.0	0	0.0	4,136	32.7	11,502	32.2	6,125	39.3
	2016	4,550	15.0	18,820	22.5	10,265	22.1	28,427	22.8	10,746	28.6
Hickory	2013	0	0.0	0	0.0	13	0.0	0	0.0	135	100.0
	2014	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2015	0	0.0	0	0.0	12	100.0	0	0.0	0	0.0
	2016	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Shad Species	2013	12,334	22.3	54,807	22.1	2,050	44.8	4,029	44.8	26,457	38.5
	2014	2,820	17.9	11,762	22.2	174	84.0	0	0.0	10,300	56.4
	2015	3,414	22.2	13,933	26.3	0	0.0	0	0.0	264	71.7
	2016	582	60.7	3,681	72.0	0	0.0	0	0.0	648	79.7

Table 5. American Shad fry stocked into the Roanoke River Basin from 1998–2016. Stockings downstream of the lower-most dam occur at Weldon, NC, stockings upstream of John H. Kerr Dam occur at either Altavista or Clover Landing, VA, stockings upstream of Gaston Dam occur at Bracey, VA, and stockings upstream of Roanoke Rapids Dam occur at Roanoke Rapids, NC. Hatchery evaluation techniques have transitioned from Oxytetracycline (OTC) marks to parentage-based tagging methods using genetic microsatellite markers.

Year	Total Fry Stocked (millions)	Fry Totals (millions) by Stocking Location					Hatchery Evaluation Technique	Age Class at-large
		Weldon, NC	Altavista, VA	Clover Landing, VA	Bracey, VA	Roanoke Rapids, NC		
1998	0.5	0.5	-	-	-	-	OTC	18
1999	0.3	0.3	-	-	-	-	OTC	17
2000	0.8	0.8	-	-	-	-	OTC	16
2001	2.1	2.1	-	-	-	-	OTC	15
2002	0.8	0.8	-	-	-	-	OTC	14
2003	2.3	1.2	1.1	-	-	-	OTC	13
2004	2.3	1.2	1.1	-	-	-	OTC	12
2005	2.5	1.3	1.2	-	-	-	OTC	11
2006	2.4	1.4	1.0	-	-	-	OTC	10
2007	4.3	2.2	2.1	-	-	-	OTC	9
2008	8.2	4.3	3.9	-	-	-	OTC	8
2009	8.6	4.5	4.1	-	-	-	OTC	7
2010	7.8	6.9	0.9	-	-	-	OTC/PBT	6
2011	4.4	4.0	-	0.4	-	-	OTC/PBT	5
2012	4.8	3.8	-	1.0	-	-	OTC/PBT	4
2013	4.5	2.4	-	1.3	0.8	-	PBT	3
2014	7.5	3.5	-	1.4	2.6	-	PBT	2
2015	4.8	2.6	-	0.8	1.5	-	PBT	1
2016	3.8	1.3	-	-	-	2.5	PBT	0
Total	72.7	45.1	15.4	4.9	4.9	2.5		

Table 6. American Shad fry stocked into the Neuse River Basin at NC Highway 117 bridge near Goldsboro and juvenile hatchery contribution based on parentage-based tagging analysis, 2012–2016.

Year	Fry Stocked	Out-migrating Juvenile Hatchery Contribution
2012	573,582	2%
2013	1,184,303	6%
2014	1,377,375	13%
2015	708,045	1%
2016	609,720	0%*
2017	440,161	NA
<b>Total</b>	<b>4,893,196</b>	

\*Sample size was only 7 fish

Table 7. American Shad movement study results in numbers of fish tagged in the Albemarle Sound and numbers of tagged fish detected on spawning runs in the Roanoke and Chowan River from 2013-2017.

Year	Tagged	Detected	Spawning Run	
			Roanoke	Chowan
2013	7	5		1
2014	53	35	2	8
2016	56	29		2
2017	75	58	2	22

Table 8. Commercial harvest seasons for American Shad 2012-2017.

System	2012*	2013	2014	2015	2016	2017
Albemarle Sound						
Roanoke River	2/1 - 4/14	2/15 - 4/14	3/3 - 3/24	3/3 - 3/24	3/3 - 3/24	3/3 - 3/24
Tar-Pamlico	2/1 - 4/14	2/1 - 4/14	2/1 - 4/14	2/1 - 4/14	2/1 - 4/14	2/1 - 4/14
Neuse	2/1 - 4/14	2/1 - 4/14	2/1 - 4/14	2/1 - 4/14	2/1 - 4/14	2/1 - 4/14
Cape Fear	2/1 - 4/14	2/20 - 4/14	2/20 - 4/14	2/20 - 4/14	2/20 - 4/14	2/20 - 4/14
All Other Areas	2/1 - 4/14	2/15 - 4/14	2/15 - 4/14	2/15 - 4/14	2/15 - 4/14	2/1 - 4/14

\*last year prior to SFP implementation

Table 9. Recreational creel restrictions for American Shad 2012-2017. All numbers represent limits within an overall 10-fish aggregate creel limit for American and Hickory Shad combined.

<b>System</b>	<b>2012*</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>
Albemarle Sound	1-fish IW					
Roanoke River	10-fish CJW*	1-fish	1-fish	1-fish	1-fish	1-fish
Tar-Pamlico	10-fish	10-fish	10-fish	10-fish	10-fish	10-fish
Neuse	1-fish IW					
	10-fish CJW*	1-fish	1-fish	1-fish	1-fish	1-fish
Cape Fear	10-fish	5-fish	5-fish	5-fish	5-fish	5-fish
All Other Areas	10-fish	10-fish	10-fish	10-fish	10-fish	10-fish

\*last year prior to SFP implementation; IW=Inland Waters; CJW = Coastal and Joint Waters, blank=all waters

8 FIGURES

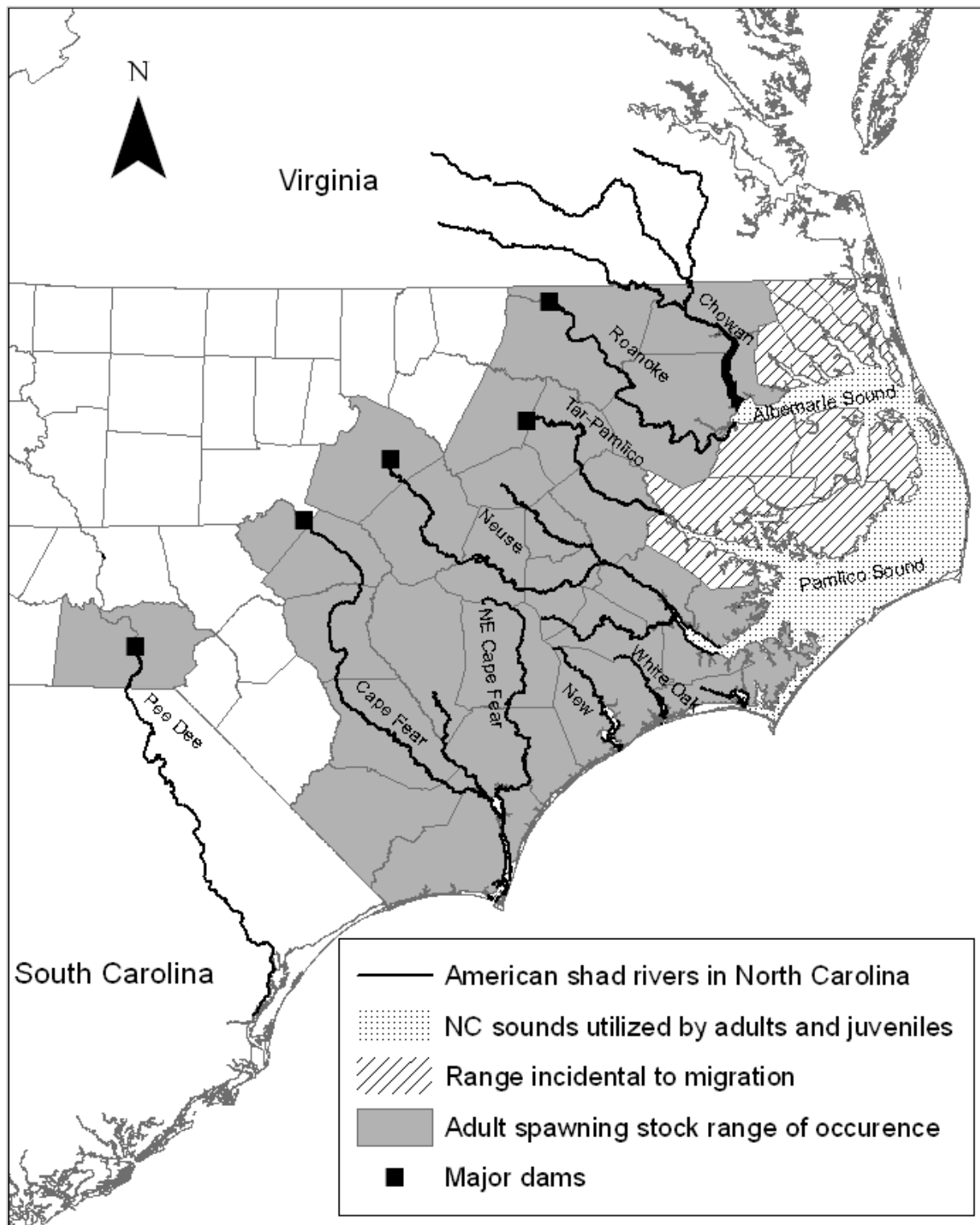


Figure 1. North Carolina river systems depicting the extent of American Shad occurrence and habitat use.

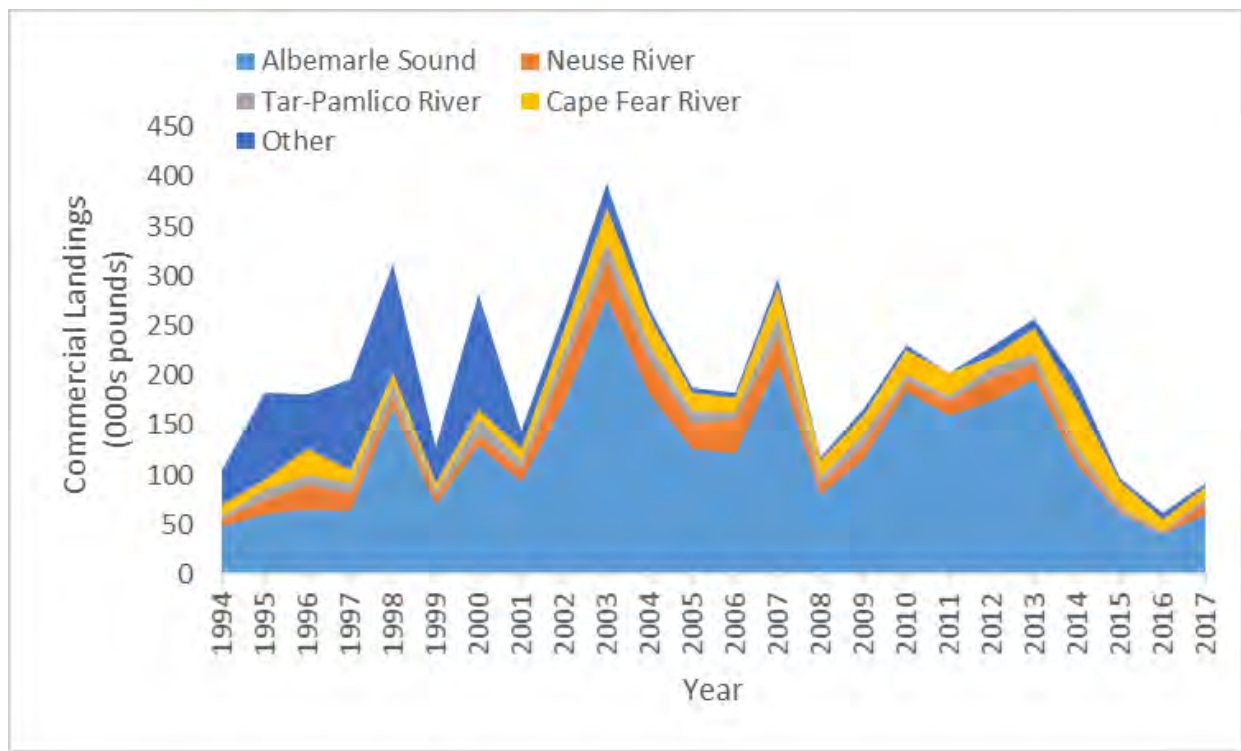


Figure 2. Commercial landings of American Shad in North Carolina by water body, 1994–2017.

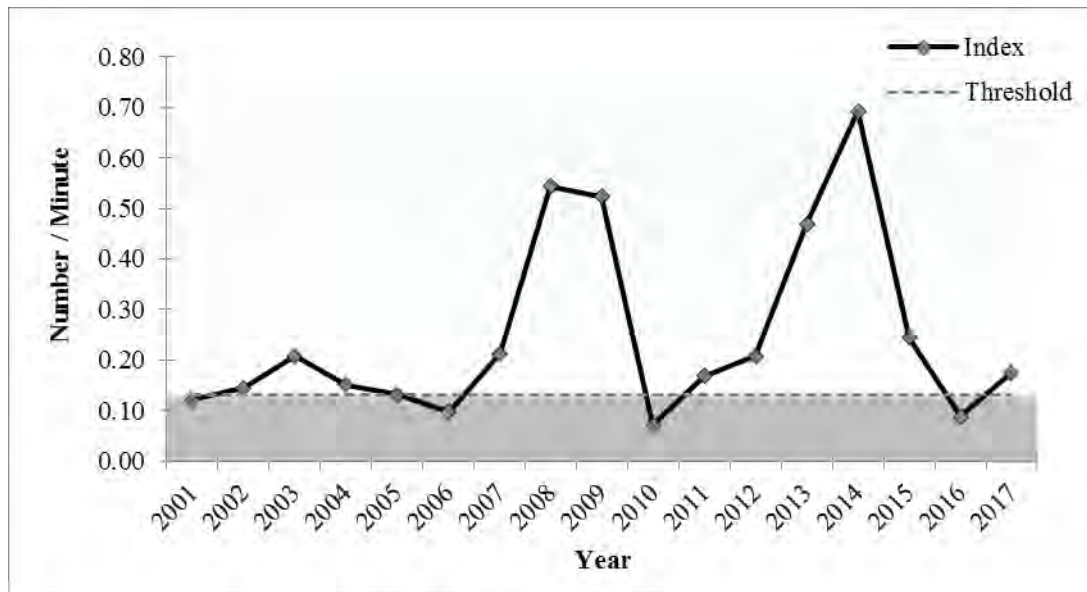
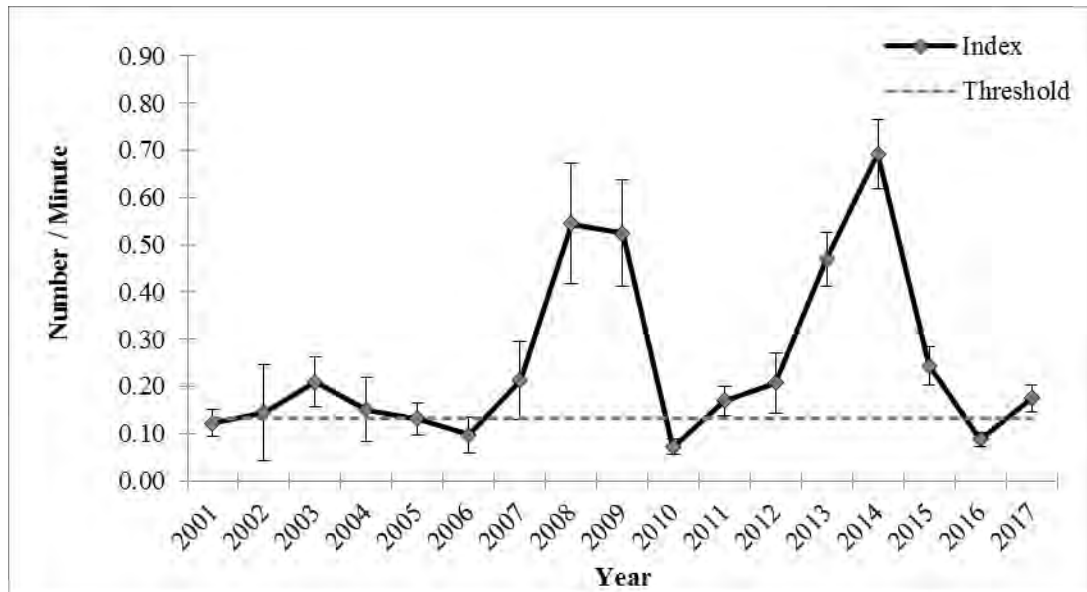


Figure 3. Female index from electrofishing survey (March–May) for Roanoke River, 2001-2017. Threshold represents 25<sup>th</sup> percentile (where 75% of all values are greater). Error bars represent  $\pm 1$  standard deviation (top graph). Values in gray are below the threshold (bottom graph).

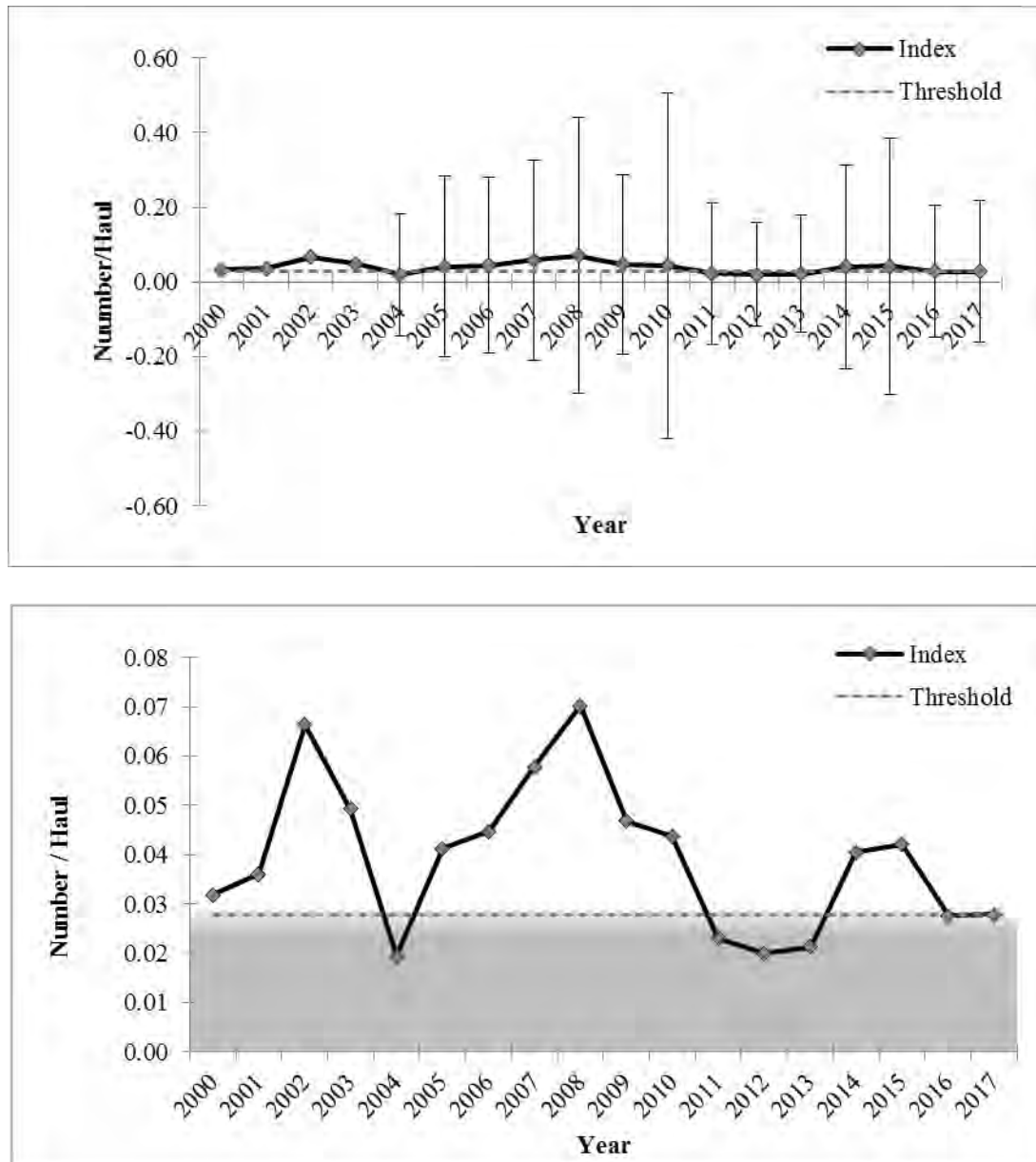


Figure 4. Female index from IGNS (January–May) for Albemarle Sound, 2000–2017. Threshold represents 25<sup>th</sup> percentile (where 75% of all values are greater). Error bars represent  $\pm 1$  standard deviation (top graph). Values in gray are below the threshold (bottom graph).



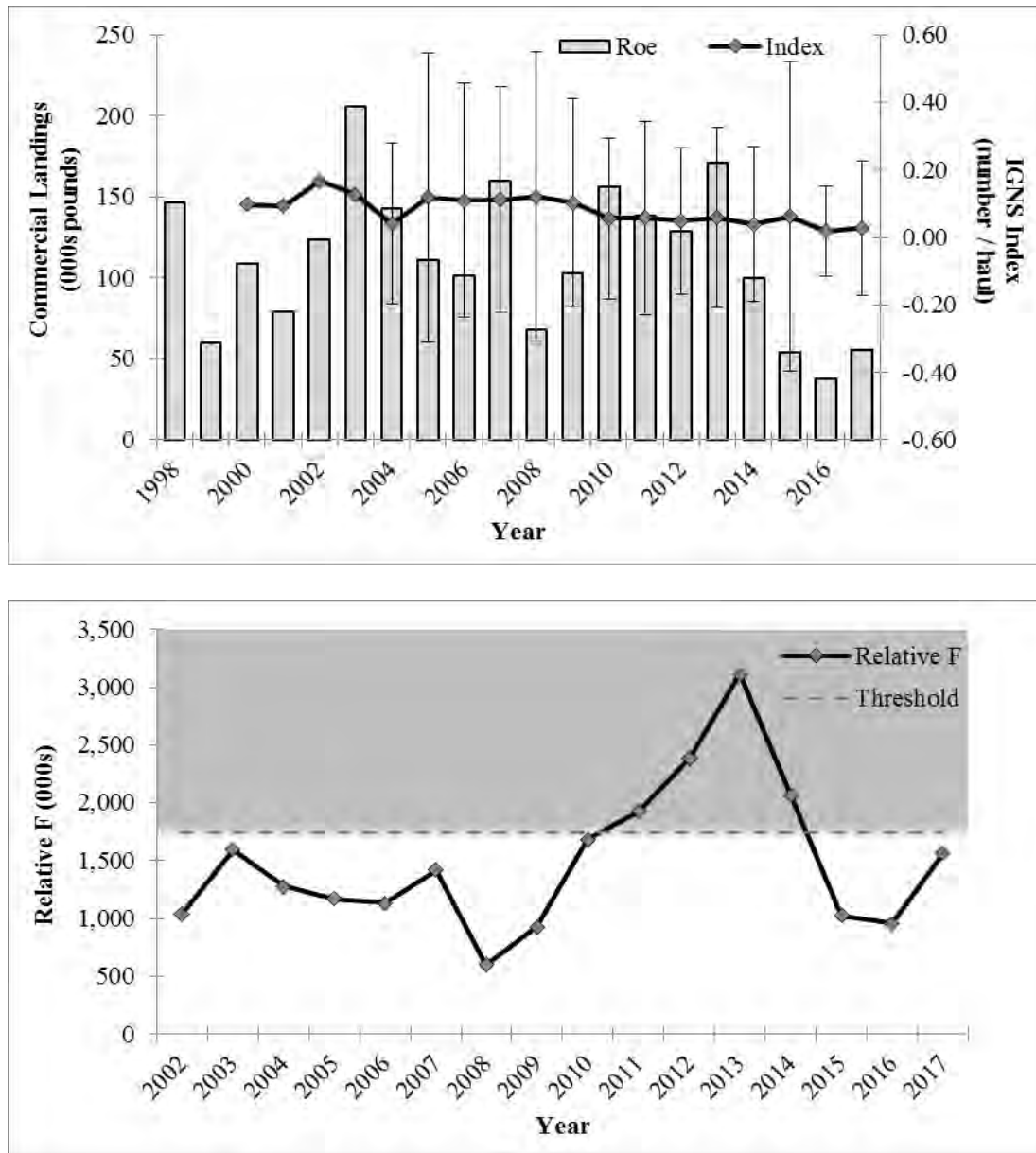


Figure 5. Commercial gill net landings of roes (1998-2013 February–April, 2014-2017 March) compared to the female IGNS index (5.0, 5.5 and 6.0-inch mesh sizes, 1998-2013 February–April, 2014-2017 March; top graph) and annual estimates of female relative  $F$  based on these data (bottom graph) for Albemarle Sound, 2002–2017. The error bars in the top graph represent  $\pm 1$  standard deviation. The threshold represents the 75<sup>th</sup> percentile (where 25% of all values are greater), values in gray are exceeding the threshold.

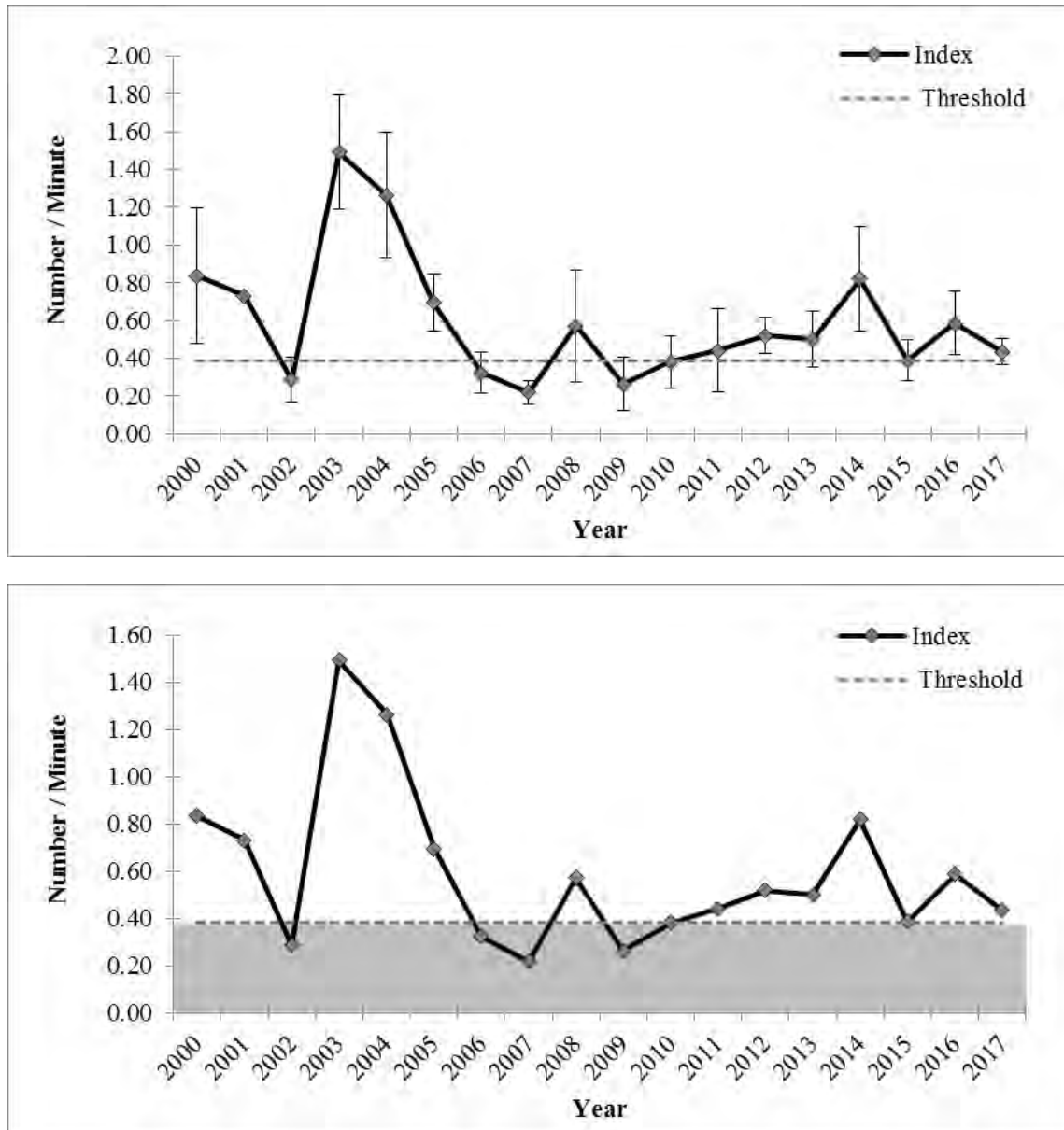


Figure 6. Female electrofishing index (March–May) for the Tar-Pamlico River, 2000–2017. The threshold represents the 25<sup>th</sup> percentile (where 75% of all values are greater). Error bars represent  $\pm 1$  standard deviation (top graph). Values in gray are below the threshold (bottom graph).

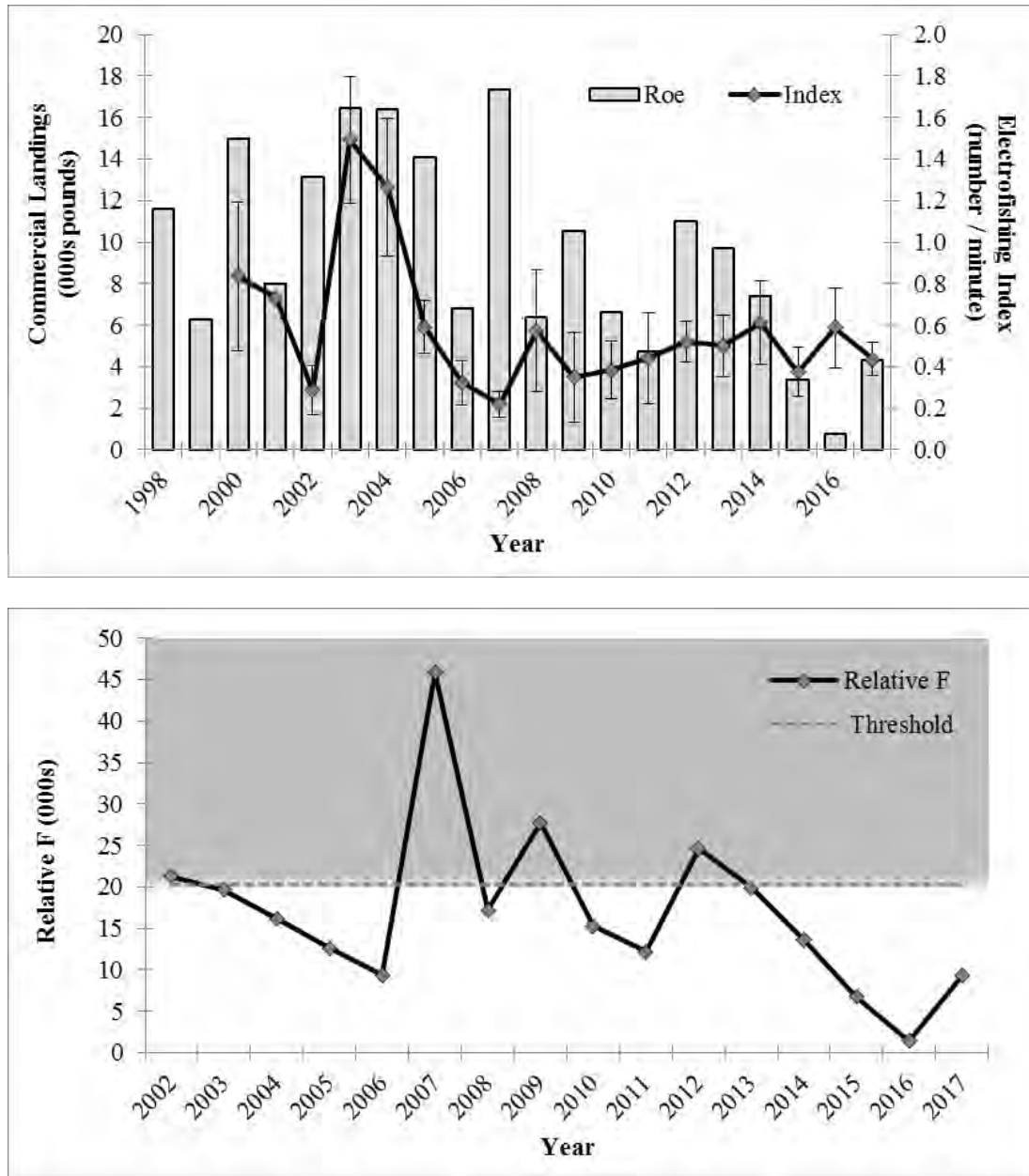


Figure 7. Commercial landings of roes by all gear types (March-April) compared to the female electrofishing index (March–April, 2000–2017; top graph) and annual estimates of female relative  $F$  based on these data (bottom graph) for the Tar-Pamlico River, 2002–2017. The error bars in the top graph represent  $\pm 1$  standard deviation. The threshold represents the 75<sup>th</sup> percentile (where 25% of all values are greater), values in gray are exceeding the threshold.

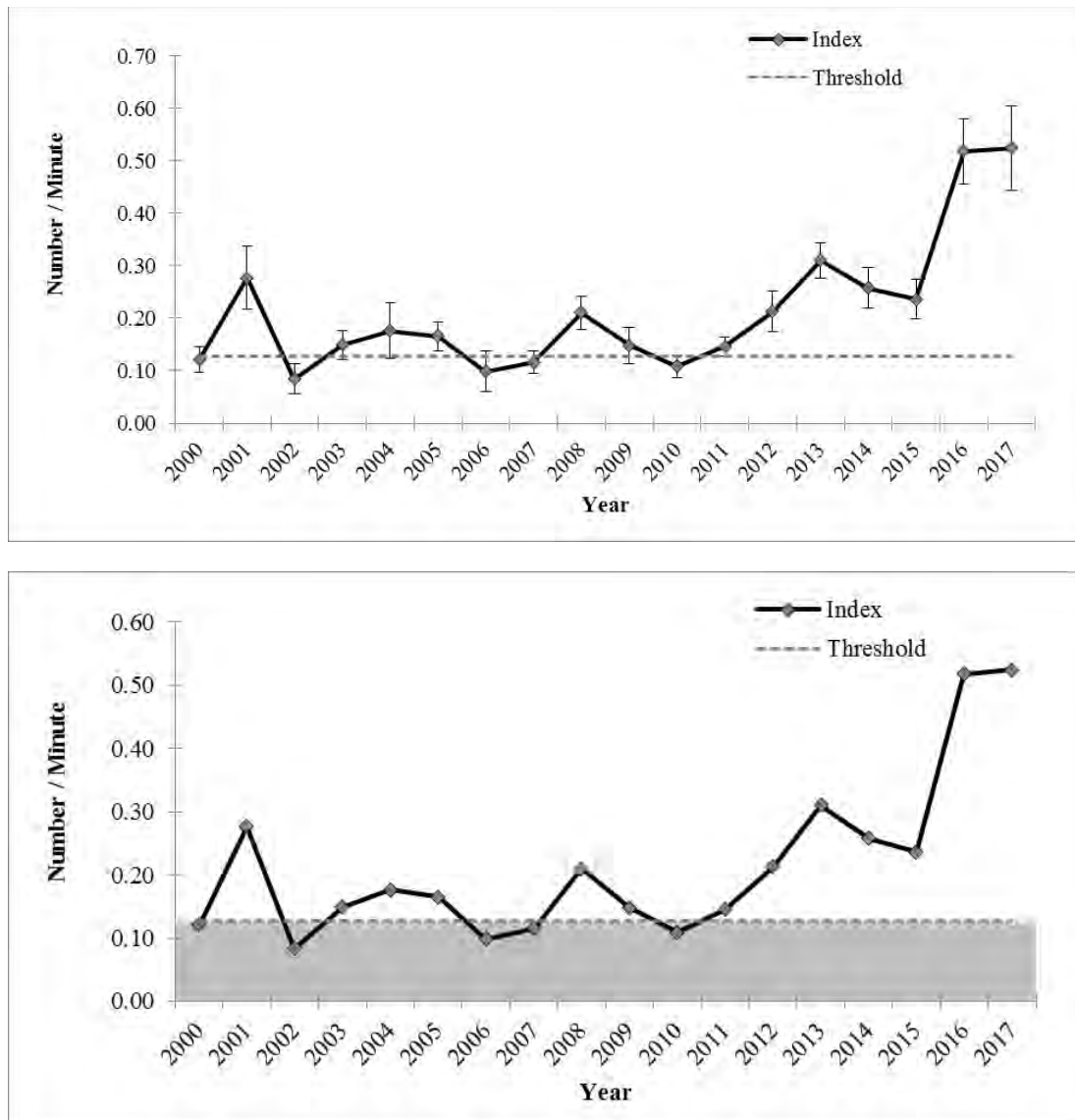


Figure 8. Female electrofishing index (March–May) for the Neuse River, 2000–2017. The threshold represents the 25<sup>th</sup> percentile (where 75% of all values are greater). Error bars represent  $\pm 1$  standard deviation (top graph). Values in gray are below the threshold (bottom graph).

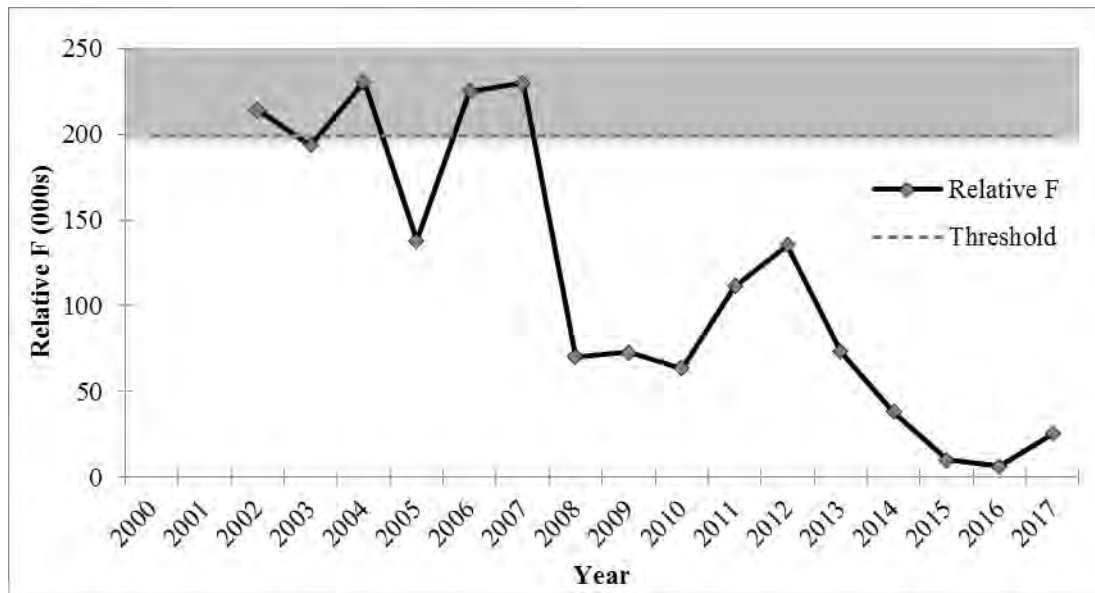
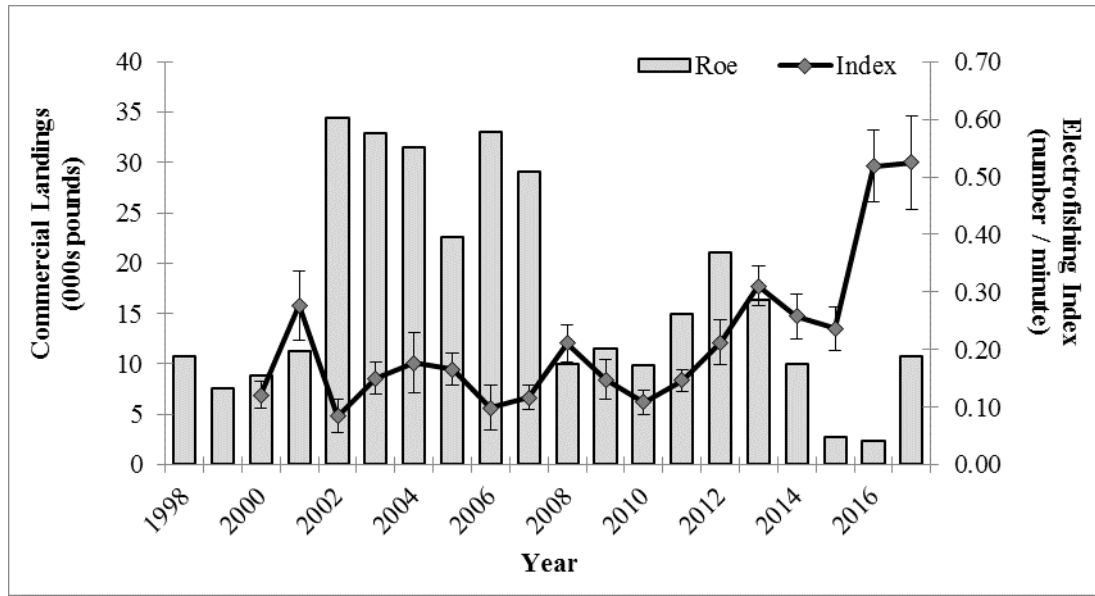


Figure 9. Commercial landings of roes by all gear types (March-April) compared to the female electrofishing index (March-April, 2000-2017; top graph) and annual estimates of female relative  $F$  based on these data (bottom graph) for the Neuse River, 2002–2017. The error bars in the top graph represent  $\pm 1$  standard deviation. The threshold represents the 75<sup>th</sup> percentile (where 25% of all values are greater), values in gray are exceeding the threshold.

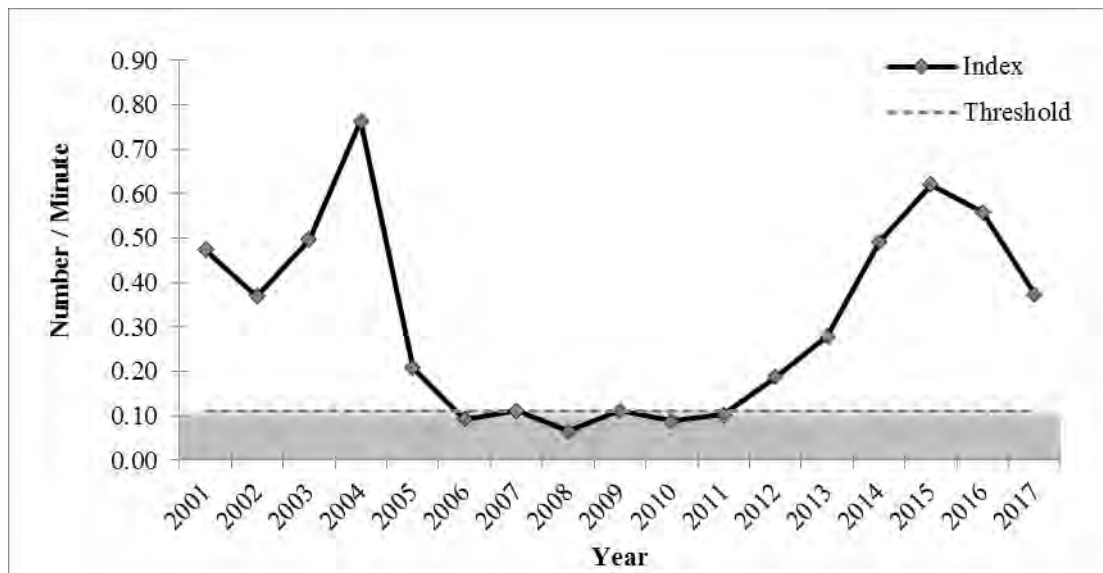
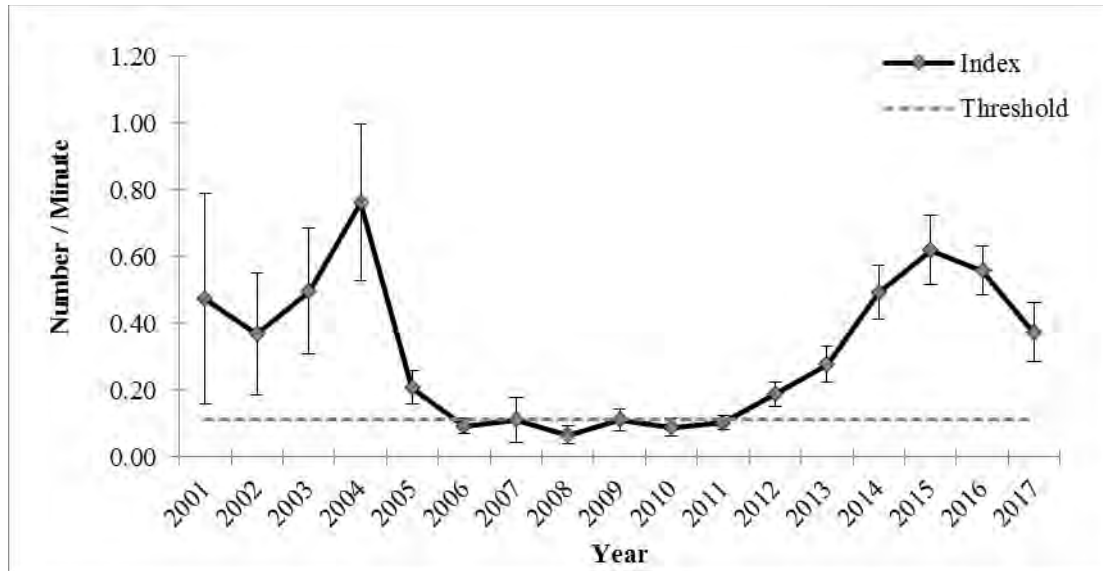


Figure 10. Female electrofishing index (March–May) for the Cape Fear River, 2001–2017. The threshold represents the 25<sup>th</sup> percentile (where 75% of all values are greater). Error bars represent  $\pm 1$  standard deviation (top graph). Values in gray are below the threshold (bottom graph).

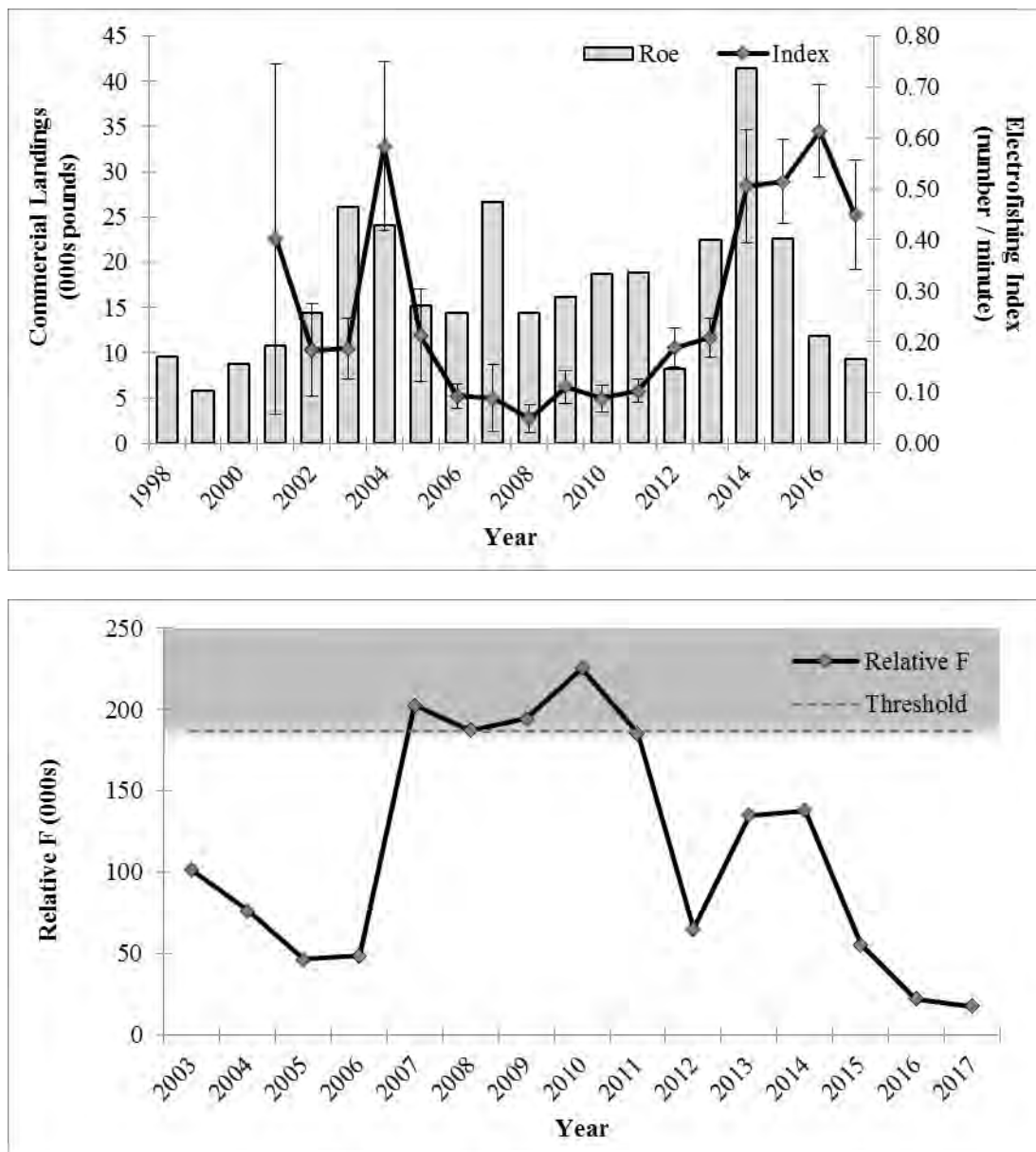


Figure 11. Commercial landings of roes by all gear types (March-April) compared to the female electrofishing index (March-April; top graph) and annual estimates of female relative  $F$  based on these data (bottom graph) for the Cape Fear River, 2003–2017. The error bars in the top graph represent  $\pm 1$  standard deviation. The threshold represents the 75<sup>th</sup> percentile (where 25% of all values are greater), values in gray are exceeding the threshold.



# COMMONWEALTH of VIRGINIA

## Marine Resources Commission

2600 Washington Avenue  
Third Floor  
Newport News, Virginia 23607

Molly Joseph Ward  
Secretary of Natural Resources

John M.R. Bull  
Commissioner

March 22, 2017

Updated September 28, 2017

### MEMORANDUM

TO: John Clark, Chair, Shad and River Herring Management Board  
Brad Chase, Chair, Shad and River Herring Technical Committee  
Caitlin Starks, ASMFC Coordinator, Shad and River Herring Management Plan

FROM: Rob O'Reilly, Virginia Marine Resources Commission, Virginia Representative, Shad and River Herring Management Board

SUBJECT: Request for a limited and sustainable bycatch allowance of American shad for 2018 through 2022

Please accept Virginia Marine Resources Commission's (VMRC) request for a limited bycatch allowance of American shad for 2018 through 2022, as described below. The VMRC is requesting the same conservation measures, in place from 2007 through 2017, be applied to 2018 through 2022. These proposed conservation measures were previously approved by ASFMC in 2012. At the recommendation of the Technical Committee in 2012 to ensure that bycatch amounts remained low, VMRC put in place a cap on the number of licenses issued for 2013 – 2017. The number of permittees had remained at or below 29 individuals since 2008, down from 77 permits issued in 2006 which was the first year the bycatch fishery was allowed. VMRC will only issue 30 permits per year, with preference to past participants. All permittees must allow biological sampling of their catch. Any permittee who do not cooperate or follow reporting procedures will not be issued a permit in the following year. Participation, effort and harvest have remained constant in this fishery, and can be considered sustainable removal rates, especially when compared to other interactions for this species (including other monitoring and restoration efforts).

*An Agency of the Natural Resources Secretariat*

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## **I. Background**

The ASMFC Shad and River Herring Management Board approved a limited bycatch allowance of American shad every year since 2006. The basis for the original request, submitted in November 2005, was to convert dead discards of American shad, taken during the pursuit of other species by select gill net gears, into a small bycatch allowance. The provisions of these approvals were that: (1) the Virginia bycatch fishery would be limited to areas above the James River Bridge, in the James River, the George P. Coleman Bridge, in the York River, and the Norris Bridge, in the Rappahannock River, to ensure that American shad harvested, as bycatch, in other upriver anchored or staked gill net fisheries (e.g. striped bass and Atlantic croaker), were principally Virginia river stocks; (2) the bycatch fishery would be limited to anchor gill net and staked gill net gears, as these gears are associated with spring harvests of spot, croaker, bluefish, catfish, striped bass, and white perch, and discard mortality rates for American shad from these gears are assumed as 100 percent; (3) the bycatch of American shad would be limited to ten American shad per vessel; (4) samples of the American shad bycatch would be collected, especially to distinguish hatchery-origin American shad from wild stocks; and (5) any future bycatch fishery proposals would be reviewed by the ASMFC American Shad and River Herring Technical Committee and Management Board.

The VMRC adopted the conservative measures listed above, for the American shad bycatch allowance, as part of Chapter 4 VAC 20-530-10 et seq., “Pertaining to American Shad.” A copy of this regulation is attached, and all provisions for the bycatch fishery specified by the ASMFC management board were adopted by the VMRC (Appendix I.). In addition, the VMRC made it unlawful to possess or land any bycatch of American shad unless an equal number of croaker, spot, striped bass, bluefish, catfish, or white perch were also possessed.

## **II. Proposal for a Sustainable Bycatch Allowance of American Shad 2018 -2022**

The VMRC requests your approval for a sustainable bycatch allowance of American shad, under conditions described below:

- 1) All management provisions of the 2013 through 2017 American shad bycatch allowance, would be maintained from 2018 through 2022 and, 2) the VMRC proposes to continue the Technical committee recommended cap on the number of permits that can be issued annually at 30.

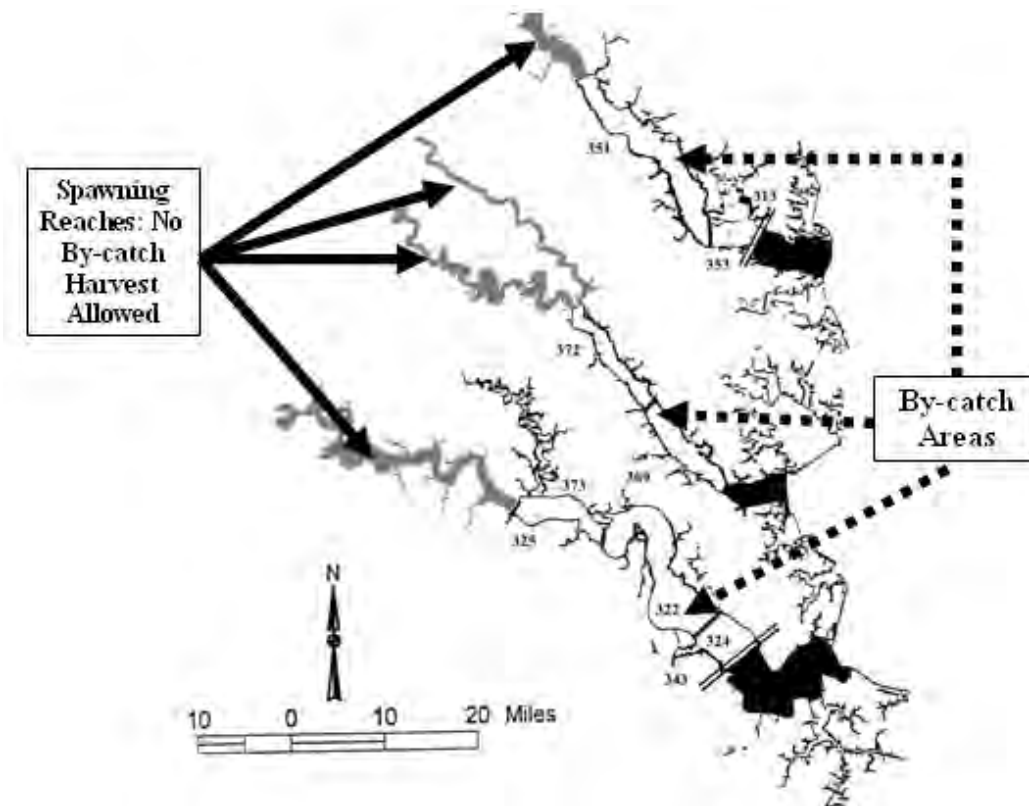


Figure 1. American shad bycatch areas, (in white) above the first bridges of the James, York, and Rappahannock rivers.

A determination of the approximate extent of Virginia’s bycatch of American shad, from all gear types, in all areas throughout the Chesapeake Bay system, is an important objective for a better understanding of these stocks. The upriver anchored and staked gill net bycatch fishery, coupled with recent Virginia Institute of Marine Science’s (VIMS) efforts to estimate bycatch from pound nets and other gear, currently represent the best method, for achieving this objective. The VMRC is requesting that waste (dead discards of American shad associated with spring fisheries, for specific gill net gear) be converted to usable product. A continuation of this American shad bycatch allowance, from 2018 through 2022, in the bycatch areas, will not challenge the health of these riverine stocks of American shad, but will allow Virginia to meet FMP sampling requirements. All Bycatch permittees agree to allow VIMS to sample their catch, and VIMS is given a weekly update, beginning in February, of any permits issued. Sampling of the permitted bycatch can assist in collection of age, size and sex composition of the adult population and provide another opportunity for the assessment of hatchery contribution to these stocks.

The Virginia Department of Game and Inland Fisheries (VDGIF) will continue its stocking program in the James River, and continue a hatchery evaluation in the James, York and Rappahannock rivers. The VDGIF will also continue push net surveys in the James and Rappahannock rivers, to monitor juvenile population trends. In addition to the push net surveys, the VIMS will continue to provide juvenile abundance indices (JAIs), for all three

river systems. The JAIs are provided in the annual compliance report to the ASMFC. The VIMS will also continue to provide catch rates, annual mortality estimates and biological data (age composition, length frequencies, sex ratio, and degree of repeat spawning), for stock assessment purposes.

The losses of American shad from monitoring and restoration projects have surpassed the modest losses recorded from the bycatch allowance in all years (four percent of total losses were attributed to the bycatch fishery, with 96 percent of removals from monitoring and restoration efforts in 2011 (see Table 1 of the compliance report). The losses from the bycatch fishery cannot inhibit the benchmark restoration goals, when compared to the losses directly resulting from the restoration and other monitoring efforts. The bycatch allowance enables bycatch monitoring of American shad as required by Amendment 3 to the FMP. If the permitted bycatch allowance was not in place, the harvesters directing efforts on striped bass, Atlantic croaker, catfish, or menhaden would not be required to report American shad discards and this information would be unknown.

The VMRC is requesting that the ASMFC Shad and River Herring Management Board review this sustainable American shad bycatch allowance proposal, for continuation through 2022, at its August 2017 meeting.

### **III. Results from the limited 2015 Virginia bycatch fishery for American shad**

All American shad bycatch allowable permittees were required to report their harvest, in pounds of American shad retained, to the VMRC Mandatory Reporting System, a system that requires all harvesters to report all daily harvest and effort data on a monthly basis. Monthly mandatory reports include type and amount of gear used, water body fished, gear soak time, and all species retained. The majority of American shad reported to the mandatory reporting database were in pounds; however, a few individuals reported to the mandatory reporting system in numbers. Using the calculated average weight, the mandatory reporting database converts numbers to pounds, based on an average weight per American shad of 3.57 pounds. A total of 1,185 pounds of American shad was reported, as harvested in 2015, to the mandatory reporting database. Using the conversion factor of 3.57 pounds per fish, that harvest corresponds to 332 American shad.

In addition to the permitted fishermen's requirement to reported catch and harvest, on a daily basis, to the Mandatory Reporting System, all fishermen permitted for the American shad bycatch fishery were required to call an Interactive Voice Response System (IVRS), for each preceding weekly period and provide the following information: name, registration number, number of fishing trips taken, water body fished, number of nets set, number of American shad caught, and number retained. All American shad in the IVRS database were reported in numbers, and a total of 343 American shad were reported as harvested to the IVRS in 2015. Using the same conversion used in the mandatory reporting database, that corresponds to 1,225 pounds of harvested American shad.

The two databases (IVRS-basis and mandatory reporting database) were reconciled by comparing data on a case-by-case basis. If the number of fish reported to the IVRS was converted to equal the pounds of American shad reported to the mandatory reporting

system, a 3.45 pound average per fish would be the result. There is a slight discrepancy between the computed weight of the two databases, and this is partly due to the different average weight data used for converting numbers to pounds.

It was beneficial to have two types of reporting systems in place, to monitor the bycatch of American shad. This allowed the VMRC to note several discrepancies between call-in reports to the IVRS and the mandatory reporting monthly reports. Through comparisons of these systems, fish that had been coded incorrectly as American shad were identified, and the errors were corrected in the mandatory reporting database.

In 2015, 29 bycatch permits were issued between the months of February and March. The number of permittees has remained at or below 29 individuals since 2008, with most of the same individuals remaining in the fishery. The number of permittees decreased from 77 permits issued in 2006 to 38 permits issued in 2007. Of the 29 permit holders, 22 reported harvesting any American shad in 2015 (Table 1).

Table 1. Number of fishermen with American shad by-catch permits, active permits, and fishing activity reported by river system January through May, 2006-2016. Permits are considered active if one or more pounds of American shad were reported. Total trips are the total number of gill net trips taken by active permit holders during this time period. \*In 2010 one fisherman in the Rappahannock River did not record the total number of shad caught, so 40 was used.

Water Body	Year	# Permit Holders	# Active Permits	Total Trips	# Shad Caught	# Shad Kept	% of Bycatch for Year
<i>James River</i>	2015	14	8	58	31	21	8
	2014	14	9	54	114	112	15
	2013	10	4	55	150	139	32
	2012	10	2	7	10	7	3
	2011	9	3	25	42	42	32
	2010	9	0	7	0	0	0
	2009	8	1	6	2	0	0
	2008	6	2	3	3	3	2
	2007	16	7	58	119	52	19
	2006	32	5	27	24	23	9
York River	2015	10	9	36	302	279	76
	2014	8	5	85	453	453	61
	2013	12	6	116	212	203	47
	2012	13	5	71	207	207	94
	2011	11	4	51	88	87	67
	2010	9	5	43	229	208	84
	2009	11	6	97	302	288	100
	2008	10	6	85	89	89	60
	2007	15	8	104	199	199	73
	2006	31	5	198	233	228	90
Rappahannock River	2015	6	5	25	63	63	16
	2014	8	4	49	182	173	23
	2013	7	6	24	273	89	21
	2012	2	1	2	7	7	3
	2011	3	1	1	1	1	1
	2010	7	2	10	40*	40*	16
	2009	1	0	0	0	0	0
	2008	3	1	8	81	57	38
	2007	5	2	23	22	20	7
	2006	14	2	8	3	3	2

#### **IV. Harvest Bycatch Allowance Monitoring**

For the bycatch fishery, it is unlawful for any person to possess aboard a vessel or land any American shad, unless that person possessed at least an equal number of fish of only the following food-grade species: spot, Atlantic croaker, bluefish, catfish, striped bass, or white perch. A comparison of trip and effort data has been summarized, for these species, by permitted gill net gear during January through April, by water area, for 2015 (Table 2). According to permitted fishermen’s past harvest activity, using anchor or staked gill net, the majority of these fishermen harvested species other than American shad prior to 2006 (first year the bycatch was allowed), from the same areas they have recently been allowed to retain bycatch of American shad.

Table 2. Harvest (pounds) by species and bycatch area during January through April 2015. All harvest is from anchored and staked gill nets (not exclusive to American Shad bycatch permit holders). Bait includes fish reported as bait and menhaden.

<b>Bycatch Area</b>	<b>Am Shad</b>	<b>Atlantic Croaker</b>	<b>Bait and Menhaden</b>	<b>Catfish</b>	<b>Hickory Shad</b>	<b>Striped Bass</b>	<b>White Perch</b>
<b>James River</b>	51	1,999	71,400	67,444	46	104,745	4,923
<b>Rappahannock River</b>	239	4,197	230,622	18,047	51	79,464	24,378
<b>York River</b>	895	5,974	821,403	14,286	.	25,370	8,539
<b>Total</b>	1,185	12,170	1,123,425	99,777	97	209,579	37,839

The total number of anchored and staked gill net trips during the months of February through April, for any species, by year (Table 3; Figure 2), was again included in this summary report to track the overall effort in the areas where bycatch has been approved by the ASMFC. The VMRC will continue to report on all activity in the area as well as the effort of those permitted for the American shad bycatch fishery. The harvest in the bycatch areas by all anchored and staked gill net trips was composed primarily of catfish, striped bass, Atlantic croaker, and bait (mostly menhaden). The top three species by weight, when American shad were actually retained by permitted fishermen as bycatch, were striped bass, catfish, and Bait (Table 4).

Table 3. Trip and effort data summarized for all species harvested by anchored (sink) and staked gill nets during the months of February through April, by water body, from 2003 through 2015.

<b>Year</b>	<b>James River</b>	<b>Rappahannock River</b>	<b>York River</b>	<b>Grand Total</b>
<b>2003</b>	358	630	465	1,453
<b>2004</b>	318	575	607	1,500
<b>2005</b>	247	536	515	1,298
<b>2006</b>	321	504	660	1,485
<b>2007</b>	367	329	557	1,253
<b>2008</b>	313	490	387	1,190
<b>2009</b>	392	656	783	1,831
<b>2010</b>	412	816	581	1,809
<b>2011</b>	361	794	446	1,601
<b>2012</b>	318	712	611	1,641
<b>2013</b>	380	723	645	1,748
<b>2014</b>	590	818	717	2,125
<b>2015</b>	391	622	519	1532

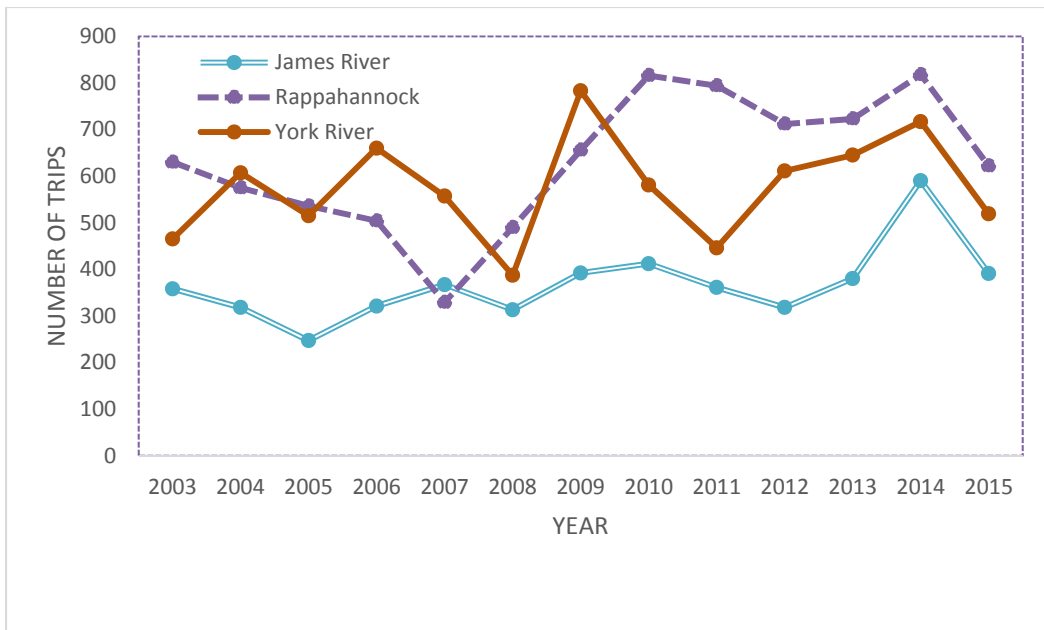


Figure 2. Total anchored and staked gillnet trips in the American shad bycatch areas from February through April, 2003 through 2015 (not exclusive to American shad bycatch permit holders). All species are included.

Table 4. Profiles of American shad bycatch permittees for 2015, including harvest totals, by species, for those trips where American shad were retained.

Harvester ID	American Shad	Croaker	Bait*	Bluefish	Catfish	Gizzard shad	Hickory Shad	Striped Bass	White Perch
1	39	13	40	14	164	.	8	.	.
2	2	.	.	.	229	.	.	490	.
3	39	.	.	.	1,459	.	.	2,588	.
4	5	.	.	.	.	.	.	265	.
5	278	.	.	.	565	.	.	.	.
6	490	70	60	.	540	60	.	.	.
7	15	15	350	.	150	.	.	.	.
8	10	.	.	.	508	.	.	391	.
9	86	.	.	.	310	.	.	154	.
10	56	.	360	.	.	.	.	479	.
11	50	75	71	2	.	.	.	.	2
12	115	26	1,300	.	3,138	275	1	.	207
<b>Total</b>	<b>1,185</b>	<b>199</b>	<b>2,181</b>	<b>16</b>	<b>7,063</b>	<b>335</b>	<b>9</b>	<b>4,367</b>	<b>209</b>

\*Bait category is primarily comprised of menhaden



Table 5. American shad bycatch in numbers from each bycatch area from 2006 to 2015 from the IVRS database.

<b>Bycatch Area</b>	<b>James River</b>	<b>York River</b>	<b>Rappahannock River</b>	<b>Total</b>
<b>2006</b>	23	228	3	254
<b>2007</b>	52	199	20	271
<b>2008</b>	3	89	57	149
<b>2009</b>	--	288	--	288
<b>2010</b>	--	208	40	248
<b>2011</b>	47	47	1	95
<b>2012</b>	7	219	7	233
<b>2013</b>	139	203	89	431
<b>2014</b>	112	453	173	738
<b>2015</b>	21	279	43	343
<b>Total</b>	404	2,213	433	3,050

#### **V. 2016 Bycatch Fishery Summary**

The 2016 Virginia bycatch fishery for American shad adhered to all guidelines established by the ASMFC. The VMRC has maintained a permitting system, based on specific criteria, that includes use of gear (staked and anchor gill nets) associated with high mortality of captured American shad. Monitoring of participating harvesters is accomplished using two separate mandatory reporting systems. The IVRS was established with specific reporting requirements placed on each permitted fisherman. In addition, corroboration of harvesting activities gathered from the IVRS was enabled through a second reporting system, the VMRC Mandatory Reporting System. The preliminary harvest for 2016 shows 11 active harvesters, reporting 338 pounds which corresponds to 95 American Shad.

#### **VI. References**

Atlantic States Marine Fisheries Commission (ASMFC). 2010. Amendment 3 to the Interstate Fishery Management Plan for Shad and River Herring (American Shad Management). 158 pp.

**Appendix I.**

**VIRGINIA MARINE RESOURCES COMMISSION  
"PERTAINING TO AMERICAN SHAD"  
REGULATION 4 VAC 20-530-10 ET SEQ.**

**PREAMBLE**

This chapter establishes a moratorium on the harvest of American shad and provides for a limited bycatch of American shad during the 2012 fishing season. This chapter is promulgated pursuant to the authority contained in § 28.2-201 of the Code of Virginia. This chapter amends and re-adopts, as amended, previous Chapter 4VAC20-530-10 et seq. which was adopted on February 22, 2011 and made effective on March 1, 2011. The effective date of this chapter, as amended, is February 1, 2012.

**4VAC20-530-10. Purpose.**

The purposes of this chapter are to rebuild the Virginia stocks of American Shad and to comply with the requirements for ocean intercept commercial fisheries as specified by the Interstate Fishery Management Plan for Shad and River Herring.

**4VAC20-530-20. Definition.**

The following words and terms when used in this chapter shall have the following meanings unless the context clearly indicates otherwise.

"Bycatch area" means those tidal waters of (i) the James River, from the James River Bridge upstream to a line connecting Dancing Point and New Sunken Meadow Creek; (ii) the York River, from the George P. Coleman Bridge upstream to the Rt. 33 Eltham and Lord Delaware bridges at West Point; and (iii) the Rappahannock River, from the Norris Bridge upstream to the Rt. 360 Downing Bridge at Tappahannock.

"Chesapeake Bay" means all Virginia tidal waters west of the Colregs Demarcation Line that connect the Cape Henry Lighthouse in Virginia Beach to the Cape Charles Lighthouse on Smith Island.

"Coastal area" means all Virginia tidal waters east of the Colregs Demarcation Line that connect the Cape Henry Lighthouse in Virginia Beach to the Cape Charles Lighthouse on Smith Island.

**4VAC20-530-23 to 4VAC20-530-29. [Repealed]**

**4VAC20-530-30. Moratorium.**

A. It shall be unlawful for any person to catch and retain possession of American shad from the Chesapeake Bay, except as described in 4VAC20-530-31.

B. It shall be unlawful for any person to possess aboard a vessel or land in Virginia any American shad harvested from the coastal area.

C. It shall be unlawful for any person to possess any American shad taken from the coastal area or the Chesapeake Bay, except as described in 4VAC20-530-31.

**4VAC20-530-31. Bycatch fishery.**

A. Any registered commercial fisherman meeting the conditions described in this subsection shall be eligible to participate in the American shad bycatch fishery in 2012:

1. The registered commercial fisherman shall apply for a VMRC American Shad Bycatch Permit and possess that permit while fishing, landing, or selling his catch of American shad.

2. The registered commercial fisherman shall complete the VMRC American Shad Bycatch Survey form to describe his pending fishing activity.

B. It shall be unlawful for any person to possess aboard a vessel more than 10 American shad. When more than one registered and permitted fisherman is fishing on the same vessel, it shall be unlawful to possess more than 10 American shad aboard that vessel.

C. It shall be unlawful for any person to possess aboard a vessel or land any American shad unless that person possesses at least an equal number of fish of only the following food-grade species: spot, croaker, bluefish, catfish, striped bass or white perch.

D. Possession of American shad by any person permitted in accordance with this section shall be lawful only when those American shad were harvested from the bycatch area. Possession of any American shad harvested in Virginia waters that are outside of the bycatch area shall constitute a violation of this regulation.

E. American shad harvested only as bycatch by anchored gill nets and staked gill nets may be possessed or retained for sale in accordance with the provisions of this regulation. It shall be unlawful for any person to harvest, land, or possess any American shad taken by any recreational gear or by any commercial gear, except anchored gill net or staked gill net.

F. Every fisherman permitted for the American shad bycatch fishery shall contact the commission's interactive voice response system once weekly to report the following for the preceding weekly period: name, registration number, number of fishing trips taken, water body fished, number of nets set, number of American shad caught and number retained.

**4VAC20-530-32. [Repealed]**

**4VAC20-530-35. [Repealed]**

**4VAC20-530-40. Penalty.**

As set forth in §28.2-903 of the Code of Virginia, any person violating any provision of this chapter shall be guilty of a Class 3 misdemeanor, and a second or subsequent violation of any provision of this chapter committed by the same person within 12 months of a prior violation is a Class 1 misdemeanor.

**REVIEW OF THE ATLANTIC STATES MARINE FISHERIES COMMISSION  
FISHERY MANAGEMENT PLAN FOR SHAD AND RIVER HERRING  
(*Alosa spp.*) FOR THE 2016 FISHING YEAR**



Shad & River Herring Plan Review Team

Caitlin Starks, Atlantic States Marine Fisheries Commission (Chair)

Mike Dionne, New Hampshire Fish and Game Department

Heather Corbett, New Jersey Division of Fish and Wildlife

Phil Edwards, Rhode Island Division of Fish and Wildlife

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**For Board Review October 2017**

**REVIEW OF THE ASMFC FISHERY MANAGEMENT PLAN FOR  
SHAD AND RIVER HERRING (*Alosa spp.*)**

**I. Status of the Fishery Management Plan**

<u>Date of FMP Approval:</u>	October 1985
<u>Amendments:</u>	Amendment 1 (April 1999) Amendment 2 (August 2009) Amendment 3 (February 2010)
<u>Addenda:</u>	Technical Addendum #1 (February 2000) Addendum I (August 2002)
<u>Management Unit:</u>	Migratory stocks of American shad, hickory shad, alewife, and blueback herring from Maine through Florida
<u>States With Declared Interest:</u>	Maine through Florida, including the Potomac River Fisheries Commission and the District of Columbia
<u>Active Boards/Committees:</u>	Shad & River Herring Management Board, Advisory Panel, Technical Committee, Stock Assessment Subcommittee, Plan Review Team, Plan Development Team

The 1985 Fishery Management Plan (FMP) for Shad and River Herring was one of the very first FMPs developed at the ASMFC. Amendment 1 was initiated in 1994 to require and recommend specific monitoring programs to inform future stock assessments—it was implemented in October 1998. A Technical Addendum to Amendment 1 was approved in 1999 to correct technical errors.

The Shad and River Herring Management Board (Board) initiated Addendum I in February 2002 to change the conditions for marking hatchery-reared alosines; clarify the definition and intent of *de minimis* status for the American shad fishery; and modify and clarify the fishery-independent and dependent monitoring requirements. These measures went into effect on January 1, 2003.

In August 2009, the Board initiated Amendment 2 to restrict the harvest of river herring (blueback herring and alewife) due to observed declines in abundance. The Amendment prohibited commercial and recreational river herring fisheries in state waters beginning January 1, 2012, unless a state or jurisdiction has a sustainable management plan reviewed by the Technical Committee and approved by the Board. The Amendment defines a sustainable fishery as “a commercial and/or recreational fishery that will not diminish the potential future stock reproduction and recruitment.” Amendment 2 required states to implement fisheries-dependent and independent monitoring programs. Sustainable fishery management plans have been approved by the Management Board for Maine, New Hampshire, Massachusetts, New York, North Carolina and South Carolina (Table 1).

In February 2010, the Board initiated Amendment 3 in response to the 2007 American shad stock assessment, which found most American shad stocks at all-time lows. The Amendment requires similar management and monitoring as developed in Amendment 2 (for river herring). Specifically, Amendment 3 prohibits shad commercial and recreational fisheries in state waters beginning January 1, 2013, unless a state or jurisdiction has a sustainable management plan reviewed by the Technical Committee and approved by the Board. The Amendment defines a sustainable fishery as “a commercial and/or recreational fishery that will not diminish the potential future stock reproduction and recruitment.” The Amendment allows any river systems to maintain a catch and release recreational fishery. Sustainable fishing plans have been approved by the Board for Florida, Georgia, South Carolina, North Carolina, the Potomac River Fisheries Commission, and the Delaware River Basin Fish Cooperative (on behalf of New York, Delaware, New Jersey, and Pennsylvania) and Connecticut (Table 1). All states and jurisdictions are also required to identify local significant threats to American shad critical habitat and develop a plan for mitigation and restoration. All states and jurisdictions habitat plans have been accepted and approved.

**Table 1. States with approved sustainable fishery management plans (SFMP) for river herring or shad. Includes year of Board approval and year the Board approved the updated<sup>1</sup> SFMP.**

<b>State</b>	<b>River Herring SFP</b>	<b>Shad SFP</b>
<b>Maine</b>	Approved (2010, 2017)	
<b>New Hampshire</b>	Approved (2011, 2015)	
<b>Massachusetts</b>	Approved (2016)	
<b>Connecticut</b>		Approved (2012)
<b>Rhode Island</b>		
<b>Pennsylvania</b>		Approved* (2012, 2017)
<b>New York</b>	Approved (2011, 2017)	Approved* (2012, 2017)
<b>New Jersey</b>		Approved*(2012, 2017)
<b>Delaware</b>		Approved*(2012, 2017)
<b>PRFC</b>		Approved (2012)
<b>Maryland</b>		
<b>Virginia</b>		
<b>North Carolina</b>	Approved (2010)	Approved (2012)
<b>South Carolina</b>	Approved (2010, 2017)	Approved (2011)
<b>Georgia</b>		Approved (2012)
<b>Florida</b>		Approved (2011, 2017)

\*Delaware River Basin Fish and Wildlife Management Co-op has a Shad SFP, though Delaware and New Jersey are only states that have commercial fisheries. All states have recreational measures, with limited to no catch in the upper Delaware River (New York & Pennsylvania).

<sup>1</sup> SFMPs have to be updated and re-approved by the Board every five years.

## II. Status of the Stocks

While the FMP addresses four species: two river herrings (blueback herring and/or alewife) and/or two shads (American shad and/or hickory shad)—these are collectively referred to as shad/river herring, or S/RH.

The most recent *American shad stock assessment report* (ASMFC 2007) identified that American shad stocks are highly depressed from historical levels. Of the 24 stocks of American shad for which sufficient information was available, 11 were depleted relative to historic levels, 2 were increasing, and 11 were stable (but still below historic levels). The status of 8 additional stocks could not be determined because the time-series of data was too short or analyses indicated conflicting trends.

Taken in total, American shad stocks do not appear to be recovering. The assessment concluded that current restoration actions need to be reviewed and new ones need to be identified and applied. These include fishing rates, dam passage, stocking, and habitat restoration. There are no coastwide reference points for American shad. There is no stock assessment available for hickory shad. A stock assessment update is scheduled for 2018 to analyze American shad stock status.

The most recent benchmark *river herring stock assessment report* (ASMFC 2012) indicated, of the 24 river herring stocks for which sufficient data were available to make a conclusion, 23 were depleted relative to historic levels and one was increasing. The status of 28 additional stocks could not be determined because the time-series of available data was too short.

Estimates of coastwide abundance and fishing mortality could not be developed because of the lack of adequate data. The “depleted” determination was used instead of “overfished” because of the many factors that have contributed to the declining abundance of river herring, which include not just directed and incidental fishing, but likely also habitat issues (including dam passage, water quality, and water quantity), predation, and climate change. There are no coastwide reference points.

The river herring stock assessment was updated in 2017 (ASMFC 2017) with additional data from 2011-2015, and indicates that river herring remain depleted at near historic lows on a coastwide basis. Total mortality estimates over the final 3 years of the data time series (2013-2015) are generally high and exceed region-specific reference points for some rivers. However, there are some positive signs of improvement for some river systems. Total mortality estimates for 2 rivers have fallen below region-specific reference points during the final 3 years of the data time series. No total mortality estimates were below reference points at the end of the 2012 stock assessment data time series. Of the 54 stocks for which data were available, 16 experienced increasing abundance trends, 2 experienced decreasing abundance trends, 8 experienced stable abundance and 10 experienced no discernable trend in abundance over the final 10 years of the time series (2006-2015).



### III. Status of the Fisheries

Shad and river herring formerly supported important commercial and recreational fisheries throughout their range. Historically fishing took place in rivers (both freshwater and saltwater), estuaries, tributaries, and the ocean. Although recreational harvest data are scarce, most harvest is believed to come from the commercial industry. Commercial landings for these species have declined dramatically from historic highs. The following summarizes each fishery:

#### **AMERICAN SHAD:**

Total combined river and ocean commercial landings decreased from a high of 2,364,263 pounds in 1985 to a low of 1,390,512 pounds in 1999, but increased in 2000 to 1,816,979 pounds. The 2005 closure of the ocean-intercept fishery (phase out started in 2000) has substantially lowered the coastwide total landings of American shad. The total landings reported in compliance reports from individual states and jurisdictions in 2016 was 239,067 pounds, a 50% decrease from landings in 2015 (478,688 pounds) (Table 2).

In 2016, landings from North Carolina and South Carolina accounted for 26% and 32% of the commercial harvest, respectively. The remainder of the harvest came from Maine, Connecticut, New York, New Jersey, Delaware, Maryland<sup>1</sup>, PRFC, Virginia, and Georgia. In 2016 New Hampshire, Massachusetts, Rhode Island, Pennsylvania, District of Columbia and Florida reported no directed shad harvest in their state compliance reports.

Substantial shad recreational fisheries occur on the Connecticut (CT and MA), Delaware (NY, PA and NJ), Susquehanna (MD), Santee and Cooper (SC), Savannah (GA), and St. Johns (FL) Rivers. Shad recreational fisheries are also pursued on several other rivers in Massachusetts, District of Columbia, Virginia, North Carolina, South Carolina, and Georgia. Tens of thousands of shad are caught by hook and line from large east coast rivers each year, but detailed creel surveys are generally not available. Actual harvest (catch and removal) may amount to only about 20-40% of total catch, but hooking mortality could boost this “harvest” value substantially. Several comprehensive angler use and harvest surveys are planned or have been recently completed. In January 2007, the Management Board suspended the requirement to monitor the recreational fishery until the stock assessment had been completed and a template for creel surveys had been developed.

Since 2009, MRFSS/MRIP data are no longer provided for American shad. This is a result of the unreliable design of MRFSS/MRIP that focuses on active fishing sites along coastal and estuarine areas. In previous years the proportional standard error (PSE) has ranged from 0-100.

#### **HICKORY SHAD:**

In 2016, Virginia, North Carolina, South Carolina, and Georgia reported hickory shad landings. North Carolina accounts for a vast majority of the landings with 96%. The coastwide commercial

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<sup>1</sup> Maryland commercial fishermen are permitted a 2 fish per day allowance of dead American shad for personal use; no sale is permitted

landings were 100,079 pounds in 2016, representing a 35% decrease from 2015 landings (153,263 pounds) (Table 2).

**RIVER HERRING (BLUEBACK HERRING/ALEWIFE COMBINED):**

Commercial landings of river herring declined 95% from over 13 million pounds in 1985 to about 700 thousand pounds in 2005. Recent commercial landings continue to increase, despite North Carolina restricting the commercial harvest of river herring in 2015. In 2016, river herring landings were reported from Maine, New York, Maryland, North Carolina and South Carolina. Landings in 2016 totaled 1,970,893 pounds, 2% less than 2015 landings of 2,005,154 pounds (Table 2).

**Table 2. Shad and river herring in-river commercial and ocean bycatch landings (in pounds) provided by states, jurisdictions and NOAA Fisheries for 2016.**

	American Shad	Hickory Shad	River Herring
Maine	^		*
New Hampshire			
Massachusetts			
Rhode Island			
Connecticut	32,620		
New York	^		*
New Jersey*	18,377		*
Pennsylvania			
Delaware	14,247		
Maryland	^		*
D.C.			
PRFC	1149		
Virginia	310	21	
North Carolina	62,244	96,543	
South Carolina	75,602	294	670,245
Georgia	34,228	3,221	
Florida			
<b>Total</b>	<b>239,067</b>	<b>100,079</b>	<b>1,970,893</b>

\*Several state landings for river herring are not shown due to confidential data for Maine and Maryland

^American shad landings for Maine, New York and Maryland are confidential and not shown

**IV. Status of Research and Monitoring**

Under Amendment 2 (2009) and Amendment 3 (2010), fishery-independent and fishery-dependent monitoring programs became mandatory for select rivers. Juvenile abundance index (JAI) surveys, annual spawning stock surveys (Table 3), and hatchery evaluations are required for select states and jurisdictions. States are required to calculate mortality and/or survival

estimates, and monitor and report data relative to landings, catch, effort, and bycatch. States must submit annual reports including all monitoring and management program requirements, on or before July 1 of each year.

**Table 3. American shad and river herring passage counts at select rivers along the Atlantic coast in 2016. This table includes the fish passage counts required by Amendments 2 and 3, it represents a sub-set the overall fish passage counts.**

State/River	Shad	River Herring
<b>Maine</b>		
Androscoggin	1,096	114,874
Saco	16,926	22,644
Kennebec	830	224,990
Sebasticook	18	3,128,753
Penobscot	1,800	1,259,307
St. Croix		33,016
<b>New Hampshire</b>		
Cocheco		99,241
Exeter		6,622
Oyster		863
Lamprey		92,364
Taylor		
Winnicut		0
<b>Massachusetts</b>		
Merrimack	67,528	417,240
<b>Rhode Island</b>		
Gilbert Stuart		74,304
Nonquit		9,664
Buckeye Brook		27,552
<b>Connecticut River</b>		
Holyoke Dam	385,930	137
<b>Pennsylvania/Maryland/Delaware</b>		
Susquehanna (Conowingo)	14,276	34
Susquehanna (Holtwood)	6,718	
Susquehanna (Safe Harbor)	4,242	
Susquehanna (York Haven)	178	
<b>South Carolina</b>		
St. Stephen Dam	41,375	3,285
<b>Total 2016</b>	540,917	5,514,890
<b>Total 2015</b>	611,368	3,825,435
<b>Total 2014</b>	426,073	3,031,753
<b>Total 2013</b>	776,162	2,922,985
<b>Total 2012</b>	205,928	2,493,322

**Note:** Passage numbers on Susquehanna River are cumulative. For example, any shad counted at the York Haven dam has also passed the previous three dams (Safe Harbor, Holtwood and Conowingo). The dams are listed in ascending order of passage mile.

In addition to the mandatory monitoring requirements stipulated under Amendments 2 and 3, some states and jurisdictions continue important research initiatives for these species. For example, Massachusetts, Pennsylvania, Delaware, Maryland, District of Columbia, Virginia, North Carolina, South Carolina, and USFWS are actively involved in shad restoration using hatchery-cultured fry and fingerlings. All hatchery fish are marked with oxytetracycline marks on otoliths to allow future distinction from wild fish. During 2016, several jurisdictions reared American shad, stocking a total of **23,535,342 American shad, an increase of 9% from the 21,519,800 shad stocked in 2015** (Table 4).

**Table 4. Stocking of Hatchery-Cultured Alosines in State Waters, 2016.**

State	American Shad	Alewife
<b>Maine*</b>		
<b>Massachusetts</b>		
Merrimack River	1,523,218	
Nashua River		
Charles River	2,059,799	
<b>Rhode Island</b>		
Pawcatuck River	1,072,252	
Pawtuxet River	1,053,167	
<b>Pennsylvania</b>		
Susquehanna River	1,746,873	
Lehigh River	236,062	
Schuykill River	261,940	
<b>Maryland</b>		
Choptank River	2,467,000	
<b>District of Columbia</b>		
Anacostia River	0**	
<b>Virginia</b>		
James River	1,879,628	
<b>North Carolina</b>		
Roanoke River	3,738,732	
Neuse River	609,720	
<b>South Carolina</b>		
Edisto River	16,494	
Santee River	4,387,007	
<b>Georgia</b>		
Altamaha River	1,720,127	
Ogeechee	763,323	
<b>Total</b>	<b>23,535,342</b>	<b>0</b>

\*Maine: Only river herring are of wild origin are stocked as adult pre-spawning individuals on the Androscoggin, Kennebec and Union Rivers

\*\*No American shad were stocked in 2016 so no samples were taken from juvenile American shad for the hatchery evaluation

## **V. Status of Management Measures**

All state programs must implement commercial and recreational management measures or an alternative program approved by the Management Board (Table 1). The current status of each state's compliance with these measures is provided in the Shad and River Herring Plan Review Team Report (enclosed).

Shad and river herring are currently managed under Amendments 2 and 3. In 2009 the Board approved Amendment 2, which was initiated in response to concerns over river herring stock. The amendment prohibits commercial and recreational fisheries in state waters beginning January 1, 2012, unless a state or jurisdiction submits a sustainable fishery management plan and receives approval from the Board. Sustainable fishery management plans (SFMPs) have been approved by the Management Board for Maine, New Hampshire, Massachusetts, New York, North Carolina and South Carolina (Table 1).

In 2010, the Board approved Amendment 3, which was initiated in response to concerns over shad stocks. The Amendment requires similar management and monitoring as developed in Amendment 2, specifically the development of a SFMP for any jurisdiction that will maintain a commercial or recreational fishery after January 1, 2013 (with the exception of catch and release recreational fisheries). SFMPs have been approved by the Management Board for Florida, Georgia, South Carolina, North Carolina, the Potomac River Fisheries Commission (PRFC), Connecticut and the Delaware River Basin Cooperative (on behalf of New York, Delaware, New Jersey, and Pennsylvania) (Table 1).

States are required to update their SFMP every five years. In 2017, states reviewed their current SFMPs and, made changes based on fishery performance or observations (e.g., revise the sustainability targets) where necessary. At minimum, states updated the data for their commercial and/or recreational fisheries and recommended the current sustainability measures be carried forward in the next plan. The Technical Committee will review all SFMPs and make recommends to the Board. States have presented SFMPs to the Board according to the following timeline:

### **2017 SFMP Timeline**

#### February Board Meeting

- Maine (RH)
- Delaware River Basin Cooperative (Shad)
- New York (RH)

#### August Board Meeting

- South Carolina (RH)
- Florida (shad)

#### October Board Meeting

- South Carolina (shad)
- PRFC (shad)
- Georgia (shad)

- North Carolina (shad)
- Connecticut (shad)

## V. Prioritized Research Needs

### **Fishery-Dependent Priorities**

#### ***High***

- Expand observer and port sampling coverage to quantify additional sources of mortality for alosine species, including bait fisheries, as well as rates of bycatch in other fisheries to reduce uncertainty.<sup>2</sup>

#### ***Moderate***

- Identify directed harvest and bycatch losses of American shad in ocean and bay waters of Atlantic Maritime Canada.

#### ***Low***

- Identify additional sources of historical catch data of the US small pelagic fisheries to better represent earlier harvest of river herring and improve model formulation.

### **Fishery-Independent Priorities**

#### ***Moderate***

- Develop demersal and pelagic trawl CPUE indices of offshore river herring biomass.

### **Modeling / Quantitative Priorities**

#### ***High***

- Conduct population assessments on river herring, particularly in the south.<sup>3</sup>
- Analyze the consequences of interactions between the offshore bycatch fisheries and population trends in the rivers.
- Quantify fishing mortality for major river stocks after ocean closure of directed fisheries (river, ocean bycatch, bait fisheries).
- Improve methods to develop biological benchmarks used in assessment modeling (fecundity-at-age, sex specific mean weight-at-age, partial recruitment vector/maturity schedules) for river herring and American shad of both semelparous and iteroparous stocks.
- Improve methods for calculating M.

#### ***Moderate***

- Consider standardization of indices with a GLM to improve trend estimates and uncertainty characterization.
- Explore peer-reviewed stock assessment models for use in additional river systems as more data become available.

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<sup>2</sup> A prior statistical study of observer allocation and coverage should be conducted (see Hanke et al. 2012).

<sup>3</sup> A peer reviewed river herring stock assessment was completed in 2012 by the ASMFC.

## **Low**

- Develop models to predict the potential impacts of climate change on river herring distribution and stock persistence.

## **Life History, Biological, and Habitat Priorities**

### **High**

- Conduct studies to quantify and improve fish passage efficiency and support the implementation of standard practices.
- Assess the efficiency of using hydroacoustics to repel alosines or pheromones to attract alosines to fish passage structures. Test commercially available acoustic equipment at existing fish passage facilities. Develop methods to isolate/manufacture pheromones or other alosine attractants.
- Investigate the relationship between juvenile river herring/American shad and subsequent year class strength, with emphasis on the validity of juvenile abundance indices, rates and sources of immature mortality, migratory behavior of juveniles, and life history requirements.
- Develop an integrated coastal remote telemetry system or network that would allow tagged fish to be tracked throughout their coastal migration and into the estuarine and riverine environments. UPDATE: currently available for American shad but not in use due to tagging mortality
- Continue studies to determine river herring population stock structure along the coast and enable determination of river origin of catch in mixed stock fisheries and incidental catch in non-targeted ocean fisheries. Spatially delineate mixed stock and Delaware stock areas within the Delaware system. Methods to be considered could include otolith microchemistry, oxytetracycline otolith marking, genetic analysis, and/or tagging.<sup>4</sup>
- Validate the different values of M for river herring and American shad stocks through shad ageing techniques and repeat spawning information.
- Continue to assess current ageing techniques for river herring and American shad, using known-age fish, scales, otoliths, and spawning marks. Conduct biannual ageing workshops to maintain consistency and accuracy of ageing fish sampled in state programs.<sup>5</sup>
- Summarize existing information on predation by striped bass and other species. Quantify consumption through modeling (e.g., MSVPA), diet, and bioenergetics studies.
- Refine techniques for tank spawning of American shad. Secure adequate eggs for culture programs using native broodstock.

### **Moderate**

- Determine the effects of passage barriers on all life history stages of American shad and river herring. Conduct studies on turbine mortality, migration delay, downstream passage, and sub-lethal effects. UPDATE: Recent studies have been conducted by T. Castro-Santos of UMass.
- Evaluate and ultimately validate large-scale hydroacoustic methods to quantify river herring and American shad escapement in major river systems.
- Conduct studies of egg and larval survival and development.

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<sup>4</sup> Genetic research currently underway in combination with otolith chemistry.

<sup>5</sup> River herring ageing workshop occurred in 2013.

- Conduct studies on energetics of feeding and spawning migrations of American shad on the Atlantic coast.
- Resource management agencies in each state shall evaluate their respective state water quality standards and criteria and identify hard limits to ensure that those standards, criteria, and limits account for the special needs of alosines. Primary emphasis should be on locations where sensitive egg and larval stages are found.
- Encourage university research on hickory shad.
- Develop better fish culture techniques, marking techniques, and supplemental stocking strategies for river herring.

### **Low**

- Characterize tributary habitat quality and quantity for Alosine reintroductions and fish passage development.
- States should identify and quantify potential shad and river herring spawning and nursery habitat not presently utilized, including a list of areas that would support such habitat if water quality and access were improved or created, and analyze the cost of recovery within those areas. States may wish to identify areas targeted for restoration as essential habitat.<sup>11</sup>
- Investigate contribution of landlocked versus anadromous produced river herring.

## **VII. PRT Recommendations**

### *State Compliance*

All states with a declared interest in the management of shad and river herring have submitted reports and have regulations in place that meet the requirements of the Interstate Fisheries Management Plan for Shad and River Herring.

The PRT notes, however, that some states were not able to complete the required fishery independent monitoring due to budgetary restrictions.

1. Several of the states did not report all of the monitoring requirements listed under Amendments 2 and 3 (see PRT Report). The states should take note of the required monitoring programs that were not reported and make concerted effort to report all monitoring programs in forthcoming annual reports (most common omissions were: characterization of other losses, variance, characterization of recreational harvest, length and age frequency, and degree of repeat spawning).
2. The PRT requests that those states and jurisdictions that share monitoring should report who was responsible for the required monitoring in lieu of not including the information. In addition, one report could be sent for each state or jurisdiction.

### *De Minimis Status*

A state can request *de minimis* status if commercial landings of river herring or shad are less than 1% of the coastwide commercial total. *De minimis* status exempts the state from the sub-sampling requirements for commercial and recreational catch for biological data. The following states have met the requirements and requested continued *de minimis* status in 2016:



- Maine (American *shad*)
- New Hampshire (American shad and river herring)
- Massachusetts (American shad)
- Florida (American shad and river herring)

The PRT would like clarification on recreational fishery monitoring requirements for shad and river herring. In January 2007, the Management Board suspended the requirement to monitor the recreational fishery until the stock assessment had been completed and a template for creel surveys had been developed. The stock assessment was completed, but a creel survey template was not finalized, so the requirement was not reinstated. In 2009 and 2010 Amendments 2 and 3, respectively, were approved by the Management Board, which outline recreational monitoring requirements coastwide, but still do not provide a template for creel surveys. Many states are not currently monitoring recreational fisheries as MRFSS/MRIP data are no longer provided for these species, many states do not have the funding and staff to complete these surveys, and surveys in the past have revealed that recreational harvest is relatively low compared to the coastwide commercial harvest. The PRT would like clarification if it is the intent of Amendments 2 and 3 to re-instate recreational fishery monitoring coastwide and if so should a creel survey template be developed by the Technical Committee.

## **PRT REVIEW OF SHAD AND RIVER HERRING ANNUAL COMPLIANCE REPORTS**

### **INTRODUCTION**

In accordance with the Shad and River Herring Fishery Management Plan, the states are required to submit an annual compliance report by July 1<sup>st</sup> of each year. The Plan Review Team reviewed all state reports for compliance with the mandatory measures in Amendments 2 (River Herring) and 3 (American shad). The following report provides an evaluation of each state program.

### **MAINE**

#### ***De minimis***

- The state of Maine requests *de minimis* for the commercial fishing year 2016 in the American shad fishery.

#### **Comments or trends highlighted in state report:**

- American shad recreational catch estimates = 8,870 fish caught (A+B1+B2) and 1,740 harvested (A+B1) (MRIP).
- Comparing the juvenile CPUE to past years, American shad CPUE was below average in all river segments except the Cathancee and Eastern Rivers.
- Comparing the JAI CPUE to past years, 2016 had the highest alewife CPUE on record for the lower Kennebec River. The Eastern River CPUE was the 2<sup>nd</sup> highest in 35 years. Juvenile alewife CPUE was below average for 4 of 7 river segments. Blueback CPUE were 2<sup>nd</sup> highest in upper river.
- There was a strong alewife run in the Kennebec River drainage in 2016.
- Spawning Stock Survey: In 2016, fisheries personnel counted and passed upstream 830 American shad in the trap at the Lockwood Dam on the Kennebec River, and 18 at the Benton Falls fish lift on the Sebasticook River. At the Brunswick Fishway on the

Androscoggin River, 1,096 American shad were captured in the fish lift. On the Saco River, Brookfield Energy biologists counted a total of 16,462 American shad (13,889 passing the East Channel Dam, and 2,573 passing the West Channel Dam). Additionally, 442 shad mortalities were noted, representing a total fishway mortality of 3.2%, which is higher compared to 2015.

**Unreported information / Compliance Issues:**

- Shad Fishery independent monitoring: no variance was mentioned for juvenile indices.
- River herring scale samples collected from commercial harvesters are being processed.

**Sturgeon bycatch report:**

- There was no known bycatch of Atlantic or shortnose sturgeon within the recreational fishery.

**NEW HAMPSHIRE**

***De minimis:***

- The state of New Hampshire requests *de minimis* status for the commercial and recreational fishing year 2016 for the American shad and river herring fisheries.

**Comments or trends highlighted in state report:**

- No American shad were harvested from New Hampshire waters in 2016.
- Since 2006, a total of 11 American shad have been observed in the Exeter River.
- River herring SFMP target met for 2016 – exploitation rate <20% (4.4%) and returns >72,293 fish (199,090 fish).
- In 2016, 4,354 lbs of river herring were reported harvested from New Hampshire waters through mandatory coastal harvest reports. It is noted that this harvest is for personal use and is no longer included with NMFS harvest.
- Recreational harvest estimates for river herring were 840 alewives and 0 blueback herring in NH through the Access-Point Angler Intercept Survey (APAIS).
- There is a general increase in alewife herring runs in New Hampshire waters for the last 7 years.
- Geometric mean for juvenile alewives was lower in 2016 than 2015, but still higher than the means encountered between 2009 and 2012.

**Unreported information / Compliance Issues:**

- None identified.

**Sturgeon bycatch report:**

- No protected species were reported taken as bycatch from New Hampshire's coastal harvest program.

**MASSACHUSETTS**

***De minimis:***

- The Commonwealth of Massachusetts requests *de minimis* for the commercial fishing year 2016 for the American shad fishery.

**Comments or trends highlighted in state report:**

- 0 pounds of American shad were reported landed from Massachusetts by NMFS Statistic and Economic Division.
- Merrimack River American shad counts have shown a general increase since 2010; a total of 67,528 American shad passed Essex Dam in 2016.
- Connecticut River Holyoke Dam American shad counts have seen a general increase since 2004, and appear to be relatively stable since 2012 recording greater than 300,000 American shad annually.
- An exploratory study was initiated by the Massachusetts Division of Marine Fisheries to monitor the presence and abundance of American shad in the South and Indianhead rivers.
- Since 2006, analyses indicate an increasing trend in river herring run sizes in most monitored rivers with a time series high observed in the Merrimack River in 2016.

**Unreported information / Compliance Issues:**

- Catch composition data was not available for the American shad recreational fishery in the Merrimack River.
- A juvenile abundance index was not reported for the Merrimack River American shad.
- A description of Amendment 2 and 3 requirements for river herring and shad should be included in the compliance report; it is unclear what the recreational fishery monitoring requirements are.
- Degree of repeat spawning was not evaluated in the river herring spawning stock surveys.
- Age and length composition from bycatch sampling was not reported.

**Sturgeon bycatch report:**

- No sturgeon interactions were reported in 2016.

**RHODE ISLAND****Comments or trends highlighted in state report:**

- No significant changes in monitoring, regulations, or harvest in 2016.
- A total of 169 American Shad passed through the fishway in 2016.
- In 2016, 1,072,252 American shad fry were stocked in the Pawcatuck River and 1,053,167 into the Pawtuxet River.
- River herring run counts in 2016 were; Gilbert Stuart (74,304), Nonquit (9,664), and Buckeye Brook (27,552). Gilbert Stuart and Buckeye were higher than 2015, but Nonquit had lowest return in 15+ years.

**Unreported information / Compliance Issues:**

- None

**Sturgeon bycatch report:**

- One Atlantic sturgeon was observed by the NOAA Fisheries Observer Program in 2015.

**CONNECTICUT****Comments or trends highlighted in state report:**

- The preliminary 2015 landings are 51,004 pounds (14,637 fish) of American shad from drift gillnets through harvester catch reporting.
- Shad spawning population relies on a few age classes and low rates of repeat spawners.
- Passage of 412,656 shad at Holyoke was third highest since 1992.

**Unreported information / Compliance Issues:**

- Estimate of other commercial losses is reported by weight instead of length and age.
- Directed recreational harvest of shad is not characterized due to limited budget and staff.
- No sources of river herring loss are listed.
- No age frequency, degree of repeat spawning, or annual mortality rate calculation is provided for river herring.

**Sturgeon bycatch report:**

- A total of 37 sturgeons (species unclassified) were reported as caught and released by shad fishermen in 2015.

**NEW YORK**

**Comments and trends highlighted in state report:**

- In 2016 no changes to in-river fishery, recreational or commercial regulations, or fishery independent sampling.
- Commercial and recreational shad fishery closed in 2010.
- In 2016 the fisheries unit refocused efforts on aging shad scales, age-length key was used between 2003-2015.
- Mandatory reporting of river herring harvest = 6,791 pounds landed in Hudson River.
- Shad landings were reported through ACCSP, however due to confidentiality agreements, this data cannot be disclosed.
- 2016 American shad spawning stock survey sex ratio was 66:34 (male:female)
- 2016 river herring spawning stock survey sex ratio: 70:30 (male:female) alewife and 26:74 (male:female) blueback herring.
- The 2016 index for YOY American Shad was 1.54. 2016 marks the second consecutive year below the recruitment failure limit. The 2016 index of YOY blueback herring continues a slightly declining trend while the Hudson Alewife index continues to generally increase.

**Unreported Information / Compliance Issues:**

- No data for commercial or recreational “other loss” of river herring is available.
- A river herring recreational creel survey was not conducted in 2016.

**Sturgeon bycatch report:**

- Sturgeon bycatch was not mentioned in 2016 report, though shad fishery remains closed.

**NEW JERSEY**

**Comments and trends highlighted in state report:**

- Coastal commercial shad fishery closed in 2016.
- Directed ocean shad fishery closed in 2005.

- NMFS landings of shad unavailable for 2016, but was 0 in 2015.
- The NJ Ocean Trawl Survey had a geometric mean CPUE of shad in 2016 of 1.72, ranking first in the 28 year time series.
- During 2016 NJ commercial fishers reported harvest of 4 lbs. of river herring.
- Ocean Trawl Survey for both alewives and blueback herring had sharp decline in geometric mean beginning in 2010, but now starting to increase.

**Unreported Information / Compliance Issues:**

- No fishery independent monitoring in 2016 for shad or river herring.
- No recreational fishery data for river herring.
- No state regulations listed.
- No sex or age data for shad or river herring. Length data from Ocean Trawl Survey only.

**Sturgeon bycatch report:**

- No sturgeon was reported as bycatch in 2016 coastal fishery due to the required closure in coastal waters.

**PENNSYLVANIA**

**Comments or trends highlighted in state report:**

- No commercial or recreational harvest of American Shad is permitted within the Susquehanna River basin. Commercial harvest of hickory shad, alewife and blueback herring is prohibited in any state water.
- Recreational harvest of river herring was prohibited in 2016.
- In general, the 2016 American shad spawning stock showed a 1:0.5 (M:F) sex ratio, a decrease in mean total length and mean total weight, a slight decrease in mean age, and an increase in the frequency of repeat spawning.
- 89% of recovered juvenile American Shad in 2016 were found to be of hatchery origin.
- No juvenile Hickory Shad, Blueback Herring or Alewife were collected in haul seine efforts from 2002 to 2016.

**Unreported Information / Compliance Issues:**

- None.

**Sturgeon bycatch report:**

- No sturgeon have been reported using the fish passage structures on the Susquehanna River.

**DELAWARE – NANTICOKE RIVER**

**Comments or trends highlighted in state report:**

- Thirty-three juvenile American Shad were collected in the Nanticoke River which was slightly lower than the 2015 JAI.
- The 2016 electrofishing American Shad CPUE increased noticeably from 2015 and ranked seventh lowest in the time series.
- Most shad restoration efforts throughout the Northeast United States rely on stocking programs to supplement natural reproduction and accelerate the recovery process. An

estimated 437,000 American Shad fry were stocked in Nanticoke River tributaries during the spring of 2016.

- The Blueback Herring JAI decreased from 2015 to the sixth lowest value in the time series. Alewife abundance decreased from its 2015 value to the ninth lowest value in the time series.

**Unreported information / Compliance Issues:**

- None.

**Sturgeon bycatch report:**

- There have been no voluntary or anecdotal reports of Atlantic Sturgeon or other protected species caught in the Nanticoke River commercial gill net fishery.

**DELAWARE BASIN F&W COOPERATIVE**

**Comments or trends highlighted in state report:**

- Commercial landings of American Shad in the Delaware Estuary and Bay as reported to New Jersey in their directed fishery (18,377 pounds) were slightly below the time series average of ~25,000 pounds.
- Landings of American Shad reported to Delaware declined in 2016 (14,247 pounds) compared to 2015 (21,733 pounds).
- The Smithfield Beach CPUE was suggestive of a below average spawning run of American shad in the Delaware River in 2016
- Review of the identified four indices and their respective benchmarks in the American Shad Sustainable Fishing Plan indicate two of the four indices were well within acceptable levels.
- Juvenile abundance indices from New Jersey's upper tidal beach seine survey shows a serious decline in the overall health of the Blueback Herring stock within the river. Alewife recruitment for 2016 was also below the time series average.
- Adult river herring catch rates increased from 2015, but are highly variable between years.

**Unreported information / Compliance Issues:**

- Age and repeat spawning composition data from the commercial fishery were not reported for 2016. The Co-op members have been working on developing standardized ageing protocols specific to the Delaware River Basin. Once finalized, age and repeat spawning frequencies will be determined from commercial landing samples.
- No recreational angler use or harvest information is available for 2016.

**Sturgeon bycatch report:**

- According to commercial reports collected from New Jersey commercial shad fishers there were six Atlantic Sturgeon caught as bycatch during 2016 in Delaware Bay.
- In the Delaware River above the head of tide and the Lehigh and Schuylkill rivers, no sturgeon (Atlantic Sturgeon or Shortnose Sturgeon) have been reported caught.
- No sturgeon (Atlantic and Shortnose) have been observed using the fish passage structures on the Lehigh and Schuylkill rivers.

## **MARYLAND**

### **Comments or trends highlighted in state report:**

- American shad and river herring commercial fishery is closed; catch and release only.
- Relative abundance of American shad in Nanticoke and Potomac rivers has significantly increased over time series.
- No significant changes in American shad management in 2016.
- Total recreational release mortality is estimated to be 144 American shad per year (estimate based on two studies, one from 1997 and one from 2010).
- American shad JAI Decreased bay wide in 2016.
- Total loss of American shad from turbine mortality is somewhere between 3,241-8,589 for 2016.
- American Shad Stocking continues in Choptank River.
- In 2016, the Conowingo Dam tailrace American shad population was estimated at 153,171.
- Shad JAI for Upper Chesapeake Bay and Potomac River have increased linearly since 1980 while Nanticoke River has shown no trend.
- River herring relative abundance in Nanticoke River has declined over time series. River herring abundance declined in North East River in 2016.
- In 2016, The JAI CPUE for alewife and blueback herring both decreased in both the Upper Bay and the Nanticoke River.

### **Unreported / Compliance Issues:**

- Spawning stock assessment for river herring began with 2013 gillnet survey for adult river herring in the North East River. Longer time series needed for this assessment.
- No characterization of other losses in commercial fishery due to lack of bycatch monitoring, funding, and staffing constraints.

### **Sturgeon bycatch report:**

- The Atlantic sturgeon bycatch for Maryland's American shad ocean intercept fishery has been zero since this fishery was closed in 2005.

## **DISTRICT OF COLUMBIA**

### **Comments or trends highlighted in state report:**

- Commercial and recreational fisheries for river herring and shad remained closed.
- American shad fry stocking did not occur in 2016.
- In 2016, the American shad CPUE (fish per 6,000 square foot of net) increased to 2.78 compared to 2.04 in 2015.

### **Unreported information / Compliance Issues:**

- DOEE has no direct estimate of any other losses occurring in any of the shad and river herring fisheries in the District of Columbia.
- No ageing has been done for American shad or river herring, thus age frequency, degree of repeat spawning and mortality estimates have not been reported.

### **Sturgeon bycatch report:**

- No sturgeon captures were reported in the District of Columbia during 2016.

## **POTOMAC RIVER FISHERIES COMMISSION**

### **Comments or trends highlighted in state report:**

- Since 2012, all fisheries are closed to the taking and/or possession of river herring.
- The Potomac River is closed to the directed harvest, commercial and recreational, of American and hickory shad.
- Bycatch landings in 2016 included 1,149 pounds of American shad and no hickory shad.
- In 2016, the American shad restoration target (31.1) was exceeded for the sixth year in a row with a value of (43.3)
- The 2016 JAI index for American shad (3.84) greatly decreased from the time series high in 2015 (19.81), and the alewife and blueback herring indices (0 and 0.17, respectively) both decreased.

### **Unreported information / Compliance Issues:**

- Variances for juvenile indices are missing.

### **Sturgeon bycatch report:**

- In 2016, two Atlantic sturgeon captures were reported in the Potomac River. Both were released alive.

## **VIRGINIA**

### **Comments or trends highlighted in state report:**

- 93 American shad (310lbs) were taken under the 10 American shad per vessel per day bycatch allowance, which is less than the total adult American shad taken for research and monitoring.
- The number of trips taken by bycatch permit holders has declined the last two years.
- Juvenile abundance for American shad was lower in 2016 for all rivers compared to 2015 values, but remained relatively high in the Rappahannock River.
- The 2016 American shad spawning stock catch index was the lowest on record for the James and York Rivers.
- The overall assessment of the James River American shad population is that the stock remains at historically low levels and is dependent on hatchery inputs.
- In 2016, river herring fishery remained closed to both commercial and recreational harvest and possession.
- As of 2016, annual spawning stock surveys and representative sampling of river herring are occurring in all required Virginia systems.

### **Unreported information / Compliance Issues:**

- Age and length composition was not reported for river herring bycatch monitoring from pound nets in the upper western Chesapeake Bay scientific permit collections.
- Degree of repeat spawning was not evaluated in the river herring spawning stock surveys.

### **Sturgeon bycatch report:**

- In 2016, a total of two Atlantic sturgeon were caught as bycatch and released alive (James River, n=2; York River, n=0; Rappahannock River, n=0).



## **NORTH CAROLINA**

### **Comments and trends highlighted in state report:**

- In 2015, American shad landings totaled 62,244 pounds and were approximately 35% lower than 2015 due to various factors including weather and fish availability during the shortened season and represented the lowest harvest since the implementation of the SFP in 2013.
- The 2016 JAI for blueback herring (0.00) was below 2015 and the only year in the time series where no blueback herring were caught. The alewife JAI (0.38) was below 2015 (7.13) and also the time series average (~2.50).
- A total of 588 (184 aged) blueback herring and 997 (210 aged) alewife samples were obtained from four contracted Chowan River pound net fishermen.
- A total of 96,543 pounds of hickory shad were harvested in 2016 worth \$29,418 which was a 35% decrease in the pounds landed as compared to 2015.

### **Unreported information / Compliance Issues:**

Due to staff turnover and vacancy of the river herring biologist position, 2015 ageing analysis of blueback herring and alewife are incomplete. Ages will be included in the 2016 report or provided to the ASMFC as an appendix to this report, whichever comes first.

### **Sturgeon bycatch report:**

- In 2016, 26 Atlantic sturgeon were observed or reported from the Albemarle Sound: four via the DMF observer data (released alive), and 22 via the DMF IGNS (1 fatality).
- Four Atlantic sturgeon were reported captured via onboard observers within the Pamlico Sound, Pamlico, Neuse and Cape Fear River Areas. One shortnose sturgeon was recorded during this reporting period in the Cape Fear River.
- In the Cape Fear River, DMF observer data recorded four Atlantic sturgeon interactions (three released alive, one dead). The DMF IGNS captured one Atlantic sturgeon which was released alive.
- Observer trips completed in the Pamlico and Neuse rivers recorded no sturgeon interactions.
- The DMF IGNS in the Pamlico Sound, Pamlico, Pungo, and Neuse Rivers captured five Atlantic sturgeon, all released alive.

## **SOUTH CAROLINA**

### **Comments and trends highlighted in state report:**

- In 2016, total estimated commercial landings of American shad, as reported through NMFS, was 75,801 pounds (100% in-river).
- In 2016, observed sex ratios for American shad were not available for the Santee and Waccamaw River because only females were available. The high occurrence of females in these samples is most likely due to the marketability of females vs. males.
- In 2016, three year running average for blueback herring on the Santee Cooper was  $u = 0.036$ , which was below the sustainability benchmark of 0.050.
- In 2016, the three year running average for blueback herring on the Pee Dee River did not exceed the benchmark of 1,000 kg.

**Unreported information / Compliance Issues:**

- None.

**Sturgeon bycatch report:**

- Atlantics – 15 total from Carolina DPS.
- Shortnose – 8 total from the Santee River.

**GEORGIA****Comments and trends highlighted in state report:**

- In 2016, commercial American shad landings was 32,071 pounds on the Altamaha and 2,157 pounds on the Savannah River.
- A recreational fishery at 8 shad per day (combination of American and/or Hickory) exists only on Savannah and Ogeechee River.
- The population of American shad in the Altamaha River in 2016 was estimated at 221,775 shad, an 8% decrease from 2015.
- In the 2016 American shad electrofishing surveys, catch rates increase for both the Savannah and Ogeechee Rivers.
- American shad fry were stocked into Altamaha tributaries and the Ogeechee River.

**Unreported information / Compliance Issues:**

- Shad recreational harvest data was not reported for 2016.

**Sturgeon bycatch report:**

- Atlantic and shortnose sturgeon are caught in gill nets. In drift nets, essentially 100% of the sturgeon can be released unharmed. During 30 direct observations of monitoring adult shad in 2016, no sturgeon were captured in drift gill nets from the Altamaha River. Shad fishermen reported capturing 23 Atlantic and 16 shortnose sturgeon from the Altamaha River. Commercial fishermen reported no incidental catches of sturgeon on the Savannah River during the 2016 commercial shad season.

**FLORIDA****Comments and trends highlighted in state report:**

- No commercial fishery exists for shad or river herring.
- There is no recreational harvest of river herring.
- An access point creel total estimated shad catch was 492 fish in Mullet Creel area and 2,287 in Puzzle Lake Creel area.
- In 2016, 499 American shad and 85 blueback herring were caught during eighty electrofishing transects on the St. Johns River.

**Unreported information / Compliance Issues:**

- Include more detail on blueback herring (currently no CPUE, length or age data).

**Sturgeon bycatch report:**

- No netting is allowed for shad, so no sturgeon bycatch is expected.

# Atlantic States Marine Fisheries Commission

## Horseshoe Crab Management Board

October 17, 2017  
9:45 a.m. – 12:15 p.m.  
Norfolk, Virginia

### Draft Agenda

The times listed are approximate; the order in which these items will be taken is subject to change; other items may be added as necessary.

1. Welcome/Call to Order (*M. Rhodes*) 9:45 a.m.
2. Board Consent 9:45 a.m.
  - Approval of Agenda
  - Approval of Proceedings from October 2016
3. Public Comment 9:50 a.m.
4. Review Results of Eel and Whelk Bait Practices Survey (*R. Sysak*) 10:00 a.m.
5. Consider 2018 Benchmark Stock Assessment Terms of Reference (*K. Anstead*) 10:30 a.m.  
**Action**
  - Assessment Timeline
  - Data Confidentiality Procedures for the Assessment
  - Advisory Panel (AP) Recommendations
6. Set 2018 Harvest Specifications **Final Action** 11:10 a.m.
  - Review Horseshoe Crab and Red Knot Indices of Abundance for 2017 Adaptive Resource Management (ARM) Model Runs (*K. Anstead*)
  - Review Results of 2017 ARM Model Runs (*K. Anstead*)
  - Set 2018 Harvest Specifications (*M. Schmidtke*)
7. Review Results of ARM Model Runs Incorporating Biomedical Data and Recommendations from the ARM Subcommittee, Technical Committees, and AP (*K. Anstead & M. Schmidtke*) 11:30 a.m.
8. Consider 2017 Fishery Management Plan Review and State Compliance Reports (*M. Schmidtke*) **Action** 11:55 a.m.
9. Populate AP with Non-Traditional Stakeholders (*T. Berger*) 12:05 p.m.  
**Possible Action**
10. Elect Vice-Chair **Action** 12:10 p.m.

The meeting will be held at the Waterside Marriott Hotel, 235 East Main Street, Norfolk, Virginia 23510; 757.627.4200

# MEETING OVERVIEW

**Horseshoe Crab Management Board Meeting**  
**Tuesday October 17, 2017**  
**9:45 a.m. – 12:15 p.m.**  
**Norfolk, Virginia**

Chair: Dr. Malcolm Rhodes (SC) Assumed Chairmanship: 10/17	Horseshoe Crab Technical Committee Chair: Rachel Sysak (NY)	Stock Assessment Subcommittee Chair: Dr. John Sweka (FWS)
Vice Chair: Vacant	Horseshoe Crab Advisory Panel Chair: Dr. Jim Cooper (SC)	Law Enforcement Committee Representative: Doug Messeck (DE)
Shorebird Advisory Panel Chair: Dr. Sarah Karpanty (VA)	Delaware Bay Ecosystem Technical Committee Chair: Greg Breese (FWS)	Previous Board Meeting: October 26, 2016
Voting Members: MA, RI, CT, NY, NJ, DE, MD, DC, PRFC, VA, NC, SC, GA, FL, NMFS, USFWS (16 votes)		

## 2. Board Consent

- Approval of Agenda
- Approval of Proceedings from October 26, 2016 Board Meeting

3. Public Comment – At the beginning of the meeting public comment will be taken on items not on the agenda. Individuals that wish to speak at this time must sign-in at the beginning of the meeting. For agenda items that have already gone out for public hearing and/or have had a public comment period that has closed, the Board Chair may determine that additional public comment will not provide additional information. In this circumstance the Chair will not allow additional public comment on an issue. For agenda items that the public has not had a chance to provide input, the Board Chair may allow limited opportunity for comment. The Board Chair has the discretion to limit the number of speakers and/or the length of each comment.

## 4. Review Results of Eel and Whelk Bait Practices Survey (10:00 – 10:30 a.m.)

### Background

- At the 2016 Annual Meeting, the Board tasked the Horseshoe Crab TC with conducting a survey of the channeled whelk and American eel fisheries to learn about baiting practices within these fisheries, particularly as they relate to horseshoe crab and manufactured alternative baits.
- The Horseshoe Crab TC conducted these surveys earlier in 2017 and developed a report summarizing the results. (**Briefing Materials**)

### Presentations

- TC Report on Eel and Whelk Bait Practices Survey by R. Sysak

## 5. Consider 2018 Benchmark Stock Assessment Terms of Reference (10:30-11:10 a.m.) Action

### Background

- In May, 2016, the Board moved to schedule a regional benchmark stock assessment, which was scheduled for completion in 2018.
- The Stock Assessment Subcommittee (SAS) has been populated and has developed Draft Terms of Reference and an approximate timeline for the Board's review. (**Briefing Materials**)
- The Board tasked the SAS with considering confidential data from the biomedical industry in this assessment. The Board will be updated on steps being taken to ensure confidentiality of these data during the assessment process.

### Presentations

- Draft Terms of Reference and Assessment Timeline by K. Anstead
- Confidentiality Procedures for the Assessment by M. Schmidtke

### Board actions for consideration at this meeting

- Consider Draft Stock Assessment Terms of Reference.

## 6. Set 2018 Delaware Bay Horseshoe Crab Fishery Specifications (11:10-11:30 a.m.) Final Action

### Background

- The ARM Subcommittee met by conference call in August 2017.
- The Virginia Tech Trawl Survey was conducted in 2016, so the ARM Subcommittee used population estimates from this survey estimate horseshoe crab abundance in the Delaware Bay region.
- The ARM model was run using estimated abundances of horseshoe crabs in fall of 2016 and red knots in spring of 2017 to provide a recommendation for harvest specifications for Delaware Bay states in 2018. (**Briefing Materials**)

### Presentations

- Horseshoe Crab and Red Knot Abundances and Results of 2017 ARM Model Runs by K. Anstead

### Board actions for consideration at this meeting

- Consider ARM harvest recommendations and set specifications for the Delaware Bay states in 2018.

## 7. Review Results of ARM Model Runs Incorporating Biomedical Data (11:10-11:30 a.m.)

### Background

- In October 2016, the Board tasked the ARM Subcommittee with conducting alternative runs of the ARM model that incorporated biomedical mortality.

- The ARM subcommittee met by conference call in August 2017 to review and discuss the results of these runs and a recommendation for management actions to be considered by the Board.
- The TCs and Advisory Panel also met to review these results and provide recommendations for management actions to be considered by the Board.

#### **Presentations**

- Results of ARM Model Runs Incorporating Biomedical Data by K. Anstead
- TC Recommendations by M. Schmidtke
- AP Recommendations by J. Cooper

### **8. Consider Approval of the 2017 FMP Review and State Compliance (11:55 a.m. -12:05 p.m.) Action**

#### **Background**

- State Compliance Reports were due March 1, 2017.
- The Plan Review Team reviewed each state report and compiled the annual FMP Review. **(Briefing Materials)**
- The Potomac River Fisheries Commission, South Carolina, Georgia, and Florida have requested and meet the requirements of *de minimis* status.

#### **Presentations**

- Overview of the FMP Review by M. Schmidtke

#### **Board actions for consideration at this meeting**

- Accept 2017 FMP Review and State Compliance Reports.
- Approve *de minimis* requests.

### **9. Populate Horseshoe Crab AP with Non-Traditional Stakeholders (12:05 -12:10 p.m.) Possible Action**

#### **Background**

- In October, 2016, the Board discussed addition of two non-traditional stakeholder positions to the AP.
- An announcement for nominations was sent out in September, 2017.

#### **Board actions for consideration at this meeting**

- Consider approval process for nominees.

### **10. Elect Vice-Chair (12:10 -12:15 p.m.) Action**

#### **Board actions for consideration at this meeting**

- Elect Board Vice-Chair.

### **11. Other Business/Adjourn**

11. Other Business/Adjourn

12:15 p.m.

The meeting will be held at the Waterside Marriott Hotel, 235 East Main Street, Norfolk, Virginia 23510; 757.627.4200

*Vision: Sustainably Managing Atlantic Coastal Fisheries*

**DRAFT PROCEEDINGS OF THE  
ATLANTIC STATES MARINE FISHERIES COMMISSION  
HORSESHOE CRAB MANAGEMENT BOARD**

**The Harborside Hotel**  
Bar Harbor, Maine  
**October 26, 2016**

These minutes are draft and subject to approval by the Horseshoe Crab Management Board  
The Board will review the minutes during its next meeting



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Adjournment.....20

**INDEX OF MOTIONS**

1. **Approval of Agenda** by Consent (Page 1).
2. **Approval of Proceedings of August 2016** by Consent (Page 1).
3. **Move to postpone development of Draft Addendum VIII until after the 2018 Benchmark Stock Assessment has been completed for Delaware Bay** (Page 9). Motion by Michael Luisi; second by Roy Miller. Motion carried (Page 10).
4. **Move to select Harvest Package 3 for 2017 Horseshoe crab harvest in Delaware Bay** (Page 15). Motion by Michael Luisi; second by Stewart Michels. Motion is adopted unanimously (Page 15).
5. **Move to accept the Horseshoe Crab 2016 FMP Review and State Compliance Reports and approve *de minimis* requests for the Potomac River Fisheries Commission, South Carolina, Georgia and Florida** (Page 19). Motion by Robert Boyles; second by Bill Adler. Motion is adopted unanimously (Page 19).
6. **Move that the board approve the request of transfer of quota, 1,250 crabs, from Georgia to North Carolina** (Page 19). Motion by Dr. Michelle Duval; second by Pat Geer. Motion is adopted unanimously (Page 19).
7. **Move to adjourn**, by Consent (Page 22).

**ATTENDANCE**

**Board Members**

Bill Adler, MA (GA)	Rachel Dean, MD (GA)
Sarah Ferrara, MA, proxy for Rep. Peake (LA)	Ed O'Brien, MD, proxy for Del. Stein (LA)
Dan McKiernan, MA, proxy for D. Pierce (AA)	Rob O'Reilly, VA, proxy for J. Bull (AA)
Bob Ballou, RI, proxy for J. Coit (AA)	Catherine Davenport, VA (GA)
Eric Reid, RI, proxy for Sen. Sosnowski (LA)	Michelle Duval, NC, proxy for B. Davis (AA)
David Borden, RI (GA)	David Bush, NC, proxy for Rep. Steinburg (LA)
Colleen Giannini, CT, proxy for D. Simpson (AA)	Doug Brady, NC (GA)
Rep. Melissa Ziobron, CT, proxy for Rep. Miner (LA)	Robert Boyles, Jr., SC (AA)
James Gilmore, NY (AA)	Malcolm Rhodes, SC (GA)
Emerson Hasbrouck, NY (GA)	Sen. Ronnie Cromer, SC (LA)
Brandon Muffley, NJ, proxy for D. Chanda (AA)	Spud Woodward, GA (AA)
Tom Fote, NJ (GA)	Nancy Addison, GA (GA)
Adam Nowalsky, NJ, proxy for Asm. Andrzejczak (LA)	Pat Geer, GA, proxy for Rep. Nimmer (LA)
Stewart Michels, DE, proxy for D. Saveikis (AA)	James Estes, FL, proxy for J. McCawley (AA)
Craig Pugh, DE, proxy for Rep. Carson (LA)	Mike Millard, USFWS
Roy Miller, DE (GA)	Chris Wright, NMFS
Michael Luisi, MD, proxy for D. Blazer (AA)	Martin Gary, PRFC

**(AA = Administrative Appointee; GA = Governor Appointee; LA = Legislative Appointee)**

**Ex-Officio Members**

Steve Doctor, Technical Committee Chair

Doug Messeck, Law Enforcement Representative

Robert Beal  
Toni Kerns  
Kristin Anstead

Kirby Rootes-Murdy  
Mike Schmidtke

**Guests**

The Horseshoe Crab Management Board of the  
Atlantic States Marine Fisheries Commission

convened in the Stotesbury Grand Ballroom of the Bar Harbor Club, Harborside Hotel, Bar Harbor, Maine, October 26, 2016, and was called to order at 8:00 o'clock a.m. by Chairman James J. Gilmore.

#### **CALL TO ORDER**

CHAIRMAN JAMES J. GILMORE: Welcome to the Horseshoe Crab board meeting. I would like to call the meeting to order. If you have important conversations, please take them out in the back. My name is Jim Gilmore; I am the Administrative Commissioner for New York, and I will be chairing the Horseshoe Crab Board meeting today.

We have a few things to go through in the agenda; but first before we get into that, and I know they're not here, but a shout out to the Maine delegation and the ASMFC staff for one of the best dinners I think I've ever had. I slept like a baby last night. I just hope they're going to repeat it again tonight, because I think it was really very popular.

Also, I would like to introduce Mike Schmidtke; he's a new ASMFC staff that is going to be working on horseshoe crabs and joining the team today. Welcome, Mike.

#### **APPROVAL OF AGENDA**

CHAIRMAN GILMORE: First order of business is approval of the agenda. Everyone has it in their briefing documents. Are there any changes to the agenda? Seeing none; we'll adopt those as in the briefing book.

#### **APPROVAL OF PROCEEDINGS**

CHAIRMAN GILMORE: The second order of business is the August, 2016 proceedings. Are there any changes to those proceedings? Seeing none; we will adopt those. Before each meeting we have public comment on issues not on the agenda. I did not have anybody sign up for making a comment, but is there anybody in the audience right now that would make a public comment on issues not on the agenda?

#### **ARM SUBCOMMITTEE REPORT**

CHAIRMAN GILMORE: Okay seeing none; we'll move right into our first order of business; which is the ARM Subcommittee report, and Kristen is going to give us a presentation on that.

MS. KRISTEN ANSTEAD: Good morning. This morning I'm going to update you on the activity of the ARM Subcommittee and the harvest recommendations for 2017 in the Bay. First I'll just remind you of the objective statement for the ARM model, which is to maximize the harvest of horseshoe crab while maintaining a population that can sustain the migrating birds, specifically the red knots.

This morning I would like to talk briefly about the red knot and horseshoe crab population thresholds in the ARM model. The abundance estimates for this year, the five harvest packages as they currently exist, and the recommendation for fishing for 2017. There are a couple thresholds in the ARM model that I think are important to review, one is female horseshoe crabs. That was set at 80 percent carrying capacity; and that turns out to be 11.2 million female crabs. For red knots it's 81,900 birds, and additionally you have to maintain an operational sex ratio of two males to one female, so that is on the spawning beaches; that is not out in the ocean. These two thresholds are important because this is how we understand when and how we get female harvest in the Bay, because that continues to sort of be an issue. I wanted to review these so that you understand when female harvest could be possible.

This is an either/or situation. If the birds hit their threshold, then there is the possibility for female harvest. Because regardless of how many female horseshoe crabs are there, they are sustaining the bird population. Conversely, if the crabs hit their threshold, even if the birds do not there is the possibility for female harvest; because there are enough horseshoe crabs to sustain the population where we want it to be.

Additionally, if that sex ratio falls below two-to-one, there would be no male harvest, but that hasn't happened, and it doesn't get close to that; but just a reminder that that is also a threshold that exists in the model. This is the red knot abundance for the last few years. The blue line is the mark-resight estimations of the abundance of the red knots in the Delaware Bay.

The red line is the threshold, so you can see how close or far we have been from it. Those are the 95 percent confidence intervals around their estimations. Fewer birds stopped in the Bay in 2016 than the previous year, but the estimates were very similar to 2014. The estimates were 47,300 birds, and that is below the bird threshold.

For the horseshoe crabs, we use the Virginia Tech Trawl Survey to make estimates of the population for horseshoe crabs. As you know, that doesn't run every year, so in lieu of the Virginia Tech Trawl Survey estimates, we have a composite index. It has been developed from a few surveys in the Bay.

The black lines up there are the Virginia Tech Trawl Survey estimates, and the top graph is for males and the bottom for females. You can see in the years that we have the trawl that they match pretty closely. When we don't have the trawl survey, which we did not have last year, we use the composite index.

The survey is underway this year, so next year we'll be able to use those results for the horseshoe crab abundance; as well as continue to tune the composite index with another year of data. The 2015 estimate for female horseshoe crabs was 8.1 million; that is also under the 11.2 threshold. But there was a slight uptick of crabs this year. That is a good sign.

These are the five harvest packages as they currently stand, from full moratorium to both male and female harvest. For the last several years, the ARM model has recommended Package 3; which is the 500,000 male only harvest. The way the ARM model works is we put this abundance in the

season, and it goes through all possible states of the population; the juvenile abundances, birds, males, females and recommends a harvest package based on what would be best for both of those populations.

This is just a summary of the numbers we already went over, the male and the female horseshoe crab numbers for this year, as well as the bird estimates. Both are below threshold, and the harvest package recommendation is the same as it has been for the last several years, which is Harvest Package 3; the 500,000 male only harvest. I just want to talk briefly about some of the upcoming challenges the ARM Subcommittee has been discussing. As you know, we went under this short term review and we made several recommendations about how the ARM model could be fine-tuned. One of those was the incorporation of the biomedical data, which does prove to be the largest challenge moving forward. I'll just remind you that biomedical currently is not accounted for in the ARM.

The reason we feel like it should be, is because it accounts for 8 to 12 percent of the coastwide mortality; and we have put forward the preferred option and a minority opinion that we've already presented to you. But I will just briefly remind you, so that when Kirby talks about the Addendum, you'll remember what we were talking about.

The preferred option was to adjust the harvest packages to account for what the biomedical is already harvesting. These are made up numbers. On the left are the harvest packages is we've already talked about, and on the right is just an example of what that could look like. What we would do is take a three-to-five-year average of what the biomedical harvest in the bay and remove that from the current harvest packages.

This is not a quota for biomedical. We're not putting a cap on them or limiting them; we're just purely accounting for on average the mortality we're attributing to them. That number might be revised every six years or so. We don't want to

violate any data confidentiality, so we'll be using averages; adjusting it not every year but continuing to tune that number to reflect what is occurring in the Bay.

That was the preferred option as put forth by the ARM Subcommittee. The minority opinion or option was to incorporate it into the population dynamics model, using that 15 percent mortality, putting it in the kind of workings of the model rather than applying it to the harvest packages. The harvest packages would remain unchanged.

Exploring this option is time consuming, because the model goes through multiple iterations under different states of the population; and so it is a cumbersome process, and I will just show you briefly why that is. This is as simple as I could make the population dynamics model. You can see, you have the juvenile horseshoe crabs, and they can remain juvenile horseshoe crabs to the next year; or they can go on to the pre-breeding stage, or they can skip pre-breeding and go straight to being an adult male or an adult female or they can die.

Those are multiple steps just for the juveniles. For the pre-breeders, they can also remain a pre-breeder the next year or they can mature and become a breeding male or female; additionally, they can die. Then the adult males and females have the survivorship where they can remain in that stage. They are also feeding back to the juveniles, as well as being harvested.

When the ARM model is kind of balancing all these different states, the most simplistic way to think about it is that the horseshoe crabs available next year are the number of juveniles that go straight to adults, plus the pre-breeders that go straight to adults, plus the adults that survive minus the harvest.

What we would be suggesting in this minority opinion is sort of adding on to that red step, the amount that dies or gets harvested. We would be accounting for it in this stage. It would reduce the survivorship of those males or females in the adult stage and kind of be part of the harvest there

rather than adjusting the actual harvest packages. While that sounds simple in theory, it is a time consuming step to kind of explore the sensitivity of the results to incorporating the biomedical. That is the population dynamics model. With that, I can take any questions about the ARM activities.

CHAIRMAN GILMORE: Great presentation. Questions for Kristen? Rob O'Reilly.

MR. ROB O'REILLY: I have two questions and they're old questions. The 15 percent mortality for the biomedical process, I think, last meeting we heard from one of the companies that it's much less. We've heard from others in the Technical Committee that it's more. I guess I'm just wondering, some of the sensitivity analyses that are going to be conducted.

Is it anticipated that that will also include varying that mortality rate a little bit? The reason I ask, I mean, we have a lot of discard mortality rates for fisheries where depending on the area, the time of year, and everything else, it might be just sort of pertinent to that particular study. But here we have a situation where the biomedical companies definitely have a handle on how much mortality there is. I don't know why there is such a mystery about it.

The second question, if I may, it will be a quick one. Kristi, you mentioned a six-year update. I'm just wondering, without violating any data confidentiality, in the last six years what has been the average change in the biomedical use of horseshoe crabs? I guess what I'm wondering really, is six years really something that is just thought about right now as an estimate and can be modified later on if there is information on a composite basis that the biomedical process is taking more horseshoe crabs.

MS. ANSTEAD: First, I'll answer your question about the 15 percent. We're going to do a benchmark stock assessment in 2018, so at that point we will have a great opportunity to reevaluate some of the studies, look back at the

literature, and work with biomedical to reevaluate that number. That is definitely something that's going to happen, and when that happens for the benchmark, the ARM will also adapt whatever they find to be the most appropriate number for the Delaware Bay region.

Also, when we do the benchmark, we're hoping to be able to do that on the regional basis; so if there is a study specific to the southeast, we can apply that biomedical mortality to that region as well as reevaluate that for the Delaware Bay. It may not have to be a flat percentage. If there is data specific to each region, we'll be able to use that at that time. As for the second question, I think Kirby is going to speak to that.

But yes, the six is just an example, the six-year average. Biomedical is pretty consistent, and so I think what we would look at is how often – I mean, we should reevaluate it every so often – but do we do that on a pre-chosen number of do we do that when there is some indication that it is changed? Then we would have to revise it in the ARM model, but I think Kirby has something to add.

MR. KIRBY ROOTES-MURDY: Yes, I was just going to offer, Rob, that in the supplemental materials we included the FMP review, and it lays out biomedical collection and bleeding over, I believe it's the last five to seven years or so. You can see trends there. But to what Kristen was mentioning, it has largely stayed pretty constant, in terms of the number of crabs that have been collected. The overall mortality coastwide has changed slightly year-to-year, but that trend hasn't moved either way significantly in recent years.

MR. BRANDON MUFFLEY: Just a question on the harvest information that goes into the ARM model. Does it assume, or do we provide, that it's just a 500,000 male harvest or we actually used harvest numbers from the prior year?

MS. ANSTEAD: We did talk about that recently, and it just assumes that that is what is being harvested. It has been discussed that maybe that is not the most appropriate thing to do, but that

could be something else to look at as we revise the model. But right now, it assumes that harvest packages are what are being harvested in the Bay. I know that is not exactly true every year.

MR. ROBERT BALLOU: Kristen, excellent presentation, but if you could just turn back to the core issue and expound a bit on why the workload would increase so significantly by including the biomedical mortality; in addition to the bait harvest mortality. It just seems like a different number, a larger number as it were. Why does that make it such a – you talked about sensitivities, could you just expand on that a little bit?

MS. ANSTEAD: To explore kind of the sensitivity of both of these option, would this push us to moratorium? Would it most likely keep staying at 500,000? Changing the harvest packages is a little simpler to kind of explore. You just change that one number; and then when the model goes through this optimization routine, where it looks at all these possible states of the model based on all the years of data; along with all those probabilities of moving to another stage; or staying in the stage; or the survivorship at each of those stages; or the fecundity in that year or the male/female ratio, it doesn't need to go through all of those with a different mortality rate. Both of them would take time.

But doing the population dynamics one is just much more cumbersome. That's the lengthy process of the model, whether or not we change it. When Conor McGowan goes through the ARM model each year, it's that routine that is the time consuming routine. That is why adding mortality there would make that exploratory process a little longer.

CHAIRMAN GILMORE: Other questions? I actually have one, which I won't put Kristen on the spot, because it is more of an ornithology question, so maybe Mike will help out. I was impressed by, when I was reading the reports, of the difficulty in sampling red knots. I guess, when I looked at it, and what is equally important is not only the

horseshoe crab harvest, but the 89,000 number for the population that is fed into the model for the red knots.

Right now, I think 40 something thousand was the population estimate that is put into that. But how confident are we, because when I looked at the report on the sampling for that, it seems to be a real interesting way -- it is almost like a data poor species from a fisheries perspective. I mean, is there a lot of error with that or can you just expand on that a little bit?

MR. MIKE MILLARD: I would remind you, I am not an ornithologist. I think Jim Lyons' estimates from the mark-recapture does have error bars around it. I feel a lot more confident about those estimates than the old aerial surveys that the state of New Jersey was conducting. I don't have those numbers in front of me with the error bars, but I think it is about as good as we can do right now for a species like that. I feel pretty good about it myself.

CHAIRMAN GILMORE: Great, thanks, Mike. Bill Adler.

MR. WILLIAM A. ADLER: I remember when they were talking about red knots and where they are and where they're not that there was some concern that they were still around. But they weren't landing or coming to the place where we always thought they would be coming. I didn't know if any of that information has been added into the red knot population estimates; that there were other places where these things were landing. I think you remember all that. But I don't know if any of that got into the statistics as to the population size of the red knot. I don't know if they did anything on that.

MS. ANSTEAD: We talked about that a little bit at the TC meeting, because there were some concerns about how much the population had bounced around in the last three years. From 2014, and then it went up pretty high in 2015 and came back down. Many felt that that -- well,

fluctuation is natural -- but that big of a leap couldn't be attributed to births and deaths alone.

We did talk a little bit about how maybe they didn't stop in the Bay at the same proportions that year as they usually do, or they stayed a different amount of time. That is definitely part of the estimation process, but it is not necessarily accounted for in the ARM, other than when we get that mark-resight abundance. Fluctuations can be explained by those things that you're talking about.

MR. MILLARD: Thanks for that report, Kristen. I have an observation, I think, followed by a question. In talking to some folks on the ARM Committee about the behavior of the model, I think there was a discussion in your meeting that because of the optimization routine and the way the model works, and because of the thresholds that you explained to us nicely at the beginning of your presentation, it is either going to want to go full open, wide open; once the females take value, harvest as many as you can until they no longer have value, according to that threshold; and then go to zero.

To drop into an analogy, it is like if you're in a car, it is either going to be in fifth gear, top speed or in neutral. It is never going to want to cruise along in third gear; is what I'm hearing. Now, I don't know if they've explored that rigorously with the model, but I guess that is my question to you. You mentioned it's time consuming, but I think the board, at least at the last meeting said, well, we would like to see more about how that behaves. Are they, in fact, going to undertake that analysis?

MS. ANSTEAD: Yes, I would say that's accurate that the model prefers Package 1, 3 and 5, which is moratorium, the highest male only harvest and then the highest male and female harvest; that those two other options aren't chosen as much. Exploring that, I think, was part of the long term review we suggested.



Maybe about a year ago we put forth what items could be accomplished on a short term review process, and what could be accomplished on a longer term. At that time we were tasked with doing the short term review. If we had the opportunity to do a long term review, certainly exploring what harvest packages might be more appropriate, or why those two aren't chosen would be part of that; as well as moving the ARM model into a different software program that would be more accessible for staff. Right now it is not run by us; it is run somewhere else. Those were two longer term goals, but yes, that is certainly a concern and a hope for moving forward.

#### **UPDATE ON DRAFT ADDENDUM VIII**

CHAIRMAN GILMORE: Okay, I think I'm going to move along and Kirby is now going to give us an update on Draft Addendum 8.

MR. ROOTES-MURDY: Kristen, I think, teed this up pretty nicely for me. I'm going to walk through kind of how we got to where we are today; the August, 2016 board meeting; trying to develop the Draft Addendum VIII coming out of that; some of the ARM Subcommittee comments we received; next steps, questions and considering board action today.

At the August, 2016 board meeting, as you all should remember, the ARM Subcommittee and TCs presented their recommendations on how to include biomedical mortality into the ARM framework. There were two options, as Kristen lay out. The preferred option reduced the bait harvest and accounted for biomedical mortality.

The second option, which we were calling a minority option, added biomedical mortality into the population dynamics model. Taking that into consideration, the board initiated an addendum to include biomedical mortality as well as bait harvest packages that allow for female harvest, and that was specifically outlined in Appendix C of one of the meeting materials we offered up for the August meeting.

In coming back to the addendum after the board meeting, staff sat down; we tried to think through logistically how this addendum could play out. One thought at first was an initial decision tree on how to deal with biomedical mortality. It is important to understand that from that you then would have to move down to figure out what harvest package would be the next option for someone to select.

We kind of coined it as a "choose your own adventure" in this way. When you do this, there is the possibility to have significant variation, depending on what biomedical mortality option is chosen initially. In this slide we have a breakdown of what the current harvest packages are, as Kristen presented, and then with that preferred option how they are slightly adjusted.

You start off with biomedical mortality, you have that decision point, whether to include it or not. It is pretty straightforward, no, you move to status quo. If yes, there are two options that are laid out, the preferred and the minority. The next step in that would be after you've chosen which of the options you would want to use to account for biomedical mortality; you would select a harvest package.

Again, we were guided to select, or at least include in the addendum, the options that were laid out in Appendix C. As I tried to explain, we have those two decision points in the decision tree; how to account for biomedical mortality, and then moving down to your harvest packages. When you start to look at this with the variations, you come up with multiple versions of harvest packages. The status quo would already get you at possibly two separate versions of the same sets of harvest packages. You add in Appendix C, you have four additional sets of harvest packages to look at. When you then times that by two, we would be looking at somewhere in the ballpark of 18 possible options that would be included in the addendum. From a staff standpoint, we expressed some concern that this may be possibly too many

for the public to consider and provide adequate comments on.

As Kristen laid out in her presentation, I believe the harvest packages have been evaluated and were evaluated by the ARM Subcommittee going into that August meeting, as part of the initial task way back, about a year ago; when the ARM Subcommittee was asked to look at how to get at female harvest in the bait industry.

The ARM Subcommittee looked at that and found that while there may be an interest in adding more options that have female harvest, unless you are above that threshold that Kristen laid out, you're not going to increase the likelihood of getting female harvest. So long as you're below that threshold, you can add as many harvest packages as you would like to have options for female harvest, but you won't get there.

With that in mind, this could possibly further confuse public comment for the draft addendum process in that we may be going out to the public with these 18 options, and asking them to provide us comment, when in actuality if they chose one of those options we couldn't necessarily tell them for sure that all the options that included female harvest would actually be selected in a given year.

With this information, we brought it back to some members of the board to further explain how to get guidance on how to move forward with this addendum. With this information, some of the board members asked us to look at whether it would be possible to do sensitivity analyses to get at how, say including biomedical mortality would have changed harvest package selections in previous years.

One of these ideas that were put forward was doing sensitivity analysis around the two versions of how to include biomedical mortality; going back between five to ten years, running the model with then these biomedical options in there. Again, the model inputs would be using the abundance index

from the Virginia Tech Trawl Survey or the Composite Index and putting that in.

We would be keeping pretty much everything constant; it would just be seeing how the model would react with this new variation in it. In bringing this to the ARM Subcommittee in September, they expressed some concerns about the decision making process in this, and it being largely results driven versus making decisions that made the most sense, based on the information we have on the population and biological characteristic at each stage in the model.

As Kristen laid out, we have also talked with them about the sensitivity analysis work, and they expressed some concern that it would take some time. Anecdotally, the ARM Subcommittee members also offered that they thought that the approximate 34,000 mortality that may be coming out of the Delaware Bay, this is again a guestimate, not an actual number, would be a negligible amount.

It wouldn't necessarily change the optimized harvest package. The reason why is because the magnitude of the biomedical mortality there would be very small, compared to the magnitude of the abundance that we're using to set the harvest packages and specifications annually. You were just shown the graphs of what the male and female abundance estimates are in the Delaware Bay region, and so the magnitude between that abundance estimate and what these changes are in the mortality, they deem to be possibly negligible.

A separate note, harvesting female crabs, this is related to trying to put in more options that would possibly select female, so long as you're below the threshold. If you start to violate the rules of the ARM framework, you may be able to get at female harvest today. But it will actually push your timetable to getting at an optimized option for female harvest that is the model actually selecting it.

It will take a longer time to get to that; because, again, it is under the impression that it is still at a depleted state. We followed up with the ARM Subcommittee's members regarding specifically how long the timetable would be between getting these analyses done and presenting them to the board. The first one, as Kristen lay out, wouldn't take a tremendous amount of time; because of the lack of iterations that the model would have to go through.

The second one, after a little bit more conversation, we learned would possibly be able to be completed by summer of next year, 2017. For the reasons that have been laid out already that it would be time consuming, given the multiple iterations and the software availability and experienced limitations in trying to run it.

Some additional considerations for the board are that with this addendum having been initiated in August, and the benchmark stock assessment set to be started in 2017, and completed in 2018, there is a lot of work that the ARM Subcommittee will hopefully be contributing to the Technical Committee and Stock Assessment Subcommittees and completing the 2018 assessment.

There is potentially new information that would be coming out of that assessment to help inform this process. In having an addendum that would be at its earliest completed by mid or maybe even a year from now in 2017, the earliest it would be implementing harvest packages for would be 2018; therefore, we would be possibly going through the same process again once we had the results of the benchmark stock assessment.

There may be the possibility that it would be a redundant effort. Next steps, as staff we're looking for guidance from the board on whether to proceed in continuing development of this addendum, and also to consider possibly addressing this addendum after the 2018 benchmark stock assessment has been completed. With that, I'll take any questions.

MR. MICHAEL LUISI: I may be able to save you and the other commissioners around the table here a little time and quit with questions. I've got some thoughts, and I appreciate on the agenda that this presentation by Kirby was labeled as challenges with developing this addendum. I would argue that this is more than a challenge.

Challenges are things we can overcome, and there is more of a roadblock here as far as what we currently have as a framework for managing horseshoe crabs with the red knot, and trying to make adjustments as Mike alluded to kind of this third gear, rather than either neutral or in fifth gear.

For any of you who know me well, I can be a little stubborn when I get something in my mind. I just want to thank Kirby and Kristen for putting up with me the last few months, as we've communicated back and forth a number of times about how we could try to proceed with this addendum in accomplishing the goals that this board approved, as far as moving forward. The way that I see it now and where we currently stand is that we're going to set measures for 2017.

By the time an addendum would be finalized, we would be right at the base of a benchmark stock assessment. Given the comments that have already been made by staff, I think that it is probably in our best interest right now to hold off on any further development of this addendum until the benchmark is completed.

It sounds to me like the benchmark is the way we can maybe address some of the roadblocks, some of the walls that are within the model right now in moving forward. When you're ready, Mr. Chairman, I do have a motion I would like to make.

CHAIRMAN GILMORE: Okay, Mike, just let me see if there are other comments, along with where you're going and opposed to that and if we don't have that, I think we'll put your motion up. Any other questions or comments for Kirby or what

Mike just said? Okay Mike, go ahead, give us your motion.

**MR. LUISI: I move to postpone development of Draft Addendum VIII until after the 2018 Benchmark Stock Assessment has been completed.**

CHAIRMAN GILMORE: Okay, second by Roy Miller. Is there discussion on the motion? Rob O'Reilly.

MR. O'REILLY: The only comment I have, is I saw on one of the slides an indication that there is some experience needed and some software that needs to be mastered, perhaps, as part of this process. Even though I support the motion, it would seem that that also allows time for accomplishment of learning that software, the new software that might be needed and also getting the experience that is also needed. I wanted to make that comment.

CHARIMAN GILMORE: Any other questions? Brandon Muffley.

MR. MUFFLEY: I support the motion, as well. I guess my question is, do we think we will continue to work on some of these items that we talked about regarding the ARM model. Will we run sort of these sensitivity analyses with the two different biomedical methodologies and evaluating the actual harvest versus the assumed harvest of 500,000 crabs?

Will we continue to evaluate the model as we go forward, since we're going to kind of delay? I just want us to kind of be ready, once that stock assessment goes, that we've maybe kind of answered some of these questions within the ARM model that were ready to move forward.

MR. ROOTES-MURDY: That is definitely an option and a possibility for the ARM Subcommittee. I think it just needs to be clear coming out of this meeting that that is a request of the board that that analysis be carried forward. If this motion passes that it is kind of moving on two different

time tables then. But if that is the pleasure of the board, then just making sure that's clearly tasked to them would be great.

MR. MUFFLEY: Do you think we need a motion then? I think that is the way we need to go. I support delaying and getting everything right and wait for the assessment. I think that's key. But I don't want to lose time on the work that we need to do on the ARM model.

CHAIRMAN GILMORE: I don't think we need a motion on it, Brandon, I think that's really well documented that is where we're going to go. I think we're okay on it. Mike, do you have a comment?

MR. MILLARD: I, too, support the motion, and I thank Mike for making it. My sense is after the benchmark, we can revisit the ARM in a sense that we were looking at these harvest packages, but those aren't the knobs that we want to tune with. We want to go back out to the threshold maybe and the value functions. Those would be the tuning knobs that the ARM would consider, I think, if I'm understanding correctly; after the benchmark assessment.

CHAIRMAN GILMORE: Yes, I agree Mike, I think that is correct. Any other discussion? Mike Luisi.

MR. LUISI: Just one more thing to add, not regarding the model but regarding the biomedical industry. In conversations that I've had with Kirby and Kristen, I think there may be things that we can do as states to help better understand the mortality associated with the biomedical companies. All the details aren't in my head right now, but Kirby, you and I have spoken about it, about what we might be able to do to capture the information that would help us all understand a little more clearly, the mortality associated with the biomedical industry.

Maybe that could be factored in at a later date, rather than incorporating that mortality now. After the benchmark we might have a better

understanding. I don't know if there is anything that you might be able to send out to the states, as far as a request for how we better those data, but I just ask maybe you could speak to that a little bit.

MR. ROOTES-MURDY: Sure thing. Hopefully, all the board members are aware, last week, prior to this meeting, Jim sent out an e-mail laying basically as a reminder that those states that have biomedical facilities that are bleeding crabs currently, are required to submit information on that; the number of males and the number of females that have been bled, because we have a process and a procedure for applying mortality to that.

As laid out in Jim's e-mail, we haven't necessarily been getting the best information on that recently. I'll be hitting on that point a little bit during my presentation for the FMP review. But just as a setup to that, it will be important for those states to keep in mind to give a better sense of what the mortality is at each stage from the collection through to those crabs that are bled and released; as well as those crabs that have been not used for bleeding, but discarded, as that can sometimes be a large category. That will help, not just for compliance components, but also for the upcoming benchmark stock assessment when we're going to be looking at how to best understand this data at a regional level.

CHAIRMAN GILMORE: Let me just go to the audience quickly; any public comment on the motion? Okay seeing none; back to the board. Any last discussion, before we vote? Okay, seeing none; is there any objection to this motion? Okay, so I guess we are going to vote. Call on Melissa on that.

MS. MELISSA ZIOBRON: I don't feel like I've sowed my oats here long enough to make a comment, this is only my second meeting. But in reading the letter from the Limuli Laboratories, my confusion really rests in the fact that it sounds like that there is reporting data available.

I don't have the information of how that is relayed to whether it is the states or to this organization, but as a legislator I have seen firsthand putting off hard decisions, and I am very concerned, after attending the August meeting, hearing this. Once again, here we are postponing these kinds of tough decisions, and for that reason I oppose it.

CHAIRMAN GILMORE: Any other discussion before we vote? Okay, does anybody need to caucus? Two minutes for a caucus. Okay, we're ready to take the vote. Move to postpone development of Draft Addendum VII until after the 2018 Horseshoe Crab Benchmark Stock Assessment has been completed.

**A motion by Mr. Luisi and seconded by Mr. Miller. All those in favor of the motion, please raise your hand. Fifteen in favor, all opposed. No opposed, any null votes; any abstentions? Motion passes 15-0-0-0.** Thanks, we're ahead of schedule.

#### **HORSESHOE CRAB TECHNICAL COMMITTEE REPORT**

Okay, next we're going to go into Technical Committee reports; and Steve Doctor has got a whole lot of great stuff to tell us.

MR. STEVE DOCTOR: Okay, we're going to look at a couple things here. We had a pretty productive Technical Committee meeting about a month ago. I'm going to try to go through some of the conclusions we came to. First, I'm going to go over the ARM framework and the recommendation for the optimal harvest, and then we're going to look at some horseshoe crab surveys.

We're going to do the shorebird survey; we're going to talk about alternative bait trials and then we're going to talk about the United States Fish and Wildlife Service response to the ESA listing. We were given Harvest Package 3, which is the 500 male only harvest. It was based on the composite index and red knot mark-resight population estimates that are the best available science at this point; and the Technical Committee was unanimous in recommending the ARM package at Package 3.

Now, we're going to go into some surveys here. The Delaware Bay Trawl Survey is one of the indexes that are going to the ARM model. Thanks to Jeff Brust, who is the Excel master of the coast, we have like male and female broken out, some nice graphs here from them. I'm going to go through these pretty quickly. They're basically showing pretty much the same trend.

This is the New Jersey Ocean Trawl Survey. When I say they are showing the same trend, they are all pretty much stable, is what I would say. Some of them are starting to show a little bit of increase in the tail end of the survey. This is the Ocean Trawl Survey, and it is also in the Composite Index; the Composite Index is made up of three surveys.

Then this is Delaware Bay Spawning Survey. The one survey that has a little bit of a significant trend is the Beach Delaware Bay Spawning Survey. It has a significant trend and a decline in females, but when we go further, you'll see that when you put them all together it doesn't show up. The next one is the Delaware Survey. I think Stew Michels has his hands in these maybe, John Clark too. These surveys are a 16 and a 30 foot trawl survey in Delaware Bay. This is the Maryland Offshore Trawl Survey. This is my survey, so I'll spend the most time on this one. You'll see that this is taken on commercial boats that go offshore and they're collecting horseshoe crabs for bait and biomedical. You'll see it goes along here real good until about 2008. I wish that was an increase in horseshoe crabs, but what they discovered is that you catch more horseshoe crabs at night, so they went to doing the survey at night.

Also, the Virginia Tech Trawl Survey discovered this, so it's been a learning experience going through this horseshoe crab stuff. You'll see this one index up here is really high. That year we were averaging 60 horseshoe crabs per minute. While in the 2008, you'll see a jump, it is still an upward trend. I really don't think that this index is going to go much higher, because you really can't cram

more than 5,000 horseshoe crabs into the net in 40 minutes.

We'll probably plateau off there. But it did show an increase for a while. I've given you a bunch of surveys. What I would kind of like to do now is try to tie it all together for you. I've been involved with this since 1998. We started with horseshoe crabs and eels in '98. I met some great guys, Stew Michels and John Clark and Mike Millard.

We have been working on this ever since. Back then Stew and John, we used to go across the street to a gas station to get our lobster rolls, so we've evolved a little bit since then. What I would like to show you here is there is a paper by Sweka, Smith, and Millard that was done in 2007. What it did was a forward projection of the female abundance, using this model that they had. It is a stage-based model projection.

What you have down here on the X axis is years. What I want to show you here is that they started at like 3,000 females, but they didn't really know where it was. The population came up to like 6,000. The reason I'm showing you this, the stock seems to be acting like what the projections said it would do.

If you go to it, where we're at right now like 6 million 800 animals is like Year 37 of the projections. That isn't as important as what the projection does from there. To get to the threshold, this is actually where carrying capacity comes from, too. That's why I started looking at this, because the 80 percent carrying capacity is the threshold for female harvest.

It is going to be about 44 years before we get to those 11,000 animals, a carrying capacity where female harvest is going to be allowed. While we look forward to the index every year, where the male crabs are, where the females crabs are. I kind of want to temper your expectations that we're going to walk in here one day and we're going to have female harvest.

I mean it looks like about 2060 is where it's going to happen. The reason I have faith in this is I overlaid the projection to the estimates of abundance of female crabs from the composite index and also the Virginia Tech Survey. As a fisheries biologist, you live for stuff like this; where you can get a correlation that is that strong like that. It just matches beautifully. What this tells me is, I kind of almost believe the estimate of female abundance and where it's going. It's kind of interesting.

The reason I'm bringing this up is like I said, I don't want you to walk in here and think that we're going to go to Package 4 next year. It's probably going to be like 2060. That is why I wanted to let you know. Also, with the red knots, I talked with Jim Lyons who is the Fish and Wildlife -- he's a really excellent ornithologist with the Fish and Wildlife Service. I said, well, Jim, how are the other shore birds doing, because like red knots, we're trying to do this for red knots? But red knots you might want to think of more like a poster child for shorebirds; because there are like 15 different kinds of shorebirds.

There are plovers, Sanderlings, all up in Delaware Bay. While those horseshoe crab abundance eggs are affecting the red knots, they are affecting all of the shore birds. I said Jim, how are the shorebird populations doing up and down the coast? He says, "They're all declining, and he says and the ones that are declining the fastest are the ones that travel the furthest."

Well, do you know a bird that goes further than from Tierra del Fuego to Hudson Bay? I mean, that bird goes a long way, and there are a lot of things affecting that bird along that route. To see this population, which I think Jim Lyons answer is excellent, go from 40,000 to 80,000 birds, does anybody want to take some bets with me? I don't think it's going to happen next year.

I just wanted to give you that information. The shorebird stopover and winter population estimates are low but stable. The horseshoe crab estimates are low but stable. In the long term,

where are we? Well, we've got this Package 5, and it is not really a bad thing. The market is kind of like stabled out.

Maryland had a really hard time. We've had the same harvest package for four years now. But the market kind of found itself. It worked itself out. The worst thing then a bad harvest is changing your harvest package. We left the harvest alone for four years. The market has kind of adapted to it, and I think we can kind of feel good that we're trying to do what we can for the red knots and the other shorebirds.

They might not come back. You know we might be here in 2060 or some of our offspring might be here in 2060. But we are doing what we can, and the market seems to have like found itself. I just wanted to give you that message on the population. Then I'm going to move on to alternative bait discussion.

We were going to go ahead and try some alternative bait from one supplier, and we sat together as a Technical Committee and we decided, you know, we can't get this product sometimes. We're not sure if it works. What we decided to do is step back a little bit and do a survey of what bait practices actually are right now, what the cost of the baits are, and then move forward from there.

There is a recommendation from the Technical Committee that all states evaluate the feasibility of conducting a survey to get bait bag ingredients and report back survey results by the beginning of 2017. That is where the Technical Committee is moving forward on that. The next thing is the red knot listing. I've got to be careful with my language here.

The service has kind of changed the way that they do threatened and endangered species. They are doing a species status assessment, and they're looking at critical habitat proposals for the red knot. It doesn't really affect us, because as long as the ARM model is in place, they are not considering

the harvest of horseshoe crabs as incidental take. That is something that I just wanted to let the board know that we're progressing on; I mean the Fish and Wildlife Service is progressing on, and it looks like we're in the green to make things short. The one last thing that I would like to add is that the ASMFC has brought on a guy by the name of Mike Schmidtke; he is over here.

He's going to be our new coordinator for horseshoe crabs, and the guy is a stock assessment guru. He is really good. With Kristen on it, I'm really happy that ASMFC has stepped up and brought these really good stock assessment people to help with our 2018 exercise. With that, I conclude my report. If there are any questions, Mr. Chairman.

CHAIRMAN GILMORE: Thanks, Steve that was enlightening. Let's see, it is the 75th Anniversary so at the 118th Anniversary, we'll be having female harvest, Mike. How does that sit? Go ahead, Mike.

MR. LUISI: Steve, we ought to meet in my office when we get back in three days.

CHAIRMAN GILMORE: Questions for Steve. Bob Ballou.

MR. BALLOU: That was an awesome presentation. If you don't mind, I would like to circle back to the alternative bait portion of your presentation. It makes good sense to me that the survey work would be a logical next step before moving forward with additional trials. You want to get a good handle on what the needs are of the fishermen that rely upon bait.

Yet, I am not sure -- I think there was some bullet there, where it was sort of like the Rhode Island prospectus was discussed, and I don't know what phrase you used, but it didn't seem like it necessarily carried forward. For me, the prospectus, and it was frankly inspired by Toni Kerns, was all about trying to set some objectives; in terms of why we would even pursue alternative bait.

I think, as I remember, it was something along the lines of well there has to be some sort of conservation benefit. The bait has to prove that it's using less horseshoe crab than just using horseshoe crabs. The efficacy needs to be there. The cost needs to be reasonable and hopefully comparable, and the logistics and the handling need to be there.

Those seemed to be the factors that would drive us forward in our efforts to explore the use of alternative bait. Does the TC still identify with those issues, or is there some other perspective now that I'm missing, in terms of where the TC is on this issue? I just felt like those were key concepts to put forward, so that we knew what we were trying to do and what we were looking to evaluate. If it didn't meet those standards, if alternative bait wasn't as effective, wasn't as affordable and certainly didn't lead to a conservation benefit, i.e. use less horseshoe crabs than otherwise. No point in pursuing it. But I thought that was the whole point; to explore those issues. Are those issues still relevant?

MR. DOCTOR: Those issues are absolutely relevant, and it is because of those issues that we went forward with the action that we did.

MR. ROY W. MILLER: Steve, can you bring us up to speed on what alternative bait trials have been conducted, thus far? Were there any ongoing this year or is everything still in the planning stage in that regard; using the alternative baits, artificial baits, whatever you want to call them?

MR. DOCTOR: There was a study done last year, and I believe it was Rhode Island that did it. Was it Rhode Island that did the study last year?

MR. BALLOU: And Connecticut, I believe.

MR. DOCTOR: And Connecticut. It was a bait by one vendor, and there were a lot of problems getting the bait, number one, handling the bait, using the bait; and it seemed to have some



efficacy. There is a report available of it. It also used female horseshoe crab in the bait, which was kind of disconcerting for a lot of people, and also they were not specific on how much female horseshoe crab they were using, and the cost of the bait was a question.

The more we looked into it, the more questions we had. What we tried to do as a Technical Committee is identify what questions we have. One of the main questions we had was, what baits are people using, how much of it are they using, and what is the cost of it? We needed to know that information before we would be able to compare it to artificial bait.

CHAIRMAN GILMORE: Go ahead, Roy.

MR. MILLER: If I may just follow up on that. Was that bait that was tried in Rhode Island and Connecticut, was that the bait that University of Delaware worked on that contained roughly a tenth of a horseshoe crab that was marketed by LaMonica Foods, or was it something else?

MR. ROOTES-MURDY: I'm going to help Steve out on this just a little bit, because I was closer to it in the spring. Staff was instructed coming out of, I believe, the February meeting, to try to undertake this cost comparison between the bait that was used in those trials in Connecticut and Rhode Island, which was LaMonica Fine Foods product; and determine if it was the most cost effective alternative to what fishermen are doing currently, in terms of their mix or suite of ingredients they're using in the bait bags and pots.

What we found during those trials was that while the ratio for the pucks was anywhere between a tenth to a quarter of a crab, because it wasn't as effective in staying together, many times they would have to double up on the dosage. That could increase it up to anywhere between a quarter to a half, and in some instances even more.

What Steve was just mentioning is another concern that the TC had, which is the composition

wasn't always clear how much of the females and males were in it. The idea was that you would need more males to be equivalent to females, in terms of it as an attractant. But we didn't have that breakdown for what each puck had, because that information wasn't available to us.

Additionally, we also didn't know where these crabs were coming from on the coast. When speaking with LaMonica Fine Foods about this, they go from purchasing this from dealers up and down the coast. If we're concerned or if the board is concerned, excuse me, about the populations in other parts of the coast that these crabs may be coming from, the conservation savings or benefits from it may be compromised in that way.

CHAIRMAN GILMORE: Other questions for Steve? Unless there is any more advice, I think the TC and staff are pretty well ready to go on the addendum. Unless there is anything else that we want to add to that, I think they'll be ready to move forward and then reporting back in the May, 2017 meeting. Is everybody good with that?

#### **2017 DELAWARE BAY HORSESHOE CRAB SPECIFICATIONS**

CHAIRMAN GILMORE: Okay. I think we'll move along now then to Item Number 6, which is the 2017 Delaware Bay Horseshoe Crab Specs, and Kirby is going to give us a presentation on that first.

MR. ROOTES-MURDY: This should be very straightforward, given the presentations we just walked through this morning so far. The 2017 harvest specifications for the Delaware Bay Region, there is the ARM recommendation for Harvest Package 3. It is the same as what's been in place the previous three years. Both the ARM Subcommittee and the Technical Committees together recommended this package be selected.

Just in terms of a breakdown of what that means, they are 500,000 male-only crabs, and the state quotas under that 500,000 male-only crabs is broken down as the following:

Delaware and New Jersey are proportioned 162,136; also understanding that New Jersey's bait fishery has been closed in recent years. Maryland's Delaware Bay origin quota would be 141,112 and Virginia's is 34,615 east of the COLREGS line for male-only harvest. With that, if there are any questions, I'm happy to take them, but this is for board consideration and action.

CHAIRMAN GILMORE: Questions for Kirby. Seeing none; we're going to need a motion to move forward on this. Go ahead, Mike.

**MR. LUISI: I don't know if you guys prepared one already, but I guess what you're looking for is a motion, would be to move to select Harvest Package 3 for the 2017 Horseshoe Crab commercial fishery.**

CHAIRMAN GILMORE: Perfect, Mike, second, Stew Michels; discussion on the motion. Emerson Hasbrouck.

MR. EMERSON HASBROUCK: Does that motion need to say for Delaware Bay?

CHAIRMAN GILMORE: **Yes, I think it does, is that okay Mike, friendly addition, some wordsmithing yes, for Delaware Bay.** Good point, Emerson.

MR. LUISI: I think we're going to be using this motion until 2060, so we should perfect it now.

CHAIRMAN GILMORE: That's a very good point. Other discussion on the motion, questions on the motion? This is a final action. Actually, we go to the audience first, are there any comments on the motion from the audience? Seeing none; back to the board. It is a final motion so we're going to need to do a roll call vote, unless there is no objection to the motion.

**Let's start there. Is there any objection to the motion? Great, seeing none; we will approve the motion without objection.** Okay, let me just read it just so we're really clear. Move to select Harvest Package 3 for 2017 Horseshoe crab harvest in

Delaware Bay. A motion by Mr. Luisi, seconded by Mr. Michels, and that motion is adopted unanimously. We're on to other business right now. We actually have essentially some discussion on the advisory panel. Oh I'm sorry, I missed one. We're going to do the FMP review, and Kirby you're going to do that.

### **HORSESHOE CRAB FMP REVIEW**

MR. ROOTES-MURDY: All right, if you guys will just bear with me a little bit longer on this. We're going to go through the Horseshoe Crab FMP Review fairly quickly. First, I want to show you, this is a chart we have been using in previous years to lay out how bait and biomedical harvest and collection have gone in recent years.

I just want to note that we've moved away from this graph, and later on in the PowerPoint I'm going to show you the new one that we've reusing for our outreach information; just to get at more accuracy from feedback we got from the Advisory Panel members on it. The 2015 bait fishery total coastwide harvest was approximately 583,000 crabs.

A majority of those crabs came from the states of Delaware, New York and Massachusetts. They combine for about 70 percent of the coastwide harvest. Overall though, it is a decrease in what the harvest levels were relative to 2014. Delaware through Virginia, as well as Georgia through Florida all decreased landings from 2014.

It is important, I guess, to note that the total coastwide landings are approximately 36 percent of the total coastwide quota. In terms of the number of crabs that are being harvested, relative to 1998 it has been a significant decrease and even relative to last year, it is also a decline. When moving on to talking about biomedical collection and bleeding, the reported number of crabs that were brought to biomedical facilities was about 559,000 crabs.

This is a 3 percent decrease from the previous five-year average. Crabs used as bait and those that

were bled was about 56,000 crabs, which is a 2 percent decrease from the past five-year average, and biomedical only mortality estimate is approximately 70,223. If you need more information on how that's broken down, why we're looking at biomedical only bled crabs, it's in part because those that are used for the bait fishery are also then given back and attributed as having completely died, no assumed post release mortality for those.

This is the new graph that we have on our website, and I just wanted to make sure the board was aware of it. It lays out what the commercial landings are, what the number of crabs that have been collected is, and then the additional bar is the estimated biomedical mortality. We had been given at least some advice and approached about needing to change the graphics we were having on the website, because people were concerned that it was misleading.

With some feedback from advisory panel members we did make this change. In going through the FMP review, it was noted by some of the PRT members that there is an interest in reporting out on some of the synthetic alternative LAL testing that's going on. We didn't have time to address that this year, due to some of the time constraints. But moving forward, this is something that the PRT would like to have included.

There is also concern on the number of crabs that are unidentified by sex from biomedical bleeding. I mentioned this earlier on in today's meeting about trying to get at this information better across the coast as noted. Those states that have a biomedical facility, and are bleeding crabs in their state, need to report out that those numbers, males and females that have been bled.

But what sometimes gets lost in translation is there are crabs that get to the facility and then are removed and not bled, and we get a total number for that. But we don't often get what that breakdown is by males and females. While we might be getting the number going in of the males

and females, if we're subtracting a number that isn't attributing it to sex specific, then it starts to confuse how many of those males and females were actually bled, and what the mortality should be applied to those. It is important to note that the board did task the Stock Assessment Subcommittee with addressing biomedical mortality in the next stock assessment.

The sooner the states are able to better collect this information, and at least provide guidance on how to maybe apportion the sex ratio, if they aren't able to get at a specific number by males and females; it will help that process along significantly. The PRT recommends continuing to seek funding for the Virginia Tech Trawl Survey.

I will note, additionally, that during the Technical Committee's meeting there was discussion about, in the absence of the Virginia Tech Trawl Survey being able to be continued in future years if funding is not available, that the states of Delaware and New Jersey could possibly augment their current surveys to get at some of the biological sampling that we utilized through the Virginia Tech Trawl Survey.

State representatives from those states have indicated that that is a possibility and could be adjusted for future surveys; it just needs to be specified earlier on in the process. The PRT also considered a quota transfer from Virginia to North Carolina. This is a request that has come now two years in a row, and there were some concerns expressed by the PRT, just in terms of it being an occurrence that has happened more than once in recent years and whether that means the quota should be revisited for those states.

But because of the size of the quota transfer, which was approximately 900 crabs, it didn't raise significant concerns to the PRT about implications or impacts to that regional population. The PRT found, in summary, all the state management measures to be consistent with the FMP. It is important to note again that the District of Columbia did not submit a compliance report.

They still remain a member of this board, and so the PRT was not able to determine if they were in compliance with the FMP requirements. With that, an additional note, I walked you through how to best improve reporting numbers of males and females at bleeding facilities. The PRT finds all states in compliance with the FMP specifications.

In looking at requests for de minimis, the Potomac River Fisheries Commission, South Carolina, Georgia and Florida have all requested de minimis and qualify for 2017. New Jersey also qualifies, but did not request it. The PRT finds these states have met the requirements for de minimis. With that, I'll take any questions at this point.

CHAIRMAN GILMORE: Just to note the most important part of that slide was LAL, it means *Limulus Amoebocyte Lysate*, which may help you at Jeopardy some day. Rob O'Reilly.

MR. O'REILLY: Not a question, but Kirby, I heard you say the transfer from Virginia to North Carolina, it is Georgia to North Carolina.

MR. ROOTES-MURDY: Correct. The quota transfer and this was included, I believe, in your board meeting materials. It was a quota transfer from Georgia to North Carolina.

MR. MUFFLEY: Kirby, I just want to make sure I have it right. The bigger issue in regard to the sex information at the biomedical facility is sort of all of those crabs being collected and brought to the biomedical facility versus those crabs that are actually bled. You're getting more information by sex of crabs that are actually bled versus all of those that come to the facility. Is that the piece that we're missing more so? Is the total number of crabs coming to the facility versus what's actually being bled?

MR. ROOTES-MURDY: I think, just to clarify, what we get many times from the states is a breakdown that you have X number of crabs have been brought to the facility, males and females. From

the point in which they're brought to the facility to then when they're bled, there is a determination that some of those crabs aren't fit to be bled.

Those crabs are then removed; there hasn't been sex information attributed to them. Then they said X number of crabs is then bled, and we don't necessarily know after the other ones have been removed what that sex ratio is for bled crabs; and that is where we start to have some confusion on the total number of males and females that have been bled.

For more clarity, if the states can work with the facilities to get better information on the numbers of males and females that, once they are brought to the facility are determined not fit to be bled, that information will help us with getting at post release mortality for those bled crabs by sex.

MR. MILLARD: Thanks for the presentation, Kirby. Regarding the graphic on the biomedical collection, I can see the footnote says this pertains to crabs that are brought to the bleeding facility. That 15 percent mortality is applied to those crabs that are brought into the facility, maybe a question for Steve, who is more on the ground.

I haven't been on one of these biomedical collection trawls, but I have it in my head that there is a fair amount of onboard culling that goes, because the biomedes don't want crabs that are damaged or puncture. They want pretty much pristine condition crabs brought into their facility. Again, it is in my head that there is a fair amount of mortality that is not being accounted for then in that process, because of the onboard culling that doesn't go into the facility. Can you comment on that?

MR. DOCTOR: I can start from the Maryland perspective. We have a chain of custody form that follows the crabs from the point of collection all the way to release again. On that form they actually list the number of crabs that are rejected because of death or injury; and we report that to

ASMFC when we report the total number bled by male and female. It is reported.

MR. MILLARD: This terminology on here about crabs brought to the facility is really a little broader than that? Crabs that come up in the trawl is what the 15 percent is being accounted for, is what I think I just heard.

MR. DOCTOR: Okay, so Kirby says that we're reporting mortality on the number that are bled, not the total number collected.

MR. MILLARD: My point is, that bears directly on this sort of ongoing back and forth we're having with the biomedical companies about, is it 15 percent or is it a lot less. I'm suggesting there is a large, I don't know how large, but there is a component that is not being accounted for that are coming up in the trawl damaged, going right back overboard. We don't know. That's a mortality segment that we're not accounting for.

MR. DOCTOR: I just want to reiterate that I do report the number that are injured and dead at the time of collection and also at the time of release, and also the rejected because of death at the biomedical. We're in the middle somewhere is the best way I can answer that.

CHAIRMAN GILMORE: I'm not sure what the other states do either, so it is a good point, Mike, it could be higher.

DR. MICHELLE DUVAL: I just wanted to -- if you read the materials you probably saw this, but just in regards to the PRTs concern about sort of an annual request from North Carolina to Georgia to transfer horseshoe crabs. I just wanted to note that we did actually shorten our harvest season for 2016 by a month to constrain harvest to within our quota, and so we issue a proclamation prior to the beginning of the year that establishes the seasons start date and end date.

We shorten that by a month and all of the harvest that was legally pursued during that open season

was actually underneath the quota, it was actually illegal harvest that occurred after the season was closed that led to the overage; so enforcement action has been taken, and I think we feel pretty confident about next year. Thank you again to Spud and Pat for helping us out.

CHAIRMAN GILMORE: That was clear in the briefing materials. You guys are definitely managing it and putting a lot of effort into it. Any other questions? Colleen.

MS. COLLEEN CALLAHAN: Kirby, do we have an idea on the percentage of crabs that are brought to the facility and ultimately not bled?

MR. ROOTES-MURDY: Yes, we have that information. I will offer that, for the FMP Review, we have to aggregate this information right now on a coastwide level. We could drill down and try to provide that, if needed, through the benchmark stock assessment, but right now we have to aggregate it at the coastwide level. I can go back and look at the FMP review a little bit more closely, and if you would like I can work at trying to get at that amount that are brought to the facility and not bled coastwide and report back to the board on that.

MS. CALLAHAN: I didn't mean to create more work. I was just trying to get a handle on how large a problem it is, since we're trying to apply mortality by sex; and that is a group that is unaccounted for.

CHAIRMAN GILMORE: Okay, any other questions? All right, we need a couple of motions here. We've actually got four things we want to cover. I think the first motion, if we combine it into one, which would be accepting the FMP review with the compliance reports and the de minimis as one motion would be efficient, and then we'll do the North Carolina/Georgia transfer as a separate one. Does anyone have a motion for the first three that they would like to offer?

**MR. ROBERT H. BOYLES JR.: I would move that the board accept the 2016 FMP Review and**

**approve the de minimis request from the Potomac River Fisheries Commission, Georgia, Florida, and South Carolina or whatever order is preferred.**

CHAIRMAN GILMORE: Do we have a second to that motion? Bill Adler. Mike Luisi.

**MR. LUISI: Would you want to add state compliance reports to that too; tackle all three?**

**CHAIRMAN GILMORE: Is that okay with you, Robert?**

**MR. BOYLES: Yes, sir.**

CHAIRMAN GILMORE: Bill. Amy is going to get that up there. We want to add the state compliance reports. While we're fixing it, is there any discussion on the motion? Okay, I think we've got the motion up there, everybody can see it. Any discussion on the motion? Okay, let me read it into the record.

Move to accept the Horseshoe Crab 2016 FMP Review and State Compliance Reports and approve de minimis requests for the Potomac River Fisheries Commission, South Carolina, Georgia and Florida. Motion by Mr. Boyles and seconded by Mr. Adler. Is there any objection to the motion? Okay, seeing none; we will approve that adopted unanimously. Okay, we're going to need a second motion now for the transfer between North Carolina and Georgia. Michelle.

**DR. DUVAL: I move that the board approve the request for transfer of quota from Georgia to North Carolina.**

CHAIRMAN GILMORE: Do we have a second to that motion? Pat Geer. Discussion on the motion. Michelle, go ahead. Michelle, you have black gloves on, I can't see your hands.

DR. DUVAL: I'll put my shiny gloves on next time. Perhaps, we should just add the amount of the

transfer, which is 1,250 crabs to the motion; just to be clear.

CHAIRMAN GILMORE: Okay, we'll put that up; 1,250 was the number? Okay. Further discussion on the motion? Let me read this before we take a vote. **Move that the board approve the request of transfer of quota, 1,250 crabs, from Georgia to North Carolina; a motion by Dr. Duval, seconded by Mr. Geer. Is there any objection to the motion? Seeing none; we will adopt that unanimously.** Bill Adler.

MR. ADLER: Just to the previous motion that passed about the de minimis and the compliance. Wasn't it to approve the FMP report, the de minimis status and the compliance things? Did it say all three in that motion?

CHAIRMAN GILMORE: Yes.

MR. ADLER: All right, thank you.

#### **OTHER BUSINESS**

CHAIRMAN GILMORE: Okay, we're on to other business now, we have one item, which is involved with the AP, and Kirby, do you want to take that?

MR. ROOTES-MURDY: One other thing that the Technical Committee did talk about when they met earlier this month was regarding the Shorebird Advisory Panel. There has been some discussion at times amongst staff on how best to engage this group, as they have not been very active in the last four years or so. Technical Committee members recommended that the Shorebird Advisory Panel should be reinvigorated, repopulated and engaged in the commission's process for reviewing any management actions and decisions. One of the unique challenges, just in terms of the dynamics we have with horseshoe crabs, is that the Shorebird Advisory Panel would be providing additional input into the process.

That would be separate from what the state agency and federal agency partners who have shorebird biologists on the ARM Subcommittee and the Delaware Bay Ecosystem Technical

Committee. Staff did make this clear to the Technical Committees that it was not apparent what additional input would be needed from those groups.

But a suggested way of moving forward would be that the current Horseshoe Crab Advisory Panel be adjusted to accommodate two nontraditional stakeholder positions that would be occupied by shorebird, essentially AP members, or to represent the shorebird conservation interest groups, as needed, to accommodate the interest of the Technical Committees to have that representation in the process. This is a suggestion from staff moving forward. Tina Berger is up at the microphone, as well.

What we're looking for, moving forward from the states, would be collectively we would be adding two more positions to the Horseshoe Crab Advisory Panel that would be specific to shorebird conservation interest and possibly interest groups. I can take any questions on that at this point. There doesn't need to be nominations made at this meeting, but to follow up with staff on who you would recommend having join that; and again, it is two more positions for the entire coast not per state.

CHAIRMAN GILMORE: Any comments on that or questions for Kirby? It appears we're all good then with just expanding the AP by the two members, and then we'll come up with recommendations for the next meeting in February, and we'll vote on them at that point. Okay, seeing no more on that, is there any other business to come before the Horseshoe Crab Board? Oh Tina, go ahead.

MS. TINA BERGER: Just one more point. We will be sending out the AP list to folks, and if you could look at your membership, there seems to be less activity by the actual bait harvesters, so we would like their voice heard to balance AP input. If you could look at that for your next meeting, that would be great.

## ADJOURNMENT

CHAIRMAN GILMORE: Thanks, Tina, great homework. Okay, any other items to come before the Horseshoe Crab Board? If not we will adjourn, thank you everyone.

(Whereupon the meeting adjourned at 9:34 o'clock a.m. on October 26, 2016)

# Atlantic States Marine Fisheries Commission

## Horseshoe Crab Technical Committee Report

### Bait Use Surveys of the American Eel and Channeled Whelk Fisheries

#### Participants:

Rachel Sysak (NY), Chair  
Derek Perry (MA)  
Scott Olszewski (RI)  
Natalie Ameral (RI)  
Colleen Giannini (CT)  
Jeff Brust (NJ)  
Jordy Zimmerman (DE)  
Steve Doctor (MD)  
Adam Kenyon (VA)

Jeff Dobbs (NC)  
Jeff Brunson (SC)  
Lindsey Aubart (GA)  
Tiffany Black (FL)  
Mike Millard (USFWS)  
Dr. John Sweka (USFWS)  
Dr. Joanna Burger (Rutgers)  
Dr. Kristen Anstead (ASMFC)  
Michael Schmidtke (ASMFC)

#### **Introduction**

The Horseshoe Crab Technical Committee conducted a survey of American eel and channeled whelk fishermen along the US Atlantic coast. The intents of this survey were to: a) characterize the preference, prevalence, and performance of horseshoe crab as bait in these fisheries, b) provide information on the relative amounts and costs of horseshoe crab bait use that could be used to assess the viability of manufactured baits with reduced amounts of horseshoe crab, and c) provide information on the fishery's current impression of manufactured baits. The surveys for the American eel and channeled whelk fisheries can be found in Appendices I and II, respectively.

#### **State Survey Distribution Methods and Response Rates**

Mail surveys were sent by state fisheries departments to American eel and channeled whelk trap/pot fishermen during January-February, 2017. All states except New York sent surveys to all current permit holders; New York only sent surveys to permit holders who were active in the past two years. Responses were voluntary in all states except for Massachusetts, where survey completion was required for permit renewal.

Harvest of horseshoe crabs for bait, or the use of horseshoe crabs as bait in any fishery in South Carolina, is prohibited, pursuant to Code of Laws of South Carolina, Title 50, Chapter 5, Article and Section 1330. The only allowable harvest of horseshoe crabs in South Carolina is for biomedical bleeding, or for research and scientific purposes, and is limited to harvest by hand. Therefore, while phone interviews were conducted with blue crab fishermen that encounter whelk as bycatch (summarized in Appendix III), data from South Carolina were not included in survey analyses.



Of 548 eel surveys mailed, coastwide, 163 voluntary responses were received, for a 30% response rate. Of 822 whelk surveys mailed, coastwide, 260 responses were received (32% response rate). Massachusetts sent 150 whelk surveys and received 133 responses, which were required for permit renewal. In states from Rhode Island through Florida, where responses were not required for permit renewal, 630 whelk surveys were mailed, and 127 responses were received, for a 20% voluntary response rate. Response rates for individual states are shown in Table 1.

**Table 1.** State response rates for the American eel and channeled whelk bait surveys. Coastwide response rates are shown for all states (Total) and states where survey completion was not a condition of permit renewal (Voluntary).

State	American Eel			Channeled Whelk		
	Surveys Sent	Responses Received	Response Rate	Surveys Sent	Responses Received	Response Rate
MA	0	0		150	133	88.7%
RI	6	2	33.3%	138	39	28.3%
CT	0	0		131	29	22.1%
NY	14	9	64.3%	28	14	50.0%
NJ	100	22	22.0%	200*	13	6.5%
DE	65	12	18.5%	64	9	14.1%
MD	40	12	30.0%	13	4	30.8%
VA	216	76	35.2%	82	18	22.0%
NC	55	6	10.9%	16	1	6.3%
GA	28	10	35.7%	0	0	
FL	24	14	58.3%	0	0	
<b>Total</b>	<b>548</b>	<b>163</b>	<b>29.7%</b>	<b>822</b>	<b>260</b>	<b>31.6%</b>
<b>Voluntary</b>	<b>548</b>	<b>163</b>	<b>29.7%</b>	<b>672</b>	<b>127</b>	<b>18.9%</b>

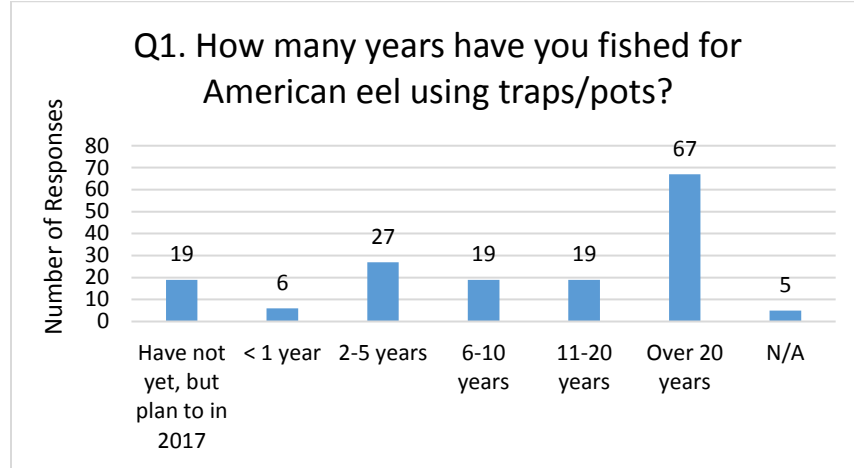
\*New Jersey sent whelk surveys to crab fishermen, as New Jersey does not currently manage whelk, but whelk are caught in New Jersey by crab fishermen.

## Results and Discussion

### Eel

#### Characterization of the American Eel Fishery

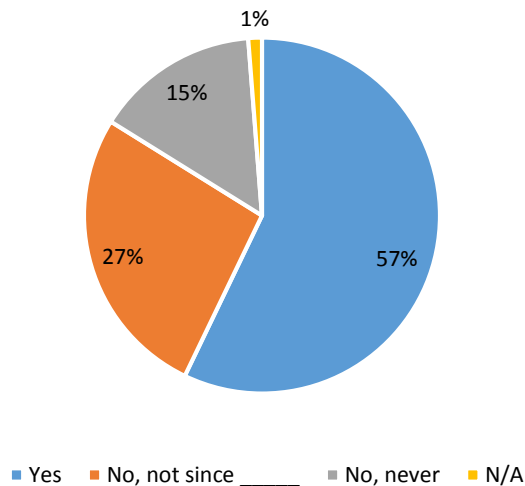
**Figure 1.** Respondents' years of experience in the American eel trap/pot fishery (N=162). (Q1)



For all analyses presented, only data from respondents that fished for American eel in 2016 were used, unless otherwise indicated with “all respondents”.

**Figure 2.** Percentages of respondents who did or did not fish for American eel in 2016 with traps/pots (N=161). (Q2)

Q2. Did you fish for American eel in 2016 with traps/pots?



**Table 2.** Most recent year fished for fishermen who are no longer active in the American eel fishery. (Q2)

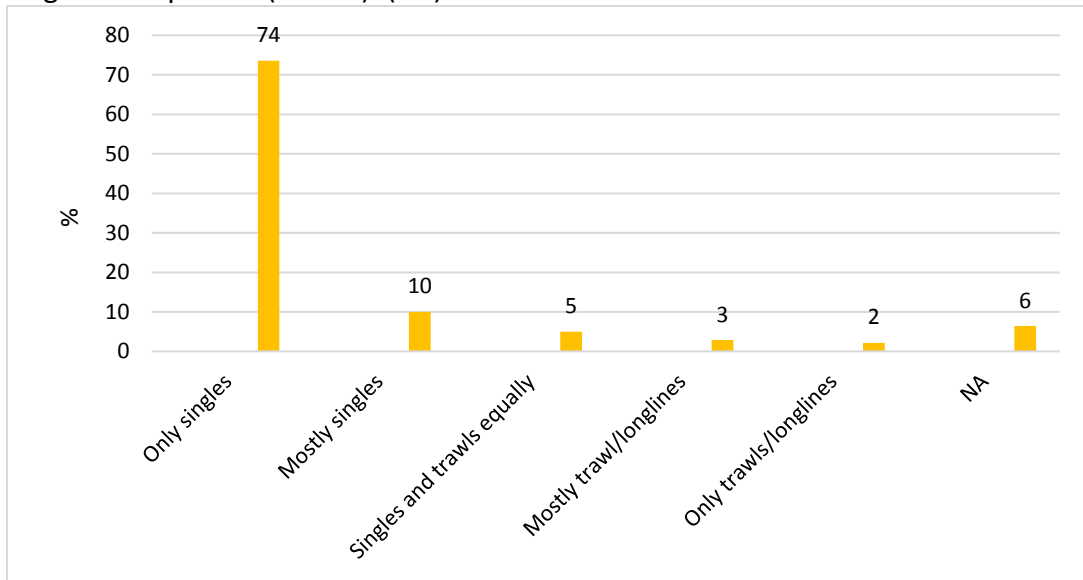
Last Year Fished	No. of Responses
1990	1
1995	1
2000	1
2005	1
2008	1
2010	1
2011	3
2012	4
2013	1
2014	8
2015	11
No Response	10

**Table 3.** Months fished in the American eel fishery using traps/pots, by state, in numbers of responses. Month(s) of greatest fishing activity for each state and all states combined is highlighted. (Q4)

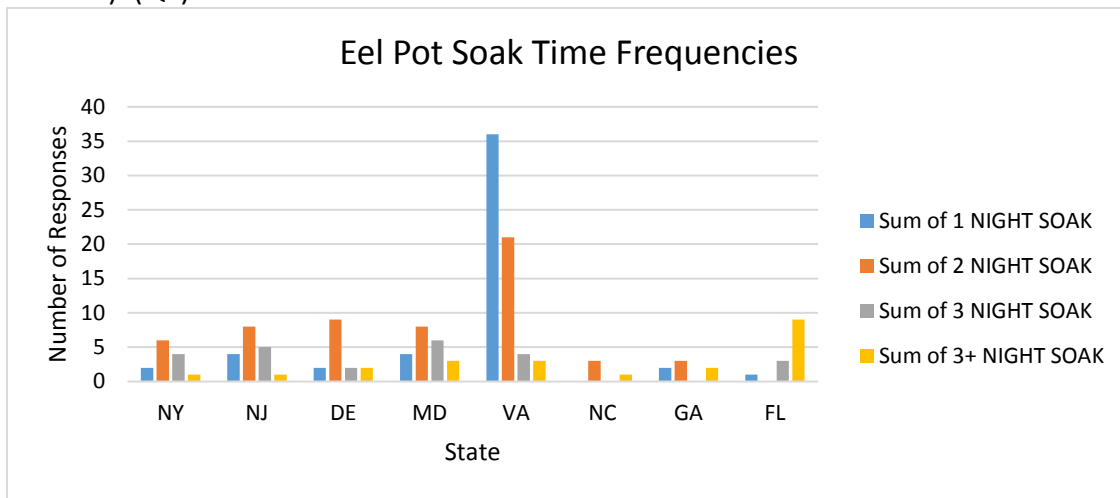
Month	All States	RI	NY	NJ	DE	MD	VA	NC	GA	FL
Jan	15	0	0	1	0	0	0	0	3	11
Feb	13	0	0	1	0	0	1	1	3	7
Mar	49	0	3	6	4	10	15	1	3	7
Apr	75	1	5	9	5	10	40	1	4	0
May	82	1	7	11	7	10	41	0	5	0
June	49	1	5	7	3	7	21	1	3	1
July	27	1	3	2	0	4	13	1	2	1
Aug	35	1	3	3	3	5	15	2	2	1
Sept	79	1	6	11	8	10	36	3	3	1
Oct	89	1	8	15	9	10	36	5	2	3
Nov	74	1	7	10	10	7	26	4	2	7
Dec	33	0	0	2	4	5	6	3	2	11
Total	620	8	47	78	53	78	250	22	34	50

Fishing Practices of the American Eel Fishery

**Figure 3.** Use of single and trawl/longline methods for traps/pots in the American eel fishery in percentages of responses (N=140). (Q5)



**Figure 4.** Soak time frequencies by state for traps/pots in the American eel fishery (all respondents). (Q6)



From the survey responses, eel trap/pot usage was considerably variable. With the exception of Maryland, average traps/pots per trip ranged from 31 – 190 and average max traps/pots ranged from 48 – 220 (Table 4). Maryland reported an average of 411 traps/pots per trip and an average of 1024 max traps/pots.

**Table 4.** Numbers of traps/pots used per trip, by state, in the American eel fishery (all respondents). (Q7-8)

State	n	Average of Max Traps/Pots	stdDev of Max Traps/Pots	Min Traps/Pots	Max Traps/Pots	Average Traps/Pots per Trip	stdDev of Traps/Pots per Trip
NY	8	92	47	35	150	70	40
NJ	16	89	86	6	250	78	80
DE	11	137	105	30	400	104	66
MD	10	1024	956	35	3000	411	239
VA	60	79	91	1	500	72	86
NC	5	220	110	100	300	190	102
GA	7	48	36	8	100	31	25
FL	12	105	71	15	300	92	75

#### Bait Use in the American Eel Fishery

Of 90 respondents to the American eel survey, 30 (22.56%) typically use horseshoe crab as bait. The most prominent bait in the American eel fishery is blue crab, with 54 (40.60%) respondents typically using blue crab as bait. Numbers and percentages of respondents that typically use different types of bait in the eel fishery are shown in Table 5. About half of respondents (52.2%) reported typical use of multiple bait types. Fish are the second most prominent bait in the American eel fishery (27.07%), with menhaden being the most common identified species within this bait type. Of 28 responses that identified fish to the species level, 26 identified menhaden as a typical bait used.

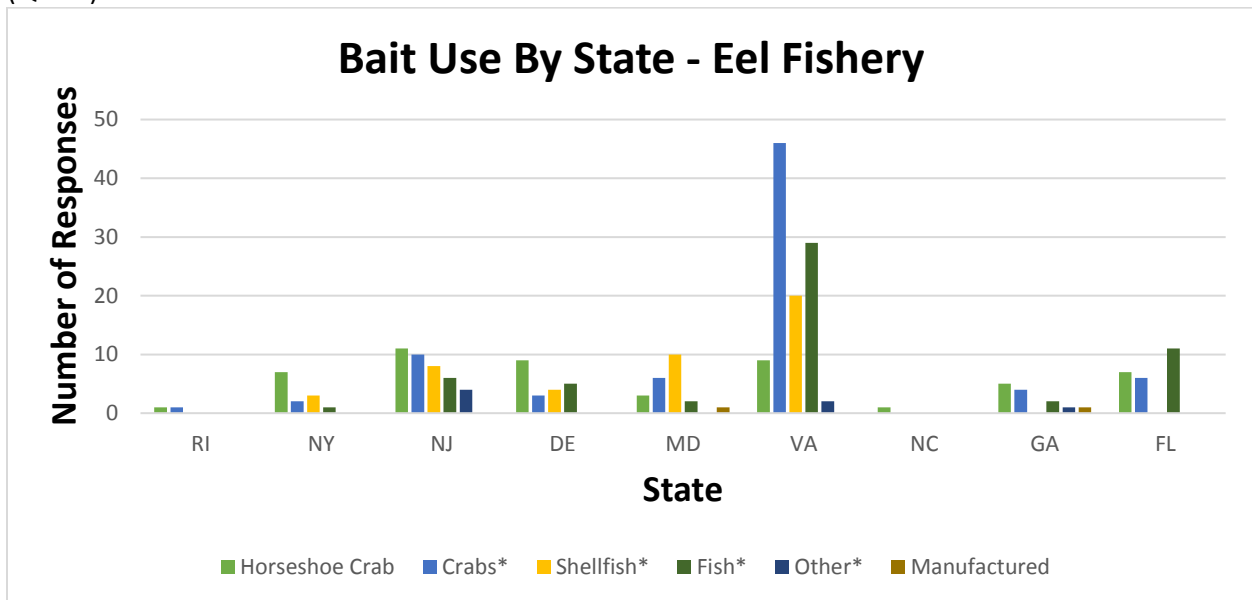
**Table 5.** Bait types typically used by American eel fishermen in 2016 shown in numbers and percentages of responses to eel bait surveys. Fishermen may typically use multiple bait types, so percentages do not sum to 100%. (Q9-10)

Bait Type	Eel (N=90)	
	Responses	Use Percentage
Blue crabs	54	40.60%
Fish racks or whole	36	27.07%
Horseshoe crab	30	22.56%
Shellfish	27	20.30%
Other**	9	6.77%
Razor Clams	7	5.26%
Green crabs	1	0.75%
Manufactured bait	1	0.75%
Rock crabs	1	0.75%
Jonah crabs	1	0.75%
Sharks/Skates/Dogfish	0	0.00%

\*\*No individual bait type included in Other had a use percentage greater than 5% for the American eel trap/pot fishery.

Figure 5 contains data representing 241 individual responses to bait use surveys in the eel fishery. 32% of the responses designate “crab” use, 23% designate “fish” use, 22% designate “horseshoe crab” use, 19% designate “shellfish” use, 3% designate “other”, and only 1% designate “manufactured” bait use. This demonstrates the minor role of manufactured bait in the industry. Although horseshoe crabs are not the most frequently used bait under current fishing practices, it is the only bait being employed in every state. It is worth noting that many of these responses were from the same individuals as the survey allowed users to select up to 5 bait types and over 75% of responses exemplified the roles of other bait sources in the fishery.

**Figure 5.** Numbers of respondents who use each bait type in the American eel fishery. Does not include amount used. Number after bait type represents sum of all state responses (all respondents). (Q9-10)



\*Crabs column compiled individual responses for: green crab, rock crab, blue crab, Jonah crab, and shrimp heads.

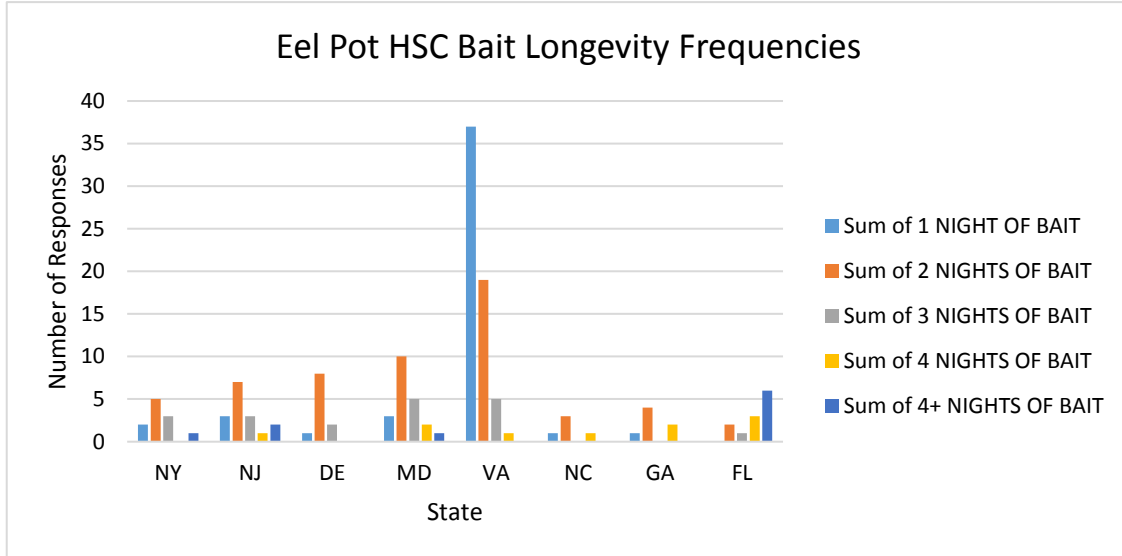
\*Shellfish column compiled individual responses for: shellfish and razor clams

\*Fish column compiled individual responses for: fish racks or whole, menhaden, herring, and porgy

\*Other column compiled individual responses for: other, road kill, and chicken scraps

Soak time (Figure 4) and bait longevity (Figure 6) varied from state to state, however within each state soak time and bait longevity correlated very well. Overall, most states had 2 nights of soak and bait time as their most frequent responses. Most eel fishermen (83%) do not use bait saving devices such as cups or bags (Table 6), and use of these devices is not required by current state regulations.

**Figure 6.** Bait longevity, by state, in the trap/pot American eel fishery (all respondents). (Q13)

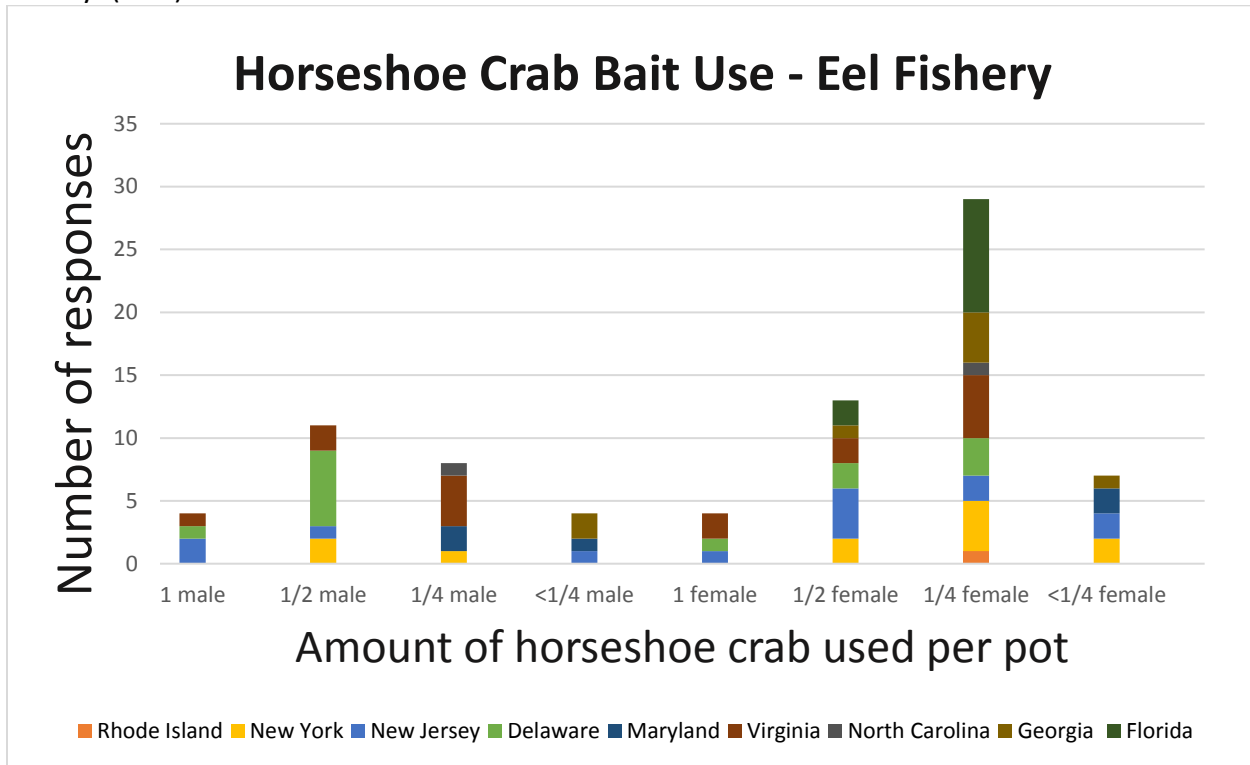


**Table 6.** Use of bait-saving devices in the American eel fishery. Bait-saving devices are required in the American eel trap/pot fishery in Delaware, but not in other states. (Q14)

	All States	RI	NY	NJ	DE	MD	VA	NC	GA	FL
Yes, HSC only	3	0	1	1	0	0	1	0	0	0
Yes, mix	14	0	2	4	3	1	4	0	0	0
No	62	1	5	4	3	0	36	4	3	6
NA	3	0	0	1	0	0	1	0	0	1

66% of respondents who use horseshoe crabs typically use females (Figure 7). The most common amount of female horseshoe crab used per trap/pot was one fourth of a female crab (36% of respondents who use horseshoe crabs). 34% of the respondents who use horseshoe crabs typically use males. The most common amount of male horseshoe crab used per trap/pot was one half of a male crab. Of respondents who typically use male horseshoe crabs, 40% use one half of a male crab per trap/pot. The sexual dimorphism of horseshoe crabs (with females growing larger than males) may explain the difference in the relative amounts of male and female crab used. Additionally, considering sexually dimorphic size differences, the amount of horseshoe crab in volume per trap/pot is likely similar between one fourth of a male crab and one half of a female crab.

**Figure 7.** Typical amounts of horseshoe crab used per trap/pot, by state, in the American eel fishery. (Q17)

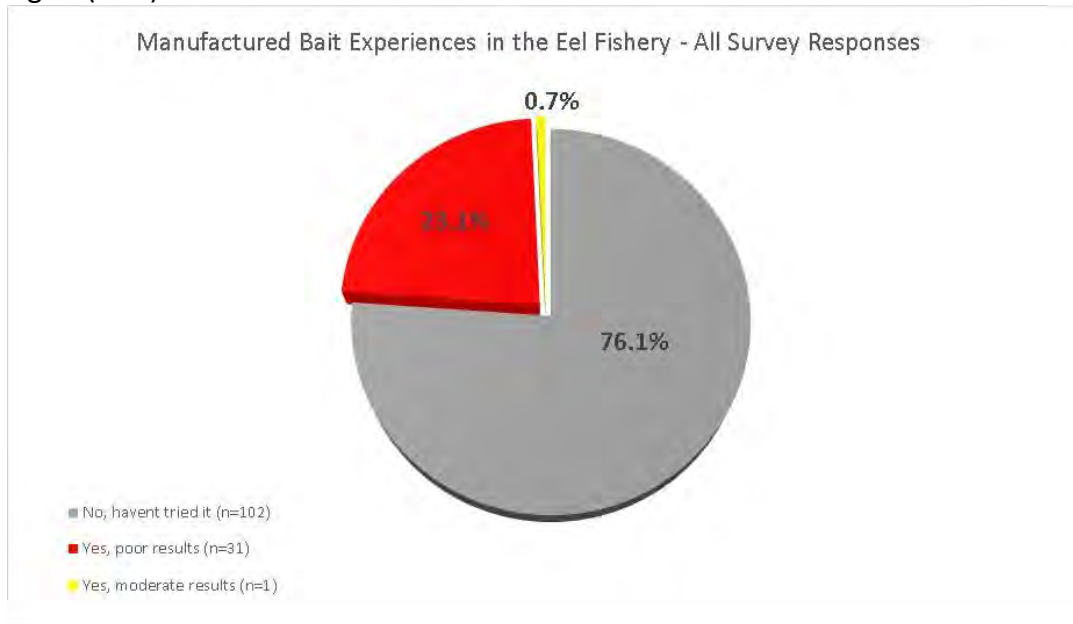


### Use and Impression of Manufactured Bait in the Eel Fishery

Looking at all survey responses for the eel fishery the majority (76.1%) of respondents indicated they had never used manufactured bait (Figure 8). Less than 24% of survey responders had used manufactured bait with the majority (97.1% of respondents who have used manufactured bait; 23.1% of all respondents) reporting poor results. It is important to note there were no responses for the eel fishery in the surveys received from Massachusetts or Connecticut and only one survey was received from an active eel fisherman in Rhode Island.

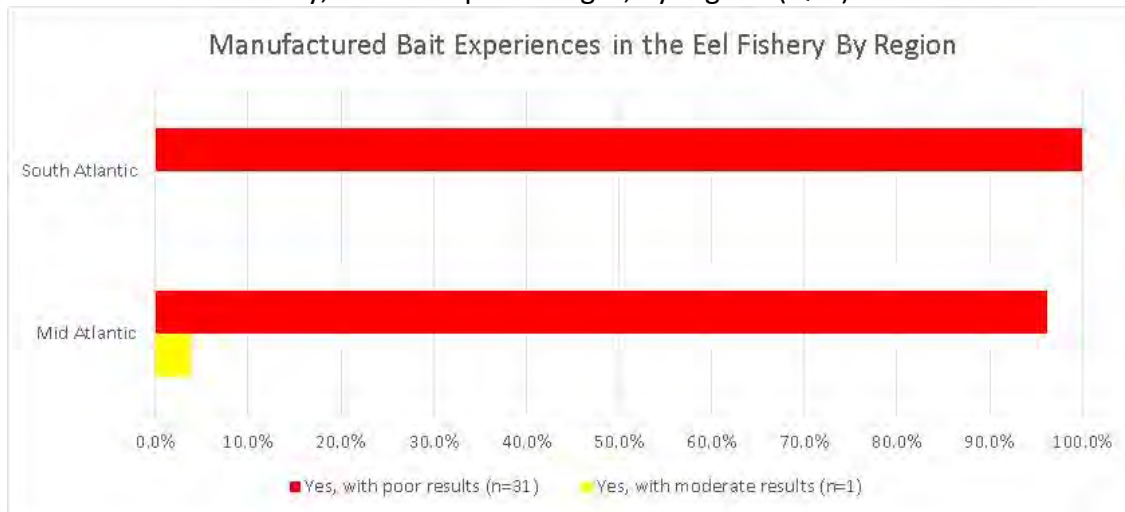


**Figure 8.** Experiences with manufactured bait in the American eel fishery, shown as percentages. (Q11)



When looking at responses by region for those who had used manufactured bait in the past, the same pattern develops. The majority (average 98%) of fishermen in both the Mid Atlantic (New York to North Carolina) and the South Atlantic (Georgia and Florida) reported poor results with the product, with a single responder (4%) in the Mid Atlantic indicating having positive results using the product (Figure 9). The single survey received from Rhode Island indicated they had not used manufactured bait and therefore is not included in these analyses.

**Figure 9.** Moderate and poor experiences with manufactured bait for fishermen who have used it in the American eel fishery, shown as percentages, by region. (Q11)



### Bait costs in the American Eel Fishery

Greater than 53% of eel fishermen using only non-HSC bait paid less than \$1.00 per trap/pot for bait, and nearly 89.3% paid \$1.50 or less (Table 7). Among those eel fishermen that used HSC in combination with other types of bait, 47% paid \$1.50 or less, and 58.8% paid less than \$2.00 per trap/pot for bait. Only one fisherman used exclusively HSC, at an average cost of \$1.00 to \$1.50 per trap/pot for bait.

**Table 7.** Costs to bait American eel traps/pots using baits that include only horseshoe crab (HSC Only), horseshoe crab and other bait (HSC Plus), and no horseshoe crab (Non-HSC). (Q12)

Cost to Bait Eel Trap/Pot	Percent of Respondents			
	Non-HSC (n=56)	HSC Plus (n=17)	HSC Only (n=1)	All Baits (N=74)
< \$1.00	53.6	29.4	0	47.3
\$1.00 - \$1.50	35.7	17.6	100	32.4
\$1.51 - \$2.00	8.9	11.8	0	9.5
\$2.00 or more	0.0	17.6	0	4.1
\$2.00-\$2.50	1.8	11.8	0	4.1
> \$2.50	0.0	11.8	0	2.7

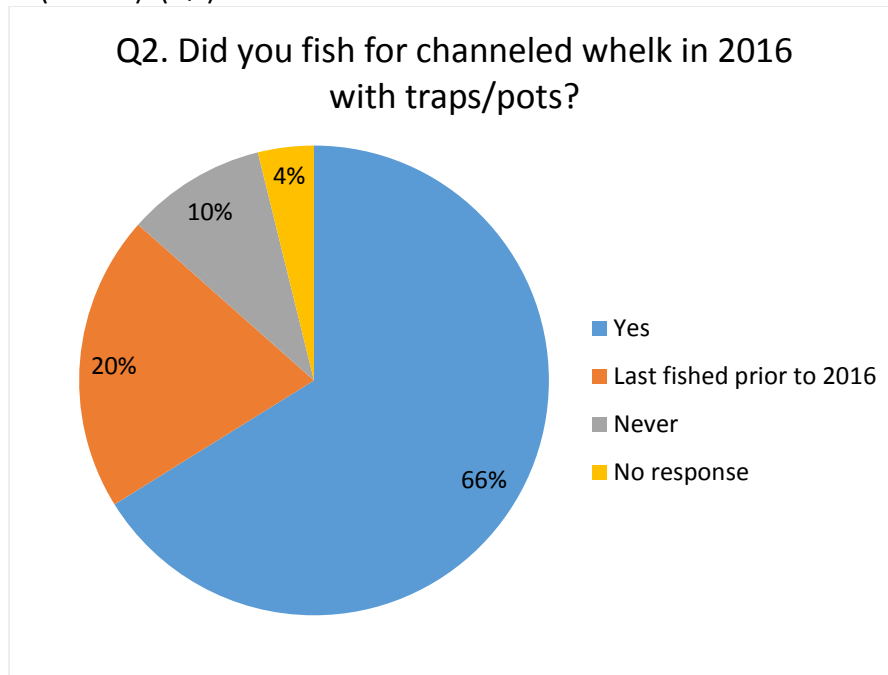
### **Channeled whelk**

**Table 8.** Number of total respondents by state by number of years fishing for channeled whelk with traps/pots. (Q1)

	Q1. How many years have you fished for whelk using traps/pots?									
	All States	MA	RI	CT	NY	NJ	DE	MD	VA	NC
Yet to fish	21	10	4	2	1	2	0	1	1	0
≤1 year	9	4	2	1	1	0	1	0	0	0
2-5 years	42	23	10	2	2	1	1	1	2	0
6-10 years	46	23	8	6	3	0	1	0	4	1
11-20 years	51	25	6	4	4	3	2	1	6	0
>20 years	75	37	9	13	3	5	2	1	5	0
No response	16	11	0	1	0	2	2	0	0	0

For all analyses presented, only data from respondents that fished for channeled whelk in 2016 were used, unless otherwise indicated with “all respondents”.

**Figure 10.** Percentages of respondents who did or did not fish for channeled whelk in 2016 with traps/pots (N=260). (Q2)



**Table 9.** Fishing activity by month by state for respondents that reported fishing channeled whelk traps/pots in 2016. Month(s) of greatest fishing activity for each state and all states combined is highlighted. (Q4)

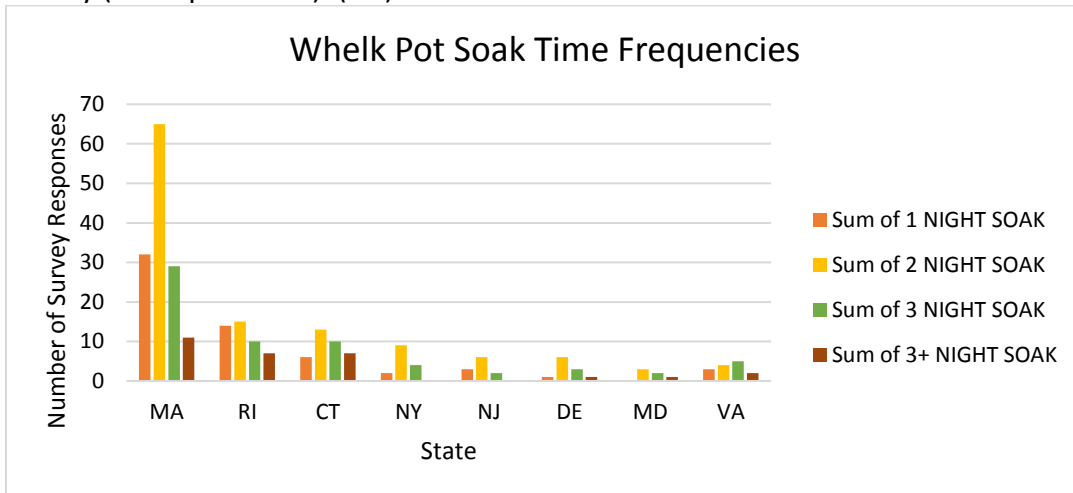
	Q4. What months do you fish whelk traps/pots?								
	All States	MA	RI	CT	NY	NJ	DE	MD	VA
Jan	14	0	2	1	1	1	1	2	6
Feb	2	0	0	0	0	0	0	0	2
Mar	4	0	2	0	1	0	0	0	1
Apr	61	28	13	8	5	2	0	2	3
May	119	50	27	19	11	6	0	3	3
June	127	63	23	22	10	5	1	2	1
July	106	57	18	21	6	3	0	1	0
Aug	73	41	8	16	6	2	0	0	0
Sept	121	68	22	14	9	5	1	1	1
Oct	156	81	26	20	11	8	3	3	4
Nov	154	79	22	20	11	8	4	3	7
Dec	115	56	15	18	7	6	4	2	7

Fishing Practices of the Channeled Whelk Fishery

**Table 10.** Gear configuration by state for all respondents that reported fishing channeled whelk traps/pots in 2016.

	Q5. In 2016, did you fish your whelk traps/pots as singles or trawls/longlines?								
	All States	MA	RI	CT	NY	NJ	DE	MD	VA
Only singles	82 (52.9%)	46	4	6	8	3	3	3	8
Mostly singles	20 (12.9%)	7	4	4	3	2	0	0	0
Both about equally	0 (0%)	0	0	0	0	0	0	0	0
Mostly trawl/longlines	24 (15.5%)	7	9	4	2	2	0	0	0
Only trawls/longlines	28 (18.1%)	19	7	2	0	0	0	0	0
No response	1(0.6%)	0	0	1	0	0	0	0	0

**Figure 11.** Soak time frequencies by state for traps/pots using all bait types in the channeled whelk fishery (all respondents). (Q6)



From the survey responses, MA through NY use less traps/pots per trip on average (107 – 139), they also reported lower averages of max traps/pots fished (133 – 239). NJ – VA used more traps/pots per trip on average (225 – 269) and had higher averages of max traps/pots fished (436 – 738) (Table 11).

**Table 11.** Numbers of traps/pots used per trip, by state, in the channeled whelk fishery (all respondents). (Q7-8)

State	N	Average of Max Traps/Pots	stdDev of Max Traps/Pots	Min Traps/Pots	Max Traps/Pots	Average Traps/Pots per Trip	stdDev of Traps/Pots per Trip
MA	104	153	61	1	240	139	59
RI	32	133	90	35	300	107	74
CT	27	239	203	12	1000	116	53
NY	13	216	151	35	500	113	59
NJ	7	454	688	80	2000	269	247
DE	7	436	358	180	1200	229	48
MD	4	738	565	50	1200	225	140
VA	14	389	193	200	800	259	136

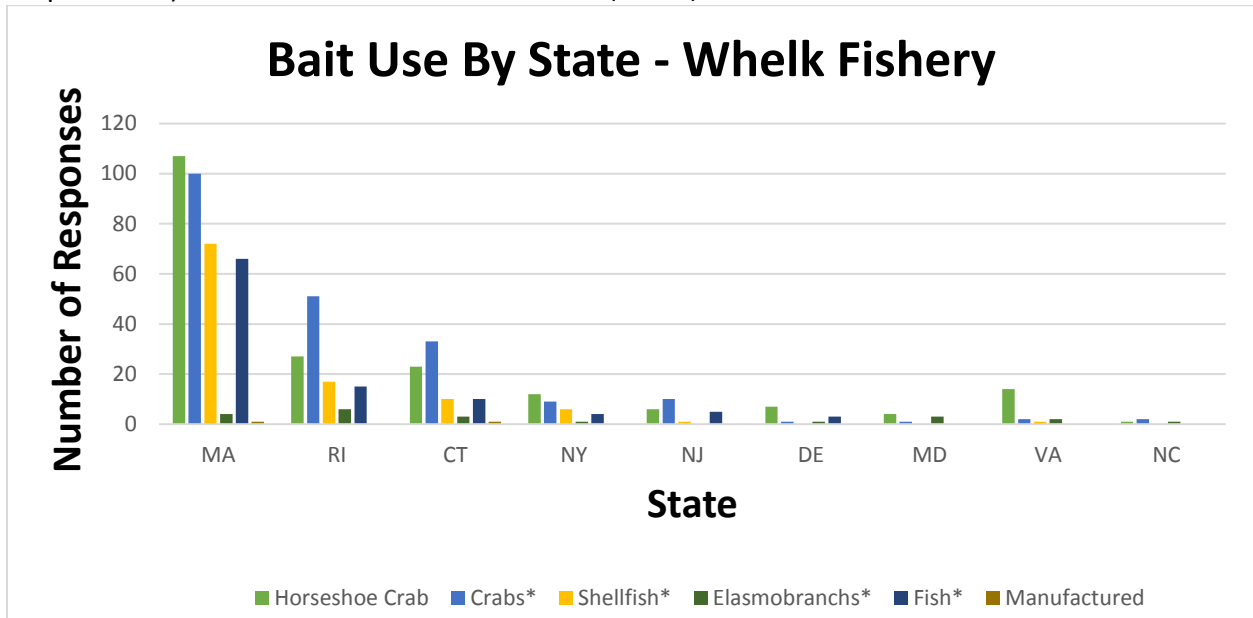
### Bait Use in the Channeled Whelk Fishery

Horseshoe crabs are the most prominent bait in the channeled whelk fishery, with 91.2% of 172 coastwide respondents to the whelk survey typically using horseshoe crab as bait (Table 12). Most respondents reported typical use of multiple bait types. Prominent baits other than horseshoe crab include shellfish (typically used by 54.4% of respondents), green crabs (typically used by 50.3% of respondents), and fish (typically used by 50.3% of respondents), and. Of 19 responses that identified fish to the species level, 10 identified Atlantic herring and 8 identified menhaden as typical baits used.

**Table 12.** Bait preferences by state for all respondents that reporting fishing for channeled whelk in 2016. NA's responded to survey but left this question blank. Percentages are based on the number of respondents that fished in 2016 and answered the question. Fishermen may typically use multiple bait types, so percentages do not sum to 100%. (Q9-10)

	All States	MA	RI	CT	NY	NJ	DE	MD	VA
Number	172	85	28	23	13	8	4	3	8
NA	1	0	0	0	0	1	0	0	0
Horseshoe crab	91.2%	91.8%	82.1%	91.3%	100.0%	85.7%	100.0%	100.0%	100.0%
Shellfish	54.4%	72.9%	57.1%	34.8%	46.2%	14.3%	0.0%	0.0%	0.0%
Green crabs	50.3%	64.7%	75.0%	34.8%	15.4%	0.0%	0.0%	0.0%	0.0%
Fish racks/whole	50.3%	65.9%	46.4%	17.4%	46.2%	71.4%	25.0%	33.3%	0.0%
Manufactured bait	5.3%	0.0%	0.0%	39.1%	0.0%	0.0%	0.0%	0.0%	0.0%
Rock crabs	17.0%	10.6%	21.4%	47.8%	15.4%	14.3%	0.0%	0.0%	0.0%
Jonah crabs	14.6%	7.1%	14.3%	43.5%	15.4%	28.6%	0.0%	33.3%	0.0%
Blue crabs	21.1%	14.1%	28.6%	0.0%	38.5%	100.0%	25.0%	33.3%	25.0%
Other*	13.5%	0.0%	35.7%	21.7%	7.7%	28.6%	25.0%	66.7%	25.0%
-Dogfish	5.3%	0.0%	21.4%	0.0%	7.7%	0.0%	0.0%	0.0%	25.0%
-Skates	1.2%	0.0%	0.0%	4.3%	0.0%	0.0%	0.0%	33.3%	0.0%
-Spider crabs	4.1%	0.0%	10.7%	17.4%	0.0%	0.0%	0.0%	0.0%	0.0%
-Chicken	0.6%	0.0%	3.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
-Sharks	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	33.3%	0.0%
-Other	1.8%	0.0%	0.0%	0.0%	0.0%	28.6%	25.0%	0.0%	0.0%
Horseshoe crab only	9.9%	5.9%	3.6%	8.7%	23.1%	0.0%	25.0%	33.3%	50.0%

**Figure 12.** Numbers of respondents who use each bait type in the channeled whelk fishery (all respondents). Does not include amount used. (Q9-10)



\*Crabs column compiled individual responses for: green crab, rock crab, blue crab, spider crab, spider crab/starfish, spring crab, and Jonah crab.

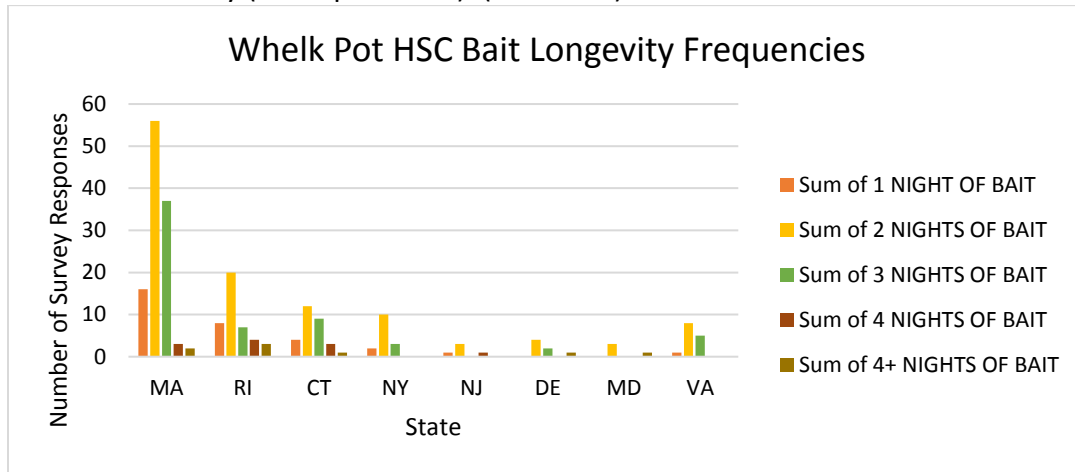
\*Shellfish column compiled individual responses for: shellfish, clam bellies, and surf clams

\*Elasmobranchs column compiled individual responses for: sharks, skates, and dogfish

\*Fish column compiled individual responses for: fish racks or whole, menhaden, bluefish, cod, pollock, herring, and mackerel

Soak time (Figure 11) and bait longevity (Figure 13) correlated fairly well. The most frequent responses were 2 nights of both bait longevity and soak time. Most whelk fishermen (94%) use bait saving devices such as cups or bags (Table 13), and use of these devices is only required by current state regulations in Delaware. Use of these devices is not required in the states with the largest annual whelk harvests (MA-CT).

**Figure 13.** Soak time frequencies by state for traps/pots including horseshoe crab as bait in the channeled whelk fishery (all respondents). (Q10 & 13)



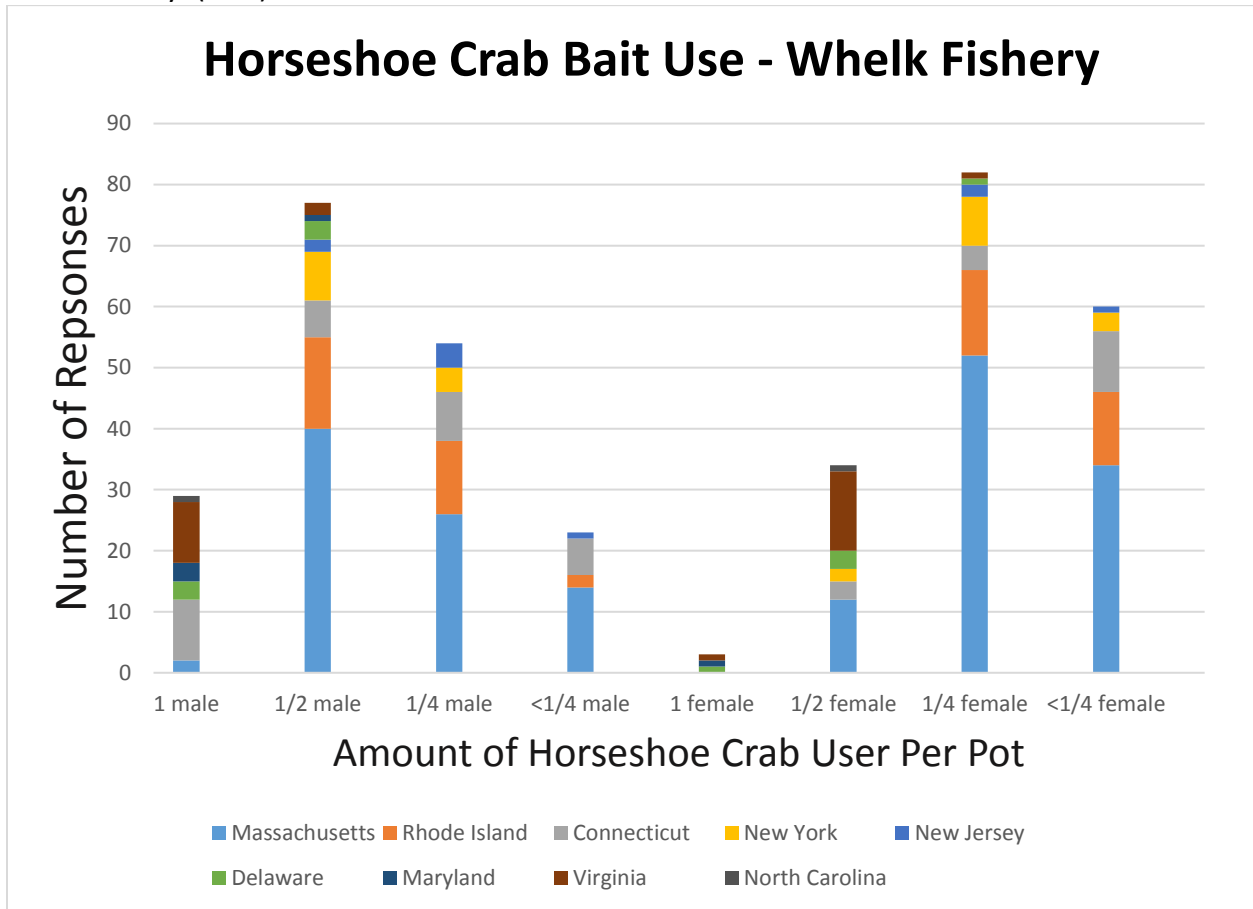
**Table 13.** Use of bait saving devices in the channeled whelk fishery, by state. Bait-saving devices are required in the whelk trap/pot fishery in Delaware, but not in other states. (Q14)

	All States	CT	MA	RI	NY	NJ	DE	MD	VA
Yes, HSC only	14	2	3	3	2	1	1	0	2
Yes, mix	144	20	75	24	10	5	3	2	5
No	10	1	6	0	1	0	0	1	1
NA	4	0	1	1	0	2	0	0	0

As seen with the eel fishery survey results, the most popular responses for amounts of horseshoe crab used as bait were for half of a male and a quarter female. Of the 362 responses (respondents could select more than one option), 23% were for one quarter female and 21% were for half of a male. The divide between male and female responses were almost exactly even with female responses at 49% and male responses at 51%. This may speak to the possibility of fishermen in the eel fishery favoring female crabs as a better, more successful bait, while whelk fishermen find males and females equally successful.



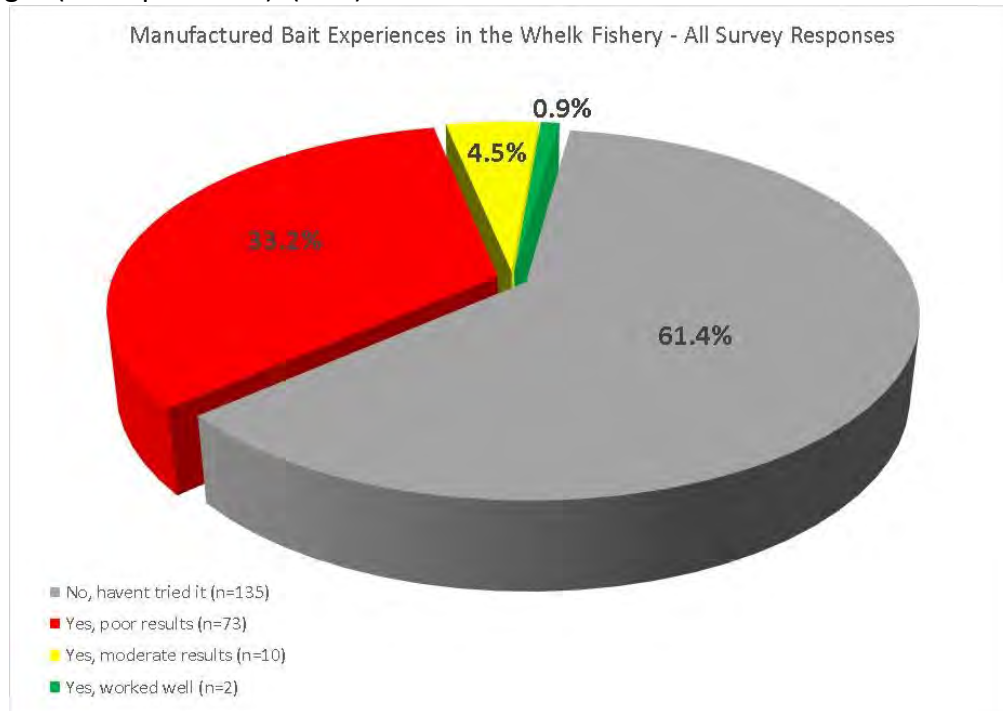
**Figure 14.** Typical amounts of horseshoe crab used per trap/pot, by state, in the channeled whelk fishery. (Q17)



Use and Impression of Manufactured Bait in the Channeled Whelk Fishery

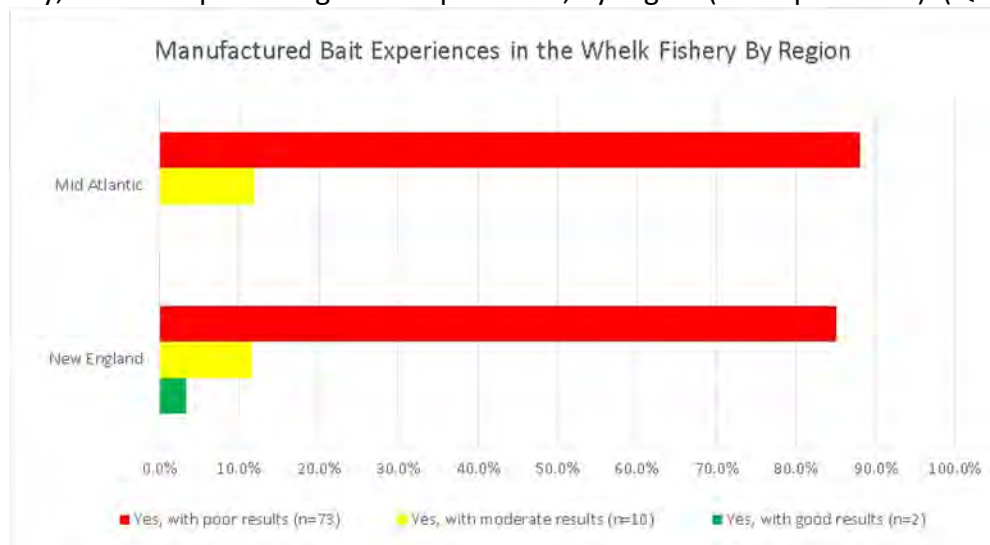
Considering all survey responses for the channeled whelk fishery (there were no responses for the channeled whelk fishery from Georgia or Florida), the majority (61.4%) of respondents indicated they had never used manufactured bait (Figure 15). A third of survey responders had used manufactured bait and observed poor results (33.2%). Just over 5% had also used manufactured bait and reported moderate to good results.

**Figure 15.** Experiences with manufactured bait in the channeled whelk fishery, shown as percentages (all respondents). (Q11)



Considering responses by region for those who had used manufactured bait in the past, the same pattern develops as seen coastwide (Figure 16). The majority of fishermen in both New England (Massachusetts to Connecticut) and the Mid Atlantic (New York to North Carolina) reported poor results with the product, with less than 5% in each region having had positive results (Figure 16).

**Figure 16.** Experiences with manufactured bait for fishermen who have used it in the channeled whelk fishery, shown as percentages of respondents, by region (all respondents). (Q11)



## Bait Costs in the Channeled Whelk Fishery

Among channeled whelk fishermen using only non-HSC bait, 61.5% paid less than \$1.00 to bait a trap/pot, and all paid \$1.50 or less (Table 14). Among those respondents that used a combination of HSC and non-HSC bait, 54.7% paid \$1.50 or less, and 71.8% paid \$2.00 or less. Similarly, among those respondents that used exclusively HSC for bait, 50% paid \$1.50 or less, and 85.7% paid \$2.00 or less.

**Table 14.** Costs to bait channeled whelk traps/pots using baits that include only horseshoe crab (HSC Only), horseshoe crab and other bait (HSC Plus), and no horseshoe crab (Non-HSC). (Q12)

Cost to Bait Whelk Traps/Pots	Percent of respondents			
	Non-HSC (n=13)	HSC Plus (n=117)	HSC Only (n=14)	All Bait Types (N=144)
< \$1.00	61.5	15.4	7.1	18.8
\$1.00 - \$1.50	38.5	39.3	42.9	39.6
\$1.51 - \$2.00	0.0	17.1	35.7	17.4
\$2.00-\$2.50	0.0	17.9	7.1	15.3
> \$2.50	0.0	10.3	7.1	9.0

## Conclusions

- **Roughly half of the respondents have fished for over 10 years, so they are experienced.**
- **Channeled whelk trap/pot fishermen generally use a bait medley including horseshoe crabs and other baits.**
- **The American eel fishery uses a mix of horseshoe crab and non-horseshoe crab bait, with zero responses stating they only use horseshoe crab.**
- **Overall, the channeled whelk fishery uses more horseshoe crabs for bait than the American eel fishery.**
  - Reported use of Horseshoe crab as bait is 91% in the whelk fishery vs 23% in the eel fishery.
  - The whelk fishery has higher averages of maximum traps/pots fished and traps/pots per trip: 212 and 147 vs 165 and 80 in the eel fishery (across all respondents regardless of whether they fished in 2016). Regional differences exist. MA – NY fish less traps/pots on average than NJ – VA in the whelk fishery. For the eel fishery MD had several fishers that reported extremely high traps/pots per trip and max traps.
  - The coastwide whelk fishery occurs in a more defined seasonal pattern, occurring from April through December, while the coastwide eel fishery occurs more continuously with definite peaks in March-June and September-November.
  - Most states, including those with the greatest whelk harvests (MA-CT), do not require the use of bait-saving devices in the trap/pot fishery. These devices are required in Delaware.
- **The American eel fishery uses more female crabs than male crabs.**
- **Both fisheries use larger proportions of male crabs than female crabs – this could be related to the fact that male crabs are smaller than female crabs.**

- **Bait saving devices, like bait bags, are more prevalent in the channeled whelk fishery than in the American eel fishery with 92% of respondents reporting some type of use versus 21%, respectively.**
- **Important Information for future manufactured baits:**
  - For both fisheries and all current bait practices, the bait typically lasts for 2 days.
  - Both fisheries had low percentages of participants who had tried manufactured baits, and most of the fishers who tried them reported poor results. Based on Technical Committee discussions of previous manufactured bait trials<sup>1</sup>, poor results may not necessarily be solely indicative of poor performance, as fishers reported issues of cost and availability of manufactured bait.
  - Most fishers in both fisheries typically pay \$1.50 or less per trap/pot, with cost per trap/pot being generally more expensive in the whelk fishery than the eel fishery.

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<sup>1</sup> ASMFC Horseshoe Crab Alternative Bait Working Group Call Summary. March, 2016.

## Appendix I

### **American Eel Bait Use Survey**

Please answer the following questions by circling or writing in your response(s) as requested.

1. How many years have you fished for American eel using traps/pots?
  - a. Have not yet, but plan to in 2017
  - b. 1 month - 1 year
  - c. 2 - 5 years
  - d. 6 - 10 years
  - e. 11 - 20 years
  - f. Over 20 years
  
2. Did you fish for American eel in 2016 with traps/pots?
  - a. Yes
  - b. No, I last fished for American eel in \_\_\_\_\_. (Please answer the rest of the survey based on the last year you fished.)
  - c. No, I have not fished for American eel. (Thank you for your time. Please discontinue and submit the survey.)
  
3. To identify region fished, in 2016 which area did the majority of your American eel catch come from (trap/pot only)?
  
4. What months do you fish American eel traps/pots? *(Circle all that apply)*

a. January	g. July
b. February	h. August
c. March	i. September
d. April	j. October
e. May	k. November
f. June	l. December
  
5. In 2016, did you fish your American eel traps/pots as singles or trawls/longlines?
  - a. Only singles
  - b. Mostly singles
  - c. Both about equally
  - d. Mostly trawls/longlines
  - e. Only trawls/longlines
  
6. How long do you let your traps/pots soak?
  - a. 1 night
  - b. 2 nights

- c. 3 nights
  - d. More than 3 nights
7. What was the maximum number of American eel traps/pots you fished in 2016?  
\_\_\_\_\_
8. How many traps/pots do you haul per trip, on average? \_\_\_\_\_
9. Which of the following do you primarily use as bait for your American eel traps/pots (select all that apply)?
- a. Horseshoe crab
  - b. Shellfish
  - c. Green crabs
  - d. Fish racks/whole
  - e. Manufactured alternative bait (artificial bait)
  - f. Rock crabs
  - g. Jonah crabs
  - h. Blue crabs
  - i. Other: \_\_\_\_\_
10. On average, how many of each type of bait do you use per trip? *(Please provide approximate quantity and circle bushel or tote where applicable)*
- a. \_\_\_\_\_ Horseshoe crab: total # of crabs (**\*if >0 please answer questions 15-17**)
  - b. \_\_\_\_\_ Shellfish: bushels or totes
  - c. \_\_\_\_\_ Green crabs: bushels or totes
  - d. \_\_\_\_\_ Fish (Species: \_\_\_\_\_): bushels or totes
  - e. \_\_\_\_\_ Manufactured alternative bait (artificial bait): premade pieces
  - f. \_\_\_\_\_ Rock crabs: bushels or totes
  - g. \_\_\_\_\_ Jonah crabs: bushels or totes
  - h. \_\_\_\_\_ Blue crabs: bushels or totes
  - i. \_\_\_\_\_ Other: \_\_\_\_\_
  - j. \_\_\_\_\_ Other: \_\_\_\_\_
11. Have you ever tried a manufactured alternative bait for American eel, and if so, was it effective?
- a. No, I have never tried it
  - b. Yes, I tried it but it performed poorly
  - c. Yes, I tried it with moderate success
  - d. Yes, I tried it and it worked well
12. In 2016, what was your average cost to bait an American eel trap (per trap/pot)?
- a. Less than a dollar
  - b. \$1.00 - \$1.50

- c. \$1.51 - \$2.00
- d. \$2.00 - \$2.50
- e. More than \$2.50

13. How long do your baits typically last?

- a. 1 night
- b. 2 nights
- c. 3 nights
- d. 4 nights
- e. More than 4 nights

14. Do you use bait-saving devices, such as cups or bags?

- a. Yes, with horseshoe crab only
- b. Yes, with horseshoe crab and other types of bait
- c. No

**(\*Please answer questions 15-17 if your response to 10a was greater than 0)**

15. How much, on average, do you pay per crab for female horseshoe crabs?

- a. Price: \$\_\_\_\_\_
- b. I harvest my own.

16. How much, on average, do you pay per crab for male horseshoe crabs?

- a. Price: \$\_\_\_\_\_
- b. I harvest my own.

17. In a typical trap/pot, do you use (*circle all that apply*):

- |   |   |
|---|---|
| a. A whole female horseshoe crab                        | e. A whole male horseshoe crab                        |
| b. Half of a female horseshoe crab                      | f. Half of a male horseshoe crab                      |
| c. $\frac{1}{4}$ of a female horseshoe crab             | g. $\frac{1}{4}$ of a male horseshoe crab             |
| d. Less than a $\frac{1}{4}$ of a female horseshoe crab | h. Less than a $\frac{1}{4}$ of a male horseshoe crab |

## Appendix II

### **Channeled whelk Bait Use Survey**

Please answer the following questions by circling or writing in your response(s) as requested.

1. How many years have you fished for channeled whelk using traps/pots?
  - a. Have not yet, but plan to in 2017
  - b. 1 month - 1 year
  - c. 2 - 5 years
  - d. 6 - 10 years
  - e. 11 - 20 years
  - f. Over 20 years
  
2. Did you fish for channeled whelk in 2016 with traps/pots?
  - a. Yes
  - b. No, I last fished for channeled whelk in \_\_\_\_\_. (Please answer the rest of the survey based on the last year you fished.)
  - c. No, I have not fished for channeled whelk. (Thank you for your time. Please discontinue and submit the survey.)
  
3. To identify region fished, in 2016 which area did the majority of your channeled whelk catch come from (trap/pot only)?
  
4. What months do you fish channeled whelk traps/pots? (*Circle all that apply*)

a. January	g. July
b. February	h. August
c. March	i. September
d. April	j. October
e. May	k. November
f. June	l. December
  
5. In 2016, did you fish your channeled whelk traps/pots as singles or trawls/longlines?
  - a. Only singles
  - b. Mostly singles
  - c. Both about equally
  - d. Mostly trawls/longlines
  - e. Only trawls/longlines
  
6. How long do you let your traps/pots soak?
  - e. 1 night
  - f. 2 nights
  - g. 3 nights
  - h. More than 3 nights



7. What was the maximum number of channeled whelk traps/pots you fished in 2016?  
\_\_\_\_\_
8. How many traps/pots do you haul per trip, on average? \_\_\_\_\_
9. Which of the following do you primarily use as bait for your channeled whelk traps/pots (select all that apply)?
- |   |                 |
|---|-----------------|
| a. Horseshoe crab                                     | f. Rock crabs   |
| b. Shellfish  | g. Jonah crabs  |
| c. Green crabs  | h. Blue crabs   |
| d. Fish racks/whole                                   | i. Other: _____ |
| e. Manufactured alternative<br>bait (artificial bait) |                 |
10. On average, how many of each type of bait do you use per trip? *(Please provide approximate quantity and circle bushel or tote where applicable)*
- \_\_\_\_\_ Horseshoe crab: total # of crabs **(\*if >0 please answer questions 15-17)**
  - \_\_\_\_\_ Shellfish: bushels or totes
  - \_\_\_\_\_ Green crabs: bushels or totes
  - \_\_\_\_\_ Fish (Species: \_\_\_\_\_): bushels or totes
  - \_\_\_\_\_ Manufactured alternative bait (artificial bait): premade pieces
  - \_\_\_\_\_ Rock crabs: bushels or totes
  - \_\_\_\_\_ Jonah crabs: bushels or totes
  - \_\_\_\_\_ Blue crabs: bushels or totes
  - \_\_\_\_\_ Other: \_\_\_\_\_
  - \_\_\_\_\_ Other: \_\_\_\_\_
11. Have you ever tried a manufactured alternative bait for channeled whelk, and if so, was it effective?
- No, I have never tried it
  - Yes, I tried it but it performed poorly
  - Yes, I tried it with moderate success
  - Yes, I tried it and it worked well
12. In 2016, what was your average cost to bait a channeled whelk trap (per trap/pot)?
- Less than a dollar
  - \$1.00 - \$1.50
  - \$1.51 - \$2.00
  - \$2.00 - \$2.50

e. More than \$2.50

13. How long do your baits typically last?

- a. 1 night
- b. 2 nights
- c. 3 nights
- d. 4 nights
- e. More than 4 nights

14. Do you use bait-saving devices, such as cups or bags?

- a. Yes, with horseshoe crab only
- b. Yes, with horseshoe crab and other types of bait
- c. No

**(\*Please answer questions 15-17 if your response to 10a was greater than 0)**

15. How much, on average, do you pay per crab for female horseshoe crabs?

- a. Price: \$\_\_\_\_\_
- b. I harvest my own.

16. How much, on average, do you pay per crab for male horseshoe crabs?

- a. Price: \$\_\_\_\_\_
- b. I harvest my own.

17. In a typical trap/pot, do you use (*circle all that apply*):

- a. A whole female horseshoe crab
- b. Half of a female horseshoe crab
- c.  $\frac{1}{4}$  of a female horseshoe crab
- d. Less than a  $\frac{1}{4}$  of a female horseshoe crab
- e. A whole male horseshoe crab
- f. Half of a male horseshoe crab
- g.  $\frac{1}{4}$  of a male horseshoe crab
- h. Less than a  $\frac{1}{4}$  of a male horseshoe crab

## **Appendix III**

### **A Brief Synopsis of the Commercial Whelk Fishery in South Carolina** Prepared by Jeff Brunson, South Carolina Department of Natural Resources February 2017

The whelk fishery in South Carolina is small relative to those fisheries in the mid-Atlantic states. The South Carolina Department of Natural Resources does issue a small number of whelk trawling permits occasionally, but those landings data are minimal and confidential. Commercial hand-harvest of whelk is allowed, and requires a commercial saltwater license. Whelk harvested in this manner are reported to wholesale dealers. By far, most of the reported commercial whelk landings come in the form of crab trip ticket reports from commercial blue crab fishermen, and it has been speculated that such harvest is simply bycatch. Since 2004, mean annual whelk harvest reported on crab trip tickets was 6962 shell on pounds, and ranged from 1370 to 22,104 pounds. In order to validate the assumption that reported whelk landings by commercial crabbers were as bycatch, the nine commercial crabbers with the highest reported whelk landings were identified. Phone interviews were then attempted to determine if whelk were targeted by commercial crab fishermen, and if so, what type of bait was used. Below are the general conclusions from conversations with seven of those nine identified crab fishermen:

- 1) Harvest of whelk by blue crab fishermen was characterized as “bycatch.”
- 2) Whelk landings are dominated by channeled whelk (*Busycotypus canaliculatus*), with harvest primarily occurring “off the beach.”
- 3) In some cases, whelk were actually avoided, because they compete with crabs for bait.
- 4) In other cases, “targeting” of whelk meant that crabbers may set extra commercial crab pots in an area where whelk are being caught in larger numbers. However, this practice occurs while the fishermen adhere to their normal blue crab harvest practices.
- 5) Crab traps are primarily baited with menhaden, even when the expectation is to increase the catch of whelk. Little, if any, effort is made to use an alternative bait to target whelk.
- 6) Interestingly, one respondent suggested that when in the process of trawling for shrimp, he had encountered a number of open top traps, similar to those used for whelk harvest, in the waters off the northern coast of the state. However, that report could not be substantiated

It should be noted that the harvest of horseshoe crabs for bait, or the use of horseshoe crabs as bait in any fishery in South Carolina, is prohibited, pursuant to Code of Laws of South Carolina, Title 50, Chapter 5, Article and Section 1330. The only allowable harvest of horseshoe crabs in South Carolina is for biomedical bleeding, or for research and scientific purposes, and is limited to harvest by hand.

## **Horseshoe Crab Draft Terms of Reference**

1. Define population structure based on available data. If alternative population structures are used in the models (e.g., coast-wide, regional, sub-regional or estuary-specific), justify use of each population structure.
2. Characterize precision and accuracy of fishery-dependent and fishery-independent data, including biomedical data, that are used in the assessment, including the following but not limited to:
  - a. Provide descriptions of each data source (e.g., geographic location, sampling methodology, potential explanation for outlying or anomalous data)
  - b. Describe calculation and potential standardization of abundance indices.
  - c. Discuss trends and associated estimates of uncertainty (e.g., standard errors)
  - d. Justify inclusion or elimination of available data sources.
  - e. Discuss the effects of data strengths and weaknesses (e.g., temporal and spatial scale, gear selectivities, aging accuracy, sample size) on model inputs and outputs.
3. Develop models used to estimate population parameters (e.g.,  $F$ , biomass, abundance) and biological reference points, and analyze model performance.
  - a. Describe stability of model (e.g., ability to find a stable solution, invert Hessian)
  - b. Justify choice of CVs, effective sample sizes, or likelihood weighting schemes.
  - c. Perform sensitivity analyses for starting parameter values, priors, etc. and conduct other model diagnostics as necessary.
  - d. Clearly and thoroughly explain model strengths and limitations.
  - e. Briefly describe history of model usage, its theory and framework, and document associated peer-reviewed literature. If using a new model, test using simulated data.
  - f. If multiple models were considered, justify the choice of preferred model and the explanation of any differences in results among models.
  - g. State assumptions made for all models and explain the likely effects of assumption violations on synthesis of input data and model outputs.
  - h. Incorporate biomedical data into the models used. Reassess associated mortality of bled crabs coast-wide, or regionally.
4. Characterize uncertainty of model estimates and biological or empirical reference points.
5. Perform retrospective analyses, assess magnitude and direction of retrospective patterns detected, and discuss implications of any observed retrospective pattern for uncertainty in population parameters (e.g.,  $F$ , SSB), reference points, and/or

management measures.

6. Recommend stock status as related to reference points (if available). For example:
  - a. Is the stock below the biomass threshold?
  - b. Is F above the threshold?
7. Other potential scientific issues:
  - a. Compare trends in population parameters and reference points with current and proposed modeling approaches, including the results of the ARM model for the Delaware Bay. If outcomes differ, discuss potential causes of observed discrepancies.
  - b. Compare reference points derived in this assessment with what is known about the general life history of the exploited stock. Explain any inconsistencies.
8. If a minority report has been filed, explain majority reasoning against adopting approach suggested in that report. The minority report should explain reasoning against adopting approach suggested by the majority.
9. Develop detailed short and long-term prioritized lists of recommendations for future research, data collection, and assessment methodology. Highlight improvements to be made by next benchmark review.
10. Recommend timing of next benchmark assessment and intermediate updates, if necessary relative to biology and current management of the species.

### ***Generic ASMFC Terms of Reference for External Peer Review***

1. Evaluate the thoroughness of data collection and the presentation and treatment of fishery-dependent and fishery-independent data in the assessment, including the following but not limited to:
  - a. Presentation of data source variance (e.g., standard errors).
  - b. Justification for inclusion or elimination of available data sources,
  - c. Consideration of data strengths and weaknesses (e.g., temporal and spatial scale, gear selectivities, aging accuracy, sample size),
  - d. Calculation and/or standardization of abundance indices.
2. Evaluate the methods and models used to estimate population parameters (e.g., F, biomass, abundance) and biological reference points, including but not limited to:
  - a. Evaluate the choice and justification of the preferred model(s). Was the most appropriate model (or model averaging approach) chosen given available data and life history of the species?
  - b. If multiple models were considered, evaluate the analysts' explanation of any differences in results.
  - c. Evaluate model parameterization and specification (e.g., choice of CVs, effective

sample sizes, likelihood weighting schemes, calculation/specification of M, stock-recruitment relationship, choice of time-varying parameters, plus group treatment).

3. Evaluate the diagnostic analyses performed, including but not limited to:
  - a. Sensitivity analyses to determine model stability and potential consequences of major model assumptions
  - b. Retrospective analysis
4. Evaluate the methods used to characterize uncertainty in estimated parameters. Ensure that the implications of uncertainty in technical conclusions are clearly stated.
5. If a minority report has been filed, review minority opinion and any associated analyses. If possible, make recommendation on current or future use of alternative assessment approach presented in minority report.
6. Recommend best estimates of stock biomass, abundance, and exploitation from the assessment for use in management, if possible, or specify alternative estimation methods.
7. Evaluate the choice of reference points and the methods used to estimate them. Recommend stock status determination from the assessment, or, if appropriate, specify alternative methods/measures.
8. Review the research, data collection, and assessment methodology recommendations provided by the TC and make any additional recommendations warranted. Clearly prioritize the activities needed to inform and maintain the current assessment, and provide recommendations to improve the reliability of future assessments.
9. Recommend timing of the next benchmark assessment and updates, if necessary, relative to the life history and current management of the species.
10. Prepare a peer review panel terms of reference and advisory report summarizing the panel's evaluation of the stock assessment and addressing each peer review term of reference. Develop a list of tasks to be completed following the workshop. Complete and submit the report within 4 weeks of workshop conclusion.

### 2018 Horseshoe Crab Benchmark Stock Assessment Timeline

What	Who	When	Why
Pre-Assessment Webinar	Rachel Sysak (TC Chair,), Michael Schmidtke (FMP Coordinator), Kristen Anstead (Stock Assessment Scientist), SAS	Early September 2017	Develop timeline, draft ToRs, roles & responsibilities, and develop a data submission form and needs
Obtain Data Confidentiality	ASFMC Staff, State partners	Early September 2017	May need to contact each state with biomedical facilities individually to resolve confidentiality issues
Pre-Assessment TC Meeting	TC, SAS, ASMFC staff	September 2017	Review timeline and ToRs for Board Approval, identify data sources & availability, develop assignments & due dates for TC, SAS, and staff members, review previous assessment (2009), review data confidentiality
Data Workshop Preparation	TC, SAS, ASMFC staff	September-December 2017	Circulate data submission workbooks, presentation needs for the data workshop, clear instructions & expectations to TC and SAS members; Stock assessment scientist compiles data as it is submitted, ASMFC staff develops & distributes data workshop agenda, FMP coordinator forwards ToRs & timeline to the Board
Board Approval of ToRs, timeline	HSC Board	October 2017	
Data Workshop	TC, SAS, ASMFC staff, invited data holders (university, biomedical, etc.)	January 2018? (at least 2-3 months after TC meeting)	Review previous assessments, summary of literature review (life history, habitat, etc), all data sets; Develop list of data analysis and report writing assignments and due dates; Determine data analyses to conduct and possible approaches for assessing stock, finalize date of assessment workshop
Assessment Workshop Preparation	Rachel Sysak (TC Chair,) SAS Chair, Michael Schmidtke (FMP Coordinator), Kristen	January-February 2018	FMP coordinator sends data workshop report, assignments, due dates to SAS

	Anstead (Stock Assessment Scientist)		
Assessment Workshop	SAS, ASMFC Staff	March 2018	Review report sections, data analyses, ToRs; Determine best approach for assessing stock, conduct model runs, sensitivity analyses, consensus recommendation of stock status, research recommendations
<i>Assessment Workshop II??</i>		<i>May 2018</i>	<i>*if needed and the budget allows??</i>
TC Review of Stock Assessment	TC, SAS Chair, ASMFC Staff	July 2018	Sweka presents the ToRs and stock assessment, TC reviews it and approves it for peer review (or not)
Preparation for Peer Review	ASMFC Staff, SAS	July-August 2018	Report revisions as needed following TC review; <b>report goes to the peer review panel one month before review meeting</b>
Peer Review Workshop	ASFMC Staff, Peer Review Panel, SAS members	Mid/late August 2018 (Note: AFS is Aug 19-23rd)	Present assessment to peer review panel and conduct additional analyses as needed
Post-Review Workshop	ASFMC Staff, Peer Review Panel, SAS members	August-September 2018	SAS and Peer Review Panel prepare presentations for the Board; FMP Coordinator finalizes report; follow up TC call held if needed; Stock Assessment Scientist drafts species overview document
Board Meeting	Board, ASMFC Staff, SAS Chair	October 2018	SAS chair presents the assessment to the Board; Science Director presents peer review report; Board accepts or rejects assessment for management



# Horseshoe Crab Harvest Recommendations Based on Adaptive Resource Management (ARM) Framework and Most Recent Monitoring Data

Report to the Delaware Bay Ecosystem Technical Committee by the ARM Subcommittee

September 2017

This report summarizes annual harvest recommendations. Detailed background on the ARM framework and data sources can be found in previous technical reports<sup>1</sup>.

## Objective statement

Manage harvest of horseshoe crabs in the Delaware Bay to maximize harvest but also to maintain ecosystem integrity and provide adequate stopover habitat for migrating shorebirds.

## Alternative harvest packages

These harvest packages were compared to determine which will best meet the above objective given the most recent monitoring data. Harvest is of adult horseshoe crabs of Delaware Bay origin.

Harvest package	Male harvest (×1,000)	Female harvest (×1,000)
1	0	0
2	250	0
3	500	0
4	280	140
5	420	210

## Population models

Population dynamics models that link horseshoe crabs and red knots were used to predict the effect of harvest packages. Three variations in the models represent the amount and type of dependence between horseshoe crabs and red knots. Stochastic dynamic programming was used to create a decision matrix to identify the optimal harvest package given the most recent monitoring data.

## Monitoring data

In 2015, and 2016, sources of data for horseshoe crab abundance were a set of trawl surveys conducted by Delaware and New Jersey.<sup>2</sup> Historic data from the independent surveys were compiled into a composite index and correlated with past VT trawl survey data. In the fall of 2016 the VT trawl survey was reinstated and the abundance estimates were reported to the ARM team<sup>5</sup>. The regression coefficients from that survey were used to estimate 2016 abundance from 2016 indices<sup>2</sup>. Red Knot abundance estimates are taken from a mark-resight estimate for red knot abundance<sup>3</sup>.

Horseshoe crab abundance (millions)			Red knot abundance (×1,000)	
Year	Male	Female	Year	Male and female
2016 (Fall)	25.4	7.7	2017 (Spring)	49.405

## Harvest recommendations

Decision matrix was optimized incorporating recommendations on red knot stopover population estimates and associated calibration of red knot threshold<sup>4</sup>.

Recommended harvest package	Male harvest (×1,000)	Female harvest (×1,000)
3	500	0

Quota of horseshoe crab harvest for Delaware Bay region states. Allocation of allowable harvest under ARM package 3 (500K males, 0 females) was conducted in accordance with management board approved methodology in *Addendum VII to the Interstate Fishery Management Plan for Horseshoe Crabs*. Note: Maryland and Virginia total quota refer to that east of the COLREGS line.

State	Delaware Bay Origin HSC Quota		Total Quota	
	Male	Female	Male	Female
Delaware	162,136	0	162,136	0
New Jersey	162,136	0	162,136	0
Maryland	141,112	0	255,980	0
Virginia	34,615	0	81,331	0

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- <sup>2</sup> John Sweka's August, 2017 Memo
- <sup>3</sup> Jim Lyons' 2017 estimate in the August, 2017 email
- <sup>4</sup> ARM's recommendations for improved estimates of red knot stopover population size and associated calibration of red knot threshold
- <sup>5</sup> Hata and Hallerman, June 2016, Horseshoe Crab Trawl Survey Report to the ASMFC

## **Results of the 2016 Horseshoe Crab Trawl Survey:**

### **Report to the Atlantic States Marine Fisheries Commission Horseshoe Crab and Delaware Bay Ecology Technical Committees**

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#### **Abstract**

To properly manage the mid-Atlantic horseshoe crab (*Limulus polyphemus*) fishery, a time-series of data on relative abundance of all demographic groups is needed. We conducted a trawl survey in the coastal Delaware Bay area and the lower Delaware Bay, quantifying mean catch per 15-minute tow and comparing the results with those of previous years. Mean catch-per-tow of mature males were higher than in previous years, although the confidence interval was large; mean catches of mature females were higher than in most previous years, but still lower than in 2008. Mean catch-per-tow of immature horseshoe crabs in the coastal Delaware Bay area has been variable since 2002 with no trend, and remained below the peak of 2009. Our findings will be used to parameterize the Adaptive Resource Management model used to set harvest levels for horseshoe crabs.

#### **Introduction**

To properly manage the mid-Atlantic horseshoe crab (*Limulus polyphemus*) fishery, accurate information on abundance levels and trends is needed. The Adaptive Resource Management model adopted by the ASMFC requires annual, fishery-independent indices of newly-mature recruit and adult abundance. The purpose of this

project was to conduct a horseshoe crab trawl survey along the Mid-Atlantic coast in order to: (1) determine horseshoe crab relative abundance, (2) describe horseshoe crab population demographics, and (3) track inter-annual changes in horseshoe crab abundance and demographics. Here, we report our cumulative results through the fall 2016 trawl survey.

## **Methods**

The 2016 horseshoe crab trawl survey was conducted in two areas (Figure 1). The coastal Delaware Bay area (DBA) survey extended in the Atlantic Ocean from shore out to 22.2 km (12 nautical miles), and from 39° 20' N (Atlantic City, NJ) to 37° 40' N (slightly north of Wachapreague, VA). This area was previously sampled from 2002 to 2011. The lower Delaware Bay (LDB) survey area extended from the Bay mouth to a line between Egg Island Point, New Jersey and Kitts Hummock, Delaware. The LDB was previously sampled from 2010 to 2012. The surveys were conducted from 17 September to 27 October 2016.

The DBA survey area was stratified by distance from shore (0-3 nm, 3-12 nm) and bottom topography (trough, nontrough) as in previous years. The LDB survey area was stratified by bottom topography only, as in previous years. Sampling was conducted aboard a 16.8-m chartered commercial fishing vessel operated out of Ocean City, MD. We used a two-seam flounder trawl with a 18.3-m headrope and 24.4-m footrope, rigged with a Texas Sweep of 13-mm link chain and a tickler chain. The net body consisted of 15.2-cm (6-in) stretched mesh, and the bag consisted of 14.3-cm (5 5/8-in) stretched mesh. Tows were usually 15-minutes bottom time, but were occasionally shorter to avoid fishing gear (e.g., gill nets, crab and whelk pots) or vessel traffic, or when the net unexpectedly hit an underwater obstruction. Bottom water temperature was recorded for each tow. We sampled 41 stations in the DBA survey and 10 stations in the LDB.

Horseshoe crabs were culled from the catch, and either all individuals or a subsample were examined for prosomal width (millimeters) and identified for sex and maturity. Maturity classifications were: immature, newly mature - those that are capable of spawning but have not yet spawned, and mature - those that are have previously spawned. Newly mature and mature males are morphologically distinct, and are believed

to be classifiable without error. However, some error is associated with distinguishing newly mature from immature females. All examined females that were not obviously mature (i.e., bearing rub marks) or immature (too small or soft-shelled) were probed with an awl to determine presence or absence of eggs. Females with eggs but without rub marks were considered newly mature. Females with both eggs and rub marks were considered mature. Initial sorting classifications were: presumed adult males (newly mature and mature), presumed adult females, and all immature. Up to 25 adult males, 25 adult females, and 50 immatures were retained for examination. The remainder were counted separately by classification and released. Characteristics of the examined subsamples were then extrapolated to the counted portions of the catch.

In each stratum, the mean catch per 15-minute tow and associated variance were calculated using two methods, i.e., either assuming a normal-distribution model or a lognormal delta-distribution model (Pennington, 1983). Stratum mean and variance estimates were combined using formulas for a stratified random sampling design (Cochran, 1977). The approximate 95% confidence intervals were calculated using the effective degrees of freedom (Cochran, 1977). Annual means were considered significantly different if 95% confidence limits did not overlap. Stratified means calculated using the lognormal delta-distribution model are not additive - i.e., means calculated for each demographic group do not sum to the mean calculated using all crabs. Likewise, stratified means from survey subregions do not sum to the means calculated using the entire survey area. Means calculated using the normal-distribution model are additive, within rounding errors.

Inter-annual comparisons for the main DBA survey used the entire area from 39° 20' N to 37° 40' N (Figure 1). This area has been subdivided in previous reports to include the core region that was sampled in the 2001 pilot study. The core region was sampled from 2001 to 2011 and again in 2016 and extends from 39° 10' N to 38° 10' N. Catch means using the core region allow extension of the time-series for that region by one year. However, sample sizes and random station selection since 2002 are based on the entire survey area. Therefore, sample sizes within the core region are small and variable year to year, resulting in large variances. In addition, because station selection is based on the entire survey area, strata within the core region may have insufficient

sample sizes, necessitating merging strata in some years. When strata were merged, weighted mean catch and variance were calculated for the combined stratum, with observations weighted by the probability of selection in the combined stratum.

Annual size-frequency distributions, in intervals of 10-mm prosomal width, were calculated for each sex/maturity category by pooling size-frequency distributions of all stations (adjusted for tow duration if necessary) in a stratum in a year to calculate the relative proportions for each size interval. Those proportions then were multiplied by the stratum mean catch per tow that year to produce a stratum size-frequency distribution. Stratum size-frequency distributions then were multiplied by the stratum weights and added in the same manner as calculating the stratified mean catch per tow. Areas under the distribution curves then would represent the stratified mean catch per tow at each size interval.

Size-frequency distributions of newly mature and mature horseshoe crabs were examined for approximate mean prosomal width to look for changes in size over time. Mean prosomal widths and standard deviations were calculated using the NORMSEP method of modal progression analysis in FiSAT II (version 1.2.2) analytical software (Guyanilo et al., 2005) fitted to the 10-mm size intervals calculated above.

## **Results**

### Delaware Bay area

Stratified mean catches per tow for immature females and males in 2016 were nearly twice those in 2011 but were not significantly higher, based on non-overlapping confidence limits (Tables 1 and 2; Figure 2). However, mean catches in 2016 remained lower than in 2009, when the largest mean catches in the time-series were observed. Likewise, stratified mean catches of newly mature females and males in 2016 were nearly twice those in 2011, but not significantly higher. Mean catches of mature females and males have been variable over the time-series, but are significantly correlated ( $r = 0.954$ ;  $T = 9.59$ ;  $p < 0.001$ ;  $n = 11$ ). Mean catches of mature males appear to be increasing over the time-series ( $r = 0.630$ ;  $T = 2.43$ ;  $p = 0.038$ ), but mature females do not ( $r = 0.485$ ;  $T = 1.66$ ;  $p = 0.131$ ). Yearly trends from the delta- and normal-distribution models followed similar patterns for all demographic groups.

Stratified mean catches of immature crabs within the DBA core region have remained generally consistent over the time-series, and typically have been comparable to mean catches in the entire DBA region, with the exception of 2009 (Tables 3 and 4; Figure 3). The large mean catches of immature crabs for the entire DBA in 2009 were due to catches outside the core region. Mean catches of newly mature and mature crabs in the core region followed similar trends to those in the entire survey area, although mean catches of mature crabs in the core region were typically larger, indicating the relative importance of the core region to the distribution of mature horseshoe crabs. As in the entire DBA, mean catches of mature females and males are significantly correlated ( $r = 0.654$ ;  $T = 2.73$ ;  $p = 0.021$ ;  $n = 12$ ). Mean catches of mature males appear to be increasing over time ( $r = 0.833$ ;  $T = 4.77$ ;  $p = 0.001$ ), but of mature females do not ( $r = 0.346$ ;  $T = 1.17$ ;  $p = 0.271$ ). Yearly trends from the delta- and normal-distribution models followed similar patterns for all demographic groups.

#### Lower Delaware Bay

This was the fourth year of sampling within the Delaware Bay. Stratified mean catches of immature crabs in 2016 were the largest observed, and were significantly higher than in 2011 but similar to 2012, based on non-overlapping confidence limits (Tables 5 and 6; Figure 4). Mean catches of mature females were consistent over time, but catches of mature males were higher in 2016 than in 2012. Mean catches of immature crabs were significantly higher within the Delaware Bay than in the coastal survey in 2010 and 2016 (Figure 4). Mean catches of mature crabs were also larger within the Bay, but only males in 2016 were significantly so.

#### Sex ratios

Mature males were typically more than twice as numerous as mature females throughout the survey time-series. Sex ratios from mean catch per tow (M:F) in the DBA surveys ranged from 2.18 in 2008 to 3.08 in 2011, and averaged 2.44 over all years. Although the sex ratio of mature crabs appeared to increase over time, the increase was not significant at  $\alpha = 0.05$  ( $r = 0.597$ ;  $T = 2.234$ ;  $p = 0.052$ ;  $n = 11$ ). In contrast, the ratio of newly mature males to females was highly variable, ranging from 0.38 in 2008 to 1.70

in 2004, and averaged 1.08. This may reflect temporal variability in recruitment to the newly mature class relative to survey period, or differences in year-class abundance because females are believed to mature a year later than males.

Sex ratios of mature horseshoe crabs were higher within the Delaware Bay than on the coast. Sex ratios (M:F) ranged from 2.67 in 2010 to 6.17 in 2016, averaging 4.05. Over the four survey years within the Delaware Bay, the ratio of mature males to females significantly increased ( $r = 0.989$ ;  $T = 9.574$ ;  $p = 0.011$ ;  $n = 4$ ). As on the coast, sex ratios of newly mature crabs within the Bay were variable, and ranged from 0.44 to 9.43, averaging 3.61. The higher sex ratios within Delaware Bay may reflect a tendency for mature male horseshoe crabs to remain near the spawning beaches later than females.

#### Size distributions

Size-frequency distributions of immature horseshoe crabs in the DBA survey display a considerable variability (Figure 5). Modal groups are generally indistinct, except for one large group of both females and males in 2009. However, that modal group, which would presumably be larger in size the following year, becomes indistinct again in 2010. Size-frequency distributions from the lower Delaware Bay do not reflect that modal group in 2010 either (Figure 6).

Mean prosomal widths of mature and newly mature horseshoe crabs remained consistent in both survey areas through the time-series. Mature females in the Delaware Bay area averaged 258 to 270 mm PW, compared to the 245 to 271 mm average for newly mature females there (Table 7). Mature females in the lower Delaware Bay averaged 255 to 265 mm PW, while newly mature females averaged 246 to 265 mm. Mean widths of mature males averaged 196 to 212 mm in the Delaware Bay area, and of newly mature males averaged 202 to 212 mm. Mature males in the lower Delaware Bay averaged 198 to 203 mm, and newly mature males averaged 184 to 203 mm.

Mean prosomal widths of mature male and female crabs in the DBA survey displayed slight but detectable decreases over time (Table 8; Figure 7). The smallest means were observed in 2016, but those decreases remained significant only when the 2002-2011 data are included.



### Effects of sampling period

The 2016 DBA survey was conducted from mid-September to late October. The average bottom water temperature in 2016 was the highest in the time series (Table 9; Figure 8). Mean bottom water temperature was inversely correlated with mean ordinal sampling date over the survey time-series ( $r = -0.796$ ;  $T = -3.94$ ;  $p = 0.003$ ;  $n = 11$ ). When comparing survey time-frames and water temperatures, it appears that the mean catches of immature crabs are correlated with mean sampling dates but not with water temperature (Table 10). In contrast, mean catches of mature males were correlated with mean water temperatures.

The lower Delaware Bay surveys were each completed within one or two days, and all four surveys were conducted within the month of October (Table 9; Figure 8). Mean water temperatures were cooler than mean temperatures in the coastal surveys, and the 2016 mean was the highest in the time series. Immature horseshoe crab catches within Delaware Bay were not correlated with ordinal sampling date, but mature male catches were correlated with sampling date (Table 10).

### **Key findings**

1. Mean catch-per-tow of immature horseshoe crabs in the coastal Delaware Bay area has been variable since 2002 with no trend, and remains below the peak of 2009.
2. Mean catch-per-tow of newly mature crabs in the coastal Delaware Bay area have remained below peaks in 2007 (males) or 2008 (females) and show no long-term trend.
3. Mean catch-per-tow of mature males in the coastal Delaware Bay area has been variable throughout the time-series, but shows an increasing trend since 2002.
4. Mean catch-per-tow of immature horseshoe crabs and mature males in the lower Delaware Bay proper were higher than in the coastal Delaware Bay area.
5. Mean sizes of mature male and female horseshoe crabs appear to have decreased slightly since 2002.
6. Mean catch-per-tow of immature crabs, at least in the coastal Delaware Bay area, may be related to sampling date. Mean catch-per-tow of mature males may be related to water temperature.

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Table 1. Stratified mean catch per tow of horseshoe crabs in the coastal **Delaware Bay area** survey, 2002-2016, with standard deviation (sd) and coefficient of variation (CV), calculated using the **delta distribution** model, by demographic group. Also included are the estimated upper and lower 95% confidence limits (UCL, LCL).

	mean	UCL	LCL	CV	sd		mean	UCL	LCL	CV	sd
Immature females						Immature males					
2002	24.7	42.6	6.9	0.34	8.5	2002	14.3	25.7	2.9	0.38	5.5
2003	7.3	12.8	1.8	0.35	2.6	2003	3.8	6.2	1.3	0.32	1.2
2004	21.5	33.4	9.7	0.26	5.6	2004	17.3	27.3	7.4	0.27	4.7
2005	28.2	49.1	7.2	0.36	10.2	2005	24.5	45.4	3.6	0.41	10.1
2006	32.0	48.5	15.6	0.24	7.5	2006	24.1	41.2	7.0	0.29	7.0
2007	42.9	87.0	-1.3	0.40	17.2	2007	32.3	66.4	-1.8	0.43	13.9
2008	29.0	50.6	7.4	0.33	9.7	2008	20.4	35.2	5.7	0.32	6.6
2009	76.5	127.1	25.9	0.32	24.3	2009	76.4	133.0	19.8	0.34	25.7
2010	8.6	11.2	6.0	0.15	1.3	2010	5.7	8.4	3.0	0.23	1.3
2011	11.2	15.3	7.1	0.17	1.9	2011	6.9	9.7	4.1	0.19	1.3
2016	23.9	46.3	1.5	0.34	8.1	2016	17.8	35.7	-0.1	0.36	6.5
Mature females						Mature males					
2002	10.8	16.0	5.6	0.23	2.5	2002	25.5	36.7	14.4	0.21	5.5
2003	7.8	11.8	3.8	0.24	1.9	2003	17.9	29.0	6.9	0.29	5.1
2004	6.5	9.9	3.2	0.25	1.6	2004	14.7	23.9	5.6	0.30	4.4
2005	9.6	15.7	3.5	0.28	2.6	2005	21.2	33.7	8.7	0.28	5.9
2006	14.7	26.5	3.0	0.35	5.1	2006	37.4	58.7	16.1	0.27	10.0
2007	18.9	30.1	7.7	0.29	5.5	2007	43.9	69.0	18.9	0.28	12.4
2008	17.3	27.0	7.6	0.27	4.7	2008	37.8	56.8	18.8	0.25	9.4
2009	7.5	12.1	2.9	0.30	2.2	2009	16.4	26.0	6.9	0.28	4.6
2010	11.0	15.9	6.0	0.22	2.4	2010	29.0	43.6	14.4	0.25	7.1
2011	10.3	16.4	4.2	0.27	2.8	2011	36.3	67.8	4.8	0.38	13.7
2016	17.9	29.2	6.6	0.30	5.4	2016	48.7	87.8	9.6	0.29	14.1
Newly mature females						Newly mature males					
2002	3.2	4.7	1.7	0.23	0.7	2002	1.6	2.5	0.6	0.28	0.4
2003	1.4	2.9	-0.1	0.51	0.7	2003	0.2	0.5	-0.1	0.74	0.1
2004	1.2	1.9	0.4	0.32	0.4	2004	2.0	2.9	1.0	0.23	0.4
2005	1.7	2.8	0.6	0.29	0.5	2005	2.5	4.5	0.6	0.37	0.9
2006	5.5	9.9	1.2	0.32	1.8	2006	7.5	12.7	2.2	0.38	3.0
2007	5.6	9.8	1.3	0.36	2.0	2007	8.6	13.8	3.3	0.29	2.5
2008	7.0	12.2	1.8	0.36	2.5	2008	2.6	4.3	1.0	0.30	0.8
2009	2.1	3.2	1.0	0.25	0.5	2009	1.7	2.8	0.5	0.32	0.5
2010	2.6	5.1	0.1	0.47	1.2	2010	3.0	6.5	-0.6	0.58	1.7
2011	2.0	3.2	0.8	0.30	0.6	2011	2.3	4.2	0.3	0.41	0.9
2016	3.4	5.0	1.8	0.22	0.7	2016	5.7	12.4	-1.0	0.42	2.4

Table 1 continued.

	mean	UCL	LCL	CV	sd
Total					
2002	76.5	108.2	44.7	0.20	15.4
2003	41.8	66.1	17.5	0.27	11.4
2004	68.2	105.8	30.6	0.27	18.2
2005	95.6	157.5	33.6	0.32	30.3
2006	118.0	173.4	62.6	0.21	24.9
2007	172.5	288.9	56.1	0.32	55.4
2008	115.1	170.0	60.2	0.23	26.5
2009	226.4	404.9	47.9	0.36	81.9
2010	58.9	83.4	34.5	0.20	12.0
2011	72.6	111.9	33.2	0.24	17.7
2016	113.6	197.9	29.4	0.27	30.3

Table 2. Stratified mean catch per tow of horseshoe crabs in the coastal **Delaware Bay area** survey, 2002-2016, with standard deviation (sd) and coefficient of variation (CV), calculated using the **normal distribution** model, by demographic group. Also included are the estimated upper and lower 95% confidence limits (UCL, LCL).

	mean	UCL	LCL	CV	sd		mean	UCL	LCL	CV	sd
Immature females						Immature males					
2002	21.3	31.5	11.0	0.23	4.9	2002	12.6	19.3	5.8	0.26	3.3
2003	7.3	12.8	1.7	0.36	2.6	2003	3.7	6.0	1.4	0.29	1.1
2004	18.8	26.1	11.5	0.19	3.6	2004	15.3	21.4	9.1	0.20	3.0
2005	25.6	43.7	7.4	0.34	8.7	2005	26.8	56.0	-2.4	0.52	13.8
2006	32.8	49.6	15.9	0.24	8.0	2006	22.0	32.7	11.4	0.23	5.1
2007	39.4	76.6	2.1	0.39	15.2	2007	34.5	68.5	0.5	0.46	15.8
2008	27.5	42.2	12.7	0.25	7.0	2008	18.9	29.0	8.8	0.26	4.8
2009	62.2	93.5	30.9	0.24	15.1	2009	60.4	90.7	30.1	0.24	14.5
2010	8.9	12.2	5.6	0.18	1.6	2010	5.9	9.2	2.6	0.27	1.6
2011	11.5	15.9	7.2	0.18	2.1	2011	7.0	9.9	4.1	0.20	1.4
2016	23.6	40.2	7.0	0.31	7.3	2016	16.8	28.3	5.4	0.31	5.2
Mature females						Mature males					
2002	10.3	14.9	5.8	0.21	2.2	2002	22.9	31.2	14.7	0.17	4.0
2003	7.7	11.3	4.1	0.22	1.7	2003	16.7	24.7	8.6	0.23	3.8
2004	6.5	9.6	3.4	0.23	1.5	2004	15.2	24.7	5.8	0.30	4.5
2005	10.3	17.1	3.4	0.32	3.3	2005	18.9	28.0	9.8	0.23	4.3
2006	16.0	27.7	4.2	0.33	5.3	2006	36.5	54.9	18.2	0.24	8.6
2007	17.0	25.7	8.3	0.25	4.3	2007	35.7	49.9	21.6	0.19	7.0
2008	19.2	32.5	5.9	0.34	6.5	2008	39.7	63.5	16.0	0.29	11.6
2009	8.0	13.0	3.0	0.30	2.4	2009	16.2	24.8	7.6	0.26	4.1
2010	11.8	18.2	5.4	0.26	3.1	2010	30.8	47.5	14.1	0.26	8.0
2011	10.1	15.7	4.5	0.26	2.6	2011	35.7	61.6	9.8	0.32	11.4
2016	16.7	25.1	8.2	0.25	4.1	2016	57.6	118.7	-3.4	0.38	22.0
Newly mature females						Newly mature males					
2002	3.1	4.6	1.7	0.22	0.7	2002	1.6	2.6	0.6	0.30	0.5
2003	1.4	3.0	-0.1	0.50	0.7	2003	0.2	0.5	-0.1	0.74	0.1
2004	1.2	1.9	0.4	0.32	0.4	2004	2.0	2.9	1.1	0.22	0.4
2005	1.8	3.2	0.5	0.33	0.6	2005	2.6	4.7	0.6	0.37	1.0
2006	5.6	9.2	2.0	0.29	1.6	2006	7.8	14.1	1.6	0.38	3.0
2007	4.9	7.5	2.2	0.26	1.3	2007	7.7	11.6	3.7	0.25	1.9
2008	7.6	12.6	2.6	0.32	2.4	2008	2.8	4.4	1.1	0.29	0.8
2009	2.1	3.1	1.0	0.25	0.5	2009	1.6	2.6	0.6	0.29	0.5
2010	3.8	9.4	-1.8	0.71	2.7	2010	3.0	6.5	-0.5	0.56	1.7
2011	2.2	3.8	0.6	0.36	0.8	2011	2.2	3.8	0.6	0.36	0.8
2016	3.3	4.7	1.9	0.20	0.7	2016	6.3	12.2	0.5	0.43	2.7

Table 2 continued.

	mean	UCL	LCL	CV	sd
Total					
2002	71.9	94.4	49.4	0.15	10.9
2003	37.0	52.1	21.9	0.19	7.2
2004	59.0	82.2	35.7	0.19	11.3
2005	86.0	140.0	32.0	0.30	26.0
2006	120.7	172.3	69.1	0.21	24.9
2007	139.1	219.6	58.6	0.27	37.3
2008	115.7	169.8	61.7	0.23	26.4
2009	150.5	213.9	87.1	0.20	30.5
2010	64.2	98.9	29.5	0.26	16.7
2011	70.8	104.9	36.7	0.22	15.5
2016	120.8	216.2	25.4	0.31	37.1

Table 3. Stratified mean catch per tow of horseshoe crabs in the coastal **Delaware Bay area** survey **core region**, 2001-2016, with standard deviation (sd) and coefficient of variation (CV), calculated using the **delta distribution** model, by demographic group. Also included are the estimated upper and lower 95% confidence limits (UCL, LCL).

	mean	UCL	LCL	CV	sd		mean	UCL	LCL	CV	sd
Immature females						Immature males					
2001	10.3	16.0	4.6	0.26	2.7	2001	5.3	8.4	2.1	0.28	1.5
2002	17.8	34.1	1.5	0.39	6.9	2002	9.8	20.2	-0.5	0.43	4.2
2003	5.6	19.9	-8.6	0.59	3.3	2003	2.3	6.2	-1.7	0.40	0.9
2004	18.1	29.7	6.6	0.29	5.3	2004	14.5	26.4	2.5	0.32	4.6
2005	28.9	50.8	6.9	0.36	10.5	2005	33.7	72.0	-4.6	0.53	17.9
2006	32.2	57.8	6.7	0.34	10.8	2006	23.7	54.3	-6.9	0.41	9.6
2007	44.7	100.8	-11.4	0.45	20.2	2007	36.0	80.2	-8.3	0.50	18.1
2008	24.4	47.2	1.7	0.38	9.3	2008	16.7	32.0	1.4	0.39	6.5
2009	22.5	49.9	-4.9	0.47	10.7	2009	23.8	60.3	-12.7	0.55	13.2
2010	9.9	15.1	4.7	0.22	2.1	2010	5.8	11.2	0.3	0.44	2.6
2011	12.3	17.8	6.8	0.19	2.4	2011	7.5	11.6	3.3	0.23	1.7
2016	34.9	230.5	-160.7	0.44	15.4	2016	25.7	169.6	-118.3	0.44	11.3
Mature females						Mature males					
2001	10.4	14.5	6.3	0.19	2.0	2001	19.7	29.7	9.6	0.24	4.8
2002	11.2	16.6	5.9	0.22	2.5	2002	24.2	34.2	14.1	0.20	4.8
2003	11.7	19.9	3.4	0.27	3.2	2003	25.9	46.5	5.2	0.33	8.4
2004	8.2	12.9	3.5	0.27	2.2	2004	22.3	38.4	6.2	0.34	7.6
2005	12.8	23.4	2.2	0.39	4.9	2005	24.7	38.2	11.2	0.26	6.3
2006	24.6	45.6	3.5	0.27	6.6	2006	47.9	77.5	18.4	0.24	11.5
2007	29.1	47.9	10.3	0.31	8.9	2007	63.3	104.7	21.9	0.31	19.4
2008	21.9	34.5	9.4	0.27	6.0	2008	48.1	73.7	22.5	0.25	12.1
2009	9.8	19.7	-0.1	0.45	4.4	2009	21.2	40.7	1.6	0.41	8.6
2010	17.5	26.3	8.7	0.24	4.1	2010	49.4	76.9	22.0	0.26	12.8
2011	16.4	34.4	-1.6	0.39	6.5	2011	63.6	136.4	-9.2	0.41	26.2
2016	17.2	76.7	-42.4	0.27	4.7	2016	91.0	640.7	-458.7	0.48	43.3
Newly mature females						Newly mature males					
2001	1.6	2.3	0.9	0.21	0.3	2001	1.3	2.4	0.3	0.37	0.5
2002	2.2	3.6	0.8	0.29	0.6	2002	0.9	1.6	0.2	0.39	0.3
2003	0.2	0.5	-0.1	0.31	0.1	2003	0.1	0.3	-0.1	0.85	0.1
2004	1.7	2.9	0.5	0.32	0.5	2004	1.5	2.7	0.3	0.37	0.6
2005	1.5	3.9	-0.9	0.51	0.8	2005	2.6	5.5	-0.4	0.51	1.3
2006	4.1	9.2	-0.9	0.38	1.6	2006	10.5	24.2	-3.2	0.57	5.9
2007	4.6	9.2	0.0	0.45	2.1	2007	10.6	18.8	2.4	0.35	3.7
2008	6.3	11.7	1.0	0.40	2.5	2008	2.3	4.1	0.6	0.35	0.8
2009	1.2	2.3	0.1	0.42	0.5	2009	0.3	0.8	-0.2	0.49	0.1
2010	4.0	9.8	-1.8	0.67	2.7	2010	4.6	10.8	-1.7	0.64	2.9
2011	2.1	3.5	0.8	0.28	0.6	2011	2.5	5.7	-0.8	0.51	1.2
2016	4.3	6.6	1.9	0.23	1.0	2016	9.5	66.3	-47.4	0.47	4.5

Table 3 continued.

	mean	UCL	LCL	cv	sd
Total					
2001	51.7	75.4	28.1	0.22	11.4
2002	67.2	103.8	30.5	0.25	16.5
2003	48.9	86.7	11.1	0.30	14.7
2004	66.5	103.8	29.2	0.26	17.5
2005	105.9	184.8	27.0	0.36	37.7
2006	139.3	240.6	38.1	0.26	36.5
2007	208.4	365.6	51.2	0.35	73.7
2008	119.1	182.8	55.3	0.25	29.9
2009	103.6	224.1	-16.9	0.48	49.2
2010	92.0	142.3	41.6	0.26	23.7
2011	108.8	194.3	23.2	0.31	33.3
2016	179.7	1126.1	-766.6	0.41	74.5



Table 4. Stratified mean catch per tow of horseshoe crabs in the coastal **Delaware Bay area** survey **core region**, 2001-2016, with standard deviation (sd) and coefficient of variation (CV), calculated using the **normal distribution** model, by demographic group. Also included are the estimated upper and lower 95% confidence limits (UCL, LCL).

	mean	UCL	LCL	CV	sd		mean	UCL	LCL	CV	sd
Immature females						Immature males					
2001	9.2	12.2	6.1	0.16	1.5	2001	4.7	6.7	2.8	0.20	1.0
2002	16.3	28.3	4.3	0.33	5.3	2002	9.8	18.6	1.1	0.41	4.1
2003	6.6	21.1	-7.8	0.51	3.4	2003	2.2	5.1	-0.6	0.40	0.9
2004	18.3	28.3	8.4	0.25	4.6	2004	13.6	21.2	6.1	0.25	3.4
2005	31.4	59.0	3.8	0.41	12.9	2005	36.2	81.7	-9.2	0.58	21.1
2006	35.5	68.4	2.7	0.40	14.3	2006	23.0	41.6	4.4	0.36	8.2
2007	43.6	93.6	-6.5	0.45	19.5	2007	44.7	101.6	-12.2	0.58	26.1
2008	24.1	42.8	5.5	0.33	7.9	2008	15.7	27.3	4.1	0.31	4.9
2009	23.2	57.7	-11.2	0.53	12.4	2009	22.3	56.7	-12.0	0.55	12.4
2010	10.3	16.0	4.6	0.26	2.7	2010	5.8	11.3	0.3	0.44	2.6
2011	12.4	18.0	6.7	0.20	2.4	2011	7.5	11.4	3.6	0.23	1.7
2016	32.4	90.8	-26.0	0.42	13.6	2016	22.9	63.2	-17.3	0.41	9.4
Mature females						Mature males					
2001	11.0	15.7	6.3	0.21	2.3	2001	19.6	28.0	11.2	0.21	4.1
2002	11.5	17.8	5.2	0.25	2.9	2002	24.5	35.4	13.6	0.21	5.1
2003	11.3	17.8	4.9	0.24	2.7	2003	23.8	38.3	9.3	0.26	6.1
2004	8.9	13.7	4.1	0.25	2.2	2004	22.4	37.0	7.8	0.30	6.8
2005	13.6	25.5	1.8	0.40	5.5	2005	24.3	36.8	11.8	0.24	5.9
2006	25.1	49.2	1.0	0.30	7.6	2006	48.3	78.3	18.2	0.25	12.3
2007	25.7	40.1	11.4	0.26	6.7	2007	52.3	74.7	29.9	0.20	10.4
2008	26.3	46.6	6.0	0.37	9.7	2008	54.7	91.5	17.8	0.32	17.4
2009	9.7	19.3	0.1	0.43	4.2	2009	20.6	36.8	4.4	0.35	7.2
2010	18.2	28.6	7.8	0.26	4.8	2010	48.9	75.6	22.1	0.25	12.3
2011	14.2	24.6	3.8	0.28	4.0	2011	57.4	105.0	9.8	0.30	17.2
2016	16.1	34.0	-1.7	0.26	4.1	2016	90.7	636.1	-454.7	0.47	42.9
Newly mature females						Newly mature males					
2001	1.7	2.5	0.9	0.23	0.4	2001	1.3	2.2	0.4	0.34	0.4
2002	2.2	3.7	0.8	0.29	0.7	2002	0.9	1.7	0.1	0.41	0.4
2003	0.2	0.5	0.0	0.32	0.1	2003	0.1	0.3	-0.1	0.85	0.1
2004	1.7	2.9	0.6	0.30	0.5	2004	1.7	2.9	0.5	0.33	0.6
2005	1.5	3.6	-0.6	0.51	0.8	2005	2.5	5.1	-0.1	0.47	1.2
2006	4.2	8.7	-0.3	0.39	1.6	2006	9.6	22.7	-3.6	0.58	5.5
2007	4.4	8.2	0.6	0.38	1.7	2007	9.7	16.1	3.4	0.31	3.0
2008	7.9	15.0	0.8	0.42	3.3	2008	2.4	4.4	0.5	0.38	0.9
2009	1.2	2.3	0.1	0.41	0.5	2009	0.3	0.6	0.0	0.49	0.1
2010	5.6	15.7	-4.5	0.82	4.6	2010	4.6	10.8	-1.6	0.62	2.9
2011	2.2	3.6	0.8	0.28	0.6	2011	2.3	4.6	0.0	0.40	0.9
2016	4.1	5.9	2.3	0.21	0.9	2016	10.1	25.3	-5.0	0.47	4.8

Table 4 continued.

	mean	UCL	LCL	cv	sd
Total					
2001	47.5	62.8	32.2	0.16	7.6
2002	65.2	94.4	36.1	0.21	13.6
2003	44.3	71.3	17.4	0.24	10.5
2004	66.7	101.1	32.3	0.24	16.0
2005	109.6	191.7	27.4	0.35	38.6
2006	145.6	240.2	51.0	0.29	41.8
2007	180.3	302.2	58.5	0.31	55.9
2008	131.1	209.0	53.2	0.28	37.4
2009	78.0	144.6	11.4	0.36	28.2
2010	93.4	151.5	35.3	0.29	26.7
2011	98.4	158.6	38.1	0.24	23.4
2016	176.5	1098.9	-745.9	0.41	72.6

Table 5. Stratified mean catch per tow of horseshoe crabs in the **lower Delaware Bay** survey area in 2010-2016, with standard deviation (sd) and coefficient of variation (CV), calculated using the **delta distribution** model, by demographic group. Also included are the estimated upper and lower 95% confidence limits (UCL, LCL).

	mean	UCL	LCL	CV	sd		mean	UCL	LCL	CV	sd
Immature females						Immature males					
2010	86.2	137.9	34.5	0.25	21.9	2010	65.6	113.8	17.4	0.32	21.3
2011	20.8	44.2	-2.6	0.44	9.1	2011	21.3	44.9	-2.3	0.43	9.2
2012	173.1	320.9	25.2	0.33	57.5	2012	182.5	356.8	8.2	0.37	67.8
2016	211.3	363.3	59.3	0.26	54.7	2016	191.9	312.8	71.0	0.25	47.0
Mature females						Mature males					
2010	45.4	88.1	2.7	0.38	17.4	2010	121.1	209.1	33.2	0.31	37.2
2011	25.9	45.6	6.2	0.30	7.7	2011	94.2	174.1	14.2	0.33	31.1
2012	17.2	33.0	1.3	0.29	5.0	2012	63.7	113.9	13.5	0.31	19.5
2016	27.2	37.1	17.3	0.14	3.8	2016	167.8	201.2	134.3	0.08	13.7
Newly mature females						Newly mature males					
2010	9.7	25.8	-6.4	0.68	6.6	2010	4.3	9.6	-1.0	0.50	2.2
2011	1.3	3.3	-0.6	0.57	0.8	2011	1.3	4.0	-1.4	0.83	1.0
2012	0.7	1.7	-0.4	0.58	0.4	2012	6.6	17.9	-4.7	0.54	3.6
2016	5.3	9.2	1.4	0.27	1.4	2016	18.8	32.6	4.9	0.27	5.0
						Total					
						2010	327.3	530.2	124.5	0.25	82.9
						2011	172.5	316.1	28.9	0.32	55.9
						2012	434.0	762.2	105.7	0.29	127.7
						2016	609.1	825.7	392.5	0.13	78.0

Table 6. Stratified mean catch per tow of horseshoe crabs in the **lower Delaware Bay** survey area in 2010-2016, with standard deviation (sd) and coefficient of variation (CV), calculated using the **normal distribution** model, by demographic group. Also included are the estimated upper and lower 95% confidence limits (UCL, LCL).

	mean	UCL	LCL	CV	sd		mean	UCL	LCL	CV	sd
Immature females						Immature males					
2010	86.9	141.7	32.0	0.26	22.4	2010	64.1	104.1	24.1	0.28	17.7
2011	21.4	46.3	-3.6	0.45	9.7	2011	22.2	48.6	-4.2	0.46	10.3
2012	171.5	321.8	21.1	0.32	54.1	2012	178.4	326.3	30.6	0.34	60.4
2016	204.4	305.6	103.1	0.19	39.4	2016	184.1	263.6	104.7	0.17	30.9
Mature females						Mature males					
2010	52.2	121.4	-17.0	0.54	28.3	2010	131.7	267.8	-4.4	0.42	55.6
2011	28.8	42.8	14.8	0.20	5.7	2011	92.2	158.1	26.3	0.28	25.6
2012	17.1	32.6	1.6	0.28	4.9	2012	62.5	104.9	20.1	0.26	16.5
2016	27.0	35.9	18.2	0.13	3.4	2016	167.7	199.5	135.8	0.08	13.0
Newly mature females						Newly mature males					
2010	11.5	33.4	-10.4	0.78	8.9	2010	4.5	10.4	-1.5	0.55	2.4
2011	1.3	3.1	-0.5	0.53	0.7	2011	1.3	4.0	-1.4	0.83	1.0
2012	0.7	1.7	-0.4	0.58	0.4	2012	6.6	17.8	-4.6	0.53	3.5
2016	5.2	8.9	1.6	0.25	1.3	2016	18.6	31.2	6.1	0.24	4.5
						Total					
						2010	350.9	656.8	44.9	0.36	125.0
						2011	167.1	279.7	54.4	0.26	43.8
						2012	436.8	767.1	106.4	0.29	128.5
						2016	607.1	783.3	430.8	0.11	68.6

Table 7. Mean prosomal widths (mm) and standard deviations (sd) of newly mature and mature males and females from the Delaware Bay area and lower Delaware Bay trawl surveys, 2002-2016, calculated using the FiSAT II program's NORMSEP method of modal progression analysis.

Year	Delaware Bay area		Lower Delaware Bay		Year	Delaware Bay area		Lower Delaware Bay	
	Mean	sd	Mean	sd		Mean	sd	Mean	sd
Mature females					Mature males				
2002	267	18.7	-	-	2002	212	14.1	-	-
2003	268	18.2	-	-	2003	210	15.6	-	-
2004	270	19.2	-	-	2004	210	14.1	-	-
2005	268	18.5	-	-	2005	210	13.0	-	-
2006	268	20.5	-	-	2006	209	13.2	-	-
2007	267	19.7	-	-	2007	208	13.6	-	-
2008	268	20.0	-	-	2008	207	12.5	-	-
2009	267	18.9	-	-	2009	206	14.8	-	-
2010	264	17.9	259	15.9	2010	206	14.0	203	11.3
2011	263	18.7	265	17.6	2011	208	14.2	203	13.0
2012	-	-	262	17.8	2012	-	-	202	14.5
2016	258	20.0	255	16.3	2016	196	15.1	198	14.2
Newly mature females					Newly mature males				
2002	262	15.2	-	-	2002	202	13.4	-	-
2003	271	16.2	-	-	2003	202	8.2	-	-
2004	257	19.9	-	-	2004	209	13.8	-	-
2005	258	13.4	-	-	2005	209	12.7	-	-
2006	264	17.9	-	-	2006	207	10.6	-	-
2007	260	15.8	-	-	2007	211	14.4	-	-
2008	261	16.9	-	-	2008	212	12.0	-	-
2009	271	20.3	-	-	2009	206	12.5	-	-
2010	260	15.1	265	21.1	2010	203	15.1	184	17.4
2011	259	24.4	257	5.7	2011	204	14.7	188	3.3
2012	-	-	250	15.7	2012	-	-	203	14.6
2016	245	19.0	246	19.6	2016	204	13.1	195	12.2

Table 8. Results of regression analyses of mean prosomal width (mm) on survey year for newly mature and mature males and females from the Delaware Bay area survey. Mean widths are listed in Table 7. Statistics presented are number of years included,  $n$ ;  $T$ -score; probability,  $p$ ; and correlation coefficient,  $r$ . A negative correlation coefficient indicates a decreasing regression slope.

<u>Maturity group</u>	<u><math>n</math></u>	<u><math>T</math></u>	<u><math>p</math></u>	<u><math>r</math></u>
2002-2016				
Mature females	11	-5.26	<0.001	-0.869
Newly mature females	11	-2.10	0.065	-0.574
Mature males	11	-6.53	<0.001	-0.909
Newly mature males	11	-0.21	0.839	-0.069
2002-2011				
Mature females	10	-2.89	0.020	-0.714
Newly mature females	10	-0.30	0.769	-0.107
Mature males	10	-5.30	<0.001	-0.882
Newly mature males	10	0.33	0.753	0.114

Table 9. Mean, minimum (min) and maximum (max) bottom water temperature (C°) and ordinal sampling date (numerical calendar date from 1 January) for survey collections in the Delaware Bay area and Lower Delaware Bay. For reference, 1 September is ordinal date 243 in non-leap years.

	Water temperature			Ordinal date		
	mean	min	max	mean	min	max
Delaware Bay area						
2002	19.6	15.0	23.5	289	274	301
2003	17.4	13.5	20.0	288	279	297
2004	16.7	14.5	20.5	294	278	303
2005	20.8	14.0	24.5	261	251	307
2006	17.4	13.0	22.3	287	247	315
2007	19.5	14.3	23.3	297	283	312
2008	20.1	19.3	22.6	278	273	288
2009	15.6	14.3	17.0	315	307	324
2010	19.3	12.3	24.1	284	265	331
2011	21.5	18.6	23.8	265	254	296
2016	22.5	18.6	24.8	276	260	299
Lower Delaware Bay						
2010	17.2	16.7	17.7	295	295	296
2011	18.3	18.0	18.6	294	294	295
2012	18.0	17.9	18.0	299	299	299
2016	19.6	19.0	20.1	289	288	289

Table 10. Correlations between annual mean catches per tow of horseshoe crabs with mean bottom water temperature and ordinal sampling date in the Delaware Bay area survey and the lower Delaware Bay survey, by demographic group. The Delaware Bay area surveys included 11 years, and the lower Delaware Bay surveys included four years. Statistics presented include correlation coefficient,  $r$ ;  $T$ -score; and probability,  $p$ . Data are from Tables 1, 5 and 9.

	Water temperature			Ordinal date		
	$r$	$T$	$p$	$r$	$T$	$p$
Delaware Bay area						
Immature females	-0.435	-1.45	0.181	0.644	2.53	0.032
Immature males	-0.478	-1.63	0.137	0.642	2.51	0.033
Mature females	0.578	2.13	0.063	-0.215	-0.66	0.525
Mature males	0.674	2.74	0.023	-0.315	-0.99	0.346
Newly mature females	0.183	0.56	0.589	0.027	0.08	0.938
Newly mature males	0.218	0.67	0.519	0.036	0.11	0.917
Lower Delaware Bay						
Immature females	0.537	0.90	0.463	0.072	0.10	0.928
Immature males	0.515	0.85	0.485	-0.078	-0.11	0.922
Mature females	-0.461	-0.73	0.539	0.500	0.82	0.500
Mature males	0.594	1.04	0.406	0.956	4.62	0.044
Newly mature females	-0.275	-0.40	0.725	0.577	1.00	0.423
Newly mature males	0.802	1.90	0.198	0.542	0.91	0.458



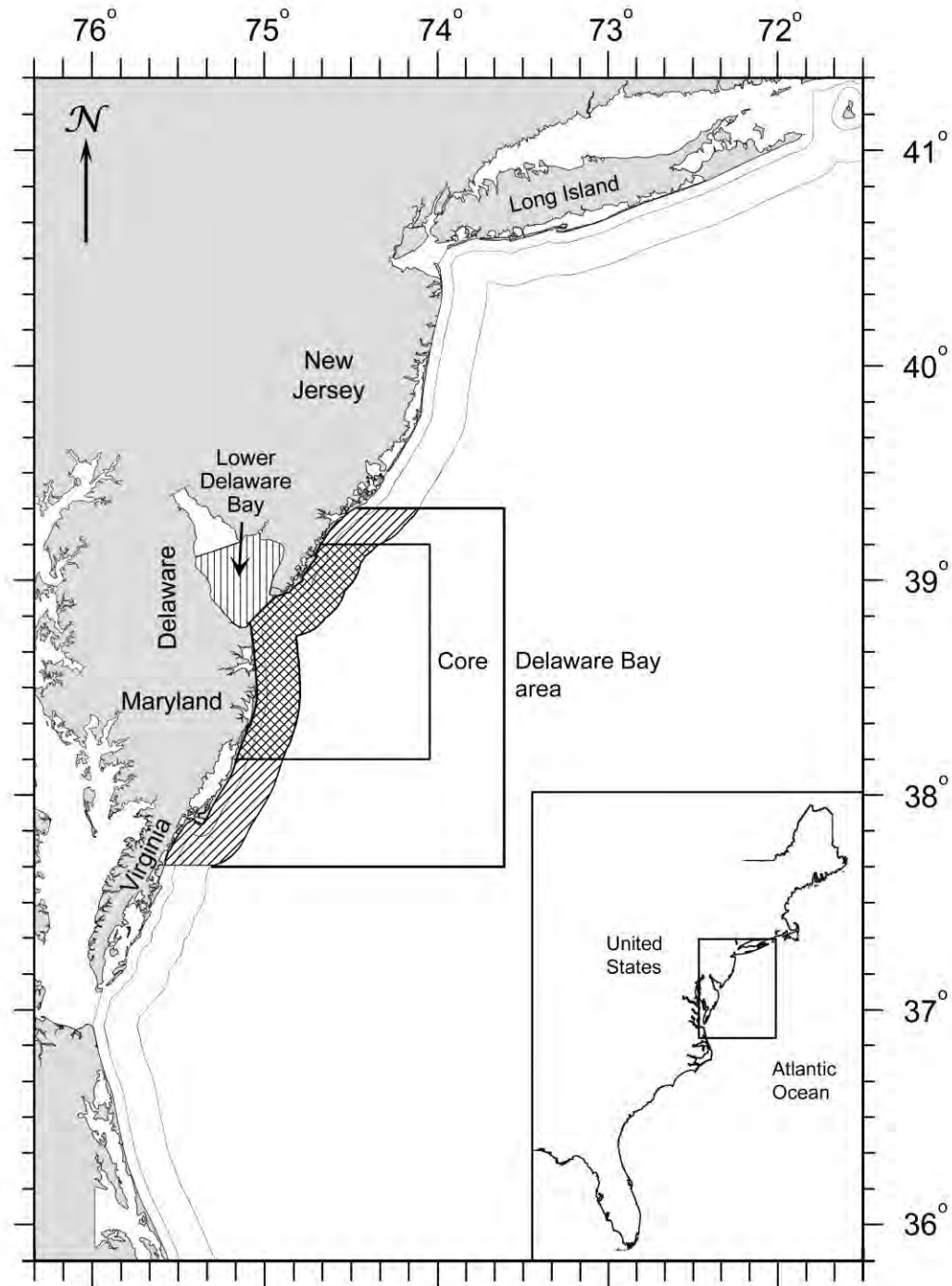


Figure 1. Fall 2016 horseshoe crab trawl survey sampling area. The coastal Delaware Bay area (DBA) and Lower Delaware Bay (LDB) survey areas are indicated. Mean catches among years were compared using stations within the shaded portions of the survey areas. The core DBA survey region, indicated by crossed lines, was surveyed from 2001 to 2011, and again in 2016. The Lower Delaware Bay was sampled from 2010 to 2012, and again in 2016.

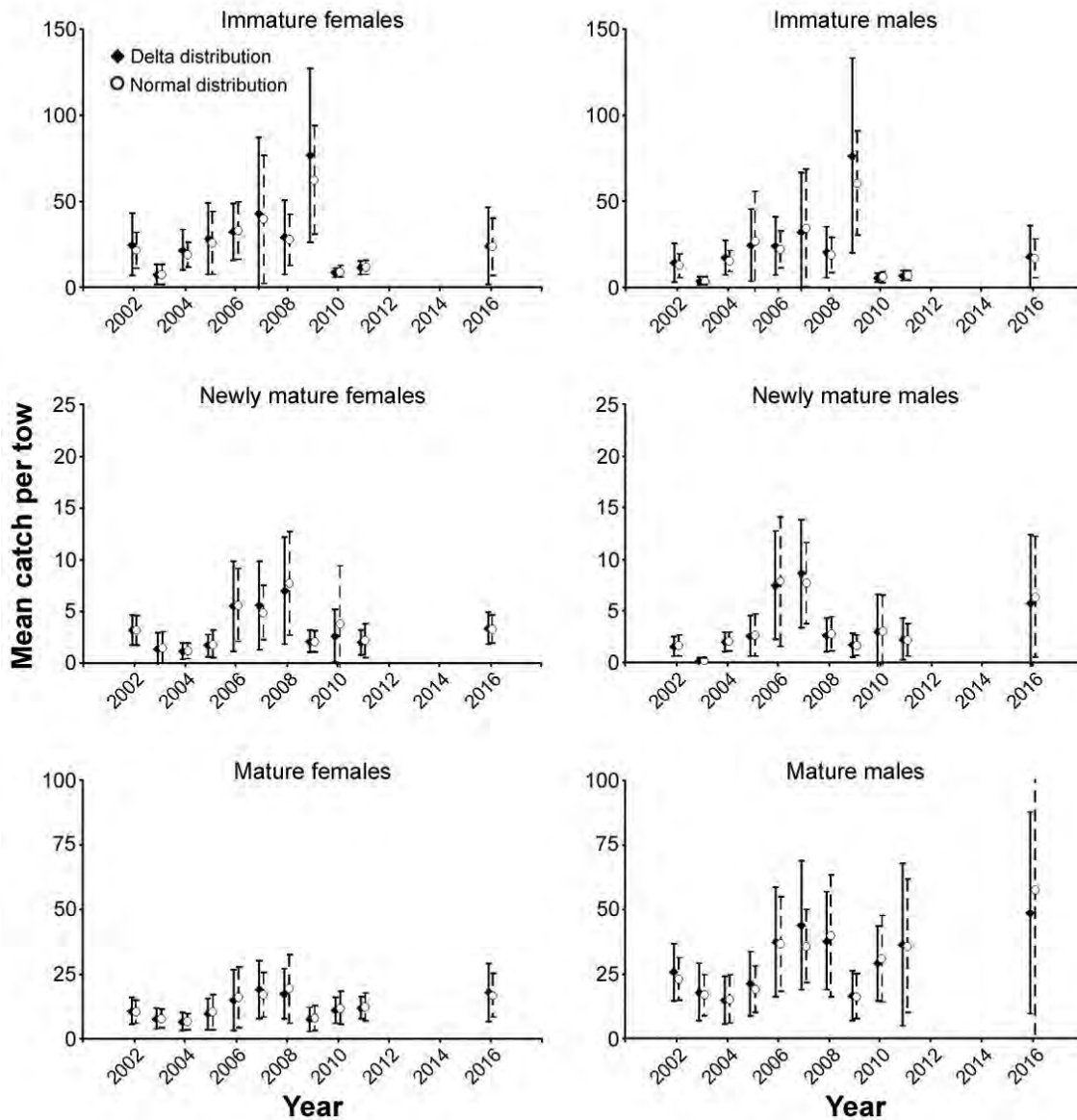


Figure 2. Plots of stratified mean catches per 15-minute tow of horseshoe crabs in the coastal **Delaware Bay** area survey by demographic group. Vertical lines indicate 95% confidence limits. Solid symbols and lines indicate the **delta distribution** model. Open symbols and dashed lines indicate the **normal distribution** model. Data are from Tables 1 and 2. Note differences in y-axis scales.

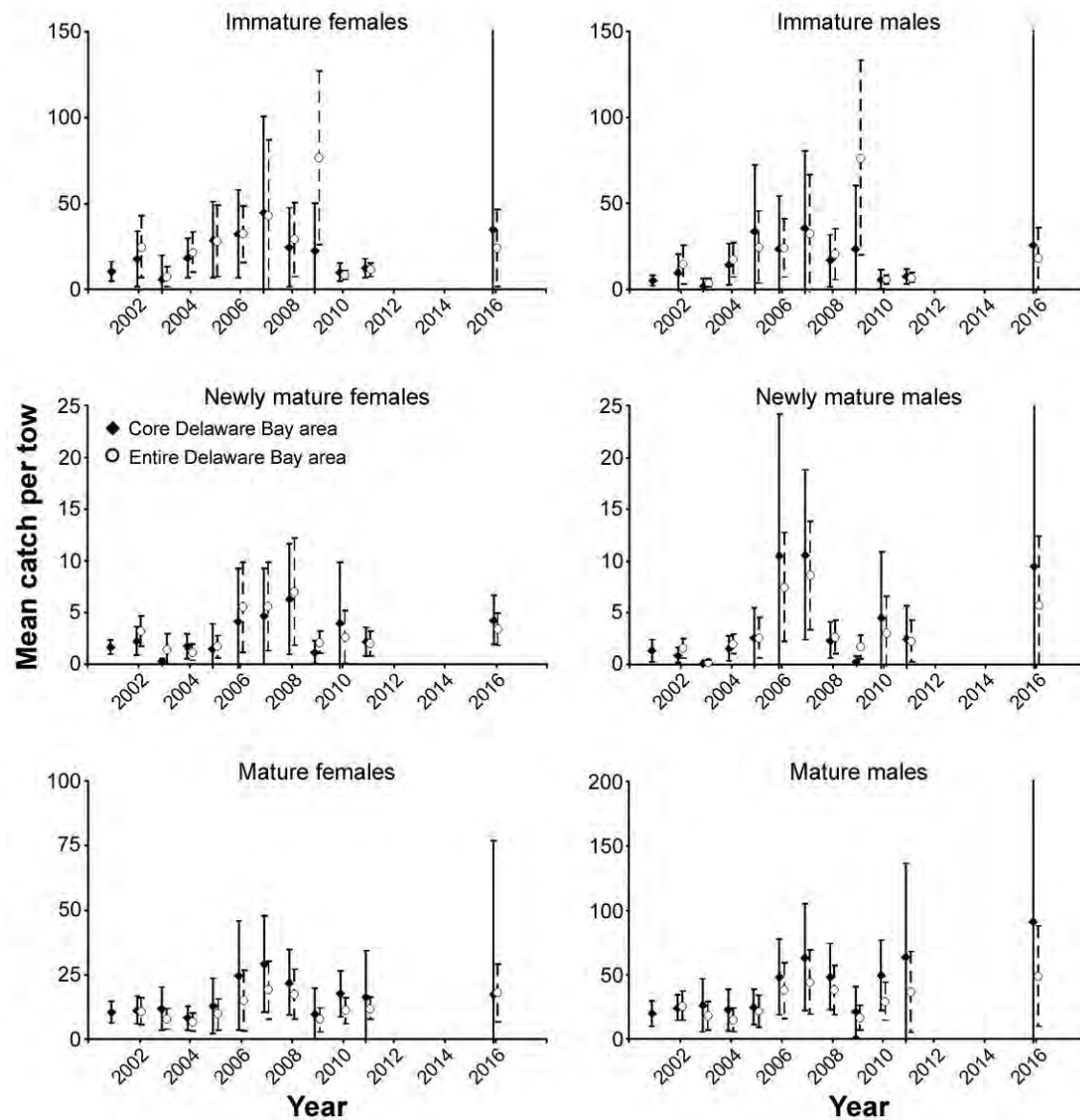


Figure 3. Plots of stratified mean catches per tow of horseshoe crabs in the **core region** of the coastal **Delaware Bay area** survey by demographic group. Vertical lines indicate 95% confidence limits. Catches in the **entire Delaware Bay area** are shown for comparison. Only **delta distribution** means are illustrated for the sake of clarity. Solid symbols and lines indicate the **core region**. Open symbols and dashed lines indicate the **entire survey region**. Data are from Tables 1 and 3. Note differences in y-axis scales.

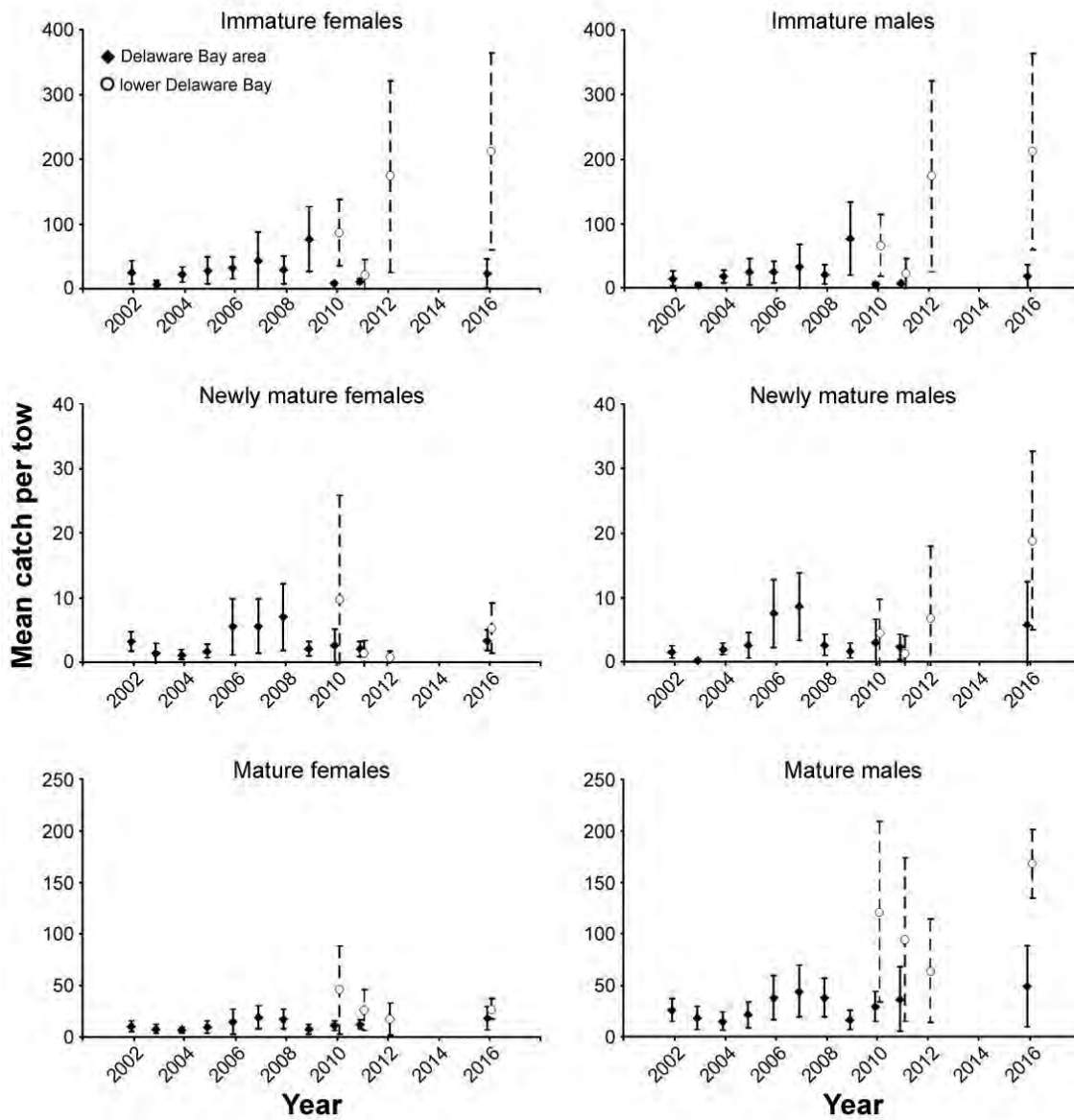


Figure 4. Stratified mean catches per tow of horseshoe crabs in the **lower Delaware Bay** survey by demographic group, 2010-2011, with coastal **Delaware Bay area** survey means for comparison. Vertical lines indicate 95% confidence limits. Only the **delta distribution** model means are presented for clarity. Solid symbols and lines indicate the coastal Delaware Bay area survey. Open symbols and dashed lines indicate the lower Delaware Bay survey. Note differences in y-axis scales.

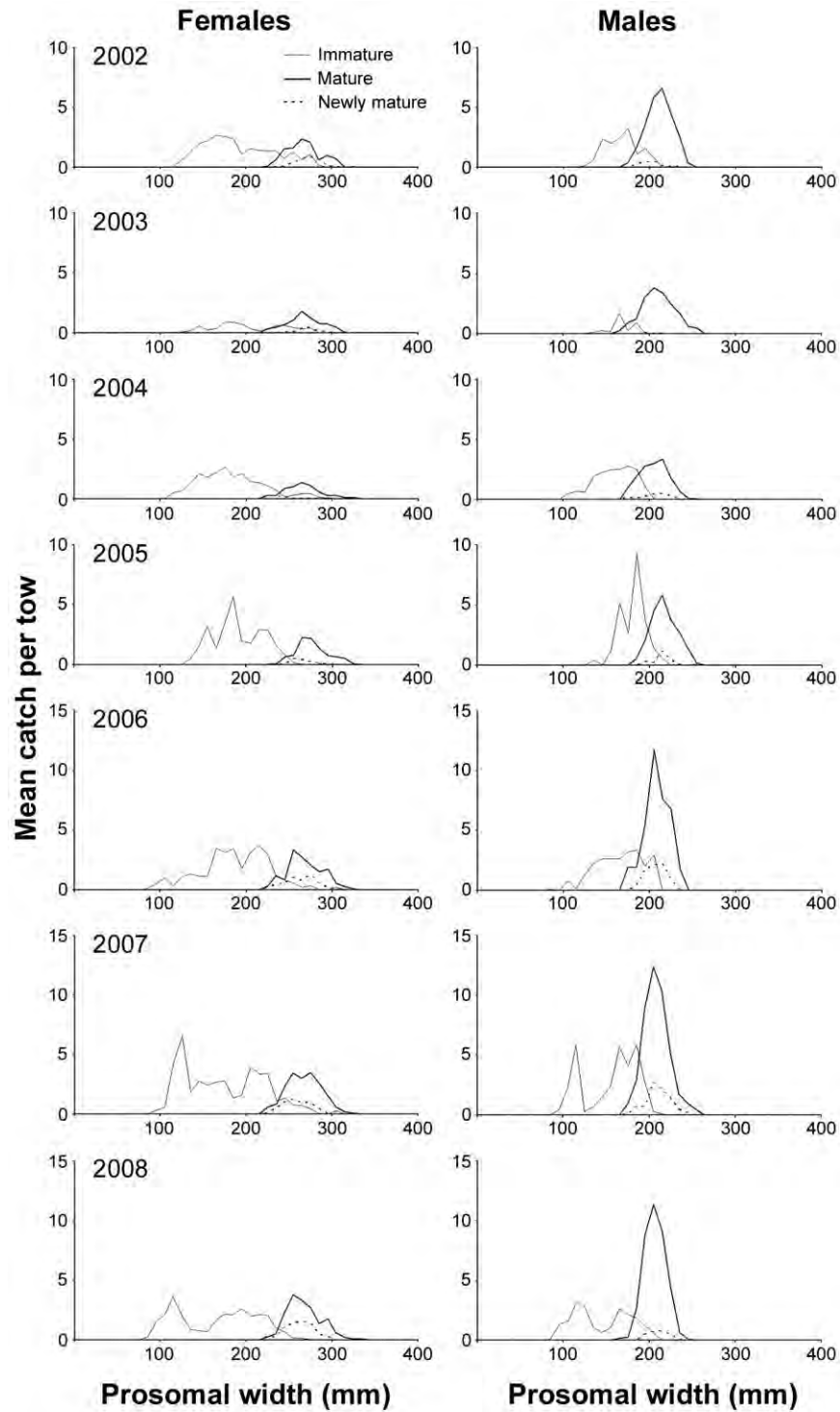


Figure 5. Relative size-frequency distributions of horseshoe crabs, by demographic group and year, in the coastal **Delaware Bay area** trawl survey. Relative frequencies are scaled to represent stratified mean catches in Table 1.

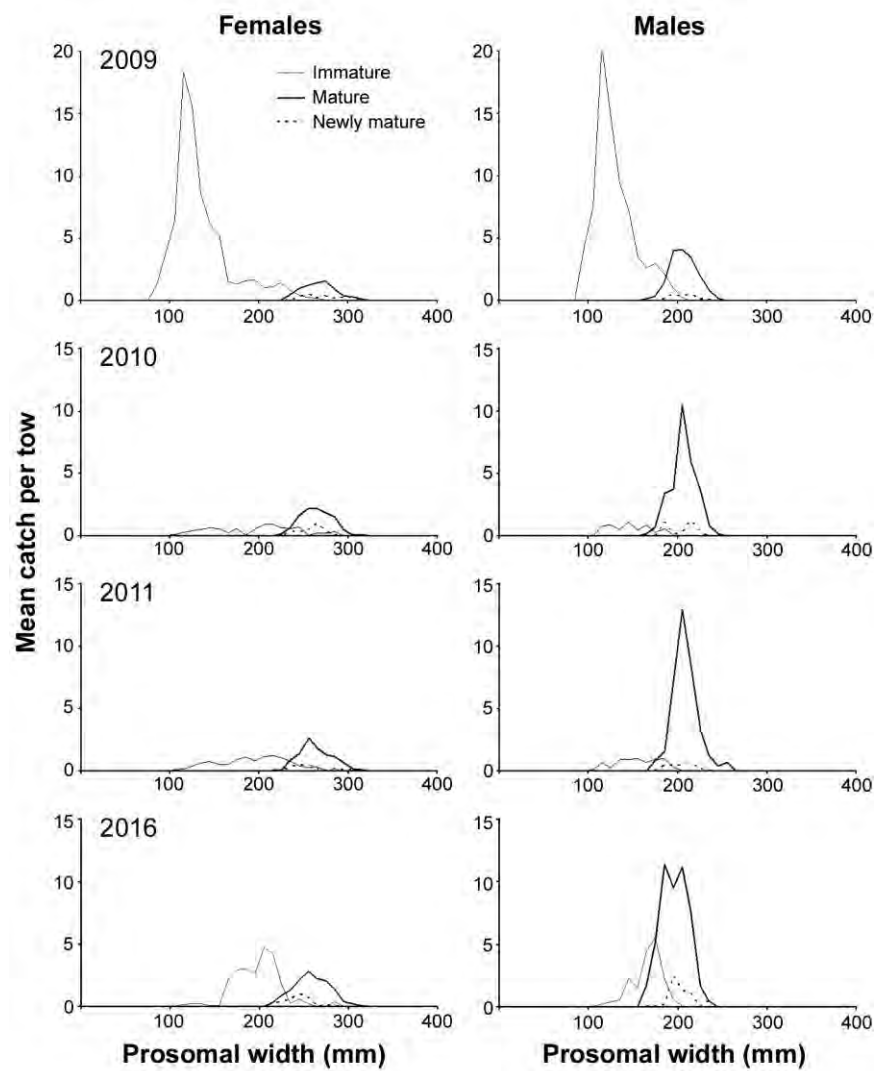


Figure 5 (continued).

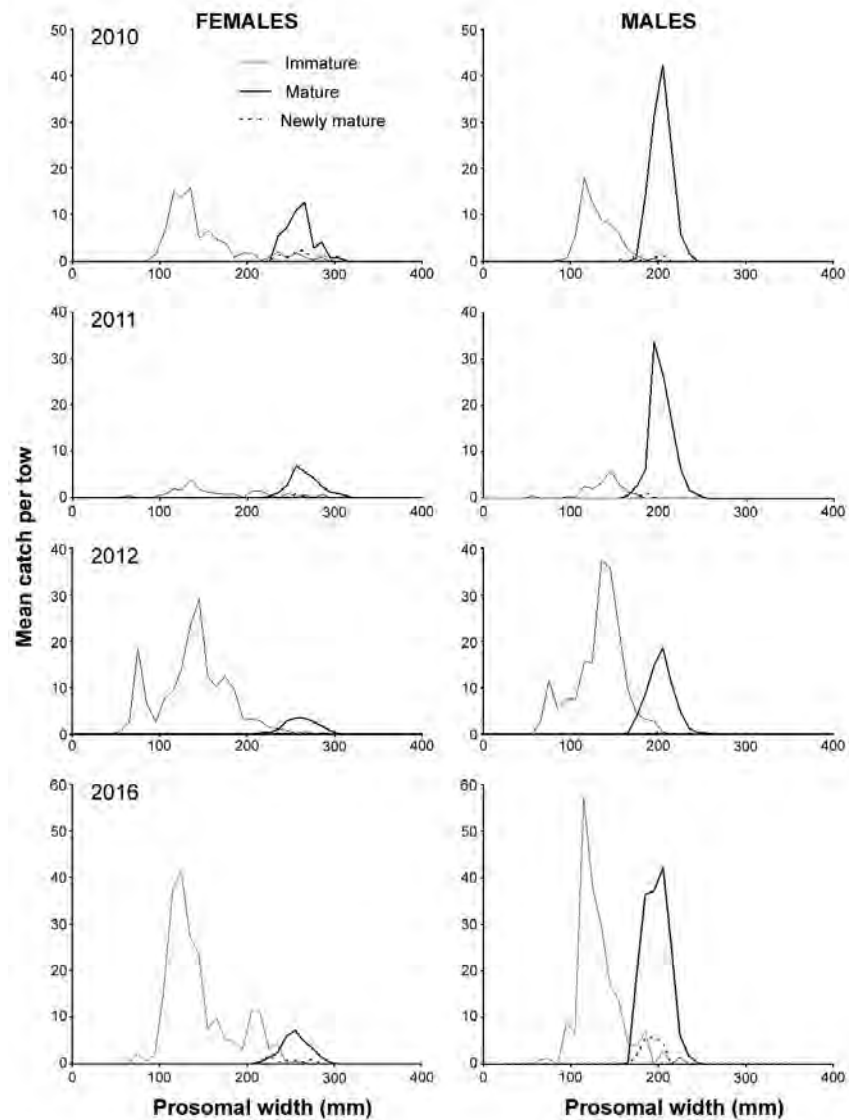


Figure 6. Relative size-frequency distributions of horseshoe crabs, by demographic group and year, in the **lower Delaware Bay** trawl survey. Relative frequencies are scaled to represent stratified mean catches in Table 7.

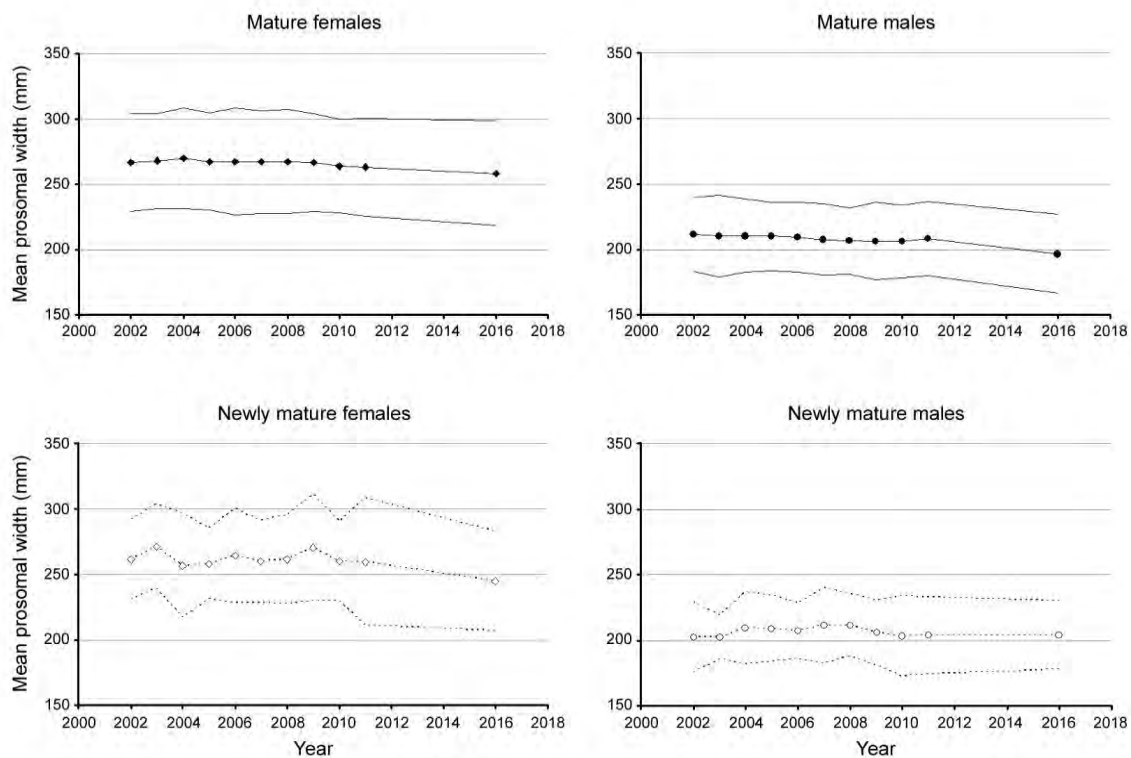


Figure 7. Mean prosomal widths (mm) ( $\pm 2$  standard deviations) of mature and newly mature female and male horseshoe crabs in the Delaware Bay area survey, 2002-2016. Means and standard deviations were calculated using the FiSAT II program's NORMSEP method of modal progression analysis. Values are from Table 9.



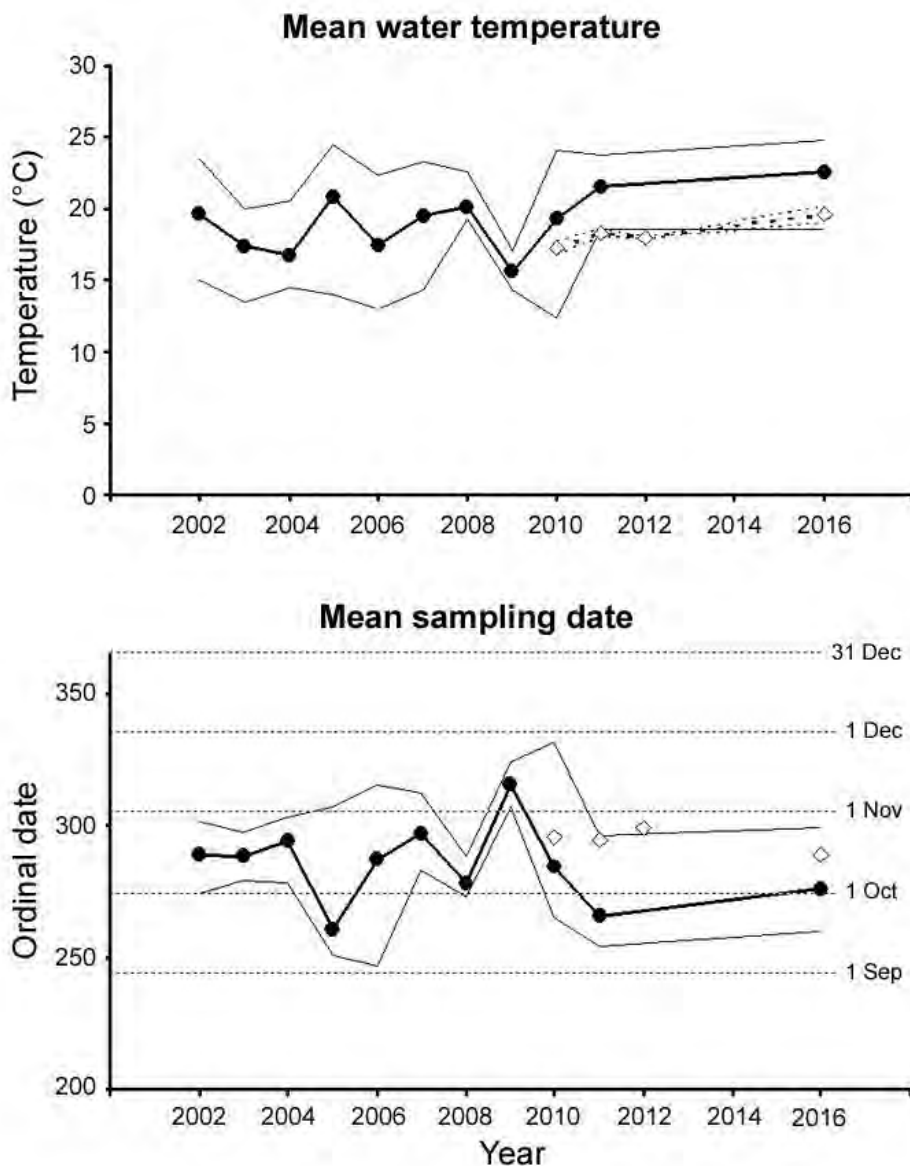


Figure 8. Plots of mean bottom water temperatures and ordinal sampling dates (days since 1 January) in the coastal Delaware Bay area and lower Delaware Bay trawl surveys. Solid symbols and heavy lines indicate means, and light lines indicate ranges for the coastal DBA survey. Open diamonds indicate means for the lower Delaware Bay survey. Approximate calendar dates are indicated by dashed lines for reference (ordinal dates are shifted by one day for leap years).

# Adult Horseshoe Crab Abundance in the Delaware Bay

Delaware Bay ARM Workgroup

Report to the Delaware Bay Ecosystem Technical Committee

July 31, 2017

## Introduction

In 2015, the Adaptive Resource Management (ARM) workgroup developed a horseshoe crab abundance index based on three trawl surveys in the Delaware Bay region: Delaware 30 foot trawl survey, the New Jersey Delaware Bay trawl survey, and the New Jersey Ocean trawl survey. This composite index was developed because the Virginia Tech trawl survey, which was used to estimate horseshoe crab abundance, lost funding and did not occur. The ARM workgroup showed that the composite index from the three other trawl surveys correlated well with the Virginia Tech Trawl survey for years in which data overlapped and could be used as a substitute for the Virginia Tech Trawl survey when estimating the abundance of male and female horseshoe crabs. The Virginia Tech Trawl Survey was funded and occurred in 2016. This report adds data collected in 2016, updates the composite index, updates the correlation between the composite index and the Virginia Tech Trawl Survey and extrapolates the composite index to horseshoe crab abundance.

## Methods

Relative abundance data from the Delaware 30 foot trawl survey, the New Jersey Delaware Bay trawl survey, and the New Jersey Ocean trawl survey were used as input to a linear mixed random effects model to generate the composite index for each year from 1998 – 2016. In this model, each individual survey within a year represented the random effect. The model was fit using the “lme” function from the package “nlme” in R 3.0.2 and was specified as a non-intercept model to allow for year specific estimates of abundance rather than differences for each year from the intercept. Index values from each survey were  $\ln + 0.01$  transformed prior to model fitting and final yearly indices of abundance from the model were back-transformed.

Estimates of mean horseshoe crab density were calculated based on the swept area of the Virginia Tech trawl. Mean density estimates were then expanded by the total area included in the trawl survey to calculate a total abundance estimate (Dave Hata, VA Tech, personal communication). Linear regression models were then developed to relate the composite indices of abundance for each sex to the total abundance estimates from the Virginia Tech Trawl Survey. These models were then used to infer total horseshoe crab abundance for years in which the Virginia Tech Trawl Survey did not occur.

## Results

The relative abundance indices for both males and females increased in all trawl surveys from 2015 to 2016. These increases translated into an increase in the composite index of abundance of 54% for males and 63% for females over the 2015 values (Table 1, Figure 1).

Sex ratios (males:females) from the composite index have varied through the time series and were lowest in the first two years (1998 – 1999). Since 2000, the sex ratio has ranged between 1.07 and 1.70 (Table 2).

Regression of population estimates of male horseshoe crabs from the Virginia Tech Trawl Survey on the composite index of abundance showed a strong positive relationship ( $p = 0.002$ ) with 66% of the variation in abundance explained by the composite index. However, the relationship for female horseshoe crabs was much weaker ( $p = 0.252$ ) and only 14% of the variation in abundance was explained by the composite index (Figure 2).

Final estimates of total abundance for each sex are shown in Table 4 and Figure 3. Abundance of male horseshoe crabs was 24.4 million in 2016 as estimated directly from the Virginia Tech Trawl Survey and was 25.4 million as estimated from the composite index. Abundance of female horseshoe crabs was 7.7 million in 2016 as estimated directly from the Virginia Tech Trawl Survey and was 9.2 million as estimated from the composite index.

**Table 1.** Relative abundance index values from three trawl surveys in the Delaware Bay region and the composite abundance index derived from the three trawl surveys.

<b>Sex</b>	<b>Year</b>	<b>Delaware 30 ft. trawl</b>	<b>NJ DE Bay trawl</b>	<b>NJ ocean trawl</b>	<b>Composite Index</b>
Male	1998	0.34	0.29		<b>0.32</b>
	1999	0.42	0.17	0.50	<b>0.33</b>
	2000	0.75	0.33	0.45	<b>0.48</b>
	2001	0.57	0.18	0.27	<b>0.31</b>
	2002	0.07	0.25	0.32	<b>0.18</b>
	2003	0.82	0.18	0.44	<b>0.41</b>
	2004	0.02	0.19	0.47	<b>0.13</b>
	2005	0.06	0.46	0.56	<b>0.26</b>
	2006	0.68	0.30	0.47	<b>0.46</b>
	2007	1.04	0.58	0.27	<b>0.55</b>
	2008	0.20	0.42	0.24	<b>0.27</b>
	2009	0.41	0.21	0.28	<b>0.29</b>
	2010	0.36	0.53	0.21	<b>0.34</b>
	2011	0.43	0.42	0.39	<b>0.41</b>
	2012	0.23	0.34	0.32	<b>0.29</b>
	2013	0.09	0.47	0.53	<b>0.29</b>
	2014	1.19	0.18	0.44	<b>0.46</b>
2015	0.68	0.32	0.55	<b>0.49</b>	
2016	0.84	0.84	0.62	<b>0.76</b>	
Female	1998	0.47	0.21		<b>0.39</b>
	1999	0.63	0.11	0.51	<b>0.33</b>
	2000	0.65	0.19	0.46	<b>0.39</b>
	2001	0.89	0.10	0.25	<b>0.28</b>
	2002	0.08	0.11	0.43	<b>0.16</b>
	2003	0.71	0.05	0.45	<b>0.25</b>
	2004	0.04	0.07	0.57	<b>0.12</b>
	2005	0.10	0.24	0.49	<b>0.23</b>
	2006	0.75	0.08	0.47	<b>0.31</b>
	2007	0.83	0.24	0.28	<b>0.39</b>
	2008	0.18	0.09	0.30	<b>0.17</b>
	2009	0.27	0.11	0.29	<b>0.20</b>
	2010	0.12	0.26	0.26	<b>0.20</b>
	2011	0.19	0.18	0.52	<b>0.26</b>
	2012	0.23	0.16	0.41	<b>0.25</b>
	2013	0.02	0.27	0.65	<b>0.17</b>
	2014	0.83	0.15	0.48	<b>0.39</b>
2015	0.47	0.18	0.68	<b>0.39</b>	
2016	0.95	0.34	0.76	<b>0.63</b>	

**Table 2.** Sex ratios (male:female) of horseshoe crabs from the composite index in the Delaware Bay region.

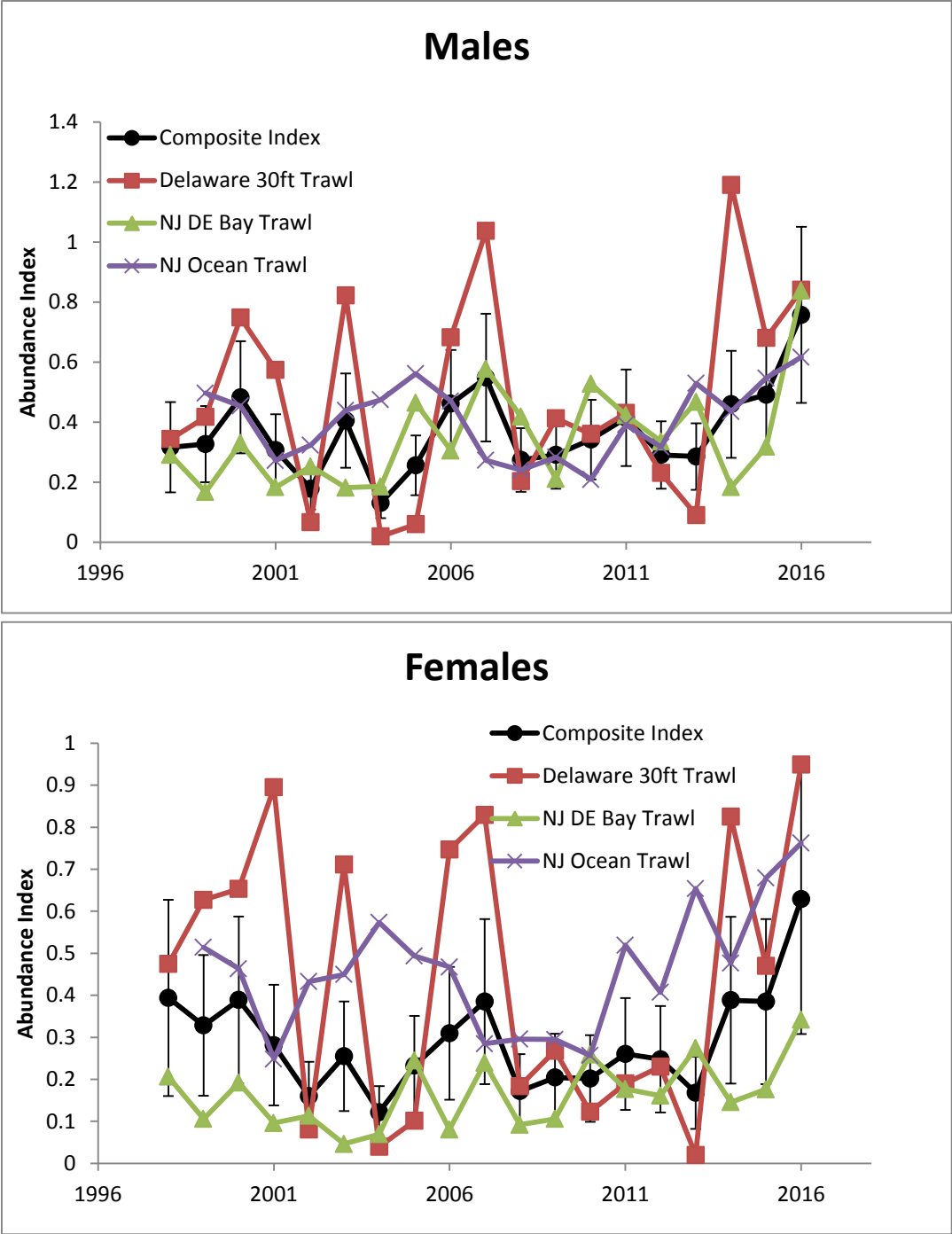
<b>Year</b>	<b>Male Index</b>	<b>Female Index</b>	<b>Sex Ratio</b>
1998	0.32	0.39	0.80
1999	0.33	0.33	1.00
2000	0.48	0.39	1.24
2001	0.31	0.28	1.09
2002	0.18	0.16	1.11
2003	0.41	0.25	1.59
2004	0.13	0.12	1.07
2005	0.26	0.23	1.10
2006	0.46	0.31	1.49
2007	0.55	0.39	1.42
2008	0.27	0.17	1.59
2009	0.29	0.20	1.43
2010	0.34	0.20	1.69
2011	0.41	0.26	1.59
2012	0.29	0.25	1.17
2013	0.29	0.17	1.70
2014	0.46	0.39	1.18
2015	0.49	0.39	1.28
2016	0.76	0.63	1.20

**Table 3.** Regression parameters relating the composite index of abundance to the estimated abundance from the Virginia Tech trawl survey (2002 – 2011 and 2016).

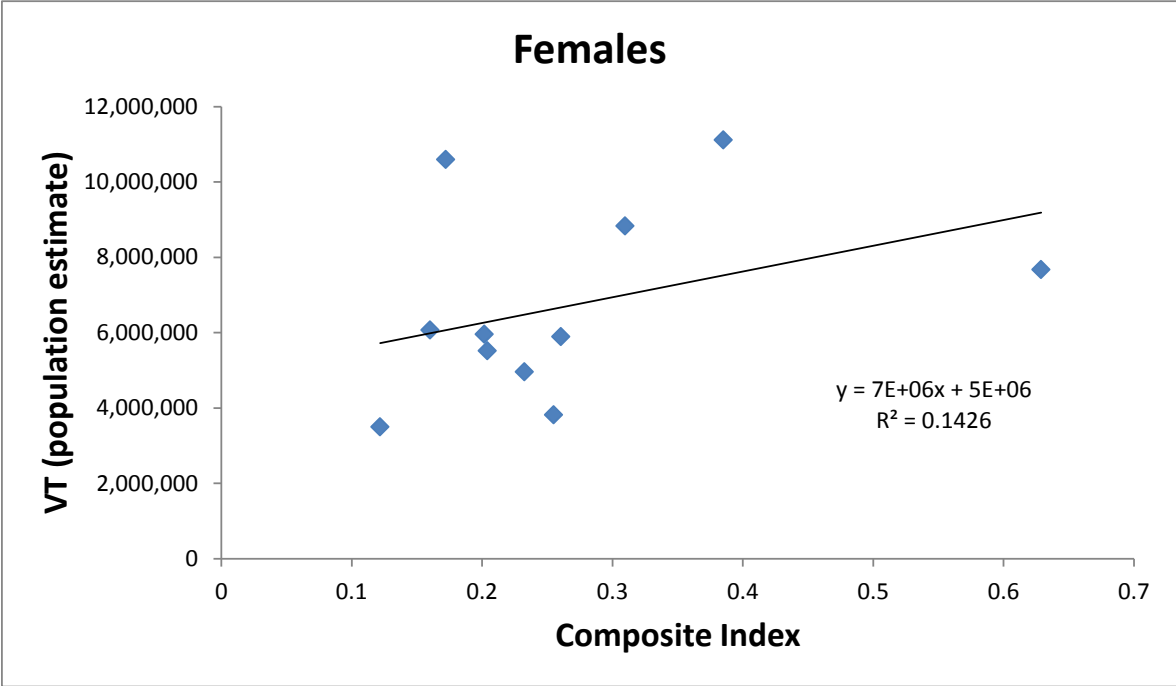
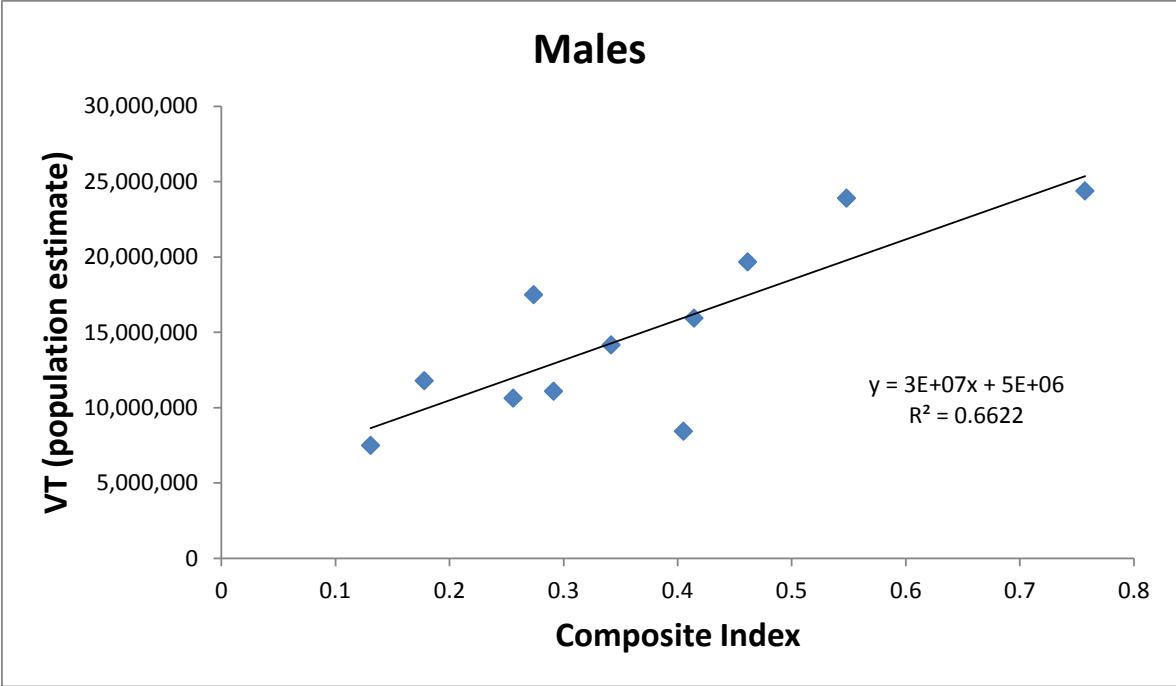
<b>Regression parameter</b>	<b>Males</b>	<b>Females</b>
Intercept	5148537 (SE = 2580195)	4893345 (SE = 1665635)
Slope	26690987(SE = 6354514)	6833214 (SE = 5584816)
p-value (Slope)	0.002	0.252
R <sup>2</sup>	0.662	0.143

**Table 4.** Estimates of total abundance of horseshoe crabs in the Delaware Bay region derived from the composite index (1998 – 2015) of abundance and the Virginia Tech trawl survey (2002 – 2011).

<b>Sex</b>	<b>Year</b>	<b>Composite Index</b>	<b>Virginia Tech</b>
Male	1998	13,588,007	
	1999	13,874,719	
	2000	18,032,348	
	2001	13,336,277	
	2002	9,898,773	11,790,000
	2003	15,965,536	8,430,000
	2004	8,637,182	7,500,000
	2005	11,979,533	10,630,000
	2006	17,464,019	19,660,000
	2007	19,779,029	23,900,000
	2008	12,454,844	17,490,000
	2009	12,921,627	11,080,000
	2010	14,271,647	14,150,000
	2011	16,206,318	15,940,000
	2012	12,897,153	
	2013	12,764,117	
	2014	17,413,356	
2015	18,257,908		
	2016	25,361,492	24,370,000
Female	1998	7,583,681	
	1999	7,135,592	
	2000	7,549,384	
	2001	6,816,421	
	2002	5,986,253	6,060,000
	2003	6,634,723	3,810,000
	2004	5,724,920	3,490,000
	2005	6,481,016	4,950,000
	2006	7,008,727	8,820,000
	2007	7,524,205	11,110,000
	2008	6,068,302	10,590,000
	2009	6,287,533	5,510,000
	2010	6,272,055	5,950,000
	2011	6,672,283	5,890,000
	2012	6,586,019	
	2013	6,042,921	
	2014	7,546,041	
2015	7,524,505		
	2016	9,189,983	7,670,000

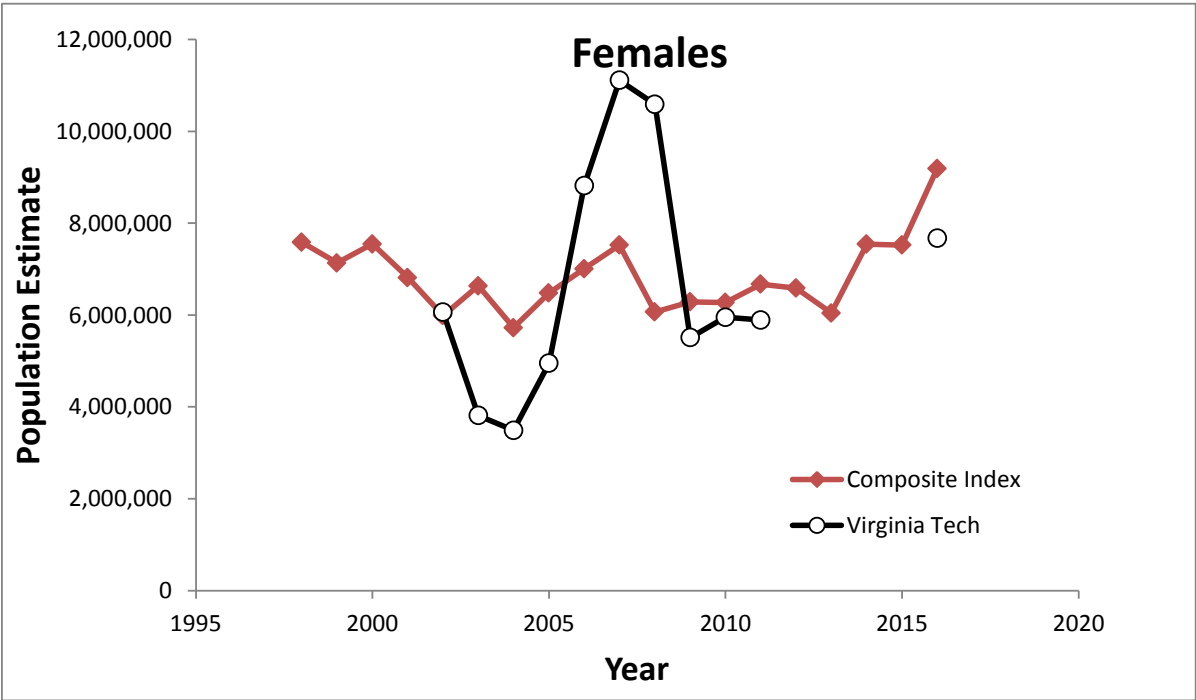
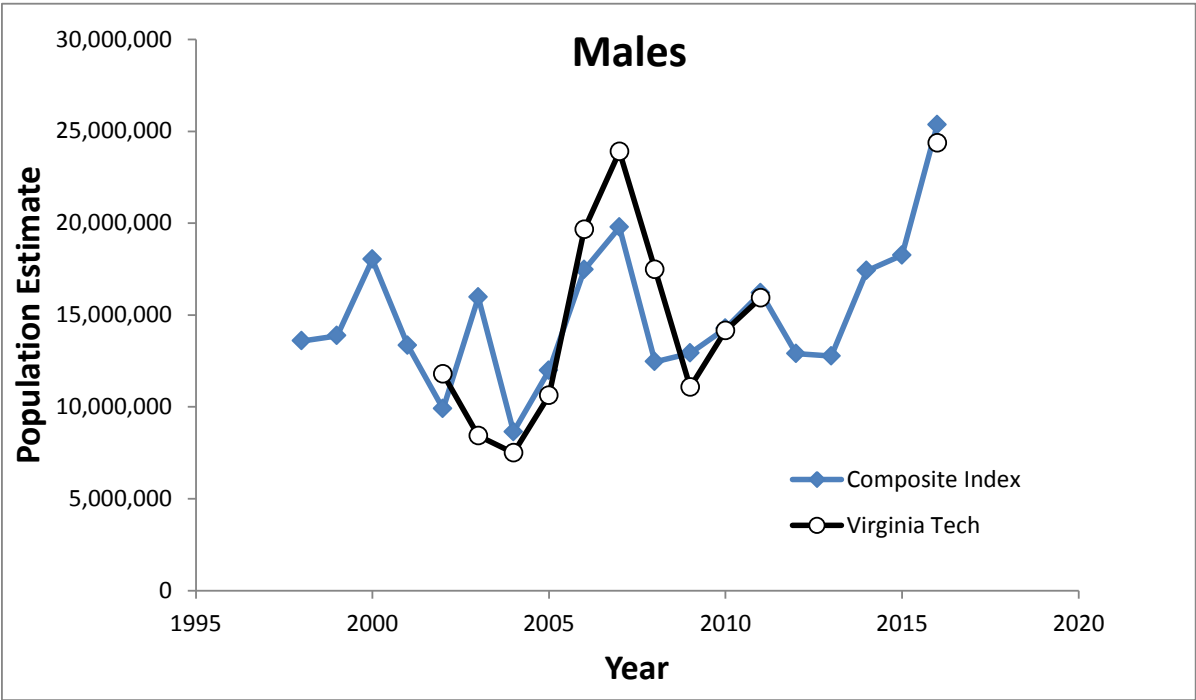


**Figure 1.** Comparison of the composite index of abundance from the linear mixed random effects model and the individual trawl surveys used to derive the composite index of abundance.



**Figure 2.** Linear regression models of the Virginia Tech population estimates versus the composite index of abundance of horseshoe crabs in the Delaware Bay region (2002 – 2011, 2016).





**Figure 3.** Time series of horseshoe crab population estimates derived from the composite index (1998 – 2016) and the Virginia Tech trawl survey (2002 – 2011, 2016).

MEMO

To: Delaware Bay ARM Working Group  
From: Jim Lyons, USGS Patuxent Wildlife Research Center, Laurel, MD  
Re: Red Knot Stopover Population Estimate for 2017  
Date: 15 August 2017

## 1 Acknowledgments

We thank the many volunteers in Delaware and New Jersey who collected mark-resight data in 2017. We are grateful to A. DeRose-Wilson (Delaware DFW), A. Dey (New Jersey ENSP), and volunteers in Delaware and New Jersey for data entry and data management, and L. Usyk (bandedbirds.org) for data management.

## 2 Methods

Mark-resight data and counts of marked and unmarked birds were conducted according to the methods for mark-resight investigations of Red Knots in Delaware Bay (Lyons 2016). Red knots have been individually marked with engraved leg flags in Delaware Bay and other locations for many years; each leg flag is engraved with a unique 3-character alphanumeric code (Clark et al. 2005). Surveys to locate flagged birds were conducted on each beach every three days according to the sampling plan (Table 1). During these resighting surveys, agency staff and volunteers recorded the alphanumeric combinations on leg flags for birds that were detected. While searching for birds marked with engraved leg flags, observers also periodically use a scan sampling technique to count marked and unmarked birds in randomly selected portions of Red Knot flocks (Lyons 2016).

Table 1. Dates for mark-resight sampling occasions (3-day periods) in Delaware Bay.			
Sample	Dates	Sample	Dates
1	≤10 May	6	23-25 May
2	11-13 May	7	26-28 May
3	14-16 May	8	29-31 May
4	17-19 May	9	1-3 June
5	20-22 May	10	≥4 June

As in previous years, all flag resightings were validated with banding data available in the data repository bandedbirds.org. Resightings without a corresponding record in bandedbirds.org of physical capture and banding (i.e., “misread” errors) were not included in the analysis (orange engraved flags from Argentina notwithstanding). Banding data from Argentina are not available in bandedbirds.org, therefore all resightings of orange engraved flags were included in the analysis without validation using banding data. We also deleted resightings of 21 flagged individuals whose flag codes were accidentally deployed in both New Jersey and South Carolina (A. Dey, pers. comm.).

We used the mark-resight data and data from the scan samples of the marked-ratio to estimate stopover population size using the methods of Lyons et al. (2016). In this “superpopulation” approach, passage population size is estimated using the Jolly-Seber model for open populations to account for the flow-through nature of migration areas and probability of detection during surveys.

In the analyses for Delaware Bay, the days of the season were aggregated into 3-day sampling periods, the same sampling periods used in prior analyses (a total of 10 sample periods possible each season, Table 1). Data are aggregated to 3-day periods because this is the amount of time necessary to complete mark-resight surveys on all beaches in the study (data summary provided in Appendix 1).

In the mark-resight superpopulation approach we estimate the number of birds that are carrying leg flags, and then adjust this number using the estimated proportion of the population with flags to account for unmarked birds. The estimated proportion with leg flags is thus an important statistic. We used the scan sample data (i.e., the counts of marked birds and the number checked for marks) and a binomial model to estimate the proportion of the population that is marked. To account for the random nature of arrival of marked birds in the bay and the addition of new marks during the season, we implemented the binomial model as a generalized linear mixed model with a random effect for the sampling period. More detailed methods are provided in Lyons et al. (2016) and Appendix 2.

### 3 Summary of Mark-resight and Count Data Collected in 2017

**Mark-resight encounter data.**—The Red Knot mark-resight database for 2017 contained a total of 4,182 individual birds recorded by observers in Delaware Bay at least once in 2017. One of the assumptions of the mark-resight approach is that individual identity of marked birds is recorded without error (see Lyons 2016 for discussion of all model assumptions). Some of the recording errors (i.e., flags that have not been deployed in the field) are removed before analysis using the banding data available from bandedbirds.org as described above. Other recording errors remain (including a second type of “false positive”, flags that have been deployed in the past but were not in fact present in Delaware Bay in 2017). In an attempt to limit the bias created by false-positive misreads, we limited the data to those collected by observers with a misread rate of 0.029 or less, the overall average misread rate for all observers.

Banding location (flag color)	No. flagged individuals detected
U.S. (lime green)	2,524 (70.2%)
U.S. (dark green)	556 (15.5%)
Argentina (orange)	289 (8.0%)
Canada (white)	153 (4.3%)
Brazil (dark blue)	50 (1.4%)
Chile (red)	26 (<1%)
Total	3,598 (100%)

After removing data from observers with a misread rate greater than average, the Red Knot mark-resight database for 2017 included 3,598 individual birds that were seen in Delaware Bay at least once in 2017. Birds from six countries were detected in Delaware Bay in 2017 (Table 2).

**Marked-ratio data.**—In 2017, 688 marked-ratio scan samples were collected: 360 samples in Delaware and 328 in New Jersey (Appendix 3).

**Aerial and ground count data.**—One aerial survey was conducted on 26 May 2017. A ground survey was attempted on the same day, but this resulted in an incomplete count as only a subset of locations were surveyed. Rough seas prevented access to some locations in NJ normally surveyed by boat and Delaware collaborators were not aware of the aerial survey plans in time to deploy observers to all beaches (Table 3). A. Dey compiled the aerial and ground survey data (Table 3).

#### **4 Summary of 2016 Migration**

Most of the birds arrived between 14 and 19 May; numbers of arrivals in the bay peaked on or about 18 May, when approximately 28% of the stopover population arrived (Fig. 1a). Similar to 2016, and unlike 2014 and 2015, relatively few birds arrived in the later stages of the migration season in 2017. For example, in 2014 a relatively large proportion of the stopover population (about 25%) arrived during 23-25 May, i.e., late in the season given typical departure dates. Similarly, in 2015 a late wave of arrivals between 23 and 28 May accounted for approximately 26% of the population. In 2017, there was not a substantial late wave of arrivals; most birds arrived before or during the 18 May sampling occasion.

Stopover persistence is the probability that a bird present in the bay during sampling occasion  $i$  is present in the bay at sampling occasion  $i + 1$ . Estimated stopover persistence declined steadily from the beginning of the 2017 season to 24 May, a small increase in persistence around 18 May notwithstanding (Fig. 1b). This pattern suggests substantial turnover in the population in 2017.

Following Lyons et al. (2016), we used the Jolly-Seber model to estimate stopover duration. In 2017, estimated stopover duration was 9.5 days (95% CI 9.1–10.0 days), shorter than estimated stopover during in 2016 when the model-based estimate of stopover duration was 12.3 days (95% CI 11.8–13.2 days). These model-based estimates of stopover duration account for probability of detection, i.e., these estimates are not negatively biased by the time present before first, and after last, detection by observers. These results suggest that birds had shorter stays in Delaware Bay in 2017 than in 2016.

In 2017, mean probability of resighting across all 3-day sampling periods was relatively constant and relatively high. Probability of resighting was generally above 0.5 for most of the season, and peaked at 0.66 around 30 May.

The estimated proportion of the 2016 stopover population with marks (leg flags) was 0.099 (95% CI 0.090–0.109, Fig. 2), very similar to the 2016 estimate. As expected, the proportion marked was fairly steady throughout the season and did not fluctuate dramatically (Fig. 2).

#### **5 Stopover Population Estimation**

The passage population size in 2017 was estimated at 49,405 (95% CI, 46,368–53,109), similar to the passage population size estimate in 2016 (47,254 [95% CI 44,873 – 50,374]). This superpopulation estimate accounts for turnover in the population and probability of detection.

The time-specific stopover population estimates in 2017 increased steadily between 10 and 18 May and then remained fairly constant during 18-24 May at approximately 24,500 birds (Fig. 1d).

**Aerial surveys in 2016.**—The aerial survey conducted on 26 May 2016 detected 17,969 birds, an index that falls between the two surrounding mark-resight estimates. The aerial survey total was approximately 26% less than the mark-resight estimate for the 23-25 May sample period and approximately 25% more than the mark-resight estimate for the 26-28 May sample period (Table 3, Fig. 1d).

## 6 References

- Clark, N.A., S. Gillings, A.J. Baker, P.M. González, and R. Porter. 2005. The production and use of permanently inscribed leg flags for waders. *Wader Study Group Bull.* 108: 38–41.
- Lyons, J.E., W.P. Kendall, J.A. Royle, S.J. Converse, B.A. Andres, and J.B. Buchanan. 2016. Population size and stopover duration estimation using mark-resight data and Bayesian analysis of a superpopulation model. *Biometrics* 72:262-271.
- Lyons, J.E. 2016. Study design guidelines for mark-resight investigations of Red Knots in

Table 3. Number of Red Knot detected during aerial and ground surveys of Delaware Bay in 2017. Data were provided by A. Dey, New Jersey Division of Fish and Wildlife, Nongame and Endangered Species Program.

	New Jersey	Delaware	Total
<b>26 May 2016</b>			
Aerial survey	13,147	4,822	17,969
Partial ground survey*	7,116	1,540	8,656

\* Note: ground survey in New Jersey did not include boat survey area from Bidwell Creek to Beadons Cove due to rough seas; ground survey in Delaware included only Mispillion Harbor because Delaware collaborators were not made aware of aerial survey plans in sufficient time to organize a full ground count.

Table 4. Stopover (passage) population estimate using mark-resight methods compared to peak-count index using aerial- or ground-survey methods. The mark-resight estimate of stopover (passage) population accounts for population turnover during migration; peak-count index, a single count on a single day, does not account for turnover.

Year	Stopover population <sup>a</sup> (mark-resight $N^*$ )	95% CI Stopover pop- ulation $N^*$	Peak-count index [aerial (A) or ground (G)]
2011	43,570	(40,880–46,570)	12,804 (A) <sup>b</sup>
2012	44,100	(41,860–46,790)	25,458 (G) <sup>c</sup>
2013	48,955	(39,119–63,130)	25,596 (A) <sup>d</sup>
2014	44,010	(41,900–46,310)	24,980 (A) <sup>c</sup>
2015	60,727	(55,568–68,732)	24,890 (A) <sup>c</sup>
2016	47,254	(44,873–50,574)	21,128 (A) <sup>b</sup>
2017	49,405 <sup>e</sup>	(46,368–53,109)	17,969 (A) <sup>f</sup>

<sup>a</sup> estimate for entire season, including population turnover

<sup>b</sup> 23 May

<sup>c</sup> 24 May

<sup>d</sup> 28 May

<sup>e</sup> Data management procedures to reduce bias from recording errors in the field not the same as previous years; see text at section 3 Mark-resight data.

<sup>f</sup> 26 May

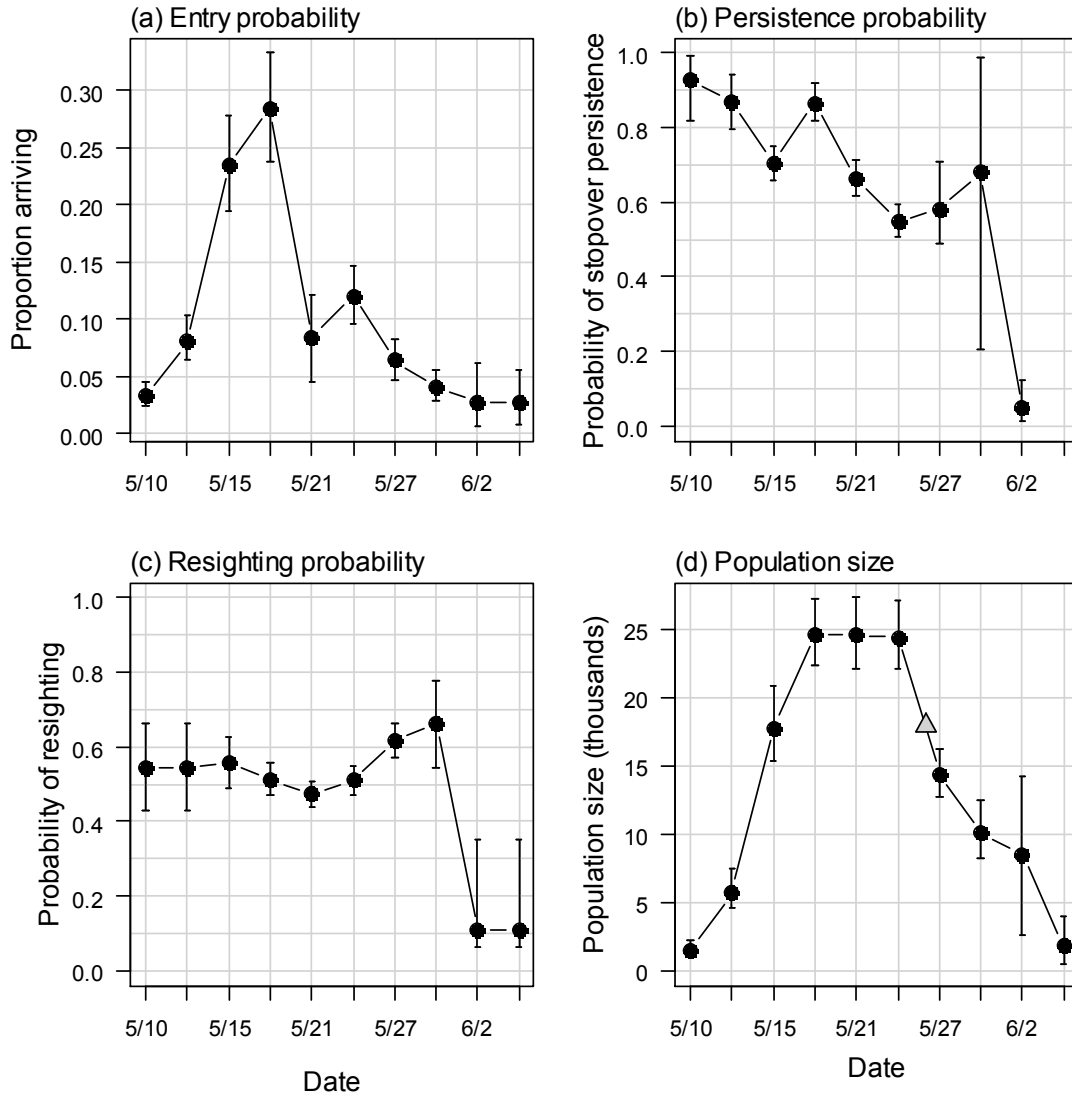


Figure 1. Estimated parameter values at sampling points throughout the 2017 season for Red Knot stopover population analysis at Delaware Bay using mark-resight data and the Jolly-Seber model for open populations: (a) proportion of stopover population arriving in Delaware Bay, (b) stopover persistence, (c) probability of resighting, and (d) time-specific stopover population size. Triangle in (d) is total count made by aerial survey on 26 May 2017.



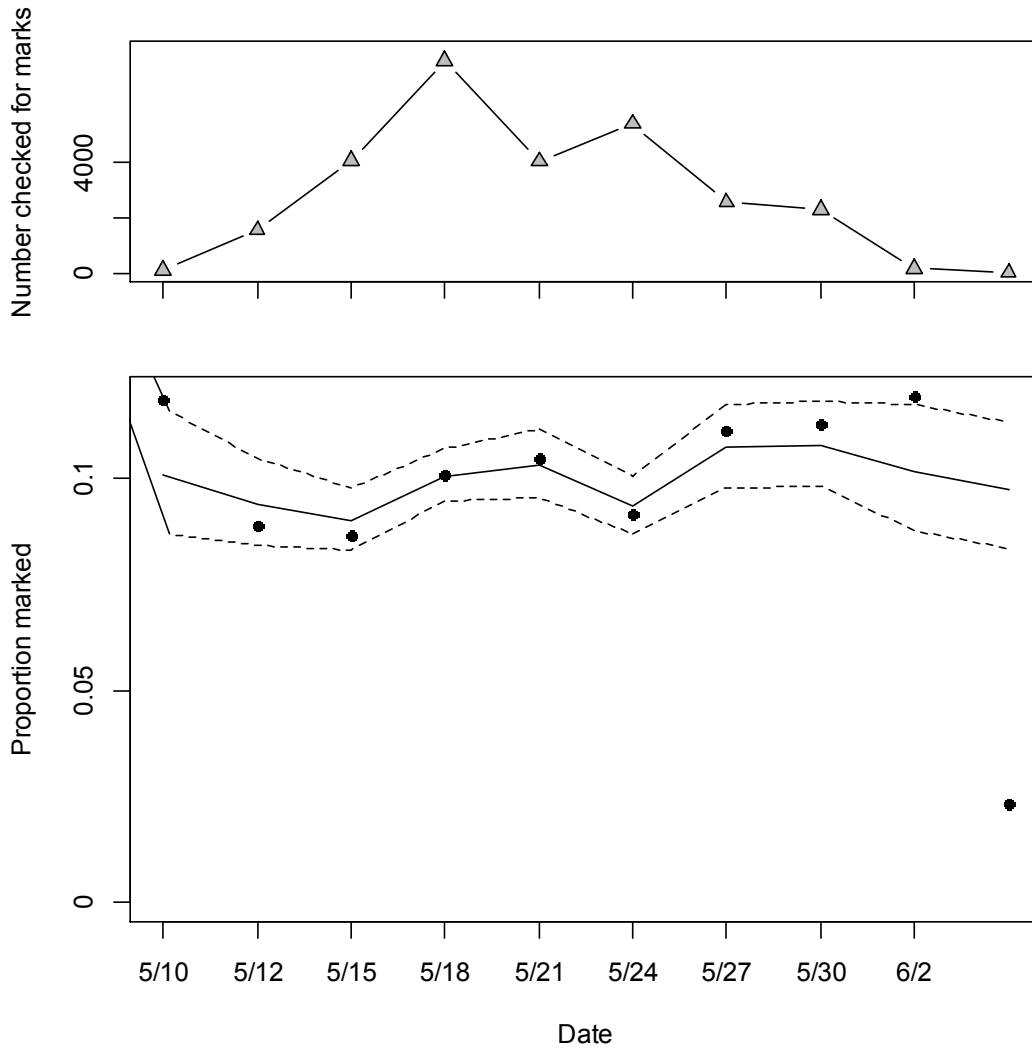


Figure 2. Estimated proportion of the Delaware Bay stopover population that has leg flags in 2017. Marked proportion was estimated from marked-ratio scan samples for each 3-day sampling period. The dates for the sampling periods are shown in Appendix 1. Sample size (number scanned, i.e., checked for marks) for each sample period is shown in the upper panel. The estimated proportion marked at each sample occasion (bottom panel) was estimated with the generalized linear mixed model described in Appendix 2. Solid and dashed lines are median proportion marked and 95% CI; filled circles show (number with marks/number scanned).

Appendix 1. Summary of 2017 mark-resight data (“m-array”). NR = never resighted.

Sample	Dates	Resighted	Next resighted at sample									
			2	3	4	5	6	7	8	9	10	NR
1	7-10 May	85	44	11	3	3	3	3	2	0	0	16
2	11-13 May	289		147	28	11	11	6	1	0	0	85
3	14-16 May	882			333	84	72	16	4	0	0	373
4	17-19 May	1268				564	166	49	16	0	0	473
5	20-22 May	1205					407	126	41	1	0	630
6	23-25 May	1158						405	78	6	1	668
7	26-28 May	955							372	10	1	572
8	29-31 May	725								57	0	668
9	1-3 June	96									1	95

## Appendix 2. Statistical Methods to Estimate Stopover Population Size Using Mark-Resight Data and Counts of Marked Birds

We converted the observations of marked birds into encounter histories, one for each bird, and analyzed the encounter histories with a Jolly-Seber (JS) model (Jolly 1965, Seber 1965, Crosbie and Manly 1985, Schwarz and Arnason 1996). The JS model includes parameters for recruitment ( $\beta$ ), survival ( $\phi$ ), and capture ( $p$ ) probabilities; in the context of a mark-resight study at a migration stopover site, these parameters are interpreted as probability of arrival to the study area, stopover persistence, and resighting, respectively. Stopover persistence is defined as the probability that a bird present at time  $t$  remains at the study area until time  $t + 1$ . The Crosbie and Manley (1985) and Schwarz and Arnason (1996) formulation of the JS model also includes a parameter for superpopulation size, which in our approach to mark-resight inferences for stopover populations is an estimate of the marked (leg-flagged) population size.

We chose to use 3-day periods rather than days as the sampling interval for the JS model given logistical constraints on complete sampling of the study area; multiple observations of the same individual in a given 3-day period were combined for analysis. A summary (m-array) of the mark-resight data is presented in an appendix.

We made inference from a fully-time dependent model; arrival, persistence, and resight probabilities were allowed to vary with sampling period [ $\beta_t \phi_t p_t$ ]. In this model, we set  $p_1 = p_2$  and  $p_{K-1} = p_K$  (where  $K$  is the number of samples) because not all parameters are estimable in the fully-time dependent model (Jolly 1965, Seber 1965, Crosbie and Manly 1985, Schwarz and Arnason 1996).

We followed the methods of Royle and Dorazio (2008) and Kéry and Schaub (2012, Chapter 10) to fit the JS model using the restricted occupancy formulation. Royle and Dorazio (2008) use a state-space formulation of the JS model with parameter-expanded data augmentation. For parameter-expanded data augmentation, we augmented the observed encounter histories with all-zero encounter histories ( $n = 2000$ ) representing potential recruits that were not detected (Royle and Dorazio 2012). We followed Lyons et al. (2016) to combine the JS model with a binomial model for the counts of marked and unmarked birds in an integrated Bayesian analysis. Briefly, the counts of marked birds ( $m_s$ ) in the scan samples are modeled as a binomial random variable:

$$m_s \sim \text{Bin}(C_s, \pi), \quad (1)$$

where  $m_s$  is the number of marked birds in scan sample  $s$ ,  $C_s$  is the number of birds checked for marks in scan sample  $s$ , and  $\pi$  is the proportion of the population that is marked. Total stopover population size  $\widehat{N}^*$  is estimated by

$$\widehat{N}^* = \widehat{M}^* / \widehat{\pi} \quad (2)$$

where  $\widehat{M}^*$  is the estimate of marked birds from the J-S model and  $\widehat{\pi}$  is the proportion of the population that is marked (from Eq. 1). Estimates of marked subpopulation sizes at each resighting occasion  $t$  ( $\widehat{M}_t^*$ ) are available as derived parameters in the analysis. We calculated an estimate of population size at each mark-resight sampling occasion  $\widehat{N}_t^*$  using  $\widehat{M}_t^*$  and  $\widehat{\pi}$  as in equation 2.

To better account for the random nature of the arrival of marked birds and addition of new marks during the season, we used a time-specific model for proportion with marks in place of equation 1 above:

$$m_{s,t} \sim \text{Binomial}(C_{s,t}, \pi_t) \quad (3)$$

for  $s$  in  $1, \dots, n_{\text{samples}}$  and  $t$  in  $1, \dots, n_{\text{occasions}}$

$$\text{logit}(\pi_t) = \alpha + \delta_t$$

$$\delta_t \sim \text{Normal}(0, \sigma_{\text{occasions}}^2)$$

where  $m_s$  is the number of marked birds in scan sample  $s$ ,  $C_s$  is the number of birds checked for marks in scan sample  $s$ ,  $\delta_t$  is a random effect time of sample  $s$ , and  $\pi_t$  is the time-specific proportion of the population that is marked. Total stopover population size  $\widehat{N}^*$  was estimated by summing time-specific arrivals of marked birds to the stopover ( $B_t$ ) and expanding to include unmarked birds using estimates of proportion marked:

$$\widehat{N}^* = \sum \widehat{B}_t / \pi_t$$

Time-specific arrivals of marked birds are estimated from the Jolly-Seber model using  $\widehat{B}_t = \widehat{\beta}_t \widehat{M}^*$  where  $\widehat{M}^*$  is the estimate of the number of marked birds and  $\widehat{\beta}_t$  is the fraction of the population arriving at time  $t$ .

Appendix 3. Number of marked-ratio scan samples.

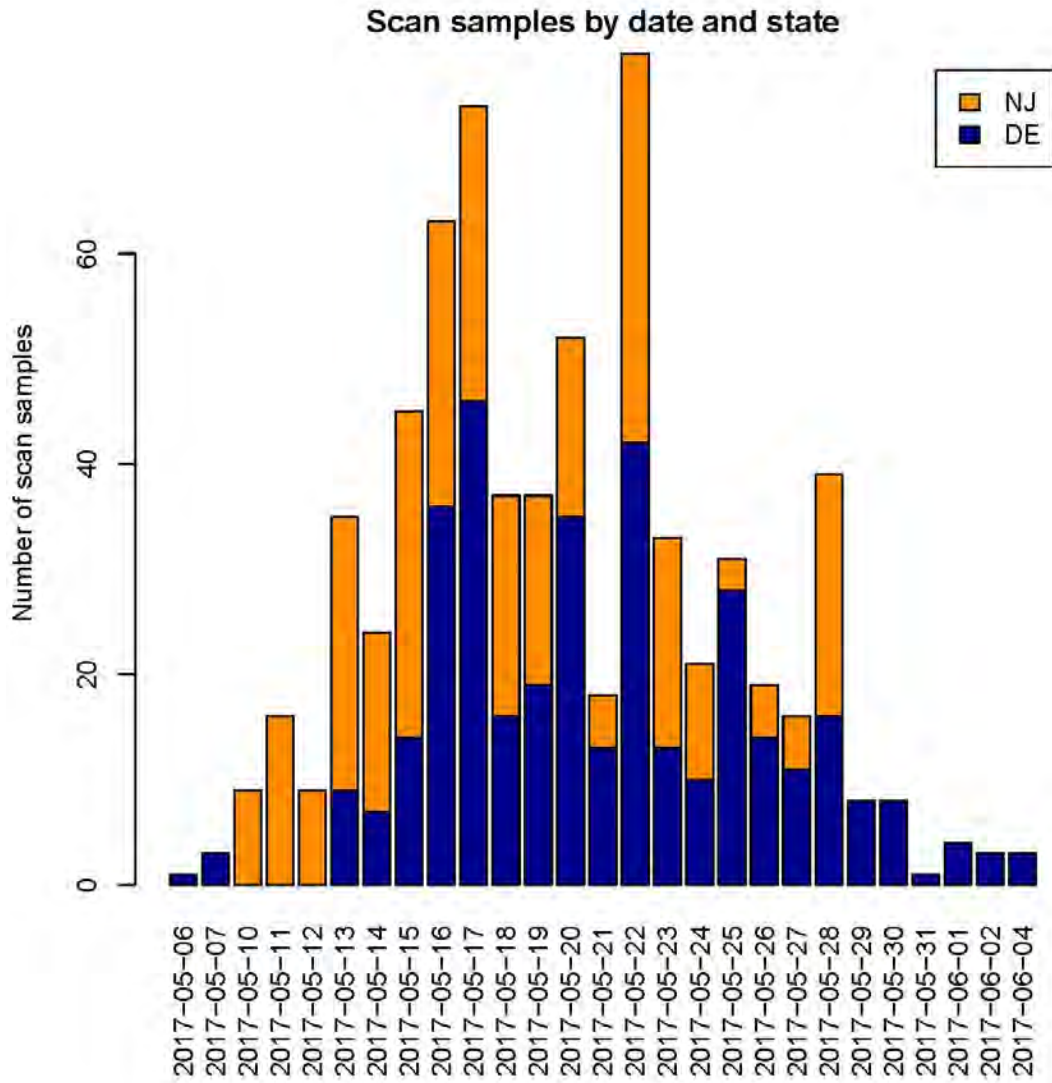


Figure A2. Number of marked-ratio scan samples collected in Delaware Bay in 2017 by field crews in Delaware (blue) and New Jersey (orange).

#### Appendix 4 Minimum length-of-stay

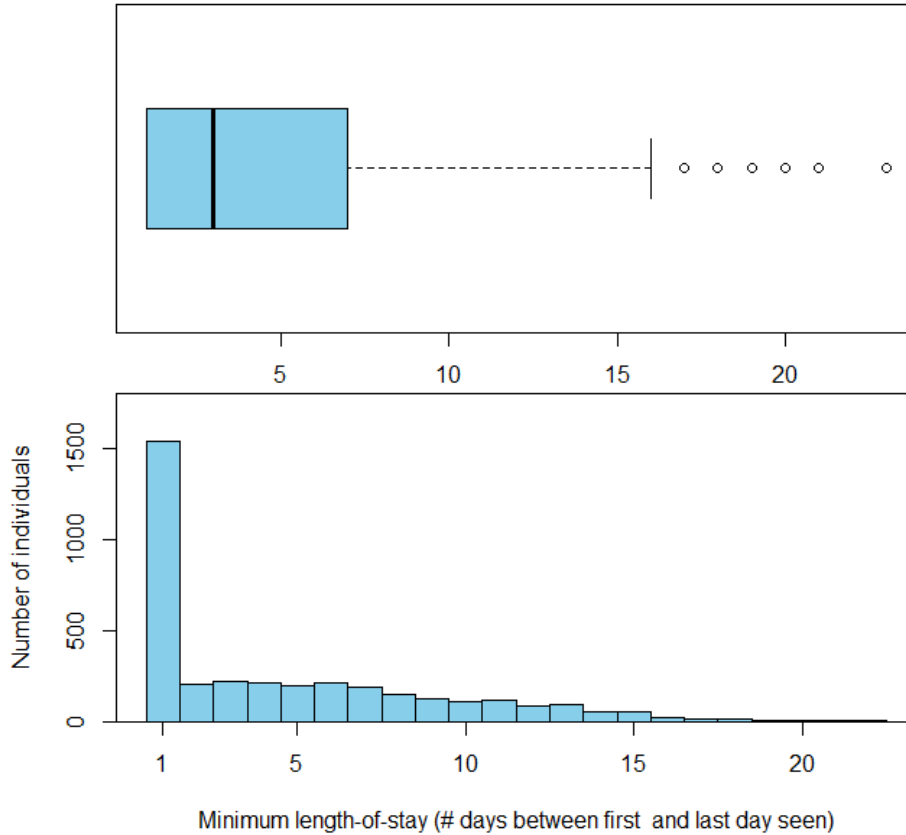


Figure A5. Minimum length-of-stay (MINLOS) in 2017 ( $n = 3,598$  birds). This is a plot of raw data and is not a model-based estimate. MINLOS does not account for time present before first, or after last, detection and therefore is negatively biased. The mean and median MINLOS in 2017 were 4.6 and 3 days, respectively. Model-based estimates of stopover duration suggest that stopover in 2017 was approximately 9.5 days.

# Atlantic States Marine Fisheries Commission

## Horseshoe Crab Advisory Panel Conference Call

Thursday September 21<sup>st</sup>, 2017

### Call Summary

#### 1) Welcome/Introductions

**Advisory Panel Members:** Dr. Jim Cooper (Chair), Allen Burgenson, Benjie Swan, Brett Hoffmeister, Jay Harrington, Rick Robins

**ASMFC Staff:** Mike Schmidtke (FMP Coordinator), Toni Kerns

#### 2) Update from October 2016 Board Meeting

Mike Schmidtke updated the AP on results of the last Horseshoe Crab Board (Board) meeting (October, 2016). At this Board meeting, harvest specifications were set for the 2017 fishing year, with specifications for the Delaware Bay coming from the ARM model, development of Draft Addendum VIII was postponed until after the 2018 stock assessment, the ARM Subcommittee was tasked with conducting alternative runs of the ARM model that incorporated biomedical mortality, and the TC was tasked with conducted a survey of horseshoe crab bait use in the eel and whelk fisheries.

#### 3) Review 2017 ARM Model Run (*M. Schmidtke*)

Mike Schmidtke presented information about the 2017 run of the ARM model for the Delaware Bay region. The model has two types of thresholds that impact potential harvest package selection. If female horseshoe crabs are less than 80% carrying capacity (approximately 11.2 million female crabs) and red knots are less than 81,900 birds in the superpopulation estimate, no female harvest options will be selected by the model. If the spawning beach sex ration falls below 2 males to 1 female, no male harvest options will be selected by the model.

Brett Hoffmeister commented that the potential scenario of a large female population that would lower the sex ratio below the 2 male to 1 female threshold. Rick Robins commented that the sex ratio used is that on the beach during spawning and is an operational ratio, attributable to spawning behavior and generally significantly higher (more males) than that of the population as a whole. Current spawning beach populations of horseshoe crab are heavily male-skewed and have exceeded the 2 male to 1 female threshold in every year the ARM model has been run. The sex ratio threshold was originally intended to ensure an adequate number of males are available to allow horseshoe crab population persistence under conditions of male-only harvest. However, if the case occurred that the female crab population threshold is exceeded and the sex ratio threshold is not, harvest package options for this population may need to be reconsidered.

Benjie Swan asked about the potential of re-evaluating these threshold levels, stating that due to current and historical levels and trends in horseshoe crab and red knot populations, attaining either of these threshold levels may be unrealistic. The AP generally agreed that an 80% carrying capacity female crab threshold is much higher than comparable threshold levels used for other species, while recognizing that a higher threshold is needed due to the multispecies management approach being used by the ARM. Mike Schmidtke commented that threshold levels used in this model go beyond the capacity of ASMFC alone and would require cooperation from other agencies that are more informed of red knot management and population needs. Rick Robins commented that the Commission should be commended for the conservative nature of the ARM model and the recent stability, particularly in the bait fishery, that has resulted from this approach.

Red knot abundance in 2017 (49,405 birds) increased from 2016, but with shorter stopover duration by approximately 3 days. Horseshoe crab abundance in 2016 was estimated by the Virginia Tech Horseshoe Crab Trawl Survey as 25.4 million males and 7.7 million females. Neither female horseshoe crabs nor red knots exceeded their population thresholds, thus female harvest package options were not available in the 2017 run of the ARM model. The ARM model selected harvest package 3 (500,000 males; 0 females) as the recommended 2018 harvest quota for the Delaware Bay region.

#### **4) Alternative ARM Model Runs Incorporating Biomedical Mortality**

At the last Board meeting, the ARM Subcommittee was tasked with performing alternative runs of the ARM model that incorporated biomedical mortality data. Runs were completed using 3-year averages of biomedical mortality in the Delaware Bay. Biomedical mortality is currently calculated as the number of horseshoe crabs reported as observed dead during the collection, transport, and handling processes plus 15% multiplied by the number of crabs bled.

The AP expressed concern with the 15% estimated mortality rate, generally indicating that they believe this rate to be lower. Brett Hoffmeister commented that adding observed mortality to the estimated 15% exacerbates the issue by increasing the effective mortality above 15%. Several members of the AP agreed, stating that they had the initial impression that the 15% rate encompassed all steps of the biomedical process. In an email following the call, Mike Schmidtke explained that the 15% rate is not all-encompassing because it is applied only to bled crabs rather than all crabs collected. Mortality at steps prior to bleeding is reported annually and then added to 15% assumed to occur as a result of the bleeding and release stages of the biomedical process.

Jay Harrington commented that the biomedical industry typically bleeds adult crabs and that natural mortality is not explicitly accounted for by the 15% estimated mortality rate. While natural mortality is not explicitly accounted for in this estimate, this estimate is not intended to evaluate sustainable collection levels of crabs for biomedical purposes, because biomedical collections are not limited by a quota. This rate is intended to only to annually estimate the amount of mortality occurring due to biomedical collections. Sustainability of these collections



and all methods of removals, will be evaluated via natural mortality and other population descriptors through the upcoming stock assessment process.

Two methods were chosen by the ARM Subcommittee for incorporating biomedical mortality into the ARM model. The “Preferred” Option of the ARM Subcommittee subtracts biomedical mortality estimates in the Delaware Bay region from the current harvest packages. Rick Robins commented that this approach should be adjusted such that the biomedical catch is incorporated as additive to the bait quota since both fisheries have operated in parallel prior to implementation of the ARM and it is not biologically or ecologically necessary to put these fisheries in conflict with respect to quotas from the harvest packages. The “Minority” Option adds biomedical mortality as a removal source (similar to bait harvest) in the population dynamics model, with no change to the harvest packages. Neither option for incorporating biomedical mortality resulted in drastic changes to harvest package selection or frequency in the resulting decision matrix. **\*\*The AP recommends that since incorporation of biomedical data made little difference to the results of these runs, that biomedical data should not be incorporated into annual ARM model runs to recommend harvest specifications\*\***. Several AP members agreed that use of the “Preferred” Option could compromise the confidentiality of facilities outside of the Delaware Bay region. Therefore, **\*\*the AP recommends that if the Board pursues incorporation of biomedical data into annual ARM model runs, it should be done through the “Minority” Option of adding biomedical mortality as a removal source in the internal population dynamics model\*\***.

#### 5) 2018 Stock Assessment Procedures

Mike Schmidtke presented the draft Terms of Reference and assessment timeline. Dr. Jim Cooper asked if there would be a time for AP participation in the assessment. Mike Schmidtke explained that the assessment is conducted by the Stock Assessment Subcommittee (SAS), with assistance from the Technical Committee (TC) as needed. The AP may view the final assessment, but does not have a role in its development. The AP would have a role in reviewing any management decisions that are made as a result of the assessment.

Mike Schmidtke explained the assessment workshops and how confidential data would potentially be handled at each step of the assessment. Prior to the Data Workshop, a press release will be published requesting horseshoe crab data. Of interest to several members of the AP is the biomedical component of data requested. Studies describing mortality at various steps of the biomedical process, particularly during bleeding and post-bleeding, would be useful in evaluating biomedical mortality levels. Dr. Jim Cooper commented that a preference for peer-reviewed literature, specifically non- or reduced consideration of studies conducted by biomedical companies and state agencies that are not in the peer-reviewed literature, could eliminate the most useful information available on post-bleeding mortality. Dr. Cooper further commented that some studies found within the peer-reviewed literature drastically depart from biomedical practices to the point that these studies would misinform biomedical mortality estimates. The Data Workshop is tentatively scheduled for January, 2018, so all data submissions should be received by then.

The AP expressed concern with literature that supports biomedical mortality rates greater than 15%. The AP feels that methods used in these studies were not consistent with those of biomedical facilities. Furthermore, several of these studies were conducted prior to the establishment of the biomedical best management practices (BMP). As biomedical practices have evolved and improved over recent years according to standards set by the BMPs, the practices of those studies are less consistent with current methods employed by biomedical facilities. Benjie Swan commented that she would submit a review evaluating these studies for future consideration by the Board and other Committees.

Mike Schmidtke explained that the Data Workshop is where submitted data will be considered for use in the assessment. All SAS members are required to gain confidential data access from all states submitting confidential data prior to viewing confidential data at the Data Workshop. Confidential access will be requested by SAS members for each state involved in the horseshoe crab fishery (Florida-Massachusetts) using the Atlantic Coastal Cooperative Statistics Program's Confidential Access Request application (as well as additional state-specific applications, where required). Within the application process and under direction of the Commission's Fishery Data Use Policy, SAS members will not be allowed to publicly distribute or discuss confidential assessment information. Additionally, SAS members will not be permitted to use confidential assessment information for purposes outside of the assessment. When confidential data is discussed at the Data Workshop, doors will be closed (both figuratively and literally) to those TC members who are not authorized to view confidential data. If questions arise about confidential data, they will be conducted in a closed-door session with the SAS and the TC representative of the providing state.

At the Assessment Workshop, the SAS applies models to the data from the Data Workshop. This meeting will only include SAS members. Confidential data may not be shown in the published Assessment Report. The SAS and ASMFC Staff are still considering potential options for handling confidentiality at this step of the assessment. One potential strategy under consideration is to have two Assessment Reports, one including confidential data for Peer Review and the other without confidential data that can be made public.

At the Review Workshop, a Peer Review Panel evaluates the Assessment Report. All Peer Review Panel members will be required to gain confidential access from all states submitting confidential data prior to viewing an Assessment Report that includes confidential data. Confidential data may not be shown in the published Review Report. ASMFC Staff are still considering potential options for handling confidentiality at this step of the assessment. One potential strategy under consideration is to have two Review Reports, one including confidential data to provide feedback for the SAS and the other without confidential data that can be made public.

This assessment is the first time that biomedical data is being included in the assessment process. As such, several members of the AP feel that evaluation of studies used to estimate biomedical mortality should be conducted by someone who has familiarity with methods used in the biomedical industry. Dr. Jim Cooper commented that at least one reviewer should be a

scientist from the biomedical community that can critically review the methodology of scientific studies used to estimate mortality associated with biomedical bleeding of horseshoe crabs. Toni Kerns explained that Peer Review Panels may be selected through the Center of Independent Experts or from federal or university scientists that have an expertise on multiple aspects of the assessment. Therefore, someone who has knowledge of the biomedical bleeding process may be considered if he or she has expertise in other areas of the assessment such as population dynamics or assessment models, but would be less likely to be considered as strictly a biomedical specialist.

#### **6) Other Business/Adjourn**

Jay Harrington commented on indirect interactions of horseshoe crabs and red knots that are not currently accounted for by the ARM model. Horseshoe crabs are known to feed on shellfish. Red knots have been documented to feed on similar types of shellfish in addition to horseshoe crab eggs. Jay proposed that in a way, the ARM model may be conflicted as horseshoe crabs or red knots increase and compete for similar food sources. Additionally, Jay commented that literature indicates that horseshoe crab abundance levels are not correlated with red knot survivorship or reproduction. Jay will be submitting a memo outlining literature on the relationship between horseshoe crabs and red knots.

**2017 REVIEW OF THE  
ATLANTIC STATES MARINE FISHERIES COMMISSION  
FISHERY MANAGEMENT PLAN FOR**

**HORSESHOE CRAB**  
*(Limulus polyphemus)*

2016 Fishing Year



**Horseshoe Crab Plan Review Team:**

Sheila Eyler, U.S. Fish and Wildlife Service

Stewart Michels, Delaware Department of Natural Resources and Environmental Control

Derek Orner, National Marine Fisheries Service

Mike Schmidtke, Chair, Atlantic States Marine Fisheries Commission

October 2017



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- I. Status of the Fishery Management Plan
- II. Status of the Stock and Assessment Advice
- III. Status of the Fishery
- IV. Status of Research and Monitoring
- V. Status of Management Measures and Issues
- VI. Recommendations of the Plan Review Team

## I. Status of the Fishery Management Plan

<u>Date of FMP Approval:</u>	December 1998
<u>Amendments</u>	None
<u>Addenda</u>	Addendum I (April 2000) Addendum II (May 2001) Addendum III (May 2004) Addendum IV (June 2006) Addendum V (September 2008) Addendum VI (August 2010) Addendum VII (February 2012)
<u>Management Unit:</u>	Entire coastwide distribution of the resource from the estuaries eastward to the inshore boundary of the EEZ
<u>States With Declared Interest:</u>	Massachusetts - Florida
<u>Active Boards/Committees:</u>	Horseshoe Crab Management Board, Advisory Panel, Technical Committee, and Plan Review Team; Delaware Bay Ecosystem Technical Committee

### a) Goals and Objectives

The Interstate Fishery Management Plan for Horseshoe Crabs (FMP) established the following goals and objectives.

#### 2.0. Goals and Objectives

*The goal of this Plan is to conserve and protect the horseshoe crab resource to maintain sustainable levels of spawning stock biomass to ensure its continued role in the ecology of the coastal ecosystem, while providing for continued use over time. Specifically, the goal includes management of horseshoe crab populations for continued use by:*

- 1) current and future generations of the fishing and non-fishing public (including the biomedical industry, scientific and educational research);*
- 2) migrating shorebirds; and,*
- 3) other dependent fish and wildlife, including federally listed (threatened) sea turtles.*

*To achieve this goal, the following objectives must be met:*

- (a) prevent overfishing and establish a sustainable population;*
- (b) achieve compatible and equitable management measures among jurisdictions throughout the fishery management unit;*
- (c) establish the appropriate target mortality rates that prevent overfishing and maintain adequate spawning stocks to supply the needs of migratory shorebirds;*

*(d) coordinate and promote cooperative interstate research, monitoring, and law enforcement;*

*(e) identify and protect, to the extent practicable, critical habitats and environmental factors that limit long-term productivity of horseshoe crabs;*

*(f) adopt and promote standards of environmental quality necessary for the long-term maintenance and productivity of horseshoe crabs throughout their range; and,*

*(g) establish standards and procedures for implementing the Plan and criteria for determining compliance with Plan provisions.*

#### **b) Fishery Management Plan Summary**

The framework for managing horseshoe crabs along the Atlantic coast was approved in October 1998 with the adoption of the Interstate Fishery Management Plan for Horseshoe Crabs (FMP). The goal of this plan is to conserve and protect the horseshoe crab resource to maintain sustainable levels of spawning stock biomass to ensure its continued role in the ecology of coastal ecosystems, while providing for continued use over time.

In 2000, the Horseshoe Crab Management Board approved Addendum I to the FMP. Addendum I established a state-by-state cap on horseshoe crab bait landings at 25 percent below the reference period landings (RPL's), and *de minimis* criteria for those states with a limited horseshoe crab fishery. Those states with more restrictive harvest levels (Maryland and New Jersey) were encouraged to maintain those restrictions to provide further protection to the Delaware Bay horseshoe crab population, recognizing its importance to migratory shorebirds. Addendum I also recommended that the National Marine Fisheries Service (NMFS) prohibit the harvest of horseshoe crabs in federal waters (3-200 miles offshore) within a 30 nautical mile radius of the mouth of Delaware Bay, as well as prohibit the transfer of horseshoe crabs in federal waters. A horseshoe crab reserve was established on March 7, 2001 by NMFS in the area recommended by ASMFC. This area is now known as the Carl N. Shuster Jr. Horseshoe Crab Reserve.

In 2001, the Horseshoe Crab Management Board approved Addendum II to the FMP. The purpose of Addendum II was to provide for the voluntary transfer of harvest quotas between states to alleviate concerns over potential bait shortages on a biologically responsible basis. Voluntary quota transfers require Technical Committee review and Management Board approval.

In 2004, the Board approved Addendum III to the FMP. The addendum sought to further the conservation of horseshoe crab and migratory shorebird populations in and around the Delaware Bay. It reduced harvest quotas and implemented seasonal bait harvest closures in New Jersey, Delaware, and Maryland, and revised monitoring components for all jurisdictions.

Addendum IV was approved in 2006. It further limited bait harvest in New Jersey and Delaware to 100,000 crabs (male only) and required a delayed harvest in Maryland and Virginia. Addendum V, adopted in 2008, extends the provisions of Addendum IV through October 31, 2010. In early 2010, the Board initiated Draft Addendum VI to consider management options



that would follow expiration of Addendum V. The Board voted in August 2010 to extend the Addendum V provisions, via Addendum VI, through April 30, 2013. The Board also chose to include language, allowing them to replace Addendum VI with another Addendum during that time, in anticipation of implementing an adaptive resource management (ARM) framework.

The Board approved Addendum VII in February 2012. This addendum implemented an ARM framework for use during the 2013 fishing season. The framework considers the abundance levels of horseshoe crabs and shorebirds in determining the optimized harvest level for the Delaware Bay states of New Jersey, Delaware, Maryland, and Virginia (east of the COLREGS).

## **II. Status of the Stock and Assessment Advice**

No definitions for overfishing or overfished status have been adopted by the Management Board. However, the majority of evidence in the most recent stock assessment, the 2013 Stock Assessment Update (available at <http://www.asmfc.org/species/horseshoe-crab#stock>), indicates abundance has increased in the Southeast region. In the Delaware Bay Region, increasing trends were most evident in juvenile indices, followed by indices of adult males. Over the time series of the survey, no trend in the abundance of female crabs is evident.

In contrast, continued declines in abundance were evident in the New York and New England regions. Decreased harvest quotas in Delaware Bay have potentially redirected harvest to nearby regions. Current harvest within the New England and New York Regions may not be sustainable. Continued precautionary management is therefore recommended coastwide to anticipate effects of redirecting harvest from Delaware Bay to outlying populations.

## **III. Status of the Fishery**

### ***Bait Fishery***

For most states, the bait fishery is open year round. However, because of seasonal horseshoe crab movements (to the beaches in the spring; deeper waters and offshore in the winter), the fishery operates at different times. New Jersey has prohibited commercial harvest of horseshoe crabs in state waters since 2006. State waters of Delaware are closed to horseshoe crab harvest and landing from January 1<sup>st</sup> through June 7<sup>th</sup> each year, and other state horseshoe crab fisheries are regulated with various seasonal/area closures.

Reported coastwide bait landings in 2016 remained well below the coastwide quota (Table 1, Figure 1). Bait landings increased 34% from the previous year, due primarily to unusually low landings in Rhode Island, Maryland and Virginia during 2015. North Carolina harvested 1,161 crabs over their 24,036 crab quota, and received a 1,250 crab quota transfer from Georgia.

**Table 1. Reported commercial horseshoe crab bait landings by jurisdiction.**

<b>Jurisdiction</b>	<b>ASMFC Quota 2016</b>	<b>State Quota 2016</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>
<b>MA</b>	330,377	165,000	106,821	128,774	106,645	108,054	101,642
<b>RI</b>	26,053	12,545	19,306	18,030	13,319	6,255	20,917
<b>CT</b>	48,689	48,689	18,958	21,503	20,634	19,632	12,135
<b>NY</b>	366,272	150,000	184,721	169,739	134,370	145,324	176,632
<b>NJ*</b>	162,136	0	0	0	0	0	0
<b>DE*</b>	162,136	162,136	100,255	163,582	168,044	151,262	159,545
<b>MD*</b>	255,980	255,980	169,087	240,688	148,269	27,494	157,013
<b>PRFC</b>	0	0	0	0	0	0	0
<b>DC</b>	0	0	0	0	0	0	0
<b>VA**</b>	172,828	172,828	151,887	156,761	145,266	102,235	133,453
<b>NC***</b>	24,036	25,286	22,902	26,559	21,196	24,948	25,197
<b>SC</b>	0	0	0	0	0	0	0
<b>GA</b>	29,312	28,062	0	5,745	0	0	0
<b>FL****</b>	9,455	9,455	0	0	2,046	264	689
<b>TOTAL</b>	<b>1,587,274</b>	<b>1,028,280</b>	<b>773,937</b>	<b>931,381</b>	<b>759,789</b>	<b>585,468</b>	<b>787,223</b>

**\*Male-only harvest**

**\*\*Virginia harvest east of the COLREGS line is limited to 81,331 male-only crabs under the ARM harvest package #3. Virginia harvests east of the COLREGS in 2015 and 2016 were 24,460 and 39,012, respectively. The total above represents harvest on both sides of the COLREGS line.**

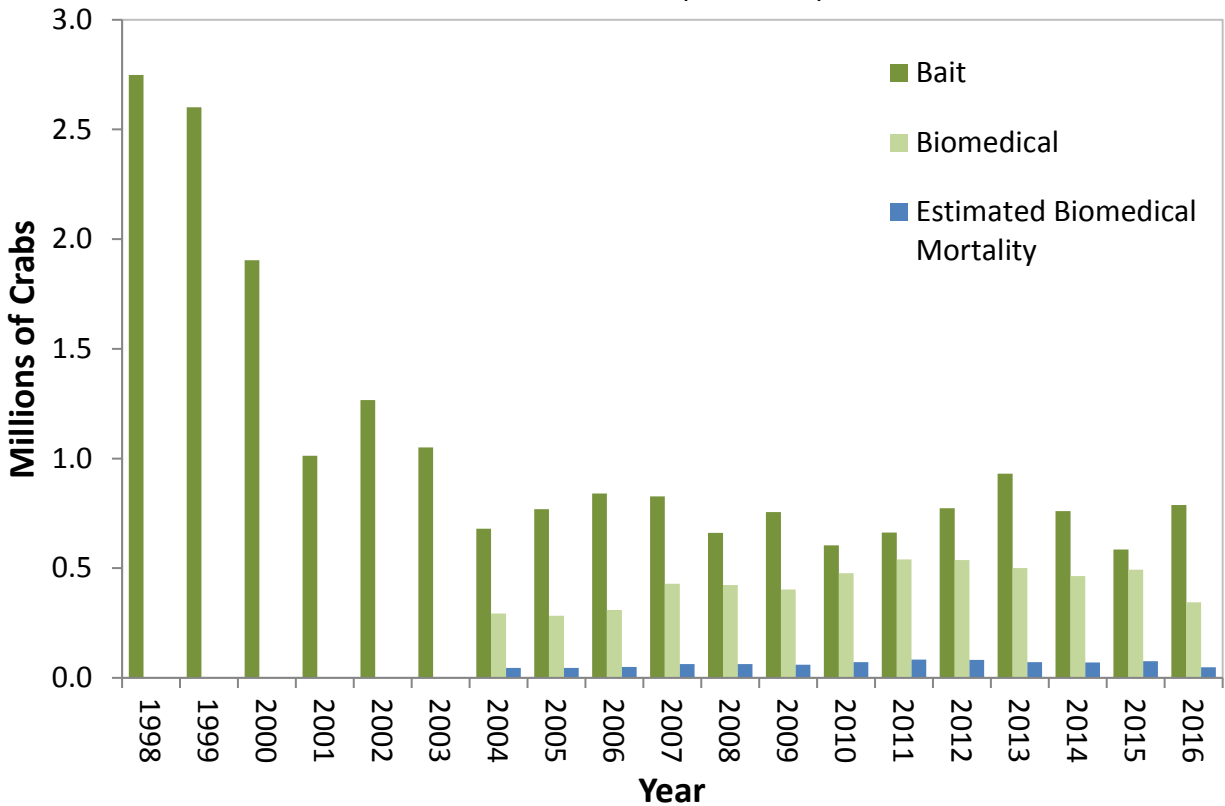
**\*\*\*Note there was quota transfer of 1,250 crabs from Georgia to North Carolina to cover their quota overage of 1,161 horseshoe crabs in 2016.**

**\*\*\*\*Bait landings do not include 1,528 marine life landings in 2016**

**Figure 1: Number of horseshoe crabs harvested for bait and biomedical purposes, 1998 -2016.**

**Coastwide Horseshoe Crab Bait Landings & Biomedical Harvest**

Source: ASMFC State Compliance Reports, 2017



**\* Biomedical collection numbers, which are annually reported to the Commission, include all horseshoe crabs brought to bleeding facilities except those that were harvested as bait and counted against state quotas.**

**\* Most of the biomedical crabs collected are returned to the water after bleeding; a 15% mortality rate is estimated for all bled crabs that are released. This number plus observed mortality reported annually by bleeding facilities via state compliance reports is noted in the above graph as 'Estimated Biomedical Mortality.'**

Reported coastwide landings since 1998 show more male than female horseshoe crabs were harvested annually. Several states presently have sex-specific restrictions in place to limit the harvest of females. The American eel pot fishery prefers egg-laden female horseshoe crabs as bait, while the whelk (conch) pot fishery is less dependent on females. Unclassified landings have generally accounted for around 10% of the reported landings since 2000.

The hand, trawl, and dredge fisheries typically account for over 85% of the reported commercial horseshoe crab bait landings. In 2016, these gears accounted for 91.8% of commercial landings. Other methods that account for the remainder of the harvest include gill nets, pound nets, and traps.

### ***Biomedical Fishery***

The horseshoe crab is an important resource for research and manufacture of materials used for human health. There are five companies along the Atlantic Coast that process horseshoe crab blood for use in manufacturing Limulus Amebocyte Lysate (LAL): Associates of Cape Cod, Massachusetts; Lonza (formerly Cambrex Bioscience), Limuli Laboratories, New Jersey; Wako Chemicals, Virginia; and Charles River Endosafe, South Carolina. Addendum III requires states where horseshoe crabs are collected for biomedical bleeding to collect and report total collection numbers, crabs rejected, crabs bled (by sex) and to characterize mortality.

The Plan Review Team annually calculates total coastwide harvest and estimates mortality. It was reported that 426,195 crabs (including crabs harvested as bait) coastwide were brought to biomedical companies for bleeding in 2016 (Table 2). This represents a decrease from the average of the previous five years (580,773 crabs). Of this total, 77,946 crabs were reported as harvested for bait and counted against state quotas, representing a 9% increase above the average of the previous five years (Table 2: row B). These crabs were not included in the mortality estimates (Rows D, F, and G) below. It was reported for 2016 that 344,467 crabs were harvested for biomedical purposes only. Males accounted for 52% of total biomedical harvest, females comprised 35%, and 13% of the harvest was unknown. Crabs were rejected prior to bleeding due to mortality, injuries, slow movement, and size (known mortality prior to bleeding is included in Row D below). Approximately 0.3% of crabs, collected solely for biomedical purposes, were observed and reported as dead from the time of collection up to the point of release. Total estimated mortality of biomedical crabs for 2016 was 47,765 crabs (at 15% post-release estimated mortality), with a range of 16,937 to 96,545 crabs (5-30% post-release estimated mortality).

**Table 2. Numbers of horseshoe crabs collected, bled, and estimated mortality for the biomedical industry.**

	2009	2010	2011	2012	2013	2014	2015	2016**
<b>A. Number of crabs brought to biomedical facilities (bait and biomedical crabs)</b>	512,853	552,083	623,680	624,440	554,419	536,798	564,526	426,195
<b>B. Number of bait crabs bled</b>	106,740	66,047	78,128	82,684	61,613	68,643	67,687	77,946
<b>C. Number of biomedical-only crabs collected (not counted against state bait quotas)</b>	402,503	476,962	540,323	537,514	500,565	464,709	493,144	344,467
<b>D. Reported observed mortality of biomedical-only crabs from collection to release</b>	6,523	6,447	8,485	7,396	5,485	5,658	5,250	1,015
<b>E. Number of biomedical-only crabs bled</b>	355,011	435,458	500,781	499,214	436,902	432,306	467,455	318,432
<b>F. Estimated post-bleeding mortality of bled biomedical-only crabs (15% est. mortality)</b>	53,252	65,319	75,117	74,882	65,535	64,846	70,118	47,765
<b>G. Total estimated mortality on biomedical crabs not counted against state bait quotas (15% est. mortality)</b>	59,775	71,766	83,602	82,278	71,020	70,504	75,369	48,780

\* Misinterpretation of some biomedical numbers from previously submitted reports was noted during review of these data. Previously misinterpreted numbers are corrected in the table above, but the numbers included in this table for years prior to 2016 may deviate from those of previous FMP Reviews. The Horseshoe Crab Technical Committee has constructed and recommended use of a standardized electronic reporting form that clarifies requirements of Addendum III to reduce misinterpretations of reported data in the future.

\*\*Some biomedical collections were reduced in 2016 due to temporary changes in production.

The 1998 FMP establishes a mortality threshold of 57,500 crabs that, if exceeded, requires the Board to consider management action. Based on an estimated total mortality of 48,780 crabs, this threshold was not exceeded in 2016. The PRT notes that estimated mortality from biomedical use is approximately 6% of the total horseshoe crab mortality (bait and biomedical) coastwide for 2016, down from approximately 11% in 2015. Although the 57,500 crab threshold was not exceeded in 2016, because it has been exceeded in 7 of the last 8 years, the PRT continues to recommend including biomedical mortality in the next benchmark stock assessment.

#### **IV. Status of Research and Monitoring**

The Horseshoe Crab FMP set forth an ambitious research and monitoring strategy in 1999 and again in 2004 to facilitate future management decisions. Despite limited time and funding there are many accomplishments since 1999. These accomplishments were largely made possible by forming partnerships between state, federal and private organizations, and the support of hundreds of public volunteers.

#### ***Addendum III Monitoring Program***

Addendum III requires affected states to carry out three monitoring components:

All states who do not qualify for *de minimis* status report monthly harvest numbers and subsample a portion of the catch for gender and harvest method. In addition, those states with annual landings above 5% of the coastwide harvest report all landings by sex and harvest method. Although states with annual landings less than 5% of annual coastwide harvest are not required to report landings by gender, the PRT recommends all states require gender reporting for horseshoe crab harvest.

States with biomedical fisheries landings are required to monitor and report harvest numbers and mortality associated with the transportation and bleeding of the crabs.

States must identify spawning and nursery habitat along their coasts. All states have completed this requirement, and a few continue active monitoring programs.

#### ***Virginia Tech Research Projects***

The Virginia Tech Horseshoe Crab Trawl Survey (VT Survey) was not conducted in 2013 - 2015, due to a lack of funding, but was conducted in 2016. The 2016 survey results indicate no long-term trend in abundance of immature, newly mature, or mature female crabs, but mature male crabs have increased for the time series (2002-2016). The Adaptive Resource Management (ARM) Working Group will use the indices from this survey to estimate horseshoe crab abundance for the ARM model, which specifies harvest limits for the upcoming year. This year's VT Survey indices will also be used to tune a composite abundance index from current Delaware Bay region state trawl surveys (Delaware 30 foot trawl survey, New Jersey Delaware Bay trawl survey, and New Jersey Ocean trawl survey) that has been used to estimate horseshoe crab abundance for the ARM model when the VT Survey was not conducted. The VT

Survey has been funded for 2017. Funding sources beyond 2017 as well as alternative data sources continue to be explored.

### ***Spawning Surveys***

The redesigned Delaware Bay spawning survey was completed for the 18th year in 2016. No trend was detected in the baywide indices of spawning activity (both male and female) for the time series. No trends were detected in male or female spawning activity for Delaware or New Jersey. Most spawning activity in 2016 was observed in early June. This was only the fifth year of the 18-year survey when peak spawning did not occur in May, a critical time period for migratory shorebird foraging in Delaware Bay. The annual baywide sex ratio was 4.6:1 (Male: Female). The range of annual observed sex ratios on the Delaware Bay spawning beaches over the time series has varied from 3.1:1 to 5.2:1.

### ***Tagging Studies***

The USFWS continues to maintain a toll-free telephone number as well as a website for reporting horseshoe crab tag returns and assists interested parties in obtaining tags. Tagging work continues to be conducted by biomedical companies, research organizations, and other parties involved in outreach and spawning surveys. Beginning with the 2013 tagging season, additional efforts were implemented to ensure that current tagging programs are providing data that benefits the management of the coast-wide horseshoe crab population. All existing and new tagging programs are required to submit an annual application to be considered for the tagging program and all participants must submit an annual report along with their tagging and resight data to indicate how their tagging program addresses at least one of the following objectives: determine horseshoe crab sub-population structure, estimate horseshoe crab movement and migration rates, and/or estimate survival and mortality of horseshoe crabs. The PRT recommends all tagging programs, approved by the state, coordinate with the USFWS tagging program, in order to ensure a consistent coastwide program for providing management input.

Since 1999, over 300,000 crabs have been tagged and released through the USFWS tagging program along the Atlantic coast. Approximately 12% of tagged crabs have been recaptured and reported. Crabs have been tagged and released from every state on the Atlantic Coast from Florida to New Hampshire. In the early years of the program, tagging was centered around Delaware Bay; however, in recent years, tagging has expanded and increased in the Long Island Sound and Southeast. The Technical Committee noted that recapture rates inside and outside Delaware Bay are likely not directly comparable due to increased re-sighting effort and spawning concentration in Delaware Bay compared to other areas along the coast. There may be data in the USFWS tagging database to determine differences in effort and recapture rates.

## **V. Status of Management Measures and Issues**

### ***ASMFC***

Initial state-by-state harvest quotas were established through Addendum I. Addendum III outlined the monitoring requirements and recommendations for the states. Addendum IV set

harvest closures and quotas, and other restrictions for New Jersey, Delaware, Maryland, and Virginia, which were continued in Addendums V and VI.

The Board approved Addendum VII, implementation of the ARM Framework, in February 2012 for implementation in 2013. Addendum VII includes an allocation mechanism to divide the Delaware Bay optimized harvest output from the ARM Framework among the four Delaware Bay states (New Jersey, Delaware, Maryland, and Virginia east of the COLREGS). Season closures and restrictions, present within Addendum VI, remain in effect as part of Addendum VII.

Included in this report are state-by-state charts outlining compliance and monitoring measures. The PRT recommends all jurisdictions were in compliance with the FMP and subsequent Addenda in 2016.



MASSACHUSETTS		
	2016 Compliance Report	2017 Management Proposal
<b>De minimis status</b>	Did not qualify for <i>de minimis</i>	Does not qualify for <i>de minimis</i>
<b>Bait Harvest Restrictions and Landings</b>		
- ASMFC Quota (Voluntary State Quota)	330,377 (165,000)	330,377 (165,000)
- Other Restrictions	Bait: 300 crab daily limit year round; limited entry; Biomedical: 1,000 crab daily limit; Conch pot and eel fishermen: no possession limit All: May and June 5-day lunar closures; No mobile gear harvest Fri-Sat during summer flounder season; 7" PW minimum size; Pleasant Bay Closed Area	Bait: 300 crab daily limit year round; Biomedical: 1,000 crab daily limit; Conch pot and eel fishermen: no possession limit All: May and June 5-day lunar closures; No mobile gear harvest Fri-Sat during summer flounder season; 7" PW minimum size; Pleasant Bay Closed Area
- Landings	101,642	--
<b>Monitoring Component A<sub>1</sub></b>		
- Mandatory monthly reporting	Yes, plus weekly dealer reporting through SAFIS	Yes, plus weekly dealer reporting through SAFIS
- Characterize commercial bait fishery	Yes	Yes
<b>Monitoring Component A<sub>2</sub></b>		
- Biomedical harvest reporting	Yes	Yes
- Required information for biomedical use of crabs	Yes	Yes
<b>Monitoring Component A<sub>3</sub></b> Identify spawning and nursery habitat	Yes	Yes
<b>Monitoring Component B<sub>1</sub></b> Coastwide benthic trawl survey	Yes, VT Trawl Survey was conducted in 2016	Yes, VT Trawl Survey will be conducted in 2017; future years and spatial scope unknown at this time
<b>Monitoring Component B<sub>2</sub></b> Continue existing benthic sampling programs	Yes	Yes
<b>Monitoring Component B<sub>3</sub></b> Implement spawning survey	Yes	Yes
<b>Monitoring Component B<sub>4</sub></b> Tagging program	Yes – w/NPS and USFWS; Pleasant Bay, Monomy NWR, Waquoit Bay	Yes – w/NPS and USFWS; Pleasant Bay, Monomy NWR, Waquoit Bay

Note: The daily crab possession limit in the mobile gear fishery was changed to 300 crabs in 2014. This limit has remained in place since then.

RHODE ISLAND		
	2016 Compliance Report	2017 Management Proposal
<b><i>De minimis</i> status</b>	Did not qualify for <i>de minimis</i>	Does not qualify for <i>de minimis</i>
Bait Harvest Restrictions and Landings		
- ASMFC Quota (Voluntary State Quota)	26,053 (14,655)	26,053 (12,545)
- Other Restrictions	State Restrictions: - Bait Fishery Closure: 48 hours prior to and 48 hours following new and full moons during May, June, and July - Biomedical Fishery Closure: 48 hours prior to and 48 hours following new and full moons during May, June, and July	State Restrictions: - Daily possession limit: 60 crabs per permit - Bait Fishery Closure: May 1- May 31 - Biomedical Fishery Closure: 48 hours prior to and 48 hours following new and full moons during May
- Landings	20,917	--
Monitoring Component A <sub>1</sub>		
- Mandatory monthly reporting	Yes, weekly call in and monthly on paper	Yes, weekly call in and monthly on paper
- Characterize commercial bait fishery	Yes	Yes
Monitoring Component A <sub>2</sub>		
- Biomedical harvest reporting	Yes	Yes
- Required information for biomedical use of crabs	Yes, details within Massachusetts' reports	Captured in Massachusetts' reports
<b>Monitoring Component A<sub>3</sub></b> Identify spawning and nursery habitat	Yes	Yes
<b>Monitoring Component B<sub>1</sub></b> Coastwide benthic trawl survey	Yes, VT Trawl Survey was conducted in 2016	Yes, VT Trawl Survey will be conducted in 2017; future years and spatial scope unknown at this time
<b>Monitoring Component B<sub>2</sub></b> Continue existing benthic sampling programs	Yes	Yes
<b>Monitoring Component B<sub>3</sub></b> Implement spawning survey	Yes, since 2000 (methods unspecified)	Yes
<b>Monitoring Component B<sub>4</sub></b> Tagging program	RI DEM 2001-2004 only, No current state program	No

CONNECTICUT		
	2016 Compliance Report	2017 Management Proposal
<b><i>De minimis</i> status</b>	Did not qualify for <i>de minimis</i>	Does not qualify for <i>de minimis</i>
Bait Harvest Restrictions and Landings		
- ASMFC Quota	48,689	48,689
- Other Restrictions	Limited entry program, possession limits, and seasonal and area closures	Limited entry program, possession limits, and seasonal and area closures
- Landings	12,135	--
Monitoring Component A <sub>1</sub>		
- Mandatory monthly reporting	Yes	Yes
- Characterize commercial bait fishery	No – exempt under Addendum III because landings are < 5% of coastwide total	No – exempt under Addendum III because landings are < 5% of coastwide total
Monitoring Component A <sub>2</sub>		
- Biomedical harvest reporting	Not Applicable	Not Applicable
- Required information for biomedical use of crabs	Not Applicable	Not Applicable
<b>Monitoring Component A<sub>3</sub></b> Identify spawning and nursery habitat	Yes	Yes
<b>Monitoring Component B<sub>1</sub></b> Coastwide benthic trawl survey	Yes, VT Trawl Survey was conducted in 2016	Yes, VT Trawl Survey will be conducted in 2017; future years and spatial scope unknown at this time
<b>Monitoring Component B<sub>2</sub></b> Continue existing benthic sampling programs	Yes	Yes
<b>Monitoring Component B<sub>3</sub></b> Implement spawning survey	Yes, since 1999 (methods differ from DE Bay survey)	Yes
<b>Monitoring Component B<sub>4</sub></b> Tagging program	Yes, in collaboration with local universities (Sacred Heart University since 2015)	Yes

NEW YORK		
	2016 Compliance Report	2017 Management Proposal
<b><i>De minimis</i> status</b>	Did not qualify for <i>de minimis</i>	Does not qualify for <i>de minimis</i>
Bait Harvest Restrictions and Landings		
- ASMFC Quota (Voluntary State Quota)	366,272 (150,000)	366,272 (150,000)
- Other Restrictions	Ability to close areas to harvest; seasonal quotas and daily harvest limits	Ability to close areas to harvest; seasonal quotas and daily harvest limits
- Landings	176,632	--
Monitoring Component A <sub>1</sub>		
- Mandatory monthly reporting	Yes (weekly May – July)	Yes
- Characterize commercial bait fishery	Yes	Yes
Monitoring Component A <sub>2</sub>		
- Biomedical harvest reporting	Not Applicable	Not Applicable
- Required information for biomedical use of crabs	Not Applicable	Not Applicable
<b>Monitoring Component A<sub>3</sub></b> Identify spawning and nursery habitat	Yes	Yes
<b>Monitoring Component B<sub>1</sub></b> Coastwide benthic trawl survey	Yes, VT Trawl Survey was conducted in 2016	Yes, VT Trawl Survey will be conducted in 2017; future years and spatial scope unknown at this time
<b>Monitoring Component B<sub>2</sub></b> Continue existing benthic sampling programs	Yes	Yes
<b>Monitoring Component B<sub>3</sub></b> Implement spawning survey	Yes – adapted from DE Bay survey	Yes
<b>Monitoring Component B<sub>4</sub></b> Tagging program	Yes, since 2007	Yes

NEW JERSEY		
	2016 Compliance Report	2017 Management Proposal
<b><i>De minimis</i> status</b>	Qualified for <i>de minimis</i>	Qualifies but not requesting <i>de minimis</i>
<b>Bait Harvest Restrictions and Landings</b>		
- ASMFC Quota (Voluntary state quota)	162,136 [male only] (0)	162,136 [male only] (0)
- Other Restrictions	Bait harvest moratorium	Bait harvest moratorium
- Landings	0	--
<b>Monitoring Component A<sub>1</sub></b>		
- Mandatory monthly reporting	N/A	N/A
- Characterize commercial bait fishery	N/A	N/A
<b>Monitoring Component A<sub>2</sub></b>		
- Biomedical harvest reporting	Pending	Yes
- Required information for biomedical use of crabs	Pending	Yes
<b>Monitoring Component A<sub>3</sub></b> Identify spawning and nursery habitat	Yes	Yes
<b>Monitoring Component B<sub>1</sub></b> Coastwide benthic trawl survey	Yes, VT Trawl Survey was conducted in 2016	Yes, VT Trawl Survey will be conducted in 2017; future years and spatial scope unknown at this time
<b>Monitoring Component B<sub>2</sub></b> Continue existing benthic sampling programs	Yes –NJ Ocean Trawl Survey, DE Bay Trawl Survey, and Surf Clam Survey (see note below).	Yes, though funding for Surf Clam Survey uncertain past 2017
<b>Monitoring Component B<sub>3</sub></b> Implement spawning survey	Yes – since 1999	Yes
<b>Monitoring Component B<sub>4</sub></b> Tagging program	Outside, independent groups currently	No
<b>Monitoring Component B<sub>5</sub></b> Egg abundance survey	Yes, but removed as a mandatory component	Yes
<b>Monitoring Component B<sub>6</sub></b> Shorebird monitoring program	Yes	Yes

Note: the Surf Clam Dredge survey continued in 2015 and 2016, after hiatus in 2013 and 2014. The survey was continued with a new vessel and new survey gear. NJ Staff is still working through conversion factors between the previous gear type and one used in 2015-16; no new information available yet.

<b>DELAWARE</b>		
	<b>2016 Compliance Report</b>	<b>2017 Management Proposal</b>
<b><i>De minimis status</i></b>	Did not qualify for <i>de minimis</i>	Does not qualify for <i>de minimis</i>
<b>Bait Harvest Restrictions and Landings</b>		
- ASMFC Quota	162,136 [male only]	162,136 [male only]
- Other Restrictions	Closed season (January 1 – June 7)	Closed season (January 1 – June 7)
- Landings	159,545 males	--
<b>Monitoring Component A<sub>1</sub></b>		
- Mandatory monthly reporting	Yes (daily call-in reports & monthly logbooks)	Yes
- Characterize commercial bait fishery	Yes	Yes
<b>Monitoring Component A<sub>2</sub></b>		
- Biomedical harvest reporting	Not Applicable	Not Applicable
- Required information for biomedical use of crabs	Not Applicable	Not Applicable
<b>Monitoring Component A<sub>3</sub></b> Identify spawning and nursery habitat	Yes – updates once every 5 years or as needed	Yes – updates once every 5 years or as needed
<b>Monitoring Component B<sub>1</sub></b> Coastwide benthic trawl survey	Yes, VT Trawl Survey was conducted in 2016	Yes, VT Trawl Survey will be conducted in 2017; future years and spatial scope unknown at this time
<b>Monitoring Component B<sub>2</sub></b> Continue existing benthic sampling programs	Yes	Yes
<b>Monitoring Component B<sub>3</sub></b> Implement spawning survey	Yes	Yes
<b>Monitoring Component B<sub>4</sub></b> Tagging program	No state program but has assisted in the past with various Delaware Bay horseshoe crab tagging initiatives	No
<b>Monitoring Component B<sub>5</sub></b> Egg abundance survey	Removed as component	Removed as component
<b>Monitoring Component B<sub>6</sub></b> Shorebird monitoring program	Yes	Yes

Note: The egg abundance survey has been discontinued as a mandatory monitoring element. Delaware will include information on the survey if it continues, but is no longer required to perform the survey.

MARYLAND		
	2016 Compliance Report	2017 Management Proposal
<b><i>De minimis</i> status</b>	Did not qualify for <i>de minimis</i>	Does not qualify for <i>de minimis</i>
Bait Harvest Restrictions and Landings		
- ASMFC Quota	255,980 (male only)	255,980 (male only)
- Other Restrictions	Delayed harvest and closed season/area combinations	Delayed harvest and closed season/area combinations; shore harvest prohibited
- Landings	157,013	--
Monitoring Component A <sub>1</sub>		
- Mandatory monthly reporting	Yes (weekly reports for permit holders; monthly for non-permit holders)	Yes (weekly reports for permit holders; monthly for non-permit holders)
- Characterize commercial bait fishery	Yes	Yes
Monitoring Component A <sub>2</sub>		
- Biomedical harvest reporting	Yes	Yes
- Required information for biomedical use of crabs	Yes	Yes
<b>Monitoring Component A<sub>3</sub></b> Identify spawning and nursery habitat	Yes	Yes
<b>Monitoring Component B<sub>1</sub></b> Coastwide benthic trawl survey	Yes, VT Trawl Survey was conducted in 2016	Yes, VT Trawl Survey will be conducted in 2017; future years and spatial scope unknown at this time
<b>Monitoring Component B<sub>2</sub></b> Continue existing benthic sampling programs	Yes	Yes
<b>Monitoring Component B<sub>3</sub></b> Implement spawning survey	Yes	Yes
<b>Monitoring Component B<sub>4</sub></b> Tagging program	Yes – through biomedical harvest	Yes – through biomedical harvest

POTOMAC RIVER FISHERIES COMMISSION		
	2016 Compliance Report	2017 Management Proposal
<b>De minimis status</b>	<i>De minimis</i> status granted.	<i>De minimis</i> requested and meets criteria.
- Ability to close fishery if <i>de minimis</i> threshold is reached	No horseshoe crab fishery	No horseshoe crab fishery
- Daily possession limit <25 for <i>de minimis</i> state		
- HSC landing permit		
Bait Harvest Restrictions and Landings		
- ASMFC Quota	0	0
- Other Restrictions	None	None
- Landings	0	0
Monitoring Component A <sub>1</sub>		
- Mandatory monthly reporting	Yes - weekly	Yes - weekly
- Characterize commercial bait fishery	Not Applicable	Not Applicable
Monitoring Component A <sub>2</sub>		
- Biomedical harvest reporting	Not Applicable	Not Applicable
- Required information for biomedical use of crabs	Not Applicable	Not Applicable
<b>Monitoring Component A<sub>3</sub></b> Identify spawning and nursery habitat	Not Applicable	Not Applicable
<b>Monitoring Component B<sub>1</sub></b> Coastwide benthic trawl survey	Yes, VT Trawl Survey was conducted in 2016	Yes, VT Trawl Survey will be conducted in 2017; future years and spatial scope unknown at this time
<b>Monitoring Component B<sub>2</sub></b> Continue existing benthic sampling programs	Not Applicable	Not Applicable
<b>Monitoring Component B<sub>3</sub></b> Implement spawning survey	Not Applicable	Not Applicable
<b>Monitoring Component B<sub>4</sub></b> Tagging program	Not Applicable	Not Applicable



VIRGINIA		
	2016 Compliance Report	2017 Management Proposal
<b><i>De minimis</i> status</b>	Did not qualify for <i>de minimis</i>	Does not qualify for <i>de minimis</i>
Bait Harvest Restrictions and Landings		
- ASMFC Quota (State-reduced quota for overage)	172,828 (81,331 male-only east of COLREGS line)	172,828 (81,331 male-only east of COLREGS line)
- Other Restrictions	Closed season (January 1 – June 7) for federal waters. Effective January 1, 2013 harvest of horseshoe crabs, from east of the COLREGS line, is limited to trawl gear and dredge gear only.	Closed season (January 1 – June 7) for federal waters. Effective January 1, 2013 harvest of horseshoe crabs, from east of the COLREGS line, is limited to trawl gear and dredge gear only.
- Landings	133,453 (39,012)	--
Monitoring Component A <sub>1</sub>		
- Mandatory monthly reporting	Yes – new permit system; limited entry to fishery and individual quotas established	Yes
- Characterize commercial bait fishery	Yes	Yes
Monitoring Component A <sub>2</sub>		
- Biomedical harvest reporting	Yes	Yes
- Required information for biomedical use of crabs	Yes	Yes
<b>Monitoring Component A<sub>3</sub></b> Identify spawning and nursery habitat	Yes – completed	No
<b>Monitoring Component B<sub>1</sub></b> Coastwide benthic trawl survey	Yes, VT Trawl Survey was conducted in 2016	Yes, VT Trawl Survey will be conducted in 2017; future years and spatial scope unknown at this time
<b>Monitoring Component B<sub>2</sub></b> Continue existing benthic sampling programs	No	No
<b>Monitoring Component B<sub>3</sub></b> Implement spawning survey	No	No
<b>Monitoring Component B<sub>4</sub></b> Tagging program	No	No

<b>NORTH CAROLINA</b>		
	<b>2016 Compliance Report</b>	<b>2017 Management Proposal</b>
<b><i>De minimis</i> status</b>	Did not qualify for <i>de minimis</i>	Does not qualify for <i>de minimis</i>
<b>Bait Harvest Restrictions and Landings</b>		
- ASMFC Quota	24,036	24,036
- Adjusted Quota	25,286*	--
- Other Restrictions	Trip limit of 50 crabs; Proclamation authority to adjust trip limits, seasons, etc.	Trip limit of 50 crabs; Proclamation authority to adjust trip limits, seasons, etc.
- Landings	25,197	--
<b>Monitoring Component A<sub>1</sub></b>		
- Mandatory monthly reporting	Yes – trip level reporting each month	Yes – trip level reporting each month
- Characterize commercial bait fishery	Yes	Yes
<b>Monitoring Component A<sub>2</sub></b>		
- Biomedical harvest reporting	Not Applicable	Not Applicable
- Required information for biomedical use of crabs	Not Applicable	Not Applicable
<b>Monitoring Component A<sub>3</sub></b> Identify spawning and nursery habitat	Little information available Survey discontinued after 2002 and 2003 due to low levels of crabs recorded	Not specified
<b>Monitoring Component B<sub>1</sub></b> Coastwide benthic trawl survey	Yes, VT Trawl Survey was conducted in 2016	Yes, VT Trawl Survey will be conducted in 2017; future years and spatial scope unknown at this time
<b>Monitoring Component B<sub>2</sub></b> Continue existing benthic sampling programs	Yes	Yes
<b>Monitoring Component B<sub>3</sub></b> Implement spawning survey	No	No
<b>Monitoring Component B<sub>4</sub></b> Tagging program	No	No

\*Note: there was quota transfer of 1,250 crabs from Georgia to North Carolina to cover their quota overage of 1,161 horseshoe crabs in 2016.

SOUTH CAROLINA		
	2016 Compliance Report	2017 Management Proposal
<b>De minimis status</b>	<i>De minimis</i> status granted.	<i>De minimis</i> requested and meets criteria.
- Ability to close fishery if <i>de minimis</i> threshold is reached	No horseshoe crab bait fishery	No horseshoe crab bait fishery
- Daily possession limit <25 for <i>de minimis</i> state		
- HSC landing permit		
Bait Harvest Restrictions and Landings		
- ASMFC Quota	0	0
- Other Restrictions	None	None
- Landings	0	--
Monitoring Component A <sub>1</sub>		
- Mandatory monthly reporting	Yes (Biomedical) ✓	Yes (Biomedical)
- Characterize commercial bait fishery	Not Applicable	Not Applicable
Monitoring Component A <sub>2</sub>		
- Biomedical harvest reporting	Yes	Yes
- Required information for biomedical use of crabs	Yes	Yes
<b>Monitoring Component A<sub>3</sub></b> Identify spawning and nursery habitat	Completed	No
<b>Monitoring Component B<sub>1</sub></b> Coastwide benthic trawl survey	Yes, VT Trawl Survey was conducted in 2016	Yes, VT Trawl Survey will be conducted in 2017; future years and spatial scope unknown at this time
<b>Monitoring Component B<sub>2</sub></b> Continue existing benthic sampling programs	Yes	Yes
<b>Monitoring Component B<sub>3</sub></b> Implement spawning survey	No	No
<b>Monitoring Component B<sub>4</sub></b> Tagging program	Yes	Yes

GEORGIA		
	2016 Compliance Report	2017 Management Proposal
<b>De minimis status</b>	<i>De minimis</i> status granted.	<i>De minimis</i> requested and meets criteria.
- Ability to close fishery if <i>de minimis</i> threshold is reached	Yes	Yes
- Daily possession limit <25 for <i>de minimis</i> state	25/person; 75/vessel with 3 licensees	25/person; 75/vessel with 3 licensees
- HSC landing permit	Must have commercial shrimp, crab, or whelk license; LOA permit required	Must have commercial shrimp, crab, or whelk license; LOA permit required
<b>Bait Harvest Restrictions and Landings</b>		
- ASMFC Quota	29,312	29,312
(State Quota)	28,062*	29,312
- Other Restrictions	None	None
- Landings	0	--
<b>Monitoring Component A<sub>1</sub></b>		
- Mandatory monthly reporting	Yes	Yes
- Characterize commercial bait fishery	No bait landings	Yes
<b>Monitoring Component A<sub>2</sub></b>		
- Biomedical harvest reporting	Not Applicable	Not Applicable
- Required information for biomedical use of crabs	Not Applicable	Not Applicable
<b>Monitoring Component A<sub>3</sub></b> Identify spawning and nursery habitat	Completed	Not Applicable
<b>Monitoring Component B<sub>1</sub></b> Coastwide benthic trawl survey	Yes, VT Trawl Survey was conducted in 2016	Yes, VT Trawl Survey will be conducted in 2017; future years and spatial scope unknown at this time
<b>Monitoring Component B<sub>2</sub></b> Continue existing benthic sampling programs	Yes	Yes
<b>Monitoring Component B<sub>3</sub></b> Implement spawning survey	No	No
<b>Monitoring Component B<sub>4</sub></b> Tagging program	No	No

\*Note there was quota transfer of 1,250 crabs from Georgia to North Carolina to cover their quota overage of 1,161 horseshoe crabs in 2016.

FLORIDA		
	2016 Compliance Report	2017 Management Proposal
<b>De minimis status</b>	<i>De minimis</i> status granted.	<i>De minimis</i> requested and meets criteria.
- Ability to close fishery if <i>de minimis</i> threshold is reached	Yes	Yes
- Daily possession limit <25 for <i>de minimis</i> state	25/person w/ valid saltwater products license; 100/person with marine life endorsement	25/person w/ valid saltwater products license; 100/person with marine life endorsement
- HSC landing permit	See above	See above
Bait Harvest Restrictions and Landings		
- ASMFC Quota	9,455	9,455
- Other Restrictions	None	None
- Landings	689	--
Monitoring Component A <sub>1</sub>		
- Mandatory monthly reporting	Yes	Yes
- Characterize commercial bait fishery	No	Yes
Monitoring Component A <sub>2</sub>		
- Biomedical harvest reporting	Not Applicable	Not Applicable
- Required information for biomedical use of crabs	Not Applicable	Not Applicable
<b>Monitoring Component A<sub>3</sub></b> Identify spawning and nursery habitat	Yes	Yes
<b>Monitoring Component B<sub>1</sub></b> Coastwide benthic trawl survey	Yes, VT Trawl Survey was conducted in 2016	Yes, VT Trawl Survey will be conducted in 2017; future years and spatial scope unknown at this time
<b>Monitoring Component B<sub>2</sub></b> Continue existing benthic sampling programs	No	No
<b>Monitoring Component B<sub>3</sub></b> Implement spawning survey	No	Yes
<b>Monitoring Component B<sub>4</sub></b> Tagging program	No	Yes

Note: Florida reported an additional 1,528 crabs harvested along the east coast for 'marine life' use in 2016.

### ***Alternative Baits***

Delaware, Connecticut, Rhode Island and Massachusetts attempted to participate in field trials with Ecobait, available from LaMonica Fine Foods in New Jersey. Massachusetts and Delaware were unable to conduct the trials due to difficulties in securing the Ecobait samples from LaMonica; Connecticut and Rhode Island were able to conduct trials in fall 2014. The results of the study were presented to the Horseshoe Crab Technical Committee and Delaware Bay Ecosystem Technical in October 2015. The results demonstrated that the Ecobait produced by LaMonica Fine Foods performed comparable to conventional bait used by conch fishermen in Rhode Island and Connecticut. The results were presented to Board at the 2016 ASMFC Winter Meeting. Subsequently, the Board requested that a survey of current bait usage in the eel and whelk fisheries be conducted. The TC has conducted this survey and will present the results to the Board at the 2017 Annual Meeting.

### ***Shorebird***

The USFWS received petitions in 2004 and 2005 to emergency list the red knot under the Endangered Species Act. In fall 2005, it determined that emergency listing was not warranted at the time. As part of a court settlement, the USFWS agreed to initiate proposed listings of over 200 species, including the red knot. In fall 2013, the USFWS released a proposal for listing the red knot as threatened. In January 2015 the USFWS determined that red knot be designated as threatened under the Endangered Species Act.

The red knot remains listed as an endangered species in the state of New Jersey (since 2012).

## **VI. Research Needs/PRT Recommendations**

### ***De Minimis***

States may apply for *de minimis* status if, for the last two years, their combined average horseshoe crab bait landings (by numbers) constitute less than one percent of coastwide horseshoe crab bait landings for the same two-year period. States may petition the Board at any time for *de minimis* status, if their fishery falls below the threshold level. Once *de minimis* status is granted, designated States must submit annual reports to the Board justifying the continuance of *de minimis* status.

States that qualify for *de minimis* status are not required to implement any horseshoe crab harvest restriction measures, but are required to implement components A, B, E and F of the monitoring program (Section 3.5 of the FMP; further modified by Addendum III). Since *de minimis* states are exempt from a harvest cap, there is potential for horseshoe crab landings to shift to *de minimis* states and become substantial, before adequate action can be taken. To control shifts in horseshoe crab landings, *de minimis* states are encouraged to implement one of the following management measures:

1. Close their respective horseshoe crab bait fishery when landings exceed the *de minimis* threshold;

2. Establish a state horseshoe crab landing permit, making it only available to individuals with a history of landing horseshoe crabs in that state; or

3. Establish a maximum daily harvest limit of up to 25 horseshoe crabs per person per day. States which implement this measure can be relieved of mandatory monthly reporting, but must report all horseshoe crabs harvests on an annual basis.

The following states have been removed from the Management Board in recent years: Pennsylvania (2007), Maine (2011), and New Hampshire (2014). The Potomac River Fisheries Commission, South Carolina, Georgia, and Florida are requesting *de minimis* status for the 2017 fishing season based on the 2015-16 season landings and meet the FMP requirements for being granted this status (Table 1). The PRT recommends granting these jurisdictions *de minimis* status with the provision that marine life landings from Florida be considered in determining future *de minimis* status. Regarding the transfer requests from Georgia to North Carolina, the PRT finds that the quota transfer does not pose concerns for the regional horseshoe crab population or migratory shorebirds at this time, due to the size of the transfer.

#### *Funding for Research and Monitoring Activities*

The PRT strongly recommends the continuation of the VT benthic trawl survey in order to provide the critical information for stock assessments and the ARM model. The survey is a necessity to continue ARM implementation. This effort provides a statistically reliable estimate of horseshoe crab relative abundance

# Atlantic States Marine Fisheries Commission

## Coastal Sharks Management Board

*October 17, 2017*

*1:15 – 2:15 p.m.*

*Norfolk, Virginia*

### Draft Agenda

The times listed are approximate; the order in which these items will be taken is subject to change; other items may be added as necessary.

1. Welcome/Call to Order (*R. Miller*) 1:15 p.m.
2. Board Consent 1:15 p.m.
  - Approval of Agenda
  - Approval of Proceedings from May 2017
3. Public Comment 1:20 p.m.
4. Final Rule for Highly Migratory Species Amendment 5b (Dusky Sharks) 1:30 p.m.
  - Review Final Rule and NOAA Fisheries Request for Complementary Measures (*K. Brewster-Geisz*)
  - Review Law Enforcement Committee Report (*M. Robson*)
  - Review Technical Committee Report (*K. Rootes-Murdy*)
  - Review State Feedback (*K. Rootes-Murdy*)
  - Consider Complementary Management Measures (*R. Miller*) **Possible Action**
5. Set 2018 Specifications (*K. Rootes-Murdy*) **Final Action** 1:50 p.m.
6. Elect Vice-Chair (**Action**) 2:10 p.m.
7. Other Business/Adjourn 2:15 p.m.

The meeting will be held at the Waterside Marriot Hotel; 235 East Main St Norfolk, Virginia; 757.627.4200



# MEETING OVERVIEW

## Coastal Sharks Management Board Meeting

**October 17, 2017**

**1:15 – 2:15 p.m.**

**Norfolk, Virginia**

Chair: Roy Miller (DE) Assumed Chairmanship: 5/2017	Vice Chair: VACANT	Law Enforcement Committee Representative: Chrisolm Frampton
Coastal Shark Technical Committee Chair: Carolyn Belcher (GA)	Coastal Shark Advisory Panel Chair: Lewis Gillingham (VA)	Previous Board Meeting: May 2017
Voting Members: ME, MA, RI, CT, NY, NJ, DE, MD, VA, NC, SC, GA, FL, NMFS, USFWS (15 votes)		

### 2. Board Consent

- Approval of Agenda
- Approval of Proceedings from May 2017

3. Public Comment – At the beginning of the meeting public comment will be taken on items not on the Agenda. Individuals that wish to speak at this time must sign in at the beginning of the meeting. For agenda items that have already gone out for public hearing and/or have had a public comment period that has closed, the Board Chair may determine that additional public comment will not provide additional information. In this circumstance the Chair will not allow additional public comment on an issue. For agenda items that the public has not had a chance to provide input, the Board Chair may allow limited opportunity for comment. The Board Chair has the discretion to limit the number of speakers and/or the length of each comment.

<b>4. Final Rule for Highly Migratory Species (HMS) Amendment 5b (Dusky Sharks) (1:30-1:50 p.m.) Possible Action</b>
<b>Background</b> <ul style="list-style-type: none"> <li>• At the May meeting, the Board reviewed the new federal shark measures in the Final Rule for HMS Amendment 5b. Before considering final action the Board requested the Law Enforcement Committee and Technical Committee review the proposed measures.</li> <li>• The Law Enforcement Committee reviewed each measure and provided recommendations.</li> <li>• The Technical Committee was asked to provide comments regarding the potential to extend NOAA Fisheries cooperative research into state water fisheries.</li> <li>• States were asked to let staff know if they have implemented state-specific measures to address best practices for shore and pier fishing and/or require circle hooks when fishing for sharks.</li> </ul>

- The Board could complement the federal measures and require state licensed fishermen to abide by some or all of Amendment 5b measures.

#### **Presentations**

- Review Final Rule and NOAA Fisheries Request for Complementary Measures by *K. Brewster-Geisz* (**Briefing Materials**)
- Review Law Enforcement Committee Report by M. Robson (**Briefing Materials**)
- Review Technical Committee Report and Review State Feedback by (K. Rootes-Murdy) (**Briefing Materials**)

#### **Board Actions for Consideration at this Meeting**

- Set complementary measures in state waters for dusky sharks consistent with Amendment 5b

#### **4. Set 2018 Specifications (1:50-2:10 p.m.) Final Action**

##### **Background**

- Similar to the 2017 fishing season, NMFS is proposing a January 1 open date for all shark management group. Also proposed is an initial 25 shark possession limit for large coastal and hammerhead management groups with the possibility of in season adjustments. (**Briefing Materials**)

##### **Presentations**

- NMFS Proposed Rule for 2018 Specifications by K. Rootes-Murdy

##### **Board Actions for Consideration at this Meeting**

- Set the 2018 coastal shark specifications including commercial opening dates and commercial possession limits by management group.

#### **5. Elect Vice-Chair**

#### **6. Other Business/Adjourn**

**DRAFT PROCEEDINGS OF THE  
ATLANTIC STATES MARINE FISHERIES COMMISSION  
COASTAL SHARKS MANAGEMENT BOARD**

**The Westin Alexandria**  
Alexandria, Virginia  
**May 10, 2017**

These minutes are draft and subject to approval by the Coastal Sharks Management Board.  
The Board will review the minutes during its next meeting.

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1. **Approval of agenda by consent** (Page 1).
2. **Approval of proceedings of October 2016 by consent** (Page 1).
3. **Motion to adjourn** by consent (Page 13).

**ATTENDANCE**

**Board Members**

Sarah Ferrara, MA, proxy for Rep. Peake (LA)	Rachel Dean, MD (GA)
Dan McKiernan, MA, proxy for D. Pierce (AA)	Rob O'Reilly, VA, proxy for J. Bull (AA)
Jason McNamee, RI, proxy for J. Coit (AA)	Michelle Duval, NC, proxy for B. Davis (AA)
Colleen Giannini, CT, proxy for M. Alexander (AA)	Doug Brady, NC (GA)
Steve Heins, NY, proxy for J. Gilmore (AA)	David Bush, NC, proxy for Rep. Steinburg (LA)
Tom Fote, NJ (GA)	Robert Boyles, Jr., SC (AA)
Adam Nowalsky, NJ, proxy for Asm. Andrzejczak (LA)	Malcolm Rhodes, SC (GA)
Tom Baum, NJ, proxy for L. Herrighty (AA)	Pat Geer, GA, proxy for Rep. Nimmer (LA)
Craig Pugh, DE, proxy for Rep. Carson (LA)	Spud Woodward, GA (AA)
Stew Michels, DE, proxy for D. Saveikis (GA)	Rep. Thad Altman, FL (LA)
Roy Miller, DE (GA)	James Estes, FL, proxy for J. McCawley (AA)
Ed O'Brien, MD, proxy for Del. Stein (LA)	Wilson Laney, USFWS
Mike Luisi, MD, proxy for D. Blazer (AA)	Karyl Brewster-Geisz, NOAA

**(AA = Administrative Appointee; GA = Governor Appointee; LA = Legislative Appointee)**

**Ex-Officio Members**

Lewis Gillingham, Advisory Panel Chair	Doug Messick, Law Enforcement Representative
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**Staff**

Robert Beal	Ashton Harp
Toni Kerns	Max Appelman

**Guests**

Sonja Fordham, Sharks Advocates Int'l

The Coastal Sharks Management Board of the Atlantic States Marine Fisheries Commission convened in the Edison Ballroom of the Westin Hotel, Alexandria, Virginia, May 10, 2017, and was called to order at 9:55 o'clock a.m. by Chairman Roy W. Miller.

#### **CALL TO ORDER**

CHAIRMAN ROY W. MILLER: Good morning, I'm Roy Miller; I'm from Delaware. I'm the new Coastal Shark Board Chair; and I would like to convene today's Coastal Shark Board meeting.

#### **APPROVAL OF AGENDA**

CHAIRMAN MILLER: As has been our practice, we need to approve the agenda. Draft agendas are available over on the table, if you don't have one.

Are there any additions or corrections to the agenda as we have it before us? Seeing no hands; I'll assume that it is approved as proposed.

#### **APPROVAL OF PROCEEDINGS**

CHAIRMAN MILLER: The next item is the approval of the proceedings from the October, 2016 Shark Board meeting. Would anyone offer a motion to approve those proceedings from 2016? There was a hand; I think that's Rob O'Reilly.

MR. ROB O'REILLY: Recommend approval.

CHAIRMAN MILLER: Is there a second to that; second by Jason? Any objection to approval, seeing no objection we'll move on to public comment?

#### **PUBLIC COMMENT**

CHAIRMAN MILLER: As our custom has been, there was an opportunity to sign up for public comment for any items not on the agenda. No one has signed up.

However, we'll probably have an opportunity to recognize members of the public, should a particular issue catch your fancy and you wish to offer comments; particularly when we get to Item 4, concerning final rule. We'll entertain that as time would allow. Again, I'm Roy Miller and up at the table with me we have Lewis Gillingham, representing the Advisory Panel, Doug Mesick representing Law Enforcement, and of course Ashton Harp, Commission staff.

#### **FINAL RULE FOR HIGHLY MIGRATORY SPECIES, AMENDMENT 5B CONCERNING DUSKY SHARKS**

CHAIRMAN MILLER: Without further ado, I would like to move on to Agenda Item 4, concerning the Final Rule for Highly Migratory Species, Amendment 5b concerning dusky sharks. I'm probably going to call on Karyl Brewster-Geisz; concerning the review of the Final Rule for the Highly Migratory Species Amendment 5b. I'll call on Karyl first.

MS. KARYL BREWSTER-GEISZ: Hello everybody, my name is Karyl Brewster-Geisz; I work with the Highly Migratory Species Management Division of NOAA Fisheries. I'm here today with two colleagues, Tobey Curtis and Gray Redding; and they are sitting in the back. If you have any questions after this meeting, we can always talk as well.

I'm here to talk about our final Amendment 5b, regarding dusky sharks. I am going to give you a very brief background, I know I presented to all of you last fall, summarize some of the public comments we received, and go over the final measures; along with some of our requests for this Board to consider for complementary measures. Last summer we received a final stock assessment update regarding dusky sharks. This was updating a 2011 assessment. The latest update found that dusky sharks continue to be overfished, with overfishing occurring.

A mortality reduction of 12 percent was needed in order to stop overfishing, and a 35 percent reduction in mortality is needed to rebuild the

stock by the year 2107. That is 90 years from now. We issued a proposed rule back in October. Comments were accepted through December. We heard a lot of comments, as I'll go over.

We released the final Environmental Impact Statement in February, this past February, and issued the final rule April 4th. Then we have two effective dates of either June 5th of this year, or January 1st next year. Regarding public comments, most of the comments I'd say we received were regarding the recreational measures.

We had proposed that all anglers wishing to fish recreationally would need to obtain, in addition to one of our HMS permits, a shark endorsement. This shark endorsement would require watching a video and taking a quiz online. Generally, a lot of people liked that idea. We did have some people talking about how that was unheard of and we shouldn't do it. But we had some commenter's saying that we should require such educational classes, in order to get a permit for any HMS.

If you remember, we also proposed circle hooks for shark fishing, and in addition to the circle hooks we had specific leader strength, in order for those circle hooks. Most of the comments were in regard to that. People did not like the leader strength. They thought that that proposal would limit their ability to fish recreationally for other species; such as dolphin or wahoo or swordfish, tunas, billfish. We heard a lot of those comments.

Then we also heard comments that we needed to improve recreational catch data for all sharks; not just duskies. Commercially we had proposed removing as much gear as possible from the dusky shark; particularly pelagic longliners cutting the gangion no more than three feet from the hook. We heard a lot of the longliners tell us that there were safety concerns with that. That if the shark was really fighting, cutting a tight line would cause the line

to snap back in their face. They had some concerns about that.

We also had concerns that our proposed measure to move one nautical mile would not be far enough away from the dusky sharks; and you could still reach dusky sharks. Then we had some concern about whether or not circle hooks would be effective on bottom longline gear. Beyond the commercial and recreational measures, we had a lot of comments that there are a lot of dusky sharks caught as bycatch in non HMS fisheries; and we need to worry and set up measures regarding that bycatch.

We also had support for some of the hot spot closed areas that we looked at, but did not propose, and a lot of questions about how we're going to monitor the effectiveness of the final measures. We considered all of those comments and made a number of changes. With Alternative A2, this was the alternative with the shark endorsement. We did finalize this. This will go into effect January 1st of next year. This will include an educational video of about two minutes. We have a draft available right now that we showed our Advisory Panel yesterday; which if the Board likes, I can show today. It's a little bit longer than two minutes. The video focuses on how to identify dusky sharks and other ridgeback sharks; and some of the measures to handle and release sharks safely. There would then be a quiz, just to make sure that everybody heard the same information in the video; and the quiz will be really short, it's just an educational tool. Nobody would fail the quiz. If you answer the wrong answer, you would just get, nope that was wrong, here is the right answer; and it would explain it.

Then we're also working on updating all of our educational materials, so our recreational placard, we're working on a prohibited species poster, we're working on a little sticker about dusky sharks; so a lot more educational materials than we had before. Alternative 6d, this is a new alternative based on some of the



comments that we received regarding circle hooks.

This would also be effective January 1st, and this would require the use of non-offset, non-stainless steel circle hooks by all of our permit holders with a shark endorsement, when fishing for sharks recreationally south of 41°, 43 minutes north latitude. That is about equivalent with Chatham, Massachusetts, so any place north of that you don't need to use the circle hooks; any place south you would.

This was based on the northernmost range of dusky sharks. The map on the screen, you'll see the green dots on the bottom. That is all the data we have regarding where dusky sharks occur; so that's how we drew that line. Any sharks that are caught on a J-hook would need to be released, so they could not be retained.

This is on a line-by-line basis. We are aware that some recreational fishermen put out some lines for sharks and some line for some other species. Only the lines that are meant for sharks would need to use circle hooks. The commercial measures are pretty much unchanged from where they were when we proposed them. The difference would be Alternative B3. This is requiring pelagic longliners to release sharks cutting the gangion no more than three feet from the hook.

We have added, as safely as practicable, to make sure that the fishermen know they don't have to necessarily take unsafe actions, or actions they think would hurt them. But we are encouraging them to minimize as much gear as possible. They are all trained in how to do this; because they are required to take a class on how to release sea turtles and these gears they're using to release the sharks are the same.

They would also be required to complete additional information in those workshops; only this information would be on shark identification, not on sea turtles. They would need to notify others when they interact with a

dusky shark; and move at least one nautical mile away. The one nautical mile is equivalent to what we require for sea turtles and marine mammals.

This is not something outrageously new. It's just new for sharks. Then Alternative B9 is requiring the use of circle hooks in the directed bottom longline fishery. To summarize, we're pretty sure all of these final measures will end overfishing immediately; and that is that 12 percent fishing mortality reduction, and that we will achieve the mortality reduction target of 35 percent, in order to rebuild the stock by 2107.

The other thing Amendment 5b did is we did clarify what the annual catch limit is for all of our prohibited species; including dusky sharks, and that means an ACL of 0. We are aware there is bycatch of all of these species. But we did not want to encourage fishermen to try to reach any particular target. We have set it at 0 with the understanding, yes there will be some bycatch, but we will be monitoring that; and we'll take additional measures as needed to reduce that mortality, if any of the mortality on a particular species starts going up. The last thing I wanted to touch on is what measures we think we would like the states to take; in order to be complementary with us.

The first and I think probably the most obvious, is help us with outreach and education. Part of this would be helping distribute some of our educational materials we are creating; along with providing links to that material online, on the state web pages. For instance, if a state has a web page on how to get a state license, maybe also provide links to our outreach materials; and perhaps if somebody is interested in fishing in federal waters, the link to our permits web page.

We would also like to collaborate with the states on development of the best practices to handle and release sharks, particularly when we're talking about shore and pier-based fishing. Part of NOAA Fisheries, we're federal waters; we don't have any fishing from shore.

But all of you do. How you release a shark from shore can be very different than how you would release it from the side of a vessel.

We would like you to consider requiring circle hooks in the various state hook-and-line fisheries. This would be in your recreational fisheries, along with your short line, and possibly commercial hand gear fisheries. We would like you to consider requiring fishermen to maximize gear removal before removing sharks.

As I said, our pelagic longline fishermen, as of June 5th, will be required to remove sharks with no more than three feet from the gangion remaining. Then we would also like to have you consider using cooperative research with us; to improve estimates of dusky and other sharks that are caught in state water fisheries.

One idea we had could be maybe via the commercial shark research fishery. This is a research fishery that we only have between five and ten fishermen participate in annually. They are the only fishermen who are allowed to land sandbar sharks. They have 100 percent observer coverage. They are very limited in how many hooks they can use, and what their soak times are.

We regulate them pretty well. Their problem is because they can land sandbar sharks, they are not allowed to fish in state waters. But this is one way we could all collect additional data on what's happening in state waters for dusky and sandbar sharks; if we could find some way of letting these fishermen into state waters. That's all I have; if there are any questions. Thank you.

CHAIRMAN MILLER: Thank you, Karyl. At this point we'll entertain any questions based on Karyl's presentation. I see a hand in the back, is that Jim?

MR. JIM ESTES: Yes sir, thank you, Mr. Chairman, thank you, Karyl. Question that I have is if, I think we're going to be considering

adopting some of these measures in state waters. If we do not adopt the measures that you suggested in state waters, and specifically talking about the requirement to have educational information mandatory for recreational fishermen. If we do not do that do you still think that you will reach your goals?

MS. BREWSTER-GEISZ: I think we could. But it is not as likely, as certain. A big portion of Amendment 5b is the education and outreach. It is teaching recreational anglers what a dusky shark is. It is teaching the commercial fishermen what dusky sharks are. Not all fishermen are aware of it.

You will hear a lot of, particularly recreational anglers, talk about sand sharks or brown sharks. In most cases those anglers are talking about a ridgeback species that they are not supposed to be landing; and so it's getting that out. It is not necessarily teaching them this is definitely a dusky, it's teaching them this is a ridgeback shark; you should not be keeping it.

CHAIRMAN MILLER: Rob O'Reilly and then Robert.

MR. O'REILLY: I guess one thing I would be interested in. It seems that your summary pretty much captures what's in the rule; and so it would be good to have that. Most states or all states have some type of an advisory group, where the advisory group could be provided this information, both on the recreational and the commercial side. That would be beneficial. The website, I understand that part of it. I was curious, and when you talked about the circle hook, I didn't see the word shark there; but you did mean hook and line fisheries for shark, is that correct?

MS. BREWSTER-GEISZ: That's correct.

MR. O'REILLY: Okay and I'll follow if I may, Mr. Chair, just with a suggestion. The way you portrayed the quiz, I think you need to get at the psychology a little bit. We often are subjected in the states to these conflict of

interest and other types of quizzes. To just provide the right answer is probably going to be less effective than if you can look at your quiz, your design, and make them get the right answer.

Even if it takes someone three tries, I think it would be better for them to recognize that; because I would be concerned with someone taking the quiz. They really aren't paying attention. They know they're just going to get the answer, okay, on we go. There may be a subtlety there that you could consider, with the way the quiz is taken. Just a suggestion, and then the endorsement is definite that's what I saw there, is that correct?

MS. BREWSTER-GEISZ: That is correct.

CHAIRMAN MILLER: Maybe a multiple-choice answer or something like that, Rob. Robert.

MR. ROBERT H. BOYLES, JR.: Mr. Chairman, not a question for Karyl, although thank you, Karyl for the presentation, but some discussion when we're ready for it.

#### **ADVISORY PANEL REPORT**

CHAIRMAN MILLER: Are there any further questions, before we move on to the Advisory Panel? Seeing none; I'll call on Lewis Gillingham for the Advisory Panel report.

MR. LEWIS GILLINGHAM: The Advisory Panel met via conference call in early April. It was one of the most well attended meetings that the AP has had. I want to thank the Chairman, who was also in on that call; as well as Karyl, and she helped explain some of the nuances to the federal rule, which by that time had been adopted. What we were charged with reviewing, were the two recreational measures, Alternative A2 and the Alternative A6d, so that is all we discussed about moving those requirements into state waters. Overall the members on the call welcomed the shark education opportunities for fishermen.

They noted shark misidentification by recreational fishermen is common. In some cases this actually deters anglers from shark fishing; because they don't know what they can and can't keep. In other cases it leads to additional mortality; when they have a shark that they can't keep. But they think it's something else, like the proverbial sand shark, which includes I don't know how many different species in their mind.

There was opposition to the shark identification training course leading to a separate permit. But multiple participants preferred states to consider some options. They suggested states could require recreational shark anglers, fishing for sharks, take a short online quiz and video; similar to the one being developed by NOAA. Through this it was identified potential action could be an addendum to the Atlantic States Marine Fisheries Commission Coastal Sharks FMP, or a mandate put forward by each state.

In the latter case, states would develop regulatory language and then advertise a requirement amongst their anglers. If the latter is chosen, states could ask fishermen to take an identification training course quiz, when applying for the state saltwater fishing license. But the angler could take the course at any time during the year.

In that situation, after an angler completes the quiz, a unique number could be generated and shown on the screen. Anglers will provide this number to law enforcement upon request, so it is essentially a permit. The number could be written on their state fishing license, or just a copy of the original page. Potential action the Commission should work with HMS to have the quiz create a unique number at the end of their quiz; so states could piggyback onto that.

However, this is not currently part of the scope of the work, at least at the time of our conference call in early April. The AP recommends the Commission to seek feedback from Law Enforcement on enforceability of this action. The AP also noted that the NOAA HMS

permit and shark endorsement is vessel based, and their quiz is focused on fishing from vessels.

But there is a definite need for states to take the lead in developing best practices when releasing sharks; from beach, piers, and jetties. Potential action would be states on their state website, a shark angler webpage could be developed that would include shore based best practices for releasing sharks (video or text) and include a link to the HMS video.

A prime example was sharks caught in the surf, particularly the larger ones that are often tail roped and drug up on the beach through the sand; and that is about the worst way, if you want a shark to survive after it's released. Sharks caught on piers should be released with no more than three feet of line.

Outreach materials should focus on the positives of having shark education; so an angler feels comfortable in keeping what is legal, yet knows what he has to return. This would make it more than just a mere requirement; it would be advantageous for the recreational angler. One participant in particular wanted the online quiz to be strongly recommended; but stop short of making it a requirement. The second item the Committee considered was the alternative A6d, which would require the use of non-offset, non-stainless steel hooks when fishing for sharks recreationally in state waters, south of 41°, 43 minutes north latitude, except when fishing with artificial lures. Chatham, I knew that. There was broad discussion about the enforceability of this measure.

These concerns included much of the interaction with sharks in state waters will be by fishermen that incidentally catch sharks while fishing for other species. These anglers will not likely be aware of the requirement. It could lead to discarding, because anglers not using the correct hook would be prohibited from retaining any sharks.

Enforcement officers will most likely intercept anglers at the dock rather than at the time of harvest. Therefore, officers will take the anglers word that a circle hook was used for any kept shark. HMS anglers are more likely to target sharks and be aware of the regulations involved with shark fishing; whereas state anglers simply are not as knowledgeable.

There will likely be pushback if this measure is implemented, and I think that was directed at both the first option and the second option. Shark misidentification is a bigger issue than using a specific hook style. Lastly, the AP recommends the Board seek advice from the Law Enforcement Committee on this measure. I'll answer any questions.

CHAIRMAN MILLER: Any questions for Lewis on the AP report? I see one hand, is that Michelle?

DR. MICHELLE DUVAL: Thank you for that report, Lewis. Just to clarify, the AP was generally supportive of requiring taking or completing the quiz. The AP was supportive of that being a state requirement, but it sounds like they also suggested Law Enforcement Committee input on that.

MR. GILLINGHAM: Chairman Miller and Ashton were both on the call as well. They danced around the idea of making an actual permit; although they were saying yes, you should have to watch this video and get a unique number, and then it becomes a permit. But they never referred to it as a permit. We all supported the idea of any additional outreach or shark identification is really the big problem, just in the recreational shark fishery; particularly to dusky sharks.

CHAIRMAN MILLER: I'll call on Ashton, and see if she has anything to add to that.

MS. ASHTON HARP: Thank you, Lewis. One additional comment; the AP liked the idea of more education related to shark fishing. They recognize lack of education is a big problem that leads to shark mortality. But

implementation was a question. Since HMS has not fully rolled this out, they weren't sure how one could link back that the harvester had taken the quiz. For example, how would law enforcement on the water know with certainty that they had taken the quiz.

Since they didn't know what that path would be, it was hard for them to make a final decision on whether this was the right way to go. But in general they are in support of any kind of shark education for fishermen.

CHAIRMAN MILLER: Incidentally, if you go online you won't find this yet; that identification scenario. Am I right, Karyl?

MS. BREWSTER-GEISZ: That's correct. We have some outreach materials available. Now we're working on updating it as a result of Amendment 5b. As I said, I have the draft of the video with me; if anyone wants to watch it.

CHAIRMAN MILLER: Doug, I'm sorry, David.

MR. DAVID E. BUSH, JR.: No worries. Just a quick question about the use of the proper hook, if I understand what you're saying, an otherwise legally harvested shark if not caught by the proper hook, would go from a landing to a potential dead discard. Is that correct?

MR. GILLINGHAM: That would be correct.

CHAIRMAN MILLER: Mike.

MR. MICHAEL LUISI: Excuse my ignorance on this topic right now. But I'm trying to figure out, and maybe somebody can explain to me, how the requirement for obtaining this and going through this video, which the way Rob mentioned it, it kind of takes all the fun out of it to try to see how fast you can get done; if you really have to get the right answer.

But I agree that the right answer should be something you need to obtain. How does the state, if we were to require that how does that factor into our state recreational license? Is

there any connection there or is this strictly for anyone applying for an HMS permit, and that's it? We would basically host.

We could have informational materials and educational materials, and we could host the link on our webpage, let's say, to make sure that people are aware of it. I'm trying to understand how the states would implement that and mandate those actions for the federal permit.

MR. GILLINGHAM: It's a good question, Mike. I'm going to call on Karyl for advice on this.

MS. BREWSTER-GEISZ: After the AP meeting, I went back and we went through some scenarios in our office of what we could and couldn't do. One of the requirements right now of getting an HMS angling permit or charter headboat permit, and those are the permits that would be required to get the shark endorsement, is you need to have a vessel.

If anybody wanted an HMS permit, and therefore get the shark endorsement that way, they need the vessel. I don't think that would work for the states; because you have a lot of state anglers that are fishing from shore. But we did come up with some options about still putting the video up on that same webpage with the permit; where anyone could take it.

We had a couple of different options. One would be sort of they could watch the video, take the quiz; and then it would say great job, how would you like your name to appear on the certificate. Then they could print out a certificate, which would have a number on it for the states. We could either not keep any of that information, so there would be no way for the state to figure it out, that is the easiest for us, because there is not as much money involved, or we could work out some system where we keep all the information that that person enters in, so that would go on the certificate. Then the state could come back to us and say, can you please verify so and so has taken the quiz; and we could go back and do

that. We did have questions for the states on what is it the state would like.

Are there particular numbers on your licenses that you would want to be on the certificate and things like that? There are ways we can work so it is something. As Lewis pointed out though, our video is mostly focused on handling and release from a vessel. We would still have that issue to get around.

CHAIRMAN MILLER: Another question, Doug.

MR. W. DOUGLAS BRADY: I'm just trying to get my arms around how one determines if they're a directed shark fisherman or incidental; and how law enforcement determines this if you have this requirement to take a course. Now, if you're fishing for cobia you're fishing for king mackerel, you're fishing for amberjack or whatever, and you're catching sharks.

Are you directed? I don't know how you would come up and say, okay we're catching sharks, but we're really not directing the fishing effort towards sharks or you are directing the fishing effort towards sharks. The angler would, again I have a problem with it, and I don't know what he would say. I'm really catching something else, but I'm catching a lot of sharks. How do you deal with that or how is law enforcement going to deal with that?

MS. BREWSTER-GEISZ: For our endorsement and circle hook requirement, it is when you are recreationally fishing for sharks. Anytime you catch a shark on a J hook, you would have to release it. Anytime you catch a shark and you don't have a shark endorsement, you would have to release it. You would only be allowed to fish for and retain sharks if you had both the shark endorsement, which requires the video and the quiz, and circle hooks. It is fishing for sharks. It's up to the angler to decide, but if they're not using circle hooks they have to release the shark.

DR. DUVAL: I don't have any questions, but I did have some comments and thoughts. I just

didn't know whenever you're ready for that part of the discussion.

CHAIRMAN MILLER: I think we've moved into comments, so go ahead.

DR. DUVAL: First of all I want to thank Karyl and the HMS staff for their thoughtful consideration of comments that have been submitted. North Carolina submitted comments, and we had some of the same concerns about the recreational measures; in regards to the leader material and use of flies, and how they might be considered under HMS rules. Then also the safety concerns with regard to the commercial measures of cutting the line at less than three feet; so thank you very much for taking those into consideration.

We really appreciate that. I think we're very supportive of any educational and outreach materials, videos, et cetera, that are developed to better educate anglers; with regard to shark identification, best handling practices, et cetera, any of those things. I think what I'm struggling with here, and I think probably what some other board members are struggling with here is making that a requirement. Looking at the Advisory Panel report, and looking at generation of a number that you would write on a state license. I'm not trying to be a Debbie Downer here, but I think that would be sort of a non-starter from our perspective in terms of the workload. It is my understanding that to make any of these changes or some of these considerations for complementary measures would require an addendum to the fishery management plan. I see Ashton nodding her head. I would want some Law Enforcement Committee input, as recommended by the advisory panel on a couple of these measures.

The requirement for circle hooks in state waters for various state hook and line fisheries, just because I think for us we would have to go back and take a look at what overlap there might be with some existing state regulations that we have on the books; and how that might impact things.

Then I think we would be certainly more than happy to host links to any of the educational and outreach materials on our website; within our proclamations that we issue with regard to shark harvest, commercially and recreationally. I'm just struggling with making that a requirement. I understand the intent, and very supportive of those efforts. But that is something I'm struggling with. I would also be asking for some Law Enforcement Committee input on the enforceability of those measures.

CHAIRMAN MILLER: Thank you for that suggestion. Perhaps this would be a good time to invite Doug Mesick on behalf of the Law Enforcement. If they have any comments, please weigh in at any time. If you have any now, feel free to make them.

MR. DOUG MESICK: Good morning. Yes, I'm agreeing that a lot of these measures are very workable. It's going to take a lot of education and outreach on both parts of it. I'm listening to all the comments, and I do agree this does need to come back and go in front of the Law Enforcement Committee, so that each state can weigh in, so that we can look at different regulations up and down the coast.

I also agree, a lot of the shore-based fishermen, I know particularly in our state of Delaware and nearby Maryland, it's a large shore-based fishery, so we really have to incorporate that into it. To answer some of the questions beforehand, most folks when we make an initial boarding, they are in some type of targeted or directed fishery. They know what they're fishing for.

You can tell by different baits, by different setups, or you can tell by the person who is just out there to catch whatever comes along. The ones that are going to take the education are going to be those folks who are just down there that are just arbitrarily fishing for anything; and they're going to have the incidental catch. The folks who are targeting these sharks, they know what they're doing, so they will take advantage and weigh in on the options.

But I do agree that there are a lot of more questions that need to be answered. I would like to see it go in front of the Law Enforcement Committee, and address some of these questions, so we can bring them back. But yes, most of the measures are enforceable, and it's going to take a good round of education and outreach.

CHAIRMAN MILLER: Any questions or comments? David.

MR. BUSH: Probably the only comment that I really have at this point, I understand that it's going to be a lot for enforcement to wrap their head around and provide some feedback, as to whether or not some of this stuff will be even feasible. But the one concern that I have is going back to the other requirement to keep a shark as if you caught it on a circle hook. The reason for you using a circle hook is to increase the survivability of whatever it is you caught. Therefore, you're saying that using the J-hook, you've decreased the survivability of whatever that was.

You throwing it back in the water is going to increase those dead discards. Every council commission up and down this coast understands and verbally states that they wish they had more information on discards; and the ability to reduce them. I see this as something that creates more dead discards, and also the variability and not having a handle on how many that is. Maybe there is a different way we could go about this, but not catching it on the proper gear makes it illegal to keep it, I think is the wrong way to go about it.

CHAIRMAN MILLER: Any other comments or questions? Robert.

MR. BOYLES: Just a general discussion. Karyl, again thank you for the presentation, thank you for your consideration of our comments that we submitted to you back in December. I guess where I'm coming from is the request now for the complementary measures. I should note

our legislature has weighed in on this issue years ago.

Karyl, as you know we do adopt by reference federal law for sharks, and so that makes for us shark management very easy in South Carolina, very easy for recreational and commercial anglers to understand; with the complementary measures. However, general assembly has codified that no federal recreational angling permit or federal charter headboat permit would be required for taking or possessing of sharks in state waters in South Carolina.

I am not in a position to support the endorsement. I think we need to be very, very careful. I certainly understand where we are, on trying to educate folks; that education can go a long way. But I think the endorsement has the force and effect of a permit, and that force and effect of a permit, you know when our legislature has said we're not going to require this in state waters. I think we need to be very, very careful of, and I can't support that.

#### **CONSIDER COMPLEMENTARY MANAGEMENT MEASURES**

CHAIRMAN MILLER: Clearly we're now on the nearly final agenda item; Considering Complementary Management Measures and a possible action. Are there any further comments or suggestions? Michelle.

DR. DUVAL: Also, and I apologize that I didn't do this earlier. This is directed really at Karyl. But the consideration for cooperative research to improve estimates of dusky sharks via the shark research fishery, is there a little bit more detail you can add to that? I guess I'm wondering if the Service is asking that states allow those vessels that are permitted to participate in the shark research fishery that we complement that or allow that within the state fishery management plan.

I was just wondering if you had more specific thoughts on that. Because I know in North Carolina, you know we have a Scientific,

Educational Collection Permit that would be required to be filled out to allow those vessels to participate in those activities. I think you might have had some discussion with one of our staff members on that. The coastal sharks FMP requires that any activities of that nature be permitted through such a state permit. I was just curious if you could add a little bit more to what you all were thinking in that regard.

MS. BREWSTER-GEISZ: Yes, what we're looking at is some ability for once we issue the shark research fishery permit, for those vessels to be allowed into state waters and continue fishing as they do in the shark research fishery. We did have discussions with North Carolina staff members about this. We quickly ran into stumbling blocks, where we needed to fill out an application to fish in the North Carolina waters, and change how the research was being done to match North Carolina regulations.

I think the biggest issue was the sandbar sharks. That is one of the, these are the only people who are allowed to keep sandbar sharks, and as you all know under the state plan sandbar sharks cannot be fished for in state waters. That became an issue. It's just trying to find some way of potentially allowing these researchers or the research vessels to go in; and we would be willing to work with each state to figure out the best way to make that happen.

CHAIRMAN MILLER: Other comments or questions? I see a hand in the audience. I'll get to that in just a second; any more comments or suggestions from the Board? Rob.

MR. O'REILLY: I guess for Karyl, I'm just wondering, the VIMS Longline Survey, longstanding survey, does that meet more than just local objectives? Does that give more of a flavor to the Mid-Atlantic area? How is that looked at in terms of what you're seeking?

MS. BREWSTER-GEISZ: The VIMS Longline Survey is a great survey. It's one of the longest running shark surveys we have; and it's critical for a lot of our shark assessments, including



dusky and sandbar. We definitely use that and rely on that a lot. I think that samples certain portions of the Bay; but it would be interesting to have some more research farther offshore, closer to the state/federal line than where the VIMS survey reaches.

CHAIRMAN MILLER: Any more comments or suggestions from the Board? Seeing none at the moment; I'll go to the audience. There was a hand back there. Sonja. Please identify yourself.

MS. SONJA FORDHAM: Thank you, Mr. Chairman, Sonja Fordham; I'm President of Shark Advocates International, also a member of the ASMFC Shark Advisory Panel. I also serve on the HMS Advisory Panel. We're actually meeting this week in Silver Spring, and we got a similar briefing from NOAA about the Dusky Shark Amendment yesterday.

It's probably no surprise to you that I am strongly in favor of complementary action by the ASMFC to support new measures for dusky sharks, and boost the chances of effective rebuilding; especially in light of the dire status of the population, and the exceptional vulnerability of this particular species.

I wanted to just take the opportunity to express that on the record, because I wasn't able to participate in the AP call, because of a scheduling conflict. I just wanted to add that I recognize that there are a few challenges for this amendment; but to really stress that for the conservation community this has been a really long time coming, this amendment.

Karyl will remember better than I, but I think the first new measures for dusksies were proposed in 2011. It's been several years. As she said, we're looking at a 90 year recovery period; also to stress that NOAA really can attest that they've been struggling and examining these issues for many years in great depth. This is what they've come up with as the best situation, after much consideration from all types of stakeholders. This species has been

prohibited for many, many years and is simply not recovering. It needs more action. We think it's really important to get started with those new measures. Then finally for what it's worth, I just wanted to say, I think it's fair to say there was a considerable amount of support for complementary state action expressed yesterday in Silver Spring at the HMS AP meeting. Thank you for your consideration.

CHAIRMAN MILLER: Thank you, Sonja. Is there any other public comment that would be pertinent at this time? Seeing no hands, in the few minutes we have left in order to stay on schedule, I see we are at a decision point, in terms of basically two choices, voluntary implementation of these federal measures within state waters; or mandatory implementation of these federal measures within state waters. I'm wondering if Board members have opinions on this, how we should proceed. I'll call on Ashton.

MS. HARP: A potential path for consideration by the Board; over the summertime the LEC could discuss these issues; and I could reach out to states to request what kind of outreach they're already doing, as far as shore-based practices. Given some states have mentioned efforts are underway.

I would like to gather those comment into a single document, and also if any states are using or have circle hook requirements, how are they doing that and how has that worked on the water for them? All this information would be reported back at the August meeting and then a decision could be made.

CHAIRMAN MILLER: Michelle.

DR. DUVAL: Thanks for that Ashton, because that is in line with what I had suggested, in terms of going to the LEC and having them weigh in on some of the logistics involved with the request for complementary measures in state waters. I think it would be prudent and useful for that information to be collected, with regard to use of circle hooks in state waters, as

it stands right now or potential hurdles or conflicts in doing so. I'm not prepared to make a decision one way or the other today at this meeting without that input.

CHAIRMAN MILLER: I think that's a great suggestion; any others? Mike, is your hand up?

MR. LUISI: I also wanted to say, Mr. Chairman that I would support Ashton's approach. I am not prepared today to decide one way or another whether or not we make something mandatory or take the voluntary path. But I think a report back at the August meeting; I'll certainly be ready to go to make a decision at that meeting, based on what Ashton has suggested.

CHAIRMAN MILLER: Ashton, then following up on your suggestion and Michelle's and Mike's, something staff would envision accomplishing prior to the August meeting?

MS. HARP: Yes that can be done.

MR. THOMAS P. FOTE: My concern is looking at what it would cost, and would it cost in not just money and staff time, we have very little in New Jersey of both. It's even going to get worse in the next year; with all the retirements. I'm just hesitant to support anything that requires more work and more money, because I don't know where it's coming from.

MS. BREWSTER-GEISZ: While I support the idea of having OLE or Enforcement – I suppose you go by a different acronym – look at the measures and what would work. I would like to encourage ASMFC or the states to begin the process of looking at state and shore-based handling and release measures, and come up with some sort of best practices.

CHAIRMAN MILLER: Well fortunately, with regard to the recreational measures, we do have a little time; since they become effective January 1, 2018. By gathering information to show where we are at present for the August meeting; that would be at least on track. If we

need to take any further action at some point in the future, we'll probably be able to in time for the 2018 implementation; any additional suggestions or comments? Michelle.

DR. DUVAL: I guess just to note again that I agree that research, we could get some really valuable research and information from state waters, from shark research vessels being allowed to operate in state waters. I think the stumbling blocks are really, I think the Fisheries Service having some concerns about applying for a state Scientific and Educational Collection Permit, as required under the fishery management plan.

As well as, I think Karyl noted the difference in the allowable gears that are used in that fishery. I don't know if that is something that Ashton, in your work between now and the summer meeting, if this is something that the TC would consider. I am just noting that we could get a lot of valuable information if there was some way for NOAA to apply for the state Scientific and Educational Collection Permits. We're supportive of the research, it's there are these two items that I think are preventing that. I just didn't want to lose sight of that.

CHAIRMAN MILLER: That's a good point, Michelle; any other comments, suggestions. If I could briefly summarize then, ASMFC staff will basically poll the states, in terms of information gathering, in terms of where we are at present with state measures that would be complementary to the federal action.

We'll hear a report on that in August, and then that will give us a little more direction and a little more information on where we need to go as a body; in terms of the Shark Board and complementary implementation of these federal measures. Does anyone else have any other suggestions on this particular topic?

I think we've just about exhausted our agenda on this; any further questions or comments from the Board? Seeing none; any further questions or comments from the audience?

Seeing none; I will note that at a future meeting, perhaps in August, we'll take up the idea of a Vice-Chair for this particular Board. We'll defer until then. I would like to thank Adam while he's here for his previous service to this Shark Board; thank you Adam, for doing a great job.

**ADJOURNMENT**

CHAIRMAN MILLER: Is there anything further for this Board? Seeing no hands; we're adjourned, thank you.

(Whereupon, the meeting was adjourned at 10:55 o'clock a.m., May10, 2017.)



# Atlantic States Marine Fisheries Commission

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## Coastal Sharks Technical Committee Conference Call Summary June 2, 2017

**Technical Committee Members:** Karyl Brewster-Geisz, Bryan Frazier, Greg Skomal, Greg Hinks, Holly White, Julie Neer, Eric Schneider, Chris Scott, Angel Willey

**ASMFC Staff:** Ashton Harp

At the May 2017 Coastal Sharks Management Board meeting, the final rule for federal Amendment 5b was presented by NOAA Fisheries Highly Migratory Species (HMS) Division. Amendment 5b implements a range of management measures to prevent overfishing and rebuild overfished dusky sharks. These measures are based on the 2016 dusky shark stock assessment update that determined dusky sharks are overfished and experiencing overfishing.

The Board was asked to consider cooperative research with NOAA Fisheries to improve estimates of dusky (and other) sharks caught in state water fisheries. The Coastal Sharks Technical Committee (TC) held a conference call to discuss.

### Shark Research Fishery

K. Brewster-Geisz (HMS) explained that NOAA Fisheries is looking for additional fishery dependent data to garner better estimates of dusky (and other) sharks for future stock assessments. The current shark research fishery consists of approximately 5 vessels that fish under tight restrictions and 100% observer coverage. The gear is bottom longline and is limited to no more than 300 hooks (each trip fishermen can make 2 sets only - 1st set no more than 150 hooks, 2nd set no more than 300 hooks). These fishermen must keep all dead sharks (unless it's a prohibited species or the fishing season is closed) and are allowed to fish for and sell sandbar sharks.

When trying to extend the research fishery into state waters the following issues arose:

- Fishermen are fishing for sandbar sharks, which are prohibited in state waters
- Fishermen are using bottom longline and the length may exceed the requirements of "short lines" in state waters
  - Noted on the call: The Commission's definition of short lines and the HMS definition of bottom long lines overlap.
- Fishermen keep over the commercial retention limits

- Fishermen are fishing for large coastal sharks based on a quota other than the aggregated LCS quota, which means they may be fishing when the season is closed for other LCS fishermen
- The State required NMFS to apply for the research permit; that causes issues for us and is not something we could do automatically or easily

The group discussed the language in *Section 4.3.8.2 Display and Research Permits* of the Coastal Sharks FMP. As noted in the document, a state may grant exemptions from the seasonal closure, quota, possession limit, size limit, gear restrictions, and prohibited species restrictions contained in the FMP through a state display or research permit system.

**Georgia** noted that although the Coastal Sharks FMP allows long lines and gill nets, those gear types are not allowed in Georgia state waters. Since Georgia does not have a commercial fishery in state waters, there is no need for fishery-dependent data collection in Georgia's territorial waters. Georgia also noted that over the 17+ seasons fishery independent work has been conducted, they have not documented any dusky sharks in State territorial waters, however, they do encounter 5 species with regularity (At. sharpnose, bonnethead, blacknose, blacktip and sandbar).

**North Carolina** has two concerns about the shark research fishery taking place in NC state waters; 1) The NC scientific permit application requires the applicant to be affiliated with an academic institution, 2) accurate reporting of research versus commercial landings of sharks.

Currently there is one North Carolina fishermen that participates in the HMS shark research fishery and that individual is not affiliated with a research institution. As it stands now, NOAA Fisheries would be the responsible party on the NC scientific permit application and the fishermen would be the collector. However, legally NOAA Fisheries cannot be the responsible party. The application issue would need to be resolved before the landings issue can be addressed. HMS will have further discussions with the state of North Carolina.

Regarding landings data, HMS noted that the data they receive is from the observer reports. If the individual is granted a NC scientific permit, then the group offered a suggestion to resolve the landings issue:

- HMS could ask the fishermen to sign an agreement that lets HMS forward the landings data to NC. This would then allow NC to accurately depict commercial vs research landings on NC's trip ticket system.

**South Carolina** will allow the HMS shark research fishery into state waters provided the individual has a SC scientific research permit. There was a request for HMS to notify the state prior to the research fishing activity.

**ACTION: There was a request to ask the Florida and Virginia TC representatives about allowable gear types in state waters and if they would allow the HMS shark research fishery into their state waters.**

Following the call, the Florida representative noted the ban on longlines and gillnets in state waters would not be lifted for the HMS shark research survey. In addition, the collection of dusky sharks in Florida state waters is very rare.

### **NOAA Fisheries Cooperative Shark Tagging Program**

The cooperative shark tagging program is a collaborative effort between recreational anglers, the commercial fishing industry, and NOAA Fisheries to study the life history of Atlantic Sharks. Recreational anglers can volunteer to participate in the program. Given a lot of recreational anglers are tagging from the shore, North Carolina asked if any states require anglers to have a scientific research permit in order to participate in the volunteer tagging program.

Under SC state law, one must have a permit to tag a fish, therefore, South Carolina requires anglers to have a scientific research permit to participate. They do not require the anglers to submit a report.

Following the call, the Florida representative noted that Florida requires a special activity license for all fish tagging. This does not apply to the directors of a fishing tournament or their designee, who may tag up to 5 fish per tournament for purposes of awarding prizes.

Massachusetts, Maryland, North Carolina and Georgia do not require anglers participating cooperative tagging efforts to have a state scientific research permit.

# NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

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1. *Does your state have communication materials (web page, signs, text on permits, etc) to address best practices when fishing for sharks from the shore or piers?*
  - a. *Optional question: Should the Commission require communication materials from each state? Reasoning for/against.*

New York State does not currently have information available to the public related to best practices for shore fishing for sharks. The three shark species that shore fisherman frequently encounter in NY are sandbar, dusky, and sand tiger, which are all prohibited species. We are currently developing a regulation sign that will be posted at beach access sites to educate shore fisherman and the public that these species are prohibited to take or possess (see attached for draft of sign). NY would not be against a requirement for communication materials, but if best practices materials were to be a requirement for each state, we would prefer that they be developed with ASMFC support. We recommend that each state uses consistent language in their shore fishing for sharks best practices. Once developed, NYSDEC could offer these materials to our anglers via our webpage. We would not be able to offer these materials through our permitting system.

2. *Does your state require circle hooks when fishing for sharks or any other species (e.g., recreational or commercial short lines)?*
  - a. *Optional question: Should the Commission require non-offset, non-stainless steel circle hooks when fishing for sharks? Reasoning for/against.*

Yes, Section 13-0338 of the NYS Environmental Conservation Law states that sharks, excluding spiny dogfish, shall not be taken for commercial or recreational purposes by baited hooking except with the use of non-stainless steel non-offset circle hooks. Further, no person shall conduct, sponsor or participate in any shark tournament unless the rules and regulations require that exclusive use of non-stainless steel non-offset circle hooks.

3. *Does your state have measures to maximize gear removal before releasing sharks (e.g. release using a dehooker or by cutting gangion less then 3 ft from hook)?*
  - a. *Optional question: Should the Commission require fishermen to maximize gear removal? Reasoning for/against.*

NY coastal shark regulations require that:

- all persons participating in the commercial shark fishery shall practice the protocols and possess the federally required release equipment for pelagic and bottom longlines for the safe handling, release and disentanglement of sea turtles and other non-target species; and
- all captains and vessel owners must be certified in using handling and release equipment through workshops offered by National Oceanic and Atmospheric Administration's National Marine Fisheries Service

We believe that measures should exist to maximize gear removal as safely as practicable. Minimizing gear that is attached to a shark which is being released will reduce the chances of post release mortality. However, these measures should keep the safety of fisherman in mind by allowing them to release sharks as safely as the situation allows.



## New Jersey

1. Does your state have communication materials (web page, signs, text on permits, etc) to address best practices when fishing for sharks from the shore or piers?
  - a. *Optional question:* Should the Commission require communication materials from each state? Reasoning for/against.

New Jersey Does not provide communication materials regarding best fishing practices available. When requested from New Jersey Marine Fisheries Administration, fishermen are referred to sources such as NMFS for information. Before any actions should be considered for requiring such information to be posted, a coordinated movement should be considered, involving all participant states, to voluntarily provide information agreed upon as the most useful and pertinent to the goal of sustainable shark-fishing practices. To immediately require states to amend their websites, permits, and post signs would be premature and invasive to individual states' relationships with their fishermen.

2. Does your state require circle hooks when fishing for sharks or any other species (e.g., recreational or commercial short lines)?
  - a. *Optional question:* Should the Commission require non-offset, non-stainless steel circle hooks when fishing for sharks? Reasoning for/against.

New Jersey requires hook-and-line fishermen to use non-offset circle hooks while fishing for Striped Bass with natural bait within the Delaware River or its tributaries from a designated point and upstream from April 1st through May 31st and in all other non-oceanic waters from January 1st through February. Although this measure would be of benefit to all fish species, until it has been shown that the use of gear other than non-offset circle hooks are having a detrimental impact on shark populations overall throughout the Atlantic coast, regulatory measures would be premature and imprudent.

3. Does your state have measures to maximize gear removal before releasing sharks (e.g. release using a dehooker or by cutting gangion less then 3 ft from hook)?
  - a. *Optional question:* Should the Commission require fishermen to maximize gear removal? Reasoning for/against.

New Jersey does not require the maximization of gear removal before releasing sharks. Although such measures would certainly be of benefit to shark species, the enforcement of regulations that would require fishermen to do so would likely prove extremely difficult. The most feasible level of such a regulation may be to require any party or charter vessels targeting sharks to have safe handling and release equipment aboard their vessel. This would, however, suggest vessel representatives be trained in techniques and proper use of the equipment in a manner similar to NOAA's handling and release workshop. This would be great step in shark management, but NOAA may not be prepared to supply these workshops to a much larger group than they do currently. The burden, in the end, may fall on the states to administer their own form of the workshop.

## Delaware

At the May Coastal Sharks meeting, the Board reviewed the final measures for [HMS Amendment 5b](#) which includes new recreational and commercial measures for federally-permitted vessels. The Board requested the LEC weigh-in on these measures and provide a report at the August meeting. In addition, there was a request for staff to poll the states on three Amendment 5b-related issues (see below). Please let me know if your state has previously implemented these measures or measures related to these issues.

1. Does your state have communication materials (web page, signs, text on permits, etc) to address best practices when fishing for sharks from the shore or piers? Not specific to shore or piers, but we do publish a page in our fishing guide entitled “Ethical Catch and Release of Sharks” (p20 - [http://www.eregulations.com/wp-content/uploads/2017/01/17DEFW\\_LR2.pdf](http://www.eregulations.com/wp-content/uploads/2017/01/17DEFW_LR2.pdf) ). We also include a “Common Delaware Sharks” section (p 22), where we instruct folks to cut line near hook or use a dehooking device without removing the shark from the water. Shark must be released in a manner to ensure their maximum probability of survival by regulation (see item 3 below). Finally, we posted an online guide to some commonly caught/misidentified sharks of DE Bay, which includes some handling instructions (<http://www.dnrec.delaware.gov/fw/Fisheries/Documents/Delaware%27s%20Most%20Commonly%20Misidentified%20Sharks.pdf> )
  - a. *Optional question:* Should the Commission require communication materials from each state? Reasoning for/against.

Yes, but only if very specific materials are provided and the manner in which they are to be posted are detailed. Otherwise, one could simply post a sign on a beach and be compliant. Providing specific links, artwork, placards, etc. directly to states, making it as easy as possible for states to implement/distribute is most helpful. Continuing to emphasize outreach/education regarding ethical shark fishing practices is absolutely our best course of action.

2. Does your state require circle hooks when fishing for sharks or any other species (e.g., recreational or commercial short lines)? Yes, but only for striped bass on spawning grounds
  - a. *Optional question:* Should the Commission require non-offset, non-stainless steel circle hooks when fishing for sharks? Reasoning for/against. Not opposed to it; however, a number of species are gulp feeders that will likely be gut hooked regardless of hook type. Should gear restrictions be implemented, strong consideration for requiring barbless hooks should be given. My only comment against such measures is my growing concern that we are making recreational fishing so complicated, through very detailed regulations, that I fear we are driving people away from the sport and, more importantly, keeping people from becoming anglers. It’s too easy to go play golf or stay home and play a video game.
3. Does your state have measures to maximize gear removal before releasing sharks (e.g. release using a dehooker or by cutting gangion less then 3 ft from hook)?

From 7 DE Admin Code -

### 6.0 Shark Handling

It is unlawful to release any shark in the management unit or any sandbar shark in a manner that will not ensure said sharks maximum probability of survival. All species of shark when prohibited from harvest under §3541 must be immediately released.

**14 DE Reg. 193 (09/01/10)**

**14 DE Reg. 1385 (06/01/11)**

**18 DE Reg. 701 (03/01/15)**

- a. *Optional question:* Should the Commission require fishermen to maximize gear removal? Reasoning for/against.

I think something similar to DE's regulation helps. It is difficult to enforce in the strictest sense, but it does make hauling the sharks up on the beach, sitting on their backs and pulling their jaws open for a photo clearly unlawful. We have issued several citations based on social media posts and newspaper photos. These cases are helpful in spreading the word regarding shark handling practices.

Please let me know by Wednesday, May 31.

## Maryland

1. Does your state have communication materials (web page, signs, text on permits, etc) to address best practices when fishing for sharks from the shore or piers?

Yes:

- <http://dnr.maryland.gov/fisheries/Pages/coastal/SharkFacts.aspx>
- <http://dnr.maryland.gov/fisheries/Pages/coastal/shark-release.aspx>
- Fishing and Crabbing Guide (hardcopy provided with purchase of a fishing license and available online to anyone) <http://www.eregulations.com/maryland/fishing/> PDF [http://www.eregulations.com/wp-content/uploads/2017/01/17MDFW\\_LR8.pdf](http://www.eregulations.com/wp-content/uploads/2017/01/17MDFW_LR8.pdf)
- Link on publications page to (<http://dnr.maryland.gov/fisheries/Pages/coastal/publications.aspx>)  
Willey, A. L., L. S. Barker, and M. Sampson. 2016. A comparison of circle hook and J hook performance in the recreational shark fishery off Maryland. Fishery Bulletin. 114, 3: 370-372. <http://fishbull.noaa.gov/1143/willey.pdf>

- a. *Optional question:* Should the Commission require communication materials from each state? Reasoning for/against.

Yes. Ideally, each state and NOAA would have a consistent message for best practices.

Pro – Best practices could possibly reduce mortality, provide future fishing/viewing opportunities

Con – funding the costs associated with designing, printing, and web development; opposition from people that resisting circle hooks

2. Does your state require circle hooks when fishing for sharks or any other species (e.g., recreational or commercial short lines)?

Yes:

- corrodible circle hooks are required for vessels fishing commercial short lines <http://www.dsd.state.md.us/comar/comarhtml/08/08.02.22.03.htm>
- Required for recreational striped bass for a specific season and location <http://www.dsd.state.md.us/comar/comarhtml/08/08.02.05.02.htm>

- a. *Optional question:* Should the Commission require non-offset, non-stainless steel circle hooks when fishing for sharks? Reasoning for/against.

It makes sense to require corrodible circle hooks in states like Maryland where most of the catches are prohibited species or species that are not typically kept such as smooth dogfish, however, there hasn't been a hook study involving sand tiger sharks.

3. Does your state have measures to maximize gear removal before releasing sharks (e.g. release using a dehooker or by cutting gangion less then 3 ft from hook)?

No, we currently only make a recommendation; although, we did initiate the regulatory process

for implementing maximum survivability regulations last fall. We did not receive any public comments pertaining to maximum survivability.

a. *Optional question:* Should the Commission require fishermen to maximize gear removal? Reasoning for/against.

Yes, but just for line cutting because dehookers have a big learning curve and are costly. Cutting the line is something that fishermen are already equipped to do, it's fast, and does not require practice.

## Virginia Marine Resources Commission

Please let me know if your state has previously implemented these measures or measures related to these issues.

1. Does your state have communication materials (web page, signs, text on permits, etc) to address best practices when fishing for sharks from the shore or piers?

Yes, the agency has an extensive Webpage plus an active Facebook page. Our current webpage has several links to shark related material, such as the FL Museum Shark ID guide, the VIMS Shark FAQs and Shark Monitoring Survey, the NOAA/NMFS Atlantic Shark ID placard and the NOAA Sea Grant Atlantic shark identification placards. Additionally some of the private piers that charge anglers to fish do not allow shark fishing from their pier and the city of Virginia Beach does not allow shark fishing from shore in certain parts of Sandbridge that border the Atlantic Ocean.

- a. *Optional question:* Should the Commission require communication materials from each state? Reasoning for/against.

I do not believe requiring communication material from each state is the best approach. Directed recreational shark fishing from shore or pier is pretty much the same among Atlantic coastal states, although the availability of species does shift. Therefore a “one size fits all” approach would seem most appropriate. The NOAA and ASMFC are in the best position to manage and orchestrate the development of this communication material. States with well developed directed beach or pier recreational shark fisheries, such as Delaware and Florida, would be in the best position to provide video from beach or pier. After incorporating shore and pier information, states could then be required to provide a link to the NOAA/ASMFC site housing the shore based video and other outreach material or post the information directly on their webpage.

2. Does your state require circle hooks when fishing for sharks or any other species (e.g., recreational or commercial short lines)?

Yes--but only for commercial shark short lines:

### 4 VAC 20-490-30. GEAR RESTRICTIONS

B. It shall be unlawful for any person to place, set, or fish any shark shortline in Virginia's tidal waters with more than 50 hooks. All hooks must be corrodible circle hooks. In addition, any person aboard a vessel fishing shortlines must practice the protocols and possess the federally required release equipment, for pelagic and bottom longlines, for the safe handling, release and disentanglement of sea turtles and other non-target species; all captain and vessel owners must be certified in using handling and release equipment.

- a. *Optional question:* Should the Commission require non-offset, non-stainless steel circle hooks when fishing for sharks? Reasoning for/against.

- b. For recreational fishermen specifically targeting sharks requiring non-offset, non-stainless steel circle hooks when fishing for sharks would seem a reasonable request.
- 3. Does your state have measures to maximize gear removal before releasing sharks (e.g. release using a dehooker or by cutting gangion less then 3 ft from hook)?

Commercial fishermen using shark shortline gear are required to practice the protocols and possess the federally required release equipment, for pelagic and bottom longlines; all captain and vessel owners must be certified in using handling and release equipment.

For recreational anglers our website links to general safe handling and release information but this information is not shark specific.

- a. *Optional question:* Should the Commission require fishermen to maximize gear removal? Reasoning for/against.

The majority of encounters with shark by recreational fishermen in state waters occur while anglers are fishing for other species. Safety is the biggest issue and anglers may not be prepared to handle a shark—particularly larger sharks. The agency would prefer to make this information available to anglers and recommend they review it. If the other states feel a mandate is required we could support it but enforcement would be very problematic.

## North Carolina

1. Does your state have communication materials (web page, signs, text on permits, etc) to address best practices when fishing for sharks from the shore or piers?
  - a. *Optional question:* Should the Commission require communication materials from each state? Reasoning for/against.
    - NC would be more than willing to provide links to HMS angling materials on our Ethical Angling webpage
    - Having states link directly to the HMS site would be better and provide for consistency in handling practices, rather than requiring each state to develop their own communication materials
  
2. Does your state require circle hooks when fishing for sharks or any other species (e.g., recreational or commercial short lines)?
  - a. *Optional question:* Should the Commission require non-offset, non-stainless steel circle hooks when fishing for sharks? Reasoning for/against.
    - NC requires use of circle hooks for hooks larger than size 4/0 from July through September in Pamlico Sound when using natural bait at night. This rule is in place to minimize discard mortality in the recreational fishery for adult red drum ASMFC already requires circle hooks for commercial short lines for sharks
    - The use of circle hooks is great idea for conservation, but we are concerned about creating rules we can't enforce
    - Hook requirements for recreational fisheries that may encounter a wide variety of species on any one trip seems problematic, and we have concerns regarding the impacts of a shark circle hook requirement on other fisheries that employ J-hooks
    - Anglers are likely to be more receptive to positive encouragement to use circle hooks when targeting certain species, rather than a specific requirement that is in regulation
  
3. Does your state have measures to maximize gear removal before releasing sharks (e.g. release using a dehooker or by cutting gangion less then 3 ft from hook)?
  - a. *Optional question:* Should the Commission require fishermen to maximize gear removal? Reasoning for/against.
    - NC does not have any regulations requiring use of dehookers or maximizing gear removal prior to release of sharks
    - We would support requiring HMS-approved dehooking equipment onboard for commercial fishermen using short lines to harvest sharks for consistency with federal requirements for pelagic longline gear
    - Some fishermen may already be employing such practices voluntarily for gear conservation



## South Carolina

At the May Coastal Sharks meeting, the Board reviewed the final measures for [HMS Amendment 5b](#) which includes new recreational and commercial measures for federally-permitted vessels. The Board requested the LEC weigh-in on these measures and provide a report at the August meeting. In addition, there was a request for staff to poll the states on three Amendment 5b-related issues (see below). Please let me know if your state has previously implemented these measures or measures related to these issues.

1. Does your state have communication materials (web page, signs, text on permits, etc.) to address best practices when fishing for sharks from the shore or piers?

There are currently no SCDNR coordinated communication/outreach materials that address shore- and pier-based fishing for sharks. There are some communication/outreach materials and restrictions on public piers regarding catch and release of sharks, but these are coordinated by the municipality in which the pier is located or posted by pier management. Many major beachfront municipalities and public piers discourage or restrict fishing for, or landings of sharks already, as this type of fishing is deemed incompatible with other uses of the beach (e.g. tourism, swimmers, etc.). SCDNR is currently engaged in relevant research working with the recreational shore-based shark and charter fishery on a federally funded CRP (Cooperative Research Program) grant. The main objective of the grant is to obtain post-release mortality estimates (how many released die) for blacktip sharks. As part of our objectives, anglers are keeping logbooks of their catch and we are working to determine factors that may have the largest impact on survival of captured sharks. SCDNR is also currently working on video-based education and outreach materials to help anglers reduce post-release mortality in larger fish such as red drum, tarpon and cobia, but there are no plans to specifically include sharks.

- a. *Optional question:* Should the Commission require communication materials from each state? Reasoning for/against.

No. Given existing public concerns about the compatibility of shark fishing and more common uses of major beach areas SCDNR has no interest in producing education and outreach materials which would seem to promote or encourage directed shark fishing from public piers or beaches. It should be noted that concerns related to HMS Amendment 5b are not really an issue in SC waters since dusky sharks are rarely encountered and no captures have been documented from shore/piers.

2. Does your state require circle hooks when fishing for sharks or any other species (e.g., recreational or commercial short lines)?

Per SC Commercial Shark Permit – “Any vessel using a short-line must use corrodible circle hooks.” Circle hooks are not currently required in any recreational fishery in state waters, but have been promoted for a number of years through education and outreach materials as an effective means to reduce post-release mortality in recreationally targeted species.

- a. *Optional question:* Should the Commission require non-offset, non-stainless steel circle hooks when fishing for sharks? Reasoning for/against.

Decreases in deep hooking which may cause accidental mortality have been shown for many fish species (including sharks) when using circle hooks versus j-hooks. As most anglers do not remove hooks from sharks, any hook requirement implemented should certainly require non-stainless steel hooks. In addition to the conservation benefits of requiring circle hooks, there is a benefit to continued consistency between state and federal waters (one of the goals of the ASMFC Coastal Shark Management Plan).

3. Does your state have measures to maximize gear removal before releasing sharks (e.g. release using a de-hooker or by cutting gangion less than 3 ft. from hook)?

Per SC Commercial Shark Permit – “All short-line vessels must practice the protocols and possess the recently updated federally required release equipment for pelagic and bottom longlines for the safe handling, release, and disentanglement of sea turtles and other non-target species; all captains and vessel owners must be certified in using handling and release equipment. Captains and vessel owners can become certified by attending a Protected Species Safe Handling, Release, and Identification Workshop offered by NOAA Fisheries.” There are no similar requirements for recreational fishers targeting sharks either from shore or vessels.

- a. *Optional question:* Should the Commission require fishermen to maximize gear removal? Reasoning for/against.

Additional information may be needed to provide input on this question. Maximizing gear removal certainly has conservation benefits, however removal of gear less than 3 feet from hook may not be possible in all circumstances. The recent amendment to the HMS plan requires removal of gear to less than 3 feet in commercial fisheries. We do not believe the same requirement has been made for recreational fisheries and perhaps should not be. There are some SC fishing piers that do not allow sharks over a certain size limit to be landed, therefore anglers have no choice but to cut gear greater than 3 feet from the leader. Current SC law pertaining to state consistency with federal recreational shark fishing regulations precludes any requirement for a federal recreational angling permit or federal for-hire permit for fishing in state waters.

## Georgia

1. Does your state have communication materials (web page, signs, text on permits, etc) to address best practices when fishing for sharks from the shore or piers? **No.**
  - a. *Optional question:* Should the Commission require communication materials from each state? Reasoning for/against. **No. Agree with comments from Jim Estes. Assuming the outreach materials being developed by NOAA HMS are broad enough for use by state fisheries, I would assume states would be willing to share available material on their own if they do not have their own materials already.**
  
2. Does your state require circle hooks when fishing for sharks or any other species (e.g., recreational or commercial short lines)? **No.**
  - a. *Optional question:* Should the Commission require non-offset, non-stainless steel circle hooks when fishing for sharks? Reasoning for/against. **No. GA's annual regulations publication for anglers has a section for recommended (NOT mandated) Handling and Releasing Fish Guidelines. In that section, it is recommended that non-offset circle hooks be used when fishing with natural baits to avoid gut-hooking. No specific species are discussed. Would be curious how Law Enforcement views this as a potential requirement.**
  
3. Does your state have measures to maximize gear removal before releasing sharks (e.g. release using a dehooker or by cutting gangion less than 3 ft from hook)? **No. Georgia does not have a commercial fishery for sharks in state waters, nor do we have specific requirements gear removal requirements for recreationally caught sharks.**
  - a. *Optional question:* Should the Commission require fishermen to maximize gear removal? Reasoning for/against. **No. I would think most recreational fishermen would already do this to the extent practical. Again, I would be curious to hear how Law Enforcement views this as being an enforceable requirement.**

## Florida

1. Does your state have communication materials (web page, signs, text on permits, etc) to address best practices when fishing for sharks from the shore or piers? **Yes, we have info on our shark web page.**
  - a. *Optional question:* Should the Commission require communication materials from each state? Reasoning for/against. **Not necessary. Assuming the outreach materials being developed by NOAA HMS are broad enough for use by state fisheries, I would assume states would be willing to share available material on their own if they do not have their own materials already.**
  
2. Does your state require circle hooks when fishing for sharks or any other species (e.g., recreational or commercial short lines)? **Circle hooks are required when fishing for Gulf of Mexico reef fish with natural baits (recreational and commercial, except the commercial yellowtail snapper fishery). We do not have a circle hook requirement for sharks.**
  - a. *Optional question:* Should the Commission require non-offset, non-stainless steel circle hooks when fishing for sharks? Reasoning for/against. **We do not feel strongly either way, but would like to see evidence that sharks survive better when caught with circle hooks before making this a requirement.**
  
3. Does your state have measures to maximize gear removal before releasing sharks (e.g. release using a dehooker or by cutting gangion less then 3 ft from hook)? **No, the PLL fishery that will be required under 5b to use this gear does not operate in FL state waters (Longlines are illegal in Florida).**
  - a. *Optional question:* Should the Commission require fishermen to maximize gear removal? Reasoning for/against. **No – requiring this in state waters for non-PLL commercial harvesters and recreational anglers would be confusing. It would also be difficult to enforce.**



# Atlantic States Marine Fisheries Commission

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## MEMORANDUM

July 11, 2017

**To: Coastal Sharks Management Board**  
**From: Law Enforcement Committee**  
**RE: Review of Enforcement Issues in Federal Amendment 5b**

The Law Enforcement Committee (LEC) of the Atlantic States Marine Fisheries Commission (ASMFC) met via conference call on June 29, 2017 to review and provide comments on proposed management measures in Federal Amendment 5b to the Consolidated Atlantic Highly Migratory Species (HMS) Fishery Management Plan. The following members were in attendance:

*LEC: Chairman, Lt. Mike Eastman (NH); Maj. Rene Cloutier (ME); Asst. Director Larry Furlong (PA); Lt. Tom Gadomski (NY); Sgt. Greg Garner (SC); Maj. Rob Kersey (MD); Capt. Bob Lynn (GA); Capt. Doug Messeck (DE); Katie Moore (USCG); Maj. Pat Moran (MA); Director Kyle Overturf (CT); Capt. Jason Snellbaker (NJ)*

*STAFF: Ashton Harp; Mark Robson; Megan Ware*

### **Online Training Course**

The LEC reviewed federal requirements for recreational anglers to complete an online training video and questions. Members agreed that such an educational requirement has merit, but is typically very difficult to enforce. Several LEC members commented that using the educational tool as an outreach effort is suitable without taking the extra step of providing an enforcement requirement, and it is desirable to continue educating officers regarding shark identification so that they can also provide outreach to anglers on the water or at the docks. The federal requirement to have a printed certificate of completion on board is adequate for federal waters enforcement.

When discussing the development of a similar requirement for each states' waters, the LEC consensus is that it would be most enforceable to have federal permit requirements for online training be applicable if fishing in state waters, as is done for tuna. It was agreed that this would be a straightforward way to encourage the training requirement for all anglers fishing for sharks, from the shoreline out. The LEC understands that HMS issues permits to vessels and not individuals and this system will not capture anglers fishing from shore or beach locations (a significant fishery in several states). However, the LEC believes modifying a single federal permit system would be easier to implement and enforce than attempting to have each individual state develop a separate permit requirement for anglers fishing in state waters.

### **Non-offset, Non-stainless, Steel Circle Hook Requirement below Chatham, MA**

The LEC view of this regulation is that it is another example related to “targeting” a species when fishing, and the difficulty of proving that a fisherman is targeting a species with prohibited gear such as a standard J-hook. It is possible to enforce if an officer watches a fisherman repeatedly fishing for sharks in a targeted way and then verifies use of prohibited gear. Such a provision for striped bass is in place in Maryland and Delaware; however, the experience there is that such cases are difficult to make and prosecute. And once an angler leaves the fishing area, it is not enforceable at all. Further complicating any enforcement effort is the reasonable expectation (and an argument likely to be made) that recreational anglers may incidentally catch sharks while fishing for a variety of species using standard J-hooks.

### **Commercial Measures**

**Circle Hook Requirement.**—The LEC agreed that a circle hook requirement for commercial short line gear in state waters would be more enforceable than a recreational angler requirement for use of circle hooks. Commercial short line gear is easier to monitor and check by enforcement officers, and proving targeting of sharks would be a lesser hurdle in prosecutions.

**Maximizing Gear Removal.**—The LEC had strong reservations about a requirement to use release gear or techniques for sharks because of potential safety concerns to fishermen. There needs to be leeway given to fishermen when their personal safety is a factor, and the LEC feels use of certain release gear should not be prescriptive. It may be possible to require such equipment on board, and this can be enforced.

The LEC appreciates the opportunity to review and provide advice concerning implementing these regulations for sharks in state waters.

**DEPARTMENT OF COMMERCE****National Oceanic and Atmospheric Administration****15 CFR Part 902****50 CFR Part 635**

[Docket No. 130417378–7331–02]

RIN 0648–BD22

**Atlantic Highly Migratory Species; Atlantic Shark Management Measures; Final Amendment 5b**

**AGENCY:** National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

**ACTION:** Final rule.

**SUMMARY:** NMFS is amending the 2006 Consolidated Atlantic Highly Migratory Species (HMS) Fishery Management Plan (FMP) based on the results of the 2016 stock assessment update for Atlantic dusky sharks. Based on this assessment, NMFS determined that the dusky shark stock remains overfished and is experiencing overfishing. Consistent with the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), NMFS is implementing management measures that will reduce fishing mortality on dusky sharks to end overfishing and rebuild the dusky shark population consistent with legal requirements. The final measures could affect HMS-permitted commercial and recreational fishermen who harvest sharks or whose fishing vessels interact with sharks in the Atlantic Ocean, including the Gulf of Mexico and Caribbean Sea.

**DATES:** This final rule is effective on June 5, 2017, except for the amendments to § 635.4 (b), (c), and (j); § 635.19 (d); § 635.21(d)(4), (f), and (k); § 635.22 (c); § 635.71 (d)(21), (d)(22), (d)(23), and (d)(26), which will be effective on January 1, 2018.

**ADDRESSES:** Copies of the Final Amendment 5b to the 2006 Consolidated HMS FMP, including the Final Environmental Impact Statement (FEIS) containing a list of references used in this document, the dusky shark stock assessments, and other documents relevant to this rule are available from the HMS Management Division Web site at <http://www.nmfs.noaa.gov/sfa/hms/>.

Written comments regarding the burden-hour estimates or other aspects of the collection-of-information requirements contained in this final rule may be submitted to the HMS Management Division and by email to

[OIRA\\_Submission@omb.eop.gov](mailto:OIRA_Submission@omb.eop.gov), or fax to (202) 395–7285.

**FOR FURTHER INFORMATION CONTACT:** Tobey Curtis at 978–281–9273 or Karyl Brewster-Geisz at 301–427–8503.

**SUPPLEMENTARY INFORMATION:** The Atlantic shark fisheries are managed primarily under the authority of the Magnuson-Stevens Act. The authority to issue regulations under the Magnuson-Stevens Act has been delegated from the Secretary to the Assistant Administrator for Fisheries, NOAA (AA). On May 28, 1999, NMFS published in the **Federal Register** (64 FR 29090) final regulations, effective July 1, 1999, implementing the FMP for Atlantic Tunas, Swordfish, and Sharks (1999 FMP). On October 2, 2006, NMFS published in the **Federal Register** (71 FR 58058) final regulations, effective November 1, 2006, implementing the 2006 Consolidated HMS FMP, which consolidated the 1999 FMP management measures and other regulatory requirements, and details the management measures for Atlantic HMS fisheries, including the Atlantic shark fisheries. The 2006 Consolidated HMS FMP and its amendments are implemented by regulations at 50 CFR part 635.

**Background**

A brief summary of the background of this final action is provided below. Complete details of what was proposed and the alternatives considered are described in Final Environmental Impact Statement (FEIS) for Amendment 5b to the 2006 Consolidated HMS FMP and the proposed rule for Amendment 5b (81 FR 71672, October 18, 2016). Those documents are referenced in this preamble and their full description of management and conservation measures considered are not repeated here. Additional information regarding Atlantic HMS management can be found in the FEIS for Amendment 5b to the 2006 Consolidated HMS FMP, the 2006 Consolidated HMS FMP and its amendments, the annual HMS Stock Assessment and Fishery Evaluation (SAFE) Reports, and online at <http://www.nmfs.noaa.gov/sfa/hms/>. The comments received on Draft Amendment 5b and the proposed rule and our responses to those comments are summarized below in the section labeled “Response to Comments.”

On October 7, 2011 (76 FR 62331), NMFS made the determination that dusky sharks continued to be overfished and were experiencing overfishing. Initially, NMFS proposed to implement management measures through Amendment 5 to the 2006 Atlantic

Consolidated HMS FMP, however, NMFS received substantial public comment disputing the basis for the proposed Amendment 5 dusky shark measures and suggesting significantly different measures be analyzed within the range of alternatives. Thus, NMFS decided further analysis was necessary and that dusky shark measures would be considered in a separate FMP amendment, EIS, and proposed rule, labeled “Amendment 5b.”

NMFS prepared a Predraft for Amendment 5b in March 2014 that considered the feedback received on Draft Amendment 5. NMFS solicited additional public input and consulted with its Advisory Panel on the Predraft at the Spring 2014 Advisory Panel meeting. In response to two petitions from environmental groups regarding listing dusky sharks under the Endangered Species Act (ESA), NMFS simultaneously was conducting an ESA Status Review for the Northwest Atlantic population of dusky sharks which was completed in October 2014. That status review concluded that, based on the most recent stock assessment as well as abundance projections, updated analyses, and the potential threats and risks to population extinction, the dusky shark population in the Northwest Atlantic and Gulf of Mexico has a low risk of extinction currently and in the foreseeable future, and relative abundance generally appeared to be increasing across the examined time series. On December 16, 2014, NMFS announced a 12-month finding that determined that the Northwest Atlantic and Gulf of Mexico population of dusky sharks did not warrant listing under the ESA (79 FR 74954).

In light of this updated information, including indications of abundance increases, NMFS prioritized an update of the SouthEast Data, Assessment and Review (SEDAR) 21 dusky shark stock assessment using data through 2015, to be completed in summer 2016. It was determined that further action on Amendment 5b should wait until after the completion of the 2016 assessment update to ensure that it was based on the best available scientific information.

On October 27, 2015, the environmental advocacy organization Oceana filed a complaint against NMFS in Federal district court alleging violations of the Magnuson-Stevens Act and Administrative Procedure Act with respect to the timing of NMFS’s action to rebuild and end overfishing of dusky sharks. A settlement agreement was reached in *Oceana v. Pritzker* (Case No. 1:15-cv-01824–CRC) (D.D.C.), between NMFS and the Plaintiffs on May 18,

2016, regarding the timing of the pending agency action. This settlement acknowledged that NMFS was in the process of developing an action to address overfishing and rebuild dusky sharks and that an assessment update was ongoing and stipulated that, based upon the results of the assessment update, NMFS would submit a proposed rule to the **Federal Register** no later than October 14, 2016, and a final rule by March 31, 2017.

In August 2016, the update to the SEDAR 21 dusky shark stock assessment was completed, and on October 4, 2016 (81 FR 69043), NMFS made the stock status determination that dusky sharks are still overfished and still experiencing overfishing, although the level of overfishing is not high. Based on the 2016 assessment update, as well as the rationale summarized below and fully described in the preamble of the Proposed Rule (81 FR 71672, October 18, 2016) and in Section 1.2 of the Amendment 5b FEIS (see **ADDRESSES**), NMFS determined that it needs to reduce dusky shark fishing mortality by approximately 35 percent relative to 2015 levels to rebuild the stock by the year 2107. According to the outcomes of five model runs, Spawning Stock Fecundity (SSF) relative to  $SSF_{MSY}$  (proxy biomass target) ranged from 0.41 to 0.64 (*i.e.*, overfished) (median = 0.53). The fishing mortality rate (F) in 2015 relative to  $F_{MSY}$  was estimated to be 1.08–2.92 (median = 1.18) (values >1 indicate overfishing). The updated projections estimated that the target rebuilding years range from 2084–2204, with a median of 2107. In order to achieve rebuilding by 2107 with a 50% probability, the final models projected that F on the stock would have to be reduced 24–80% (median = 35%) from 2015 levels. While NMFS typically uses a 70-percent probability of rebuilding by the deadline for Atlantic highly migratory shark species, the 2016 update has a higher level of uncertainty than other shark assessments and presents a more pessimistic view of stock status than was expected based on review of all available information (as detailed in the proposed rule and Section 1.2 of the FEIS). Thus, for the purposes of this Amendment, management measures were developed that would achieve the mortality reductions associated with the median assessment model run and a 50-percent probability of rebuilding by the deadline (*i.e.*, 35-percent mortality reduction). A detailed discussion of the stock assessment can be found in the Amendment 5b FEIS (see **ADDRESSES**) and the final SEDAR 21 stock

assessment update report, available on the SEDAR Web site (<http://sedarweb.org/sedar-21>).

The proposed rule for Amendment 5b to the 2006 Consolidated HMS FMP and the Notice of Availability of the DEIS for Amendment 5b published in the **Federal Register** on October 18, 2016 (81 FR 71672) and October 21, 2016 (81 FR 72803), respectively.

Draft Amendment 5b included management measures that would reduce dusky shark mortality in the recreational shark, commercial pelagic longline, bottom longline, and shark gillnet fisheries. Draft Amendment 5b also clarified annual catch limits (ACLs) and accountability measures (AMs) for the prohibited shark complex, including dusky sharks. Detailed descriptions of the proposed management measures and ACL and AM clarifications are available in the Amendment 5b DEIS and proposed rule. The public comment period ended on December 22, 2016.

This final rule implements the measures preferred and analyzed in the FEIS for Amendment 5b to the 2006 Consolidated HMS FMP in order to end overfishing and rebuild dusky sharks. The FEIS analyzed the direct, indirect, and cumulative impacts on the quality of the human environment as a result of the preferred management measures. The FEIS, including the preferred management measures, was made available on February 24, 2017 (82 FR 11574). On March 28, 2017, the Assistant Administrator for NOAA signed a Record of Decision (ROD) adopting these measures as Final Amendment 5b to the 2006 Consolidated HMS FMP. A copy of the FEIS, including Final Amendment 5b to the 2006 Consolidated HMS FMP, is available from the HMS Management Division (see **ADDRESSES**). In brief, the final management measures implemented in this rule are: Shark endorsement and circle hook requirements in the recreational Atlantic shark fisheries; shark release protocols in the pelagic longline fishery; dusky shark identification and safe handling training in the HMS pelagic longline, bottom longline, and shark gillnet fisheries; outreach and fleet communication protocol in the HMS pelagic longline, bottom longline, and shark gillnet fisheries; and, a circle hook requirement in the directed shark bottom longline fishery. Additionally, Amendment 5b clarifies ACLs and AMs for the prohibited shark complex, including dusky sharks. As described in the Responses to Comments below, NMFS made several changes to the preferred alternatives between the proposed and final rule, based in part

on public comments. The specific changes are described below in the section titled “Changes from the Proposed Rule.”

#### *Response to Comments*

We received a total of 76 individual written comments on the proposed rule from fishermen, states, and other interested parties during the public comment period, including one comment from EarthJustice that included signatures from 19,716 individuals and another comment from Oceana that included signatures from 13,144 individuals. We also received comments from fishermen, states, and other interested parties during six public hearings, five regional fishery management council meetings, one Atlantic States Marine Fisheries Commission meeting, and one HMS Advisory Panel meeting. All written comments can be found at <http://www.regulations.gov/>.

#### A. Miscellaneous Comments

*Comment 1:* NMFS received a wide range of comments expressing general support for the proposed conservation and management measures. Commenters’ support was based upon their concerns about the current status of the dusky shark stock and the need to end overfishing and conserve the species in combination with their understanding that the proposed measures would have minimal negative impacts on the recreational and commercial fisheries. Some commenters agreed that the measures would end overfishing and rebuild the stock within the rebuilding timeframe. Most commenters supported the establishment of a shark endorsement requirement for HMS permit holders fishing for sharks recreationally, and shark identification and regulations course for commercial permit holders (HMS pelagic longline, bottom longline, and shark gillnet) as a requirement to target, land, and retain sharks in Federal waters. Many commenters generally supported requiring the use of circle hooks in the recreational and bottom longline fisheries although there were many comments requesting modifications to the wording and implementation of the alternatives, as discussed in more detailed comment responses below.

Commercial fishermen and other groups expressed general support for the commercial alternatives, including the establishment of a dusky shark avoidance and relocation protocol, requiring the use of dehookers or cutting the line within three feet of the shark to release them, and adding a shark



identification section to the protected species and safe handling workshop required of commercial fishermen. The Environmental Protection Agency (EPA) rated the DEIS as “lack of objections,” per its EIS rating criteria, and noted its support for the overall efforts by NMFS to further protect dusky sharks.

*Response:* As detailed in Chapter 4’s environmental effects analyses, NMFS agrees that the Amendment 5b measures will reduce fishing mortality below the level needed to end overfishing and rebuild the dusky shark stock consistent with the SEDAR 21 dusky shark stock assessment update and the Magnuson-Stevens Act, while minimizing effects on the commercial and recreational fisheries.

*Comment 2:* Some commenters stated that additional regulations to protect dusky sharks were not warranted as their retention is already prohibited. These commenters felt NMFS should instead focus on the enforcement of existing regulations prohibiting the harvest of dusky sharks, and that additional regulations on the fishery would result in reduced compliance. The State of Mississippi opposed the measures to protect dusky sharks because it felt the measures could interfere with the fisheries for other, healthy stocks of sharks.

*Response:* Although a prohibition on retention at times provides adequate protection for species that are experiencing overfishing, the latest dusky shark stock assessment update shows that dusky sharks are still experiencing overfishing despite their prohibited status. A detailed description of the dusky shark stock assessment update results is available in Chapter 1 of the FEIS. Because dusky sharks are still overfished and experiencing overfishing, the Magnuson-Stevens Act requires NMFS to implement management measures to stop overfishing and rebuild the stock.

*Comment 3:* Commenters stated that additional management measures to conserve dusky sharks should be implemented in all fisheries that interact with dusky sharks, and not just the HMS fisheries that do so. Fisheries not covered under Amendment 5b that were identified by various commenters as interacting with dusky sharks included state water recreational and commercial fisheries, the Gulf of Mexico reef fish bottom longline fishery, the South Atlantic snapper-grouper bottom longline fishery, and the South Atlantic dolphin/wahoo fishery.

*Response:* Based on the best scientific information available, the majority of dusky shark interactions occur in commercial and recreational HMS

fisheries, as described in Section 1.2 of the FEIS. Specifically, the available observer data for the Southeast dolphin/wahoo, reef fish, and snapper-grouper longline fisheries indicate that dusky shark bycatch is rare, averaging only a few observed mortalities per year. The commenters rely heavily on the extrapolated estimates of the first National Bycatch Report, 1st Edition Update 1 (2011), but as detailed in Chapter 1 of the FEIS and the response to Comment 13, NMFS generally does not rely on that Report for management purposes. Further, NMFS has determined that these estimates are inappropriate for use in developing conservation and management measures for this specific stock. These bycatch estimates were not accepted for use in the SEDAR 21 stock assessment and update by the data workshop working group, further highlighting their inadequacy for HMS management purposes. Dusky shark mortality does occur in state waters. However, NMFS does not manage the state water fisheries; as described in the FEIS and Appendix II, NMFS will coordinate with the states and the Atlantic States Marine Fisheries Commission on the measures implemented by this action. If the states also adopt measures commensurate with those included in Amendment 5b, as they often do with HMS actions, it will increase the mortality reduction benefits for dusky sharks. However, the measures in Amendment 5b, building on the existing Federal conservation and management measures, are sufficient to meet the Magnuson-Stevens Act requirements in the absence of state and/or Atlantic State Marine Fisheries Commission (ASMFC) action. The conservation and management measures that are components of the rebuilding plan are still in effect and include: A continued prohibition on retention of dusky sharks (§§ 635.22(c)(4) and 635.24(a)(5)), time/area closures (§ 635.21(d)), and the prohibition of landing sandbar sharks (the historic target species for the large coastal shark fishery and responsible for a significant portion of dusky interactions) outside of a limited shark research fishery, along with significant large coastal shark (LCS) retention limit reductions in the bottom longline fishery where interactions were commonly occurring (§§ 635.24(a)(1), (2), and (3)). The measures in Amendment 5b will build upon these existing rebuilding plan elements.

*Comment 4:* The EPA and some commenters expressed their concern that the proposed measures only appear to reduce mortalities as opposed to

reducing interactions. They found this particularly concerning in the commercial longline fisheries where they suggest that many dusky sharks are already dead upon haulback (*i.e.*, high at-vessel mortality). One commenter stated that sharks caught on longline gear that are still alive at haulback face significant post-release mortality. Some commenters felt NMFS should further consider alternatives that prohibit fishing during the areas/times that dusky sharks are most vulnerable to capture, reduce overall effort, or require the use of more selective fishing gear. Some commenters stated that the non-preferred alternative to implement hot spot closures is the only effective way to reduce dusky shark mortality. Some commenters advocated for the alternative that would impose a bycatch cap on the fisheries that interact with dusky sharks in hotspot areas. These commenters said that once a bycatch cap is reached, that should trigger hotspot closures in areas where dusky shark bycatch is known to be high for the corresponding fishery. Some commenters stated that the hotspot closure measures were the only alternatives that provided a quantifiable and objective reduction in dusky mortality.

*Response:* NMFS agrees that there is evidence that dusky sharks experience high at-vessel and post-release mortality rates in some fisheries, including the longline fisheries. That is why the approach taken in Amendment 5b to reduce dusky shark mortality relies, in part, on bycatch reduction (Alternative B6), gear modifications (Alternatives A6d, B9), safe release requirements (Alternative B3), and education and training on handling techniques (Alternatives A2, B5, B6) to reduce at-vessel and post-release mortality rates. NMFS analyzed a series of bycatch “hotspot” time/area closures in Alternative B4, but these alternatives were not preferred because similar or greater reductions could be achieved with other measures that would have fewer negative socioeconomic impacts. Additionally, the hotspot closure analyses only quantified the mortality reductions that could be achieved within the pelagic longline fishery (only one source of mortality), not across the whole stock. NMFS analyzed alternatives that would reduce fishing effort by making the recreational shark fishery catch-and-release only (Alternative A7), limiting the number of hooks on pelagic longline sets (Alternative B2), and entirely closing the pelagic longline fishery (Alternative B8). The analyses in Chapter 4 of the

FEIS support the determination that the Amendment 5b measures will achieve the necessary mortality reductions without the negative socioeconomic impacts associated with the hotspot closure and bycatch cap alternatives.

*Comment 5:* One commenter stated that the overarching goal of Amendment 5b should be to effectively “count, cap, and control” dusky mortality in all fisheries that interact with the species.

*Response:* NMFS disagrees that this general management approach would be feasible or necessary in Amendment 5b. The objectives of Amendment 5b are to end overfishing and rebuild dusky sharks, which must be achieved through reductions in mortality. A “count, cap, and control” approach is used in a number of other fisheries, and can reduce mortality in cases where appropriate bases exist to specify and monitor catch limits that are correlated with fishing mortality rates, but there are numerous other acceptable ways to reduce fishing mortality. In the case of the dusky shark, there are insufficient data to count or cap catches. Measures were taken in Amendment 2 to significantly reduce interactions with dusky sharks by, for example, severely reducing allowable catch in the bottom longline fishery for sandbar sharks (the primary source of dusky bycatch), and the dusky shark fishery remains closed by designating the species as a prohibited shark species and setting the catch limit at zero. These measures continue to be in effect. The same commenter acknowledges this fact, stating “[i]n order to reduce bycatch, the Service must first determine how much bycatch is occurring, when, and where,” and “[t]he Fisheries Service cannot enforce bycatch caps if the amount of bycatch is unknown.” NMFS agrees with these statements, which highlight the impracticality of the proposed “count, cap, and control” management approach in the absence of the fundamentally necessary bycatch data. As described in Section 1.2 of the FEIS and in the stock assessment update, total catch data do not exist, thus the SEDAR21 assessment update used a catch-free modeling approach, and the total allowable catch (TAC) estimates provided by the 2016 stock assessment update were not recommended as valid for use in management. For the above reasons, there is no rational basis in this situation for establishing an appropriate cap for dusky shark catches in any individual fishery or across fisheries that interact with them, or to know what level of catch would effectively and appropriately constrain fishing mortality. Consequently, the amended rebuilding plan does not contain

measures that would rely upon absolute catch or discard estimates, such as a quota or sector ACLs. Instead, the measures in Amendment 5b focus on reducing the rates and relative levels of mortality. The measures in this action will achieve the necessary mortality reductions through other means, including bycatch reduction, safe release requirements, gear modifications and training that reduce at-vessel and post-release mortality rates, and outreach and education to improve compliance rates and data collection, in addition to the measures adopted in the 2008 rebuilding plan. Additionally, with improved species identification training, data collection on recreational dusky shark catches should improve by reducing the occurrence of “unidentified” sharks in catch reports and surveys and increasing confidence in the reported catch of dusky sharks. As data collection improves, catch-based assessments and management measures may become feasible in the future.

*Comment 6:* NMFS should establish bycatch caps between fishery sectors within the Consolidated HMS FMP, as well as between non-HMS FMPs as a “preferred alternative” in the final Amendment 5b. At a minimum, NMFS should coordinate bycatch caps among the HMS fisheries, Gulf of Mexico reef fish bottom longline fishery, and South Atlantic snapper-grouper bottom longline fishery, as well as other fisheries responsible for dusky shark bycatch and mortality.

*Response:* NMFS disagrees that bycatch caps are appropriate for further limiting dusky shark mortality. Under Alternatives Considered but Not Further Analyzed in Chapter 2 of the FEIS, NMFS includes a detailed explanation of why bycatch caps, while helpful for some species, are not appropriate for the current situation with the available data for dusky sharks. The response to Comment 5 also addresses scientific concerns related to establishing dusky shark bycatch caps.

*Comment 7:* The EPA noted that the 2014 Northwest Atlantic Dusky Shark Status Review Report identified hook time, correlated with soak time, as a significant factor in predicting at vessel dusky shark mortality. As such, the EPA recommended that NMFS consider providing more detail in the FEIS concerning the appropriateness of addressing hook soak time as a means of reducing dusky shark mortality in the longline fisheries.

*Response:* NMFS agrees that there is considerable scientific information indicating that shorter hook soak times on bottom longlines are correlated with

reduced at-vessel and post-release mortality rates on many shark species, including dusky sharks. However, as described in Section 2.3 of the FEIS (Alternatives Considered but Not Further Analyzed), an alternative that would limit soak time is not considered to be reasonable at this time because of safety, enforcement, and safe-handling concerns. During the public comment period of the Amendment 5b Predraft, NMFS heard comment from industry that limiting soak time could rush fishing operations, particularly on sets with high numbers of large fish. In these instances, the crew may need to rush to meet soak time restrictions, compromising safety at sea and possibly rushing through protected resource safe handling requirements. From an enforcement perspective, concerns were raised about effectively monitoring such a measure fleetwide absent high levels of observer coverage and more general concerns were noted about the enforceability of soak times.

*Comment 8:* NMFS received a wide range of comments regarding the need for a quantitative analysis explaining how the proposed measures would achieve the 35-percent reduction in dusky shark mortality. EPA and other commenters noted that it was difficult from the analyses in the DEIS to clearly evaluate the effectiveness of the different alternatives as contributing to the necessary mortality reduction. As such, the EPA recommended providing additional information in the FEIS to help quantify the impacts of the alternatives and facilitate comparisons of alternatives. Another commenter questioned whether the qualitative analyses of the proposed alternatives meet the standards required by NEPA. Several commenters called upon NMFS to conduct a more quantitative analysis of the proposed alternatives in the FEIS to demonstrate how they would achieve the targeted 35-percent reduction in mortality.

*Response:* NMFS has been responsive to these comments in the FEIS, which includes more quantitative analysis of the expected impacts of the alternatives, to the extent possible using the best available scientific information. However, as described in Chapter 4 of the FEIS, it is not possible to specifically quantify the projected effect of most of the preferred alternatives on the overall dusky shark population because total catch and population size are unknown. The alternatives in the FEIS include more quantitative discussion than the DEIS included for the expected effects on mortality rates of individual sharks caught within the affected fisheries, but qualitative

inferences are still necessary due to the lack of data. Qualitative analyses are acceptable within NEPA analyses when quantitative resources are lacking. Therefore, while it is not possible to calculate the precise mortality reduction of the alternatives, individually or cumulatively, NMFS has determined that the best available scientific information indicates that the measures in Amendment 5b will end overfishing and rebuild the dusky shark stock as required.

*Comment 9:* Two commenters suggested that NMFS had not fully analyzed a reasonable range of alternatives to end overfishing and rebuild the dusky shark stock consistent with NEPA requirements. These commenters stated that bycatch caps are within the reasonable range of alternatives and are one of the few measures that can objectively reduce dusky shark mortality. The commenters believe that by not analyzing bycatch caps, NMFS has not analyzed a full range of alternatives. These commenters also stated that to comply with NEPA requirements, a range of alternatives considering ACLs other than zero and additional AMs should be analyzed. Furthermore, it was stated that to comply with NEPA, a range of alternatives analyzing the impacts of using different probabilities of achieving rebuilding success (*i.e.*, 50 percent, 70 percent, or 90 percent probability) should have been developed.

*Response:* The alternatives analyzed in Amendment 5b represent the reasonable range of alternatives, consistent with the purpose, need, and objectives of the rulemaking, as required by NEPA. Although some commenters have identified measures that they believe would better meet the objectives of Amendment 5b, not all of them are reasonable. Bycatch caps were not considered a reasonable alternative, as detailed in the Alternatives Considered but Not Further Analyzed section in Chapter 2 of the FEIS. See also responses to Comments 5 and 6.

Regarding the probability of rebuilding, NMFS made a scientifically-based determination about the appropriate level of risk, given the circumstances here. As discussed in Section 1.2 of the FEIS, NMFS has explained the scientific justification for using the 50 percent probability and explained why 70 percent was not feasible due to poor data, uncertainty, and other concerns. The determination of which probability to use was not based on ecological, social, or economic impacts; rather, it was based on the stock assessment output estimates, overfishing risk tolerance, and the level

of confidence in the output. A more detailed explanation of NMFS' determinations regarding the probability of rebuilding is available in the response to Comment 25.

*Comment 10:* One commenter stated that Amendment 5b is inconsistent with National Standard 9 because the action does not provide a means to quantify dusky bycatch.

*Response:* National Standard 9 of the Magnuson-Stevens Act states that “[c]onservation and management measures shall, to the extent practicable: (1) Minimize bycatch; and (2) To the extent bycatch cannot be avoided, minimize the mortality of such bycatch.” Consistent with this national standard, over the years, NMFS has implemented conservation and management measures to minimize bycatch and bycatch mortality of dusky sharks. See Chapter 1 of the FEIS. The Amendment 5b measures build upon those bycatch measures, as they are specifically designed to reduce at-vessel and post-release mortality rates of dusky sharks. In addition, the education and outreach measures will improve species identification and accurate reporting of catches of dusky sharks and other prohibited species. For an explanation of bycatch reporting methodologies for HMS fisheries, see Chapter 3 of the FEIS.

*Comment 11:* One commenter stated that state water fishermen are interacting with dusky sharks during certain times of the year and that those fishermen often misidentify shark species. The commenter stated that dealers that purchase the sharks typically take the fisherman's word on species identification.

*Response:* An important part of Amendment 5b's outreach effort to rebuild dusky sharks is working with the ASMFC and the Atlantic states to encourage them to reduce dusky shark mortality and implement measures that complement NMFS' effort within their jurisdictions. All shark dealers in Atlantic states (Maine through Florida) are required to obtain a Federal shark dealer permit, per the ASMFC Interstate FMP for Coastal Sharks, and must attend a shark identification workshop as a condition of their permit. Other members of the public, including state dealers in the Gulf of Mexico can attend these workshops and states have the option to set up their own workshops for state dealers to attend. Any Atlantic shark dealers misreporting shark species identification will continue to be referred for enforcement action as appropriate.

*Comment 12:* Some commenters, including the EPA, suggested that

NMFS consider extending the requirement to use dehookers or to cut the leader close to the hook to recreational shark anglers as well.

*Response:* This final rule requires that commercial fishermen release all sharks that are not being boarded or retained by using a dehooker, or by cutting the gangion no more than three feet from the hook as safely as practicable. NMFS does not extend the same requirement to the recreational fishery. NMFS already requires recreational anglers to release sharks in a manner that maximizes the chance of survival, and many anglers do so by using dehookers or by cutting leaders close to the hook. At-vessel and post-release mortality of dusky sharks in recreational fisheries already appears to be low according to the available recreational data in the FEIS (Section 1.2). Thus, NMFS will continue to maintain the requirement as written in the recreational fisheries without specifying the required method of release, because the requirement is already effectively implemented.

*Comment 13:* One commenter stated that Amendment 5b is not consistent with National Standard 2 because the action does not use the best available science. This commenter contends that, although highly uncertain, the TAC provided in the 2016 dusky shark stock assessment update is the best available science and should be used to provide a cap on fishing mortality. Furthermore, this commenter stated that the dusky shark bycatch estimates in the National Bycatch Report are the best available science and should be used, consistent with National Standard 2.

*Response:* Amendment 5b is consistent with National Standard 2 and uses the best available science, including the 2016 SEDAR 21 stock assessment update for dusky sharks. It also relies on scientific advice regarding the value or advisability of using certain data as the basis for management measures. While certain data were deemed not reliable enough to form the basis of management measures, the development of the conservation and management measures and impact analyses drew heavily from several up-to-date data sources, including logbooks, observer reports, fishery-independent surveys, Marine Recreational Information Program (MRIP) estimates, and recent scientific research. Results from the stock assessment update and the other data sources represent the best available science. In acceptance of the 2016 stock assessment update as the best available science, NMFS has also accepted its recommendation to *not* use the calculated TACs, as described in

Section 1.2 of the FEIS and stock assessment update report. While the commenter recommended that we use “the TAC” in the stock assessment, the final 2016 stock assessment update had five different TAC estimates ranging from 7,117 to 47,400 lb (3.2 to 21.5 mt) dressed weight (median = 27,346 lb (12.4 mt) dressed weight), and NMFS has no scientific basis to select one TAC over another, and none of them are considered acceptable for management purposes.

Because the stock assessment uses a catch-free model, it does not calculate projected levels of catch. Therefore, these estimates were not recommended for use in management according to the stock assessment documents. Specifically, the preliminary 2016 stock assessment update report stated that, “[w]e also provided an estimate of the total weight of removals associated with different reductions in total F, but caution that these are estimates only, and subject to considerable uncertainty.” Additionally, the final 2016 stock assessment update recommended that “projections based on catch-based removals should not be considered.” Therefore, NMFS accepts the recommendations of the stock assessment update, and will not use those TAC estimates as a basis for any management measures.

As detailed in Section 1.2 of the FEIS, the values estimated in the National Bycatch Report, 1st Edition Update 1 for 2006–2010, used a methodology that tended to overestimate dusky shark bycatch in these non-HMS fisheries, which was corrected in the subsequent National Bycatch Report update for 2011–2013 (Table 1.6). Specifically, because there were so few observed dusky shark interactions in the reef fish and snapper-grouper BLL fisheries (as supported by Table 1.5), the National Bycatch Report (1st Edition Update 1) initially used dusky shark catch-per-unit-effort (CPUE) from the shark BLL fishery observer program, including the shark research fishery data, and expanded that catch rate to the total effort in the BLL fisheries for reef fish and snapper-grouper. BLL sets for sharks and reef fish/snapper-grouper are different (different gear configurations, soak times, etc.) and are not directly comparable. Additionally, because sets for both sharks and reef fish/snapper-grouper can occur on the same trip, estimates that treated these fisheries completely separately would have resulted in double counting of some sharks. The shark research fishery trips target sandbar sharks and have a comparatively high interaction frequency with dusky sharks, which

resulted in artificially inflated values for dusky shark bycatch in the non-HMS BLL fisheries. Similar artificially inflated estimates were made in the vertical line and troll fisheries, where observed dusky shark interactions are near zero. Therefore, the dusky shark estimates provided in the National Bycatch Report, 1st Edition Update 1 (using 2006–2010 data) are considered invalid for use in management. The methodology used to estimate dusky shark bycatch in the National Bycatch Report, 1st Edition Update 1 was not used in the subsequent National Bycatch Report updates due to these issues. Additionally, these extrapolated catch estimates were not accepted for use in the SEDAR 21 stock assessment and update, which used catch-free models, further supporting NMFS’ determination that these estimates are not acceptable for use in management.

*Comment 14:* The EPA submitted a comment recommending additional environmental justice information in the EIS. Specifically, the EPA recommended that NMFS include the evaluation of environmental justice populations within the geographic scope of the projects. The EPA recommended that NMFS substantiate and include in the EIS whether the proposed alternatives have any potential for disproportionate adverse impacts to minority and low-income populations. The EPA also recommended that the EIS include the approaches used to foster public participation by these populations and describe outreach conducted to all other communities that could be affected by the project, because rural communities may be among the most vulnerable to health risks associated with the project.

*Response:* NMFS appreciates these recommendations from the EPA and has added additional information in the environmental justice discussion in Section 9.4 of the FEIS.

*Comment 15:* The EPA recommended providing summaries of any studies or other scientifically-supportable information that supports the assumption that recreational and commercial shark identification training will reduce dusky shark mortality through decreased misidentification and increased understanding of regulations.

*Response:* The Alternative A2 ecological impacts section of Chapter 4 of the FEIS details how species identification outreach can reduce mortality of elasmobranchs. Research on other U.S. Atlantic prohibited elasmobranch species has demonstrated that focused outreach and species identification training can improve compliance rates with prohibited species regulations to over 98 percent,

including reducing illegal landings by 95 percent (Curtis and Sosebee 2016). Additionally, angler education programs that train recreational fishermen in safe fishing, handling, and release techniques result in reduced post-release mortality rates (Poisson et al. 2016).

*Comment 16:* The EPA submitted a comment questioning the effectiveness of dusky shark species identification training, specifically with respect to Galapagos sharks. Galapagos sharks are very difficult to differentiate from dusky sharks. The EPA stated that while U.S. fishermen likely fish in areas overlapping with dusky shark distribution rather than Galapagos shark distribution, it is very difficult to tell the two species apart. The EPA contends that dusky sharks are morphologically very similar to, and genetically indistinguishable from, Galapagos sharks. Vertebral counts and subtle dorsal fin differences are characteristics used to distinguish the two species and are unlikely to be used without lethally exposing the vertebral column or comparing side-by-side specimens of the two species. The EPA stated that it is unclear how better species identification would resolve species identification difficulties.

*Response:* NMFS is aware of the difficulty in differentiating between dusky and Galapagos sharks and the emerging research examining genetic differences. However, both species are prohibited from retention and landings, thus, both would be released by any fishermen catching and confusing the species. Because both species are prohibited, NMFS does not see an immediate sustainability threat to dusky sharks due to misidentification between the two species.

*Comment 17:* The EPA submitted a comment stating that juvenile dusky sharks look very similar to juvenile sandbar, Galapagos, and silky sharks, even if adults are more readily identifiable. They were concerned that misidentification among the four species could reduce the effectiveness of efforts to reduce dusky shark mortality.

*Response:* NMFS acknowledges the species identification challenges with juvenile dusky sharks and similar-looking species, which has been a chronic hindrance to estimating catches and assessing the stock with catch-based methods. However, the measures in Amendment 5b will reduce mortality rates on all sharks in the affected fisheries, and improve species identification. Because all four of the species mentioned in the EPA’s comment are prohibited in the recreational fishery and cannot be

retained by pelagic longline fishermen, NMFS does not see an immediate sustainability threat to dusky sharks due to misidentification among these four species.

#### B. Annual Catch Limits (ACLs) and Accountability Measures (AMs)

*Comment 18:* One commenter stated that NMFS should not set the dusky shark ACL equal to zero. Instead, the commenter felt the Agency must use the best scientific information currently available to set a precautionary ACL that accounts for bycatch interactions of dusky sharks in each fishery that catches dusky sharks and propose AMs to ensure adherence to the ACL (including the current prohibition on retaining dusky sharks). Another commenter stated that dusky sharks should not be grouped with the other prohibited sharks under the same ACL.

*Response:* Amendment 3 to the HMS FMP (2010) implemented a mechanism for establishing ACLs and AMs for each of the shark management groups. For sharks in the prohibited shark complex, this methodology was not applied because the fisheries were closed and landings were prohibited. Therefore, the ACL was considered to be zero, as clarified in this Amendment. Recent revisions to the NS 1 guidelines (81 FR 71858; October 18, 2016), specify that if an ACL is set equal to zero and the AM for the fishery is a closure that prohibits fishing for a stock, additional AMs are not required if only small amounts of catch (including bycatch) occur and the catch is unlikely to result in overfishing. See 50 CFR 600.310(g)(3).

Here, the ACL for the prohibited shark complex continues to be set equal to zero, and the existing AM for all of the stocks in the prohibited shark fishery is a closure that prohibits fishing for the stocks. Inclusion of a species in the prohibited stock complex means that all commercial and recreational retention is prohibited and the fishery is closed (see § 635.28(b)(1)(iv)). Thus, AMs in addition to the closure are not required if only small amounts of catch occur and the catch is unlikely to result in overfishing. There is no information suggesting that overfishing is occurring on species in the prohibited shark complex, except for dusky sharks, and the Amendment 5b rulemaking is undertaking AMs to end that overfishing.

NMFS notes that there would be policy and scientific/data concerns if we were to specify an ACL other than zero for the prohibited shark complex, including dusky sharks. As noted in the response to Comment 13, there was a high level of uncertainty in the 2016

assessment update, given limited data on dusky sharks, multiple data sources, and five plausible model scenarios. The update had five different TAC estimates, and these estimates were so uncertain and wide-ranging as to be inappropriate for management use according to the SEDAR 21 stock assessment. NMFS does not have a basis for picking one model scenario over another and is concerned that setting an ACL based on the highly uncertain TAC estimates could encourage increased catch. Furthermore, allowing catch or landings, even at low levels, could send a message to fishermen that interactions are permissible at some level and could disincentivize avoidance of interactions, which is one of the goals of the measures adopted in this Amendment. Thus, dusky sharks remain in the prohibited shark complex, with an ACL set at zero. The measures adopted through Amendment 5b, in addition to the continuation of measures adopted as part of the dusky shark rebuilding plan, are AMs.

Regarding the comment that dusky sharks should be removed from the prohibited shark group and managed separately, separating dusky sharks and the other prohibited sharks under separate ACLs, each equal to zero, would not provide any meaningful advantage for any prohibited species over the approach being used. Catch and bycatch estimates, to the extent they are available, will still be tracked individually for each species and in any future assessments for prohibited sharks. Grouping all prohibited sharks under a single ACL does not preclude NMFS from considering management measures to address any sustainability concerns for any single stock, as evidenced by the actions in Amendment 5b. In summary, NMFS has determined that specifying an ACL of zero for the prohibited shark complex, which includes dusky sharks, is appropriate and consistent with the NS1 guidelines and requirements of the MSA.

*Comment 19:* Another commenter stated that NMFS has essentially operated under an ACL of zero since retention of dusky sharks was prohibited in 2000, has failed to track or limit bycatch of dusky sharks or enforce any limit of bycatch mortality with accountability measures, and in doing so has failed to end overfishing of the stock.

*Response:* NMFS disagrees. Dusky sharks have been prohibited since 2000, but ACLs were not established for HMS-managed sharks until Amendment 3 (2010). As clarified in this Amendment, the ACL for the stocks in the prohibited shark complex, including dusky sharks,

is zero. The recreational and commercial fisheries for dusky sharks are closed, and the measures adopted in this amendment will ensure that only small levels of bycatch will occur and will not lead to overfishing. Contrary to the commenter's assertions, NMFS has taken significant management actions to address dusky shark overfishing since the prohibition for dusky sharks went into effect and has continuously monitored bycatch levels using all available data sources (see Section 1.2 of the FEIS). The first dusky shark stock assessment was completed in 2006. As a result of that assessment, in 2008, NMFS established a rebuilding plan for dusky sharks and implemented major changes in the shark fisheries that changed how all directed shark fishermen conduct their business (e.g., creation of the shark research fishery, severe reduction of sandbar shark quota to reduce dusky shark bycatch, reduction in the trip limit, etc.). Since that time, there have been other actions in HMS fisheries, such as the implementation of Amendment 7, that have resulted in significant changes throughout HMS fisheries, not just shark fisheries. According to the SEDAR 21 dusky shark stock assessment update, NMFS' management of dusky sharks has significantly reduced fishing mortality on dusky sharks, but not yet completely ended overfishing. Dusky sharks have experienced improvements in their stock status outlook as described in the 2016 stock assessment update and Section 1.2 of the FEIS. Overfishing has been reduced substantially (median  $F_{2015}/F_{MSY}$  ratio of five scenarios = 1.18, compared to  $F_{2009}/F_{MSY}$  = 1.59 in the previous assessment). As detailed in the ecological impacts section of Chapter 4 of the FEIS, the management measures in Amendment 5b, which are AMs, will build on the success of past measures by further reducing bycatch mortality and ending overfishing. Additionally, NMFS has continually tracked dusky shark bycatch over time through numerous fishery-dependent monitoring programs (observers, logbooks, recreational surveys, etc.), as detailed in Section 1.2 of the FEIS.

*Comment 20:* One commenter stated that the National Standard 1 provision at 50 CFR 600.310(g)(3) should not apply to the dusky shark fishery. See response to Comment 18 for explanation of the provision. The commenter contends that (1) the dusky shark fishery is not closed as several fisheries that are known to interact with dusky sharks are still open; (2) overfishing is still occurring in the dusky shark fishery; and (3) bycatch is not small

considering the average annual number of dusky sharks caught as bycatch (529 per year according to the DEIS) is more than double the highest estimated TAC of adult dusky sharks (which the commenter calculated would be 249 dusky sharks by dividing the estimated TAC in the assessment by a potential average dressed weight of a mature dusky shark) that would provide a 70-percent chance of rebuilding by 2107, according to the recent SEDAR 21 update. The commenter also stated that the DEIS did not specify a threshold for determining what level of bycatch is “small.”

*Response:* As discussed in Section 1.2 of the FEIS, the ACL/AM provisions for dusky sharks in Amendment 5b meet the conditions set forth in the NS 1 guidelines. First, the dusky shark fishery is closed, as explained in response to Comment 18. Second, measures under Amendment 5b and this rule will end overfishing for dusky sharks and ensure that the small levels of bycatch are unlikely to lead to overfishing. NMFS notes that the estimated level of overfishing for dusky sharks in the current stock assessment update is not high (median of five plausible model scenarios is  $F_{2015}/F_{MSY}$  is 1.18; values  $>1$  indicate overfishing).

Third, for all sharks in the prohibited shark complex, only small amounts of catch (including bycatch) occur. The NS1 guidelines do not provide a definition or detailed guidance on what constitutes a “small” amount of bycatch. However, the available data show that prohibited shark species—including dusky sharks—are not commonly caught as bycatch in HMS or other fisheries. Prohibited sharks as a group have observed bycatch amounts in the 10s and 100s of individuals. By comparison, many fish stocks have observed bycatch amounts estimated in the hundreds and thousands of metric tons, and prohibited shark species collectively represent a small portion of total shark bycatch across all fisheries (U.S. National Bycatch Report, First Edition Update 2, 2016). With regard to the commenter’s TAC calculation, as detailed in the response to Comment 13, the TACs estimated in the 2016 stock assessment update are not considered acceptable for management. Thus, direct comparisons of the observed mortalities summarized in Section 1.2 of the FEIS against the TACs estimated in the stock assessment update are not appropriate.

In addition to requiring that the bycatch be “small,” the NS1 guidelines specify that catch be unlikely to lead to overfishing. According to the available analyses, certain prohibited shark species—basking sharks (Campana,

2008), night sharks (Carlson et al., 2008), sand tiger sharks (Carlson et al., 2009), white sharks (Curtis et al., 2014), and bigeye thresher sharks (Young et al., 2016)—are not experiencing overfishing. While such analyses have not been completed for all of the prohibited shark species, there is no information suggesting that overfishing is occurring on species in this complex, except for dusky sharks, and the Amendment 5b rulemaking is undertaking AMs to end that overfishing.

*Comment 21:* One commenter stated that the 50 CFR 600.310(g)(3) provision does not exist in the Magnuson-Stevens Act, and the Supreme Court has held that Federal agencies cannot create exemptions to a statute that Congress did not already include.

*Response:* Section 50 CFR 600.310(g)(3) from the National Standard 1 guidelines is consistent with, and not an exemption to, the Magnuson-Stevens Act. The Act requires that FMPs establish ACL/AM mechanisms with the goal of preventing overfishing from occurring, 16 U.S.C. 1853(a)(15). Section 600.310(g)(3) explicitly provides that its provisions may be invoked if there is an ACL of zero, an AM that is a closure, and “catch is unlikely to result in overfishing.” Response to comment 46 in the final National Standard 1 guidelines revisions (81 FR 71858; October 18, 2016) explains that § 600.310(g)(3) is an optional tool that will only apply to a limited set of cases where there is no way to account for the small amounts of bycatch occurring and, therefore, it is not pragmatic to establish AMs to try to account for such small amounts of bycatch that are unlikely to result in overfishing. NMFS notes that, as a statutory matter, the national standard guidelines do not have the force and effect of law, 16 U.S.C. 1851(b). Consistent with Magnuson-Stevens Act requirements, as detailed in Chapter 4 of the FEIS, there is an ACL/AM mechanism for prohibited shark species, and bycatch of dusky sharks is unlikely to result in overfishing under the Amendment 5b management measures.

*Comment 22:* A few commenters objected to setting the dusky shark ACL to zero on the grounds that it will lead to further restrictions in fisheries that interact with dusky sharks as the population recovers and interactions with the species increase accordingly due to their increasing abundance. With an ACL set equal to zero, NMFS would have no way to measure success, and dusky shark will inevitably become another choke species that will lead to unnecessary fisheries closures that the

commercial and recreational fisheries cannot afford.

*Response:* The Magnuson-Stevens Act requires fishery management measures to end and prevent overfishing and to rebuild overfished stocks. An ACL of zero for the prohibited shark complex, including dusky sharks, in conjunction with the continuation of measures adopted in the dusky shark rebuilding plan thus far (e.g., Amendment 2) and the new AMs outlined in Amendment 5b, will prevent overfishing. NMFS agrees that as the population recovers and the dusky shark stock increases, an increase in interactions could occur. NMFS will continue to monitor dusky sharks through the available fishery-dependent and -independent data sources, and future stock assessments, and consider additional management measures in the future if necessary.

*Comment 23:* One commenter stated that, while NMFS’ intention to monitor bycatch levels of prohibited sharks is necessary, there are no means to determine if bycatch mortality falls within safe ranges because nearly all the prohibited shark species have not undergone a stock assessment. Furthermore, the commenter stated that each of the prohibited shark species is unique with different life history traits, different bycatch levels, and different vulnerabilities. To address this concern, the commenter suggested creating four subgroups of prohibited shark species reflecting high and low levels of fishery interactions and high and low vulnerability based on life history traits. The commenter felt these subgroups could provide a way to prioritize monitoring and stock assessments, and those species with a high vulnerability and high fishery interactions could be prioritized over those with a low vulnerability and low fishery interactions. The commenter noted that this process could occur outside of the Amendment 5b rulemaking process.

*Response:* Many of the prohibited sharks do not have stock assessments. Stock assessments for prohibited species are often complicated by a near or complete lack of data. However, as this commenter noted, there are ways to prioritize monitoring and stock assessments among the prohibited sharks. NMFS has used methods to prioritize monitoring and stock assessments of prohibited sharks since first beginning management of Atlantic sharks with the 1993 FMP. Based on this prioritization, an initial analysis was performed of sharks that have more vulnerable life history traits and presumably higher levels of fishery interaction. Based on this information, retention of dusky sharks was

prohibited through the 1999 FMP, effective in 2000.

The Brief Management History section of Chapter 1 has more detail and final rule references for this action. NMFS later created a Vulnerability Evaluation Working Group in 2008 to provide a methodology to determine vulnerability (a function of both biological productivity and susceptibility to fisheries) of a wide range of U.S. fish stocks (Patrick et al. 2009, 2010). Atlantic HMS sharks, including prohibited species, were part of this Productivity and Susceptibility Analysis (PSA), which found that the vast majority of prohibited species fell in the same region of the PSA plot (see Figure 5 in Patrick et al. 2009) indicating similar vulnerability. It was noted in the document that 12 of the 14 prohibited species had some of the lowest susceptibility scores of all HMS Atlantic sharks. NMFS welcomes comments on ways to improve the stock assessment prioritization process, and may consider such changes in the future. However, this comment remains beyond the scope of Amendment 5b.

#### C. Dusky Shark Stock Assessment and Mortality Reduction Targets

*Comment 24:* One commenter noted that the dusky shark assessment update may not be accurate because it did not consider several issues, including fishermen avoidance of the species since 2000; the potential non-reporting of dusky shark catches; flaws in some fishery independent surveys to account for range shifts due to climate change and other factors; and continuing problems in species identification. That commenter felt the next assessment should be a benchmark assessment that considers these issues. Another commenter noted the need to conduct a benchmark assessment for dusky sharks to address these and straddling stock (trans-international boundary) issues. Commenters also stated that future dusky shark stock assessments should include data from Mexican and Cuban water fisheries that also interact with dusky sharks.

*Response:* Both the SEDAR 21 dusky shark stock assessment and stock assessment update acknowledge the uncertainties in all of the input data sources. However, these uncertainties were characterized to the extent possible and accounted for within the assessment model runs. NMFS has not yet scheduled the next dusky shark stock assessment, and agrees that the next dusky shark assessment should include a review of all available data sources, and should also investigate methods for addressing changes in

management and fishing behavior, the validity of fishery-independent sources, environmental factors, potential data from neighboring nations that may catch dusky sharks, and other relevant information to improve the assessment.

*Comment 25:* Some commenters were opposed to NMFS' decision to use mortality reduction targets estimated to provide a 50-percent probability of rebuilding the dusky shark stock by 2107. They contend that previous actions involving Atlantic HMS sharks have generally used the 70-percent probability for other sharks and that NMFS, in the Predraft for Amendment 5b, stated that the 70-percent probability is the most appropriate. The commenters stated that the necessary mortality reductions should reflect the 70-percent probability threshold given the fact that previous measures have failed to end overfishing over the last 10 years. One commenter stated that NMFS' rationale for using the 50-percent probability is incorrect. The commenter stated that while NMFS chose the 50-percent probability because the dusky shark assessment was highly uncertain, it was no more uncertain than the last dusky assessment and assessments for other shark species. The commenter also stated that NMFS chose the 50-percent probability because the assessment results were more pessimistic than expected, so NMFS changed the mortality reduction objective rather than properly addressing the results of the assessment. One commenter who supported the use of a 50-percent probability threshold noted that 50-percent is a commonly used standard that has been judicially-approved for ending overfishing and the 50-percent threshold makes sense given the higher level of uncertainty associated with the update compared to past stock assessments.

*Response:* NMFS' determination to use the fishing mortality reduction associated with a 50-percent probability of rebuilding by 2107 is a standard approach in many NMFS stock rebuilding plans, is consistent with the Consolidated HMS FMP, and is scientifically justified as detailed in Section 1.2 of the FEIS. While NMFS typically uses a 70-percent probability for Atlantic highly migratory shark species, the 2016 update has a higher level of uncertainty than other shark assessments and presents a more pessimistic view of stock status than was expected based on a preliminary review of similar information and other available information. Such information includes the information reviewed in the ESA Status Review, reductions in

U.S. fleet fishing effort due to management actions not reflected in the 2016 stock assessment update, and improved age and growth information indicating that dusky sharks have faster age and growth dynamics than previously thought, which likely results in higher productivity than that considered in most of the model scenarios of the 2016 stock assessment update (Natanson et al., 2014). It is possible that the "high productivity" model scenario encompassed the effects of this new life history information, while also reducing the plausibility of the "low productivity" scenario. This information could not be directly used in the 2016 assessment update, because assessment updates only incorporate data inputs (e.g., time series, life history parameters, etc.) that were previously vetted through the SEDAR process and approved as part of the most recent benchmark assessment. Here, that was the 2011 benchmark stock assessment (SEDAR 21). Based on its review of the 2016 update, understanding about the operation of the HMS fisheries under current management measures, and other available information, the F estimate associated with the 50-percent probability more accurately reflects current fishing pressure and accounts for the new information on dusky shark productivity than the F estimate associated with the 70-percent probability. Because of these issues, NMFS decided it was appropriate from a scientific perspective to use the F reduction associated with the 50-percent probability of rebuilding by the deadline in Amendment 5b. Using the F reduction associated with a 50-percent probability, rather than a 70-percent probability, appropriately reflects this change in risk tolerance while remaining sufficiently precautionary and is consistent with the standard used in rebuilding plans for most NMFS-managed stocks.

From a statistical perspective, the wider confidence band in the projections results in the F estimate associated with a 70-percent probability being substantially lower than the apical value (the value at the peak of the distribution of F estimates). Thus, the F reduction associated with 70-percent goes well beyond what NMFS would consider appropriately precautionary even for species with relatively slow life history such as sharks. NMFS also notes that the rebuilding year (i.e., length of time the species could rebuild with no fishing mortality plus one mean generation time) was calculated using a 70-percent probability, as is typically done in assessments, which additionally

increases the likelihood of achieving rebuilding within the mandated time period. Furthermore, while the probability of rebuilding the dusky shark stock by 2107 with a 35-percent mortality reduction is 50 percent, the probability of this mortality reduction immediately ending overfishing is approximately 77 percent according to the results of the final 2016 stock assessment update.

*Comment 26:* One commenter specifically called for an ACL that will achieve at least a 50-percent reduction in dusky shark fishing mortality across all fisheries to ensure a 70-percent probability of successfully rebuilding by 2107, as designated by the U-Shaped mortality scenario described in the DEIS and the recent SEDAR 21 stock assessment update. Another commenter suggested that only an 8-percent reduction in fishing mortality is necessary because the U-shaped mortality scenario  $F/F_{MSY}$  is only 1.08.

*Response:* NMFS acknowledges that the 2016 stock assessment update provided five different model runs, all of which represent plausible states of nature for the dusky shark stock, consistent with the SEDAR 21 benchmark assessment. However, as described in the assessment documents and Section 1.2 of the FEIS, there is no scientific basis to select one model run over another. Therefore, consistent with the approach used in comparable situations in other stock assessments, a multi-model inference was made using the results of the median model. In this case, the U-shaped Natural Mortality model run recommends a 53-percent reduction in mortality to achieve a 70-percent probability of rebuilding by 2107. As described in the response to Comment 25 above, use of a 50-percent probability of rebuilding is warranted in this case. Therefore, NMFS has determined that the best available scientific information supports the use of the median model and a mortality reduction associated with a 50-percent probability of rebuilding by the deadline (*i.e.*, 35 percent). Furthermore, there is no acceptable ACL associated with achieving any of the mortality reductions presented in the stock assessment update, as described in Section 1.2 of the FEIS. The ACL for the prohibited shark complex is zero, and this action is reducing mortality on dusky sharks using other measures since there are insufficient data to quantify catch or TACs with any certainty. Finally, NMFS disagrees that under the U-shaped mortality scenario, only an 8 percent mortality reduction is needed. An 8-percent mortality reduction may end overfishing, but would not rebuild

the stock as required. A 35-percent mortality reduction is needed to end overfishing with a 50 percent probability and will be achieved by the measures adopted in this Amendment.

*Comment 27:* The EPA suggested clarifying why it is appropriate to set a 35-percent mortality reduction target for dusky sharks when the 2011 stock assessment recommended a 58-percent decrease relative to 2009 levels.

*Response:* The mortality reduction targets changed after the 2016 assessment update and, as described in the response to Comment 25, NMFS has determined that Amendment 5b measures should reduce dusky shark mortality by 35 percent to end overfishing and rebuild the stock consistent with the most recent assessment update.

As detailed in Chapter 1, the 2011 SEDAR 21 dusky shark stock assessment used data through 2009. After finalizing that stock assessment and beginning rulemaking to implement a rebuilding plan for dusky sharks, it became apparent that management measures implemented after 2008 in HMS fisheries (*e.g.*, measures in Amendment 2) had reduced dusky shark interactions and mortality. Furthermore, fishery-independent abundance indices prepared for the ESA status review showed increasing dusky shark population trends. Consequently, the Agency prioritized an update to the SEDAR 21 dusky shark stock assessment, using data through 2015, to incorporate recent management changes and updated fishery-independent indices. The SEDAR 21 dusky shark stock assessment update found that while the stock is still overfished and experiencing overfishing, the stock status was healthier than shown in the original SEDAR 21 assessment.

#### D. Shark Endorsement, Training, Species Identification, and Outreach

*Comment 28:* NMFS received numerous comments in support of the shark endorsement (Alternative A2), including from the South Atlantic Fishery Management Council (SAFMC), and the States of North Carolina, South Carolina, and Texas. NMFS received comments expressing concerns and recommendations regarding the shark identification and training quiz. The State of Mississippi commented that shark species misidentification is not a problem in Mississippi waters. One comment stated that a test to obtain a permit was unheard of in salt and freshwater fishing and many fishermen may decide simply not to fish for sharks to avoid the burden of the online course. Another commenter noted that because

hunters need to take a safety class with bird identification in the State of Florida to get a hunting license, an online class such as what is proposed and another for all HMS species, particularly in regard to reporting requirements, in order to receive a vessel permit is reasonable. Another comment indicated that misidentification and lack of data are the underlying issues facing the rebuilding of dusky sharks, and both of these can be properly and sufficiently addressed through a comprehensive HMS shark endorsement program (as outlined in Alternative A2) with online education modules during issuance and renewal of the endorsement. The commenter suggested that the quiz should focus on prohibited species identification (specifically dusky, sandbar, or ridgeback sharks), best practices for safe handling interaction, and a cooperative data collection initiative through reporting requirements. The commenter felt that cooperatively increasing fisherman knowledge and understanding of resource interactions allows for responsible management while also creating a sense of responsibility and stewardship of the resource. Lastly, another commenter noted that most anglers who have the time, resources, and knowledge to fish offshore already know how to properly identify a fish before harvesting it.

*Response:* NMFS recognizes that the shark identification and regulations quiz accompanying the proposed shark endorsement represents a novel measure in the realm of marine recreational fisheries; however, it is by no means unprecedented in the realm of conservation management. As one of the supporting commenters noted, hunters in the State of Florida are required to take hunter safety classes that include a bird identification section, and similar hunter safety courses are required in almost all states. Compared to hunter safety courses, which historically could last an entire day or more, the proposed shark identification and regulations training course and quiz will place minimal burden on recreational anglers as it is intended to take only a few minutes to complete, while still conveying the necessary information in an efficient manner. The quiz will focus on dusky shark conservation to more effectively meet sustainability goals. Additionally, many commercial fishermen that pursue HMS fisheries have long been required to take extensive training workshops on the identification and safe release of protected species that can take a full day to complete. NMFS has identified



accidental landings due to misidentification as one of the primary sources of dusky shark mortality in the recreational fishery. NMFS considered several alternatives to address this problem including drastically increasing the minimum size for sharks and making the recreational shark fishery catch-and-release only. Both of these alternatives will have been assured to largely end accidental landings of dusky sharks in Federal waters, but will have had a far greater impact on the recreational fishery while doing far less to target the underlying issue of misidentification. As such, NMFS decided to prefer the more targeted approach of education and communication that could be provided by the shark identification and regulation training course and quiz. NMFS realizes that many recreational HMS anglers already know how to identify HMS species, including dusky sharks, and are familiar with HMS regulations. However, NMFS cannot be assured of getting the necessary information to those anglers who need it without requiring it of all Federal water anglers that wish to target and land sharks.

*Comment 29:* NMFS received a comment from the State of South Carolina which noted that they do not oppose the requirement for the shark endorsement for HMS permit holders fishing in Federal waters, but stated that NMFS needs to remove the phrase "fishing for sharks recreationally" to make it clear that the endorsement is needed to land sharks caught in Federal waters whether the angler in question was targeting sharks or not. The State of South Carolina Department of Natural Resources (South Carolina DNR) also stated that the proposed shark endorsement is in direct conflict with South Carolina law Section 50-5-2725 because permits are not required for the possession of sharks in South Carolina state waters. South Carolina DNR stated that, therefore, South Carolina would not enforce this final rule in its state waters.

*Response:* This final rule does not conflict with or preempt any state regulations, nor does it place any enforcement requirements on states. Recreational shark anglers fishing exclusively in state waters will not be required to obtain the shark endorsement just as they are not required to obtain an Atlantic HMS Angling or Charter/Headboat permit, and states need not enforce Federal regulations against shark anglers who do not hold Federal permits. However, those recreational shark anglers that wish to target, retain, and land sharks in

Federal waters will be required to obtain a shark endorsement along with their Atlantic HMS Angling or Charter/Headboat permit. Once the angler has a Federal permit, as a condition of that permit, the angler must abide by the Federal regulations, regardless of where they are fishing, including in state waters, unless the state has more restrictive regulations, as specified in the Final Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks (64 FR 29090; May 28, 1999). HMS permit holders have been required to follow federal requirements in state waters as a condition of obtaining a federal permit since 1999 for commercial permit holders and since 2006 for recreational permit holders. As explained in the FEIS for the 2006 Consolidated HMS Fishery Management Plan, the previous differing requirements between state and Federal regulations and the inability to verify whether or not a particular fish onboard a vessel was caught in state waters or Federal waters generated confusion for the federal permit holders. The states have been previously consulted on these Federal permit conditions, and are regularly consulted on all HMS management plan amendments.

*Comment 30:* NMFS received a comment that supported the shark endorsement and suggested that NMFS implement the shark endorsement in non-HMS recreational fisheries that interact with sharks as well.

*Response:* NMFS only has authority to manage shark fisheries in Federal waters, and any recreational angler fishing in Federal waters of the Atlantic, Gulf of Mexico, or Caribbean that wishes to retain sharks must possess an Atlantic HMS Angling or Charter/Headboat permit. As such, all recreational anglers that fish in Federal waters of the Atlantic will be required to obtain the shark endorsement to retain sharks. Individual states and the Regional Fisheries Management Commissions and Councils have the option to require Atlantic HMS permits of anglers fishing in state waters or for non-HMS, but the authority to do so lies with them and not NMFS. As stated above, once the angler has a Federal permit, as a condition of that permit, the angler must abide by the Federal regulations, regardless of where they are fishing, including in state waters, unless the state has more restrictive regulations.

*Comment 31:* Commenters stated that NMFS should include a reporting requirement as part of the shark endorsement for all shark landing or develop a sampling protocol to survey

shark populations to improve data reliability in the recreational sector.

*Response:* As described in Chapter 2 (under Alternatives Considered but Not Further Analyzed), NMFS is not planning to include reporting requirements as part of the initial implementation of the shark endorsement, which could result in duplicative data collection efforts in recreational fisheries (e.g., MRIP, the Large Pelagics Survey (LPS)). However, NMFS is hopeful that the endorsement can serve as a framework for improving the sampling of recreational anglers that target sharks for surveys like those conducted by MRIP. How well this works will depend on what percentage of HMS anglers acquire the endorsement. The more HMS permit holders that acquire the endorsement, the less of a targeted sample it would provide compared to the existing HMS Angling and Charter/Headboat permits. However, this is counterbalanced by the fact that the more anglers getting the endorsement means the more anglers that will be receiving the targeted outreach and education materials on shark identification, safe handling, and shark fishing regulations, and the more anglers would then provide the correct shark identification when responding to surveys.

As for the suggestion to include a reporting requirement in conjunction with the shark endorsement, HMS permit holders are already required to report their catches and landings when intercepted by NMFS catch and effort surveys like MRIP and the LPS. At this time, NMFS is not planning to require any additional reporting requirements similar to the requirements for billfish, bluefin tuna, and swordfish. The mandatory reporting requirement for most of these species is only to report fish that are landed (bluefin tuna reporting also includes dead discards), and because landing dusky sharks is prohibited, any similar reporting requirement for sharks should not provide data on dusky catches. NMFS is also reluctant to require reporting on released sharks as the agency does not have the authority to extend the requirement to state water anglers who are responsible for a significant portion of recreational catches and landings for most shark species. This is not a concern with other HMS with mandatory reporting requirements as NMFS manages bluefin tuna to the shore, and billfish and swordfish are very rarely caught in state waters. NMFS is also in the process of reviewing the needs of MRIP and the LPS as part of the Regional MRIP Implementation Plan. As part of that review, NMFS is

considering what, if any changes, are needed to improve recreational estimates of shark harvest.

*Comment 32:* NMFS received comments requesting an option to cancel the shark endorsement for fishermen when they are not fishing for sharks or sharks are not in their area. Other commenters expressed concern that providing an option for cancelling the shark endorsement throughout the year would create confusion as to who and when fishermen could retain/land sharks during a given year.

*Response:* NMFS believes the demand for the option to drop the shark endorsement will be largely negated by the new circle hook alternative (A6d) that requires endorsement holders to use circle hooks only when fishing for sharks, as opposed to the previously preferred alternative (A6a), which required the use of circle hooks whenever fishing with wire or heavy monofilament or fluorocarbon leader, as the new preferred alternative removes any potential conflicts with non-shark fisheries. If sharks are to be retained, circle hooks must be used, regardless of bait or gear configuration (with the exception of artificial lures and flies). NMFS will still provide the option for anglers to drop the shark endorsement if they so desire.

*Comment 33:* NMFS received a comment from the SAFMC suggesting that NMFS include a small fee for the shark endorsement to provide a minor barrier to entry. The comment noted that the fee would assist with defining the universe of fishermen actually targeting sharks, and thus improve the ability of the shark endorsement to provide a targeted sampling frame for shark anglers. Other commenters stated that there should not be an extra fee for the shark endorsement because the HMS Angling Permit already has a fee.

*Response:* NMFS has considered the possibility of charging a separate fee for the shark endorsement, but has opted not to take that direction at this time as it does not represent a standalone permit. Additionally, NMFS does not want to unduly discourage permit holders from receiving the endorsement as the primary goal of the endorsement is to facilitate education and outreach on shark identification, safe handling, and fishing regulations while using the endorsement as a sample frame for data collection is only a secondary benefit. Furthermore, it is generally agreed that those anglers and charter/headboat captains that do not regularly target sharks, and are more likely to only interact with a sharks incidentally, are the ones that will most benefit from the educational aspects of the shark

endorsement while also being the ones most likely to opt not to obtain it if it required paying an additional fee. As such, NMFS believes the benefits of the shark endorsement to dusky shark conservation will be maximized if a fee is not charged. Furthermore, NMFS does not see a need to limit entry into the recreational shark fishery to promote dusky shark conservation as they are not a target species, but are only caught incidentally.

*Comment 34:* NMFS received numerous comments regarding the online shark identification and training course. One commenter noted that the online quiz should be short and quick, and specifically address dusky sharks. Another commenter felt that the shark identification quiz should focus on prohibited species identification, and best practices for safe handling. To improve and evaluate the effectiveness of the shark endorsement, one commenter recommended that implementation of the endorsement and online training course follow key principles for effective e-learning, and include an evaluation component to assess its effectiveness at educating permit holders. This commenter submitted detailed information on how to approach and evaluate adult learning in online training.

*Response:* In the interest of minimizing burden to the angling public, NMFS intends to keep the shark endorsement short and targeted. It will focus on key recreational shark fishing regulations (minimum size limits, bag limits, and circle hooks), and key identifying characteristics of prohibited shark species such as the interdorsal ridge. More detailed information on shark identification and safe handling techniques will be distributed to shark endorsement holders through targeted outreach materials that the angler can keep on hand for future reference. NMFS greatly appreciates the information and literature one commenter provided on adult learning and online training. NMFS will strive to apply adult learning principles in the design of the shark endorsement training and quiz. NMFS intends the shark endorsement quiz to be an adaptive tool that will be evaluated on a regular basis to determine which questions provide the most educational benefit, what topics require the most targeted outreach, and how the training course can be improved.

*Comment 35:* NMFS received a comment requesting that all applicants applying for the shark endorsement be asked to provide an estimated number of sharks caught in the previous year. The comment noted that many

fishermen may choose to get the shark endorsement regardless of whether they intend to target sharks "just in case." Providing information on the number of sharks caught in the previous year would allow NMFS to have a more accurate representation of the universe of fishermen targeting sharks in any given year.

*Response:* Asking shark anglers to recall the number sharks they have caught in the previous year as part of the shark endorsement would result in highly inaccurate responses given the long length of the recall period (12 months). None of the current MRIP surveys use recall periods of anywhere near this length with most using recall periods of only two months. This measure is not considered reasonable because it would be duplicative with existing recreational fishery data collection efforts (e.g., MRIP, LPS) and would not meet the primary objectives of this amendment (i.e., ending overfishing and rebuilding dusky sharks). Furthermore, the collection of such data would likely be inaccurate and difficult, if not impossible, to verify as anglers would need to remember all trips and catches from the previous year. Existing data collection efforts, while still flawed, produce better catch and effort estimates than collection of such information once a year when someone is applying for a permit. Additionally, creation of this type of data collection would likely be costly in terms of the data management infrastructure needed, and the data management clearances required for the collection could delay implementation of this action, which is needed to end overfishing on dusky sharks. NMFS is currently looking at ways to improve MRIP and LPS data collection surveys for all HMS as part of its regional MRIP implementation plan. Any changes as a result of those data collection methods would result in more reliable recreational data than a once-a-year collection of information when people are applying for the shark endorsement.

*Comment 36:* NMFS received a comment from the SAFMC which noted that when applying for the shark endorsement, NMFS should make it clear that those fishermen holding the endorsement would need to use circle hooks in certain situations and that sharks caught incidentally on J-hooks would need to be released. Additionally, the SAFMC noted, when presented with the option to apply for the endorsement, NMFS should clearly inform fishermen that, without the endorsement, sharks cannot be retained.

*Response:* NMFS agrees with the SAFMC's comment that it is important

to make it clear to anglers applying for the shark endorsement that circle hooks will be required when fishing for sharks, that sharks incidentally caught on J-hooks will need to be released, and that the shark endorsement will be required to retain sharks caught in Federal waters. All of these issues will be highlighted during the permit application process and shark endorsement quiz.

*Comment 37:* NMFS received comments suggesting shark fishermen or all HMS permitted vessels be required to carry a shark identification placard (Alternative A3) instead of taking the online quiz to receive the shark endorsement.

*Response:* NMFS considered requiring HMS permitted vessels to carry a shark identification placard in alternative A3. NMFS did not prefer this alternative because while anglers could be required to carry a placard that, if used, might help identify dusky and other sharks, ensuring that anglers reference the material would be difficult. NMFS feels that Alternative A3 will provide for a more passive learning experience and does not provide feedback to the angler like the online shark endorsement quiz in Alternative A2. However, as part of the outreach and education campaign described in Alternative A2, NMFS intends to provide additional outreach materials, in addition to the placard, that anglers could use as a reference after taking the quiz.

*Comment 38:* NMFS received a comment requesting that NMFS require all HMS recreational permit applicants participate in a broader training course encompassing regulations on all HMS recreational fisheries including sharks. The comment noted that the HMS permit should be issued on completion of the training course.

*Response:* The purpose of this action is to address the specific issue of ending overfishing of dusky sharks in the Atlantic, and no additional benefit to dusky sharks would likely occur as a result of the broader training course suggested by the commenter. Rather, the commenter's suggestion was aimed at improving angler knowledge of all HMS identification and recreational fishing regulations, which has not proven to be a significant issue. Using this action to require all anglers applying for an HMS permit to take a broad training course on HMS fisheries regulations and species identification to address a minor issue that is not targeted exclusively toward ending overfishing of and rebuilding dusky sharks is beyond the scope of this action. While such a training course might be beneficial, issues of species misidentification have not proven to be

a consistent problem and driver of overfishing in non-shark HMS fisheries. As such, NMFS believes that a more targeted course on shark identification and regulations will be more likely to achieve the goals of this action.

*Comment 39:* NMFS received numerous comments from recreational fishermen regarding the impact of the shark endorsement on data collection. One commenter noted the shark endorsement would provide a better estimate of recreational shark fishermen and increase the confidence in MRIP shark catch estimates. Other commenters were concerned that the shark endorsement would lead to inflated shark catch estimates, further noting that most HMS anglers would choose to get the endorsement, regardless of whether they plan to target sharks in order to keep the option for shark fishing open. Additionally, one commenter felt that the shark endorsement benefit would be minimized by the fact that HMS permits are vessel-based; therefore, the permit holder, rather than the individuals fishing, would be reporting.

*Response:* NMFS expects that the endorsement can serve as a framework for improving the sampling of recreational anglers that target sharks for MRIP surveys like the LPS. NMFS recognizes that the more HMS permit holders that acquire the endorsement, the less of a targeted sample it would provide compared to the existing HMS Angling and Charter/Headboat permits; however, this should not result in inflated estimates of sharks caught in Federal waters. The HMS Angling and Charter/Headboat permit lists are already used as sampling frames for the LPS and the For-Hire Survey, which provide estimates of shark fishing effort and landings by HMS permit holders. If all HMS permit holders obtain the shark endorsement, then the survey sampling frames would remain the same, and the resulting estimates should be largely unchanged. However, the fact that HMS permits, and thus the shark endorsement, are vessel-based permits will limit its usefulness as a sampling frame for other MRIP surveys that are not vessel based, but instead target individual anglers.

*Comment 40:* NMFS received comments suggesting that NMFS update the shark identification placard to include information for dusky sharks. Other commenters felt that a dusky shark identification guide should be printed directly on the HMS Angling permit.

*Response:* In addition to the shark endorsement, NMFS will be conducting an extensive outreach and education

campaign on shark identification and fishing regulations. This will include updating the existing shark identification placard, and developing dusky shark specific educational materials that will be distributed at locations that anglers frequent, such as tournaments or bait shops, and to individuals that acquire the shark endorsement. NMFS does not plan to print the shark identification guide directly on the HMS Angling permit at this time as this would substantially increase the size of the permit. Furthermore, NMFS has received numerous anecdotal accounts that anglers rarely read their permits and disseminating information through permits may not be effective.

*Comment 41:* NMFS received a comment expressing concern regarding the impact the proposed dusky measures will have on charter or recreational fishing vessels that fish for both sharks and tuna on the same trip. In New England, most sharks are caught incidentally when fishing for other pelagic species, particularly tuna. The comment noted that combined tuna and shark trips are critical for charter fishing businesses and anglers should be allowed to fish for both species in the same day with the same permit.

*Response:* None of the provisions in Amendment 5b are intended to prohibit anglers from pursuing sharks and other HMS during the same fishing trip. An angler possessing a shark endorsement is not prohibited from fishing for other HMS when appropriately permitted to do so and consistent with requirements. Permit holders wishing to retain sharks will be required to use circle hooks to fish for sharks, unless they are fishing in New England waters north of 41°43' N. latitude, or are fishing with flies or artificial lures. This boundary line for the circle hook requirement was added to the new preferred Alternative A6d to eliminate any impacts to the HMS recreational fishery outside of the dusky sharks' known range. The exception for flies and artificial lures was added because NMFS heard from commenters, including the State of Florida and the SAFMC, concerned that fly fishing for sharks could inadvertently be impacted by the requirement to use circle hooks when targeting sharks with natural bait. Although not widely done at this time, some fishermen target sharks with fly fishing gear, usually with J-hooks. NMFS does not know of instances where cut or whole bait is used when fly fishing for sharks, but it is common for the terminal fly to include natural components such as bird feathers. Furthermore, it is well known by

anglers, and verified by research, that artificial lures and flies rarely gut hook sharks or other fish species, and are much less likely to do the type of tissue or organ damage that leads to post-release mortality. For these reasons, in the final action, NMFS has preferred to specifically exempt shark fishermen using flies and artificial lures from the circle hook requirement.

*Comment 42:* NMFS received comments suggesting the need for cooperation between the Agency, States, and Councils to ensure that outreach materials reach recreational state water fishermen. Commenters noted that recreational state-water fishermen have a high likelihood of misidentifying sharks. Furthermore, commenters noted recreational state-water fishermen in the State of North Carolina potentially are interacting with dusky and sandbar sharks depending on time of year and weather. The EPA also recommended that NMFS provide incentives to tournament organizers, fishery associations, etc., to encourage and enlist their participation in increasing fishermen's awareness of prohibited shark species identification and regulations.

*Response:* NMFS is aware that tournament anglers and anglers that fish exclusively in state waters make up a portion of the recreational shark fishery, and are likely interacting with dusky and sandbar sharks depending on their region and time of year and weather. As such, NMFS fully intends to work with the state agencies, commissions, councils, and shark tournament organizers to ensure that shark educational and outreach materials reach all of these anglers. NMFS will be developing a detailed outreach plan for dusky shark conservation efforts that will identify points of contact at state agencies, fishery management councils, and major shark fishing tournaments with a particular focus on those regions where dusky shark interactions are most common. Outreach efforts by NMFS will also target recreational fishing publications that cater to shark anglers.

#### E. Alternative A6—Circle Hooks in the Recreational Fishery

*Comment 43:* NMFS received various comments regarding the proposed circle hook measure's potential to achieve mortality reductions. Some commenters felt that circle hooks would reduce the chance of gut hooking and increase the chance of post-release survival for dusky sharks, consistent with our analyses in the draft Amendment. Other commenters support the circle hook requirement for recreational shark fisheries but question the effectiveness

of the requirement as it relates to reaching a 35-percent reduction in mortality given the inconsistency of study results between different species of sharks. Additionally, NMFS received a comment that noted that Amendment 5b lacks sufficient quantitative analysis on how the circle hook requirement would achieve mortality reduction. Some commenters felt the circle hook requirement would negatively impact fishermen targeting other species and cause economic hardships while being unenforceable. Other commenters felt that little scientific evidence exists to support the mandatory use of circle hooks while some commenters noted that circle hooks are designed not to hook anything until they find a hard edge, reducing the chances of hooking internal soft tissue, and would be beneficial for sharks. Commenters further noted that more research is needed on the use of circle, J, and barbless J-hooks. The EPA commented that NMFS should provide incentives to tournament operators, fishery associations, etc., to encourage and enlist their participation in advocating for recreational fishermen's use of circle hooks by all Atlantic HMS permit holders participating in fishing tournaments when targeting or retaining sharks.

*Response:* Circle hooks provide demonstrably positive benefits to dusky sharks caught and released in the recreational shark fishery. While post-release survival is important for the stock health of most species, it can be particularly important for prohibited species because post-release mortality is the primary source of fishing mortality for the stock. As such, ensuring that dusky sharks are released in a condition that maximizes survival is an important way to reduce fishing mortality. Most evidence suggests that circle hooks reduce shark at-vessel and post-release mortality rates without reducing catchability compared to J-hooks, although it varies by species, gear configuration, bait, and other factors. Willey et al. (2016) found that 3 percent of sharks caught recreationally with circle hooks were deep hooked while 6 percent caught on J-hooks were deep hooked. A more detailed examination of these data provided to NMFS by Willey et al. indicated even greater positive impacts specific to dusky sharks, showing a deep-hooking rate of 6 percent for circle hooks and 17.5 percent for J-hooks in dusky sharks (N=230); a reduction of 66 percent. Campana et al. (2009) observed that 96 percent of blue sharks that were deep hooked were severely injured or dead

while 97 percent of sharks that were hooked superficially (mouth or jaw) were released healthy and with no apparent trauma. Therefore, assuming that deep hooking in dusky sharks results in comparable post-release mortality rates to those of blue sharks (96 percent), converting recreational shark fisheries from J-hooks to circle hooks should reduce the mortality rate of hooked dusky sharks by 63 percent  $((17.5\% - 6.0\%/17.5\%) * 96\% = 63\%)$ . By requiring circle hooks for shark fishing in the recreational fishery, dusky sharks that are inadvertently caught in the recreational fishery would be more easily released in better condition, reducing dead discards and post-release mortality. While additional studies, including on the use of barbless J-hooks, are always helpful, the existing literature supports a circle hook requirement in the recreational shark fishery to reduce dusky shark mortality. As suggested by the EPA, NMFS intends broad-scale outreach across a number of fishing organizations to inform the affected public about new management measures and the dusky shark sustainability concerns.

*Comment 44:* NMFS received a large volume of comments expressing concern over the proposed definition of shark fishing for purposes of applicability of the circle hook requirement in the alternative preferred in the draft Amendment (A6a). Commenters, including the States of Florida and North Carolina, noted that the proposed language would have the effect of including fishing in multiple non-shark recreational fisheries such as swordfish deep dropping and trolling for billfish, tuna, wahoo, and mackerels. The proposed measure required that circle hooks be used by everyone who has the shark endorsement and who fishes with the specified natural bait/gear configuration. The State of South Carolina opposed Alternative A6a as originally proposed, as it would place a significant burden on fishermen not fishing for sharks but who opt to get the endorsement in case they want to land a bycaught shark, specifically impacting fishermen trolling offshore for dolphin, wahoo, and tuna. Commenters suggested that NMFS remove the definition of shark fishing as it relates to applicability of the measure to avoid potential conflicts with other fisheries. Additionally, NMFS received comments, including from the SAFMC and the State of Texas that suggested the shark fishing definition should apply to all recreational fishermen targeting sharks, instead of all fishermen using wire, or heavy monofilament or

fluorocarbon leaders, and natural baits and that doing so would minimize impacts of the measure and its attendant costs on non-shark fisheries. Furthermore, NMFS received comments stating that a better definition of shark fishing for the circle hook requirement would include chumming activities, large chunks of cut natural bait (dead or alive), wire greater than #9 gauge, multistrand cable, or monofilament leaders greater than 2.0 mm, activities that were excluded from the previous definition's approach.

NMFS received a comment suggesting that using hook size as an indicator of shark fishing, as proposed in another non-preferred alternative (Alternative A6b), would be complicated and ineffective. The comment noted that determining specific hook size requirements would be difficult given differences between manufacturers, especially regarding a multi-species fishery. NMFS also received comments from the State of Florida and the SAFMC requesting recreational fishermen using flies with natural components (*i.e.*, hair, feathers) be exempted from the natural bait definition.

*Response:* NMFS agrees that definition of shark fishing proposed in the DEIS and proposed rule would sometimes impact other types of non-shark fishing. It is not NMFS' intention to impose circle hook requirements on non-shark fisheries because those fisheries rarely interact with dusky sharks. For these reasons, NMFS modified the circle hook requirement, presented as Alternative A6d. Under this new preferred alternative, instead of requiring circle hooks when a specified gear configuration is used (*e.g.*, strong leaders and natural bait, or the non-preferred option of hook size and natural bait), circle hooks will be required on any fishing line deployed to target sharks, unless artificial lures or flies are used since artificial lures and flies rarely result in gut-hooking. With this alternative, NMFS broadly requires circle hooks for all recreational shark fishing within a defined geographical boundary unless fishing with artificial lures or flies, as discussed below), rather than more narrowly when shark fishing with a particular gear/bait configuration. This measure ensures that all recreational shark fishing is included (except when fishing with artificial lures or flies) in the circle hook requirement while avoiding the unintended effect of requiring circle hook use in non-shark fisheries. Within the defined geographical boundary, shark possession and landing will still be prohibited if the shark was not

retained on a circle hook or using an artificial lure or flies.

Chumming and large chunks of cut bait were excluded from the definition of shark fishing in the proposed rule/Draft Amendment because neither are used in all shark fishing trips, both are used in many other marine recreational fisheries, and their inclusion would have effectively limited enforcement of the circle hook requirement to when fishing activity was directly observed on the water. Additionally, what constitutes a large chunk of cut bait can vary considerably depending on the target species, including among different species of sharks.

Alternatively, wire greater than #9 gauge, multistrand cable, and monofilament leaders greater than 2.0 mm all fell within the leader requirement within the definition of shark fishing under Alternative 6a, and comment was requested on the specific leader weight definitions. However, given the general opposition to the leader requirement, and the definition of shark fishing, it was determined that another course of action was preferable to modifying the leader requirements for using circle hooks. NMFS heard from commenters, including the State of Florida and the SAFMC, concerned that fly fishing for sharks could unnecessarily be impacted by the requirement to use circle hooks whenever recreationally fishing for sharks. Although not widely done at this time, some fishermen target sharks with fly fishing gear or artificial lures, usually with J-hooks. NMFS is providing an exemption for artificial lures and flies from the circle hook requirement. Such lures, which mostly use J-hooks, are fished actively, meaning that sharks don't have an opportunity to swallow the hook, and are therefore mostly hooked in the mouth. There is no evidence that artificial lures or flies frequently cause gut-hooking and associated post-release mortality (Muoneke and Childress, 1994; Brownscombe et al., 2017). For this reason, in the final action, NMFS has preferred to specifically exempt shark fishermen using flies and artificial lures from the circle hook requirement.

*Comment 45:* The State of South Carolina suggested that NMFS exempt fishermen trolling from the circle hook requirement as the conservation benefit is unclear. NMFS also received comment that when trolling for tunas, sharks will sometimes get hooked in the lip when depredating the tuna catch. The commenter felt these sharks should be able to be retained.

*Response:* NMFS has decided, due to enforcement issues, not to include an

exemption to the circle hook requirement for sharks caught while trolling. Allowing the retention of sharks caught on J-hooks introduces a loophole in the circle hook requirement and is counterproductive to NMFS' intention to reduce dusky shark mortality. If a fisherman wishes to retain sharks caught on J-hooks, they could simply contend that they were "trolling." NMFS' concern is that the only way for enforcement officers to know a shark was caught while trolling would be to witness the catch as it happens. Conversely, an enforcement officer intercepting an angler landing a shark at the dock would have no way of knowing if the shark was caught while trolling or using another fishing method.

*Comment 46:* NMFS received several comments, including from the SAFMC, and the States of Florida, South Carolina, and North Carolina, suggesting NMFS define the type of circle hook (*e.g.*, non-offset, non-stainless steel) required for Alternative A6a; specifically, the SAFMC and the States of Florida and North Carolina suggested that NMFS specify the use of non-offset and non-stainless steel circle hooks.

*Response:* NMFS agrees that it would be more effective to specify that non-offset, non-stainless steel circle hooks are required. These hooks reduce the chance of damaging the gut track of sharks if swallowed, and because they are corrodible, will deteriorate and fall out of the jaw of the shark if left in. These two features will reduce post-release mortality of dusky sharks. Additionally, non-offset circle hooks are also currently required to be used in billfish tournaments, and the South Atlantic snapper/grouper fishery, which also requires the use of non-stainless steel hooks. For these reasons, the circle hook measure for recreational fishing has been clarified to require non-offset, non-stainless steel circle hooks to maximize reductions in post-release mortality, and to be consistent with circle hook requirements in other recreational fisheries.

*Comment 47:* NMFS received comments from the SAFMC and the State of North Carolina supporting the requirement of circle hooks in shark fishing tournaments (Alternative A6c).

*Response:* NMFS agrees that circle hook use in shark fishing tournaments will be beneficial for dusky sharks for the same reasons they are beneficial in the greater recreational shark fishery. Under Alternative A6d, fishermen fishing for sharks recreationally will be required to get a shark endorsement and will be required to use circle hooks when fishing for sharks whether they are fishing in a tournament or not,

except when using flies or artificial lures. Requiring circle hooks in the greater recreational shark fishery, rather than only in shark tournaments, provides a greater conservation benefit for dusky sharks.

*Comment 48:* NMFS received a comment from the State of North Carolina requesting that circle hooks not be required to retain, possess, or land sharks if an angler catches a shark when targeting non-shark species. The comment noted that allowing the retention of incidentally caught sharks would prevent dead discards.

*Response:* While NMFS can understand why it would appear desirable to allow anglers to retain sharks incidentally caught on J-hooks, the agency is concerned that doing so would undermine the enforcement of the circle hook requirement when targeting sharks. If shark anglers were permitted to land sharks incidentally caught on J-hooks, they could continue to fish exclusively with J-hooks and simply claim any shark they catch was caught incidentally. As such, NMFS has determined that requiring the release of all sharks caught on J-hooks is essential to the enforcement of the circle hook requirement.

*Comment 49:* NMFS received comments suggesting that the circle hook requirement be extended to all HMS recreational fisheries to reduce post-release mortality in all HMS fisheries.

*Response:* The goal of Amendment 5b is to end overfishing of the dusky shark stock, and requiring the use of circle hooks when fishing for all tunas, billfish, or swordfish would not accomplish this goal. Furthermore, while there is evidence that circle hooks are effective in reducing dusky shark post-release mortality, not all studies have conclusively found that circle hooks significantly reduce post-release mortality for all HMS species across all HMS recreational fisheries. Also, NMFS heard during the public comment period that circle hooks are not appropriate for all fishing styles (e.g., deep drop fishing or trolling). While NMFS encourages anglers to adopt the use of circle hooks in a manner that appropriately contributes to the needed mortality reduction for dusky sharks, the Agency also recognizes that data and the conservation goals of the current action do not warrant a blanket extension of the circle hook requirement to all HMS recreational fisheries at this time.

*Comment 50:* NMFS received comments requesting that circle hooks only be required on the lines targeting sharks, not all lines that are deployed.

The commenters stated that at times fishermen may have multiple lines deployed, and only some of those lines are specifically targeting sharks.

*Response:* Under the new circle hook alternative (A6d), HMS permit holders will only be required to use circle hooks when fishing for sharks, and this can be determined by the angler on a line-by-line basis. Circle hooks are required for any line that is targeting sharks. Anglers will be required to release any sharks incidentally caught on lines with J-hooks targeting other species. As such, HMS anglers will have to weigh their desire to use J-hooks against their desire to retain incidentally-caught sharks, and make their hook choices accordingly.

*Comment 51:* NMFS received a comment requesting the requirement of barbless J-hooks instead of circle hooks for recreational fishermen.

*Response:* While NMFS encourages anglers to use barbless hooks, which can allow easier releases, be they circle or J-hooks, NMFS does not have information indicating that barbless J-hooks provide better conservation benefits for sharks than do circle hooks. While barbless J-hooks could certainly be removed from a shark's jaw with less damage than a circle hook, barbless J-hooks would still have a higher probability of deep hooking, which is the larger concern for post-release mortality of incidentally caught dusky sharks. As such, NMFS does not believe a requirement to use barbless J-hooks would accomplish the objectives of this action.

*Comment 52:* NMFS received several comments, including from the Commonwealth of Massachusetts, opposing the circle hook requirement in New England offshore waters given the rare seasonal occurrence of dusky sharks in the region. The commenters stated that tournament catch data collected in Massachusetts from 1987–2014 indicated low dusky interactions off Massachusetts with the majority of shark catch consisting of blue, shortfin mako, and common thresher sharks. Additionally, commenters noted studies that suggest a lack of evidence for reducing deep-hooking of shark species commonly caught in New England waters such as shortfin mako sharks, thresher sharks, and porbeagle sharks. Commenters, including the Commonwealth of Massachusetts, requested that NMFS set a demarcation line if the circle hook requirement is implemented. Some commenters noted a demarcation line in the vicinity of Shinnecock, NY (40°50'25" N.)

extending to the east. Additionally, the Commonwealth of Massachusetts noted a demarcation line extending southeast from the eastern tip of Long Island, NY.

*Response:* NMFS agrees that measures to reduce dusky shark mortality would have little utility in areas beyond dusky sharks' range. For Alternative A6d, NMFS undertook an analysis of available data to determine the northern extent of the dusky shark range. Based on the analysis, NMFS has determined that, at this time, dusky sharks are not found north of 41°43' N. latitude, located around the southeastern edge of Cape Cod. Although fishermen fishing for and retaining sharks north of this line will need to obtain a shark endorsement, shark fishermen will not need to use circle hooks. This line is somewhat north of some suggestions; however, the line was placed in a location to ensure that all dusky sharks caught in the recreational shark fishery are given the best odds of post-release survival. Dusky shark distribution will be examined periodically, and if the dusky shark's range expands northward (e.g., as a result of climate change or as result of the species rebuilding), the boundary line may be moved in a future regulatory action.

*Comment 53:* NMFS received comments suggesting that the economic impact of the proposed dusky measures for New England recreational, Charter/Headboat, or Atlantic tunas General category permit holders were not considered. Requiring the release of mako sharks incidentally caught on J-hooks would further negatively impact these permit holders.

*Response:* NMFS fully analyzed the economic impacts (refer to Chapters 4–7 of the FEIS) and concluded that it expects the economic impacts of the circle hook requirement to be minimal. Sharks that are incidentally caught are by definition not the primary target species of the trip, and thus should not be a major driving decision in a charter client's decision to go on the trip. However, to further minimize the potential impacts outside of the dusky shark's range, NMFS has revised the alternative so that it will exempt anglers fishing north of 41°43' N. latitude from having to use circle hooks to land sharks. This line marks the northernmost range of the dusky shark based on the best available fishery independent data. HMS permit holders fishing north of this line will be permitted to land sharks caught on J-hooks and will not be required to use circle hooks when targeting sharks.

*Comment 54:* NMFS received comments suggesting that an exemption to the circle hook requirement be made for shortfin mako and thresher sharks. The comments noted that these species are occasionally caught incidentally while trolling for other species with J-

hooks and, although not targeted with J-hooks, are retained because they are a "trophy" catch.

*Response:* As mentioned in previous comment responses, NMFS has modified its circle hook alternative to exempt shark anglers from the requirement to use circle hooks in New England waters north of 41°43' N. latitude. As such, anglers fishing north of this line will be allowed to retain sharks caught on J-hooks. Shortfin mako and thresher sharks are among the most commonly targeted sharks in the Atlantic. MRIP data in the Mid-Atlantic region, where dusky shark interactions are most frequent, shows that many trips where dusky shark interactions are reported are on trips targeting mako sharks. As such, exempting anglers targeting shortfin mako and thresher sharks from the circle hook requirement would greatly reduce its ability to meet the conservation goals of this action.

#### F. Commercial Alternatives

*Comment 55:* Numerous commenters, including the States of North and South Carolina, stated that the requirement to release a shark by cutting the leader no more than three feet from the hook as specified in Alternative B3 should be modified to provide an exemption for situations when the safety of the fishermen is in question. For example, of particular concern were situations when the fishermen are working from a vessel with a high gunwale in heavy seas, or situations where a tight line may recoil back at the fisherman after cutting the line. Some commenters suggested the "three feet or less" language should be removed so that the alternative simply states the leader should be cut as close to the hook as safely possible.

*Response:* NMFS agrees that there may be times when it is unsafe to cut a leader within three feet of the hook. Each of the conditions and gear attributes described in these comments could reduce the feasibility of cutting the leader three feet or less away from the hook. For these reasons, NMFS has changed the preferred alternative in this final action to require releasing of sharks not to be retained by using a dehooker or by cutting the leader/gangion less than three feet from the hook as safely as practicable. As described below, removal of as much fishing gear as possible, in as safe a manner as possible, should increase post-release survival of sharks while also addressing safety concerns for fishermen onboard the vessel.

*Comment 56:* Several commenters expressed that NMFS should encourage commercial fishermen to follow the

status quo and not create new specifications or require new gear regarding the release of sharks. Fishermen currently have safe handling and release protocols, they attend safe handling and release workshops on a regular basis, and they carry the necessary gear on the fishing vessel to release all non-target catch.

*Response:* NMFS agrees that commercial fishermen currently have gear and protocols onboard that specify the handling and safe release of non-target species and bycatch. As explained in the comment below, NMFS prefers not to specify a certain type of dehooker or line cutter as commercial fishermen most likely already have the necessary gear onboard. However, while commercial fishermen are required to release marine mammals, sea turtles, and smalltooth sawfish, and release all HMS that are not retained in a manner that will ensure maximum probability of survival without removing the fish from the water, Alternative B3 specifically addresses all sharks that are not retained, as the identification of sharks is often difficult, especially while sharks are still in the water. Removal of gear is known to increase post-release survival for other species, such as sea turtles and thresher sharks. While NMFS recognizes that hooks may not be removed from sharks due to safety concerns during certain conditions, NMFS encourages commercial fishermen to remove as much gear as safely possible. This could help prevent situations where the sharks' tails become entangled in the gear or the gear becomes wrapped around the sharks' bodies impeding their ability to feed and/or swim. Research on other pelagic species indicates that the more gear that is removed, the higher the post-release survival. Thus, under this alternative, fishermen will be required to release sharks in a manner that removes either all or most of the gear given safe handling and release protocols and gear that commercial fishermen currently possess.

*Comment 57:* Another commenter stated that using a thresher shark study estimate for reduction in post-release mortality due to reduced trailing gear as a proxy for dusky shark impacts is not appropriate and that dusky-specific estimates are required.

*Response:* While NMFS agrees it would be ideal to have a dusky-specific estimate to quantify the potential decrease in mortality that would be associated with the removal of gear, current research on this does not exist. In the absence of that research, NMFS feels it is most logical to use research on similar species, such as thresher sharks

and smalltooth sawfish, as well as information for sea turtles and marine mammals, as proxies for estimating mortality reductions, because that currently represents the best available scientific information.

*Comment 58:* In regard to the requirement to use dehooking devices when releasing sharks, a commenter said NMFS should specifically require use of the "I" type dehooker device instead of the "Z" type device, as the commenter contends the latter is much more difficult and dangerous to use properly.

*Response:* At this time, NMFS prefers not to specify the type of dehooker fishermen are required to use when releasing sharks. Although different dehooking devices may provide advantages in certain situations, NMFS leaves dehooker type to the discretion of fishermen.

*Comment 59:* Commenters, including States of North Carolina and Texas, and the SAFMC, generally supported Alternative B9, which requires the use of circle hooks by shark directed permit holders in the bottom longline fishery. The State of South Carolina also supported the alternative, but stated that the alternative should be modified to specifically require the use of non-offset, non-stainless circle hooks. Other commenters also requested that NMFS be more specific about the type of circle hooks, specifically, non-offset, non-stainless steel circle hooks should be required. Another commenter supported Alternative B9 and suggested that such hooks should be required for incidental shark permit holders in addition to directed shark permit holders. Other commenters stated that circle hooks should only be required when targeting small or large coastal sharks, allowing the continued use of J-hooks when targeting non-shark species.

*Response:* NMFS agrees that requiring circle hooks in the directed bottom longline shark fishery should help reduce the mortality of incidentally caught dusky sharks because individuals will be released in better condition with a better chance of survival. Regarding the suggestion of using non-stainless steel hooks, current regulations already require that bottom longline fishermen use non-stainless steel, corrodible hooks. Regarding the suggestion of using non-offset circle hooks, NMFS disagrees. The pelagic longline fishery is allowed to use some circle hooks that are offset less than 10° in order to allow the hooks to be baited. Because there is overlap between the fishermen using pelagic longline and bottom longline gear and because circle hooks are required in other fisheries and

may have other requirements, to reduce conflict between regulations, NMFS has decided to allow fishermen to choose circle hook offset type at this time.

The intent of the directed bottom longline shark fishery circle hook requirement is to reduce mortality of dusky sharks caught and released on bottom longline, one of the few commercial fisheries that does not have a circle hook requirement. Dusky sharks most often interact with bottom longline gear when the gear is fished in a manner meant to target sharks, as is shown in the large coastal shark and sandbar shark research fisheries. Some of the other non-HMS bottom longline fisheries that do not target sharks require non-stainless steel circle hooks and dehookers such as the South Atlantic snapper-grouper bottom longline fishery and vessels participating in the Gulf of Mexico reef fish fishery when using natural bait. Many of these fishermen possess HMS incidental shark fishing permits (see Table 5.2 in the FEIS), and therefore are most likely already using circle hooks when fishing in a bottom longline fishery and not targeting sharks; as such, any dusky sharks caught in these fisheries would experience the conservation benefit of circle hooks. Therefore, NMFS believes that requiring circle hooks for incidental shark permit holders is not necessary at this time. Directed shark permit holders fishing with bottom longline gear, however, will be required to use circle hooks regardless of the target species to make a clear distinction for the enforcement of the regulation. If directed shark permit holders were not targeting sharks, but fishing with J-hooks and still interacting with sharks, it would make the regulation difficult to enforce.

*Comment 60:* Other commenters opposed the proposed alternative to implement circle hooks in the shark bottom longline fishery. One commenter stated that when fishing with J-hooks, he has no bycatch of other species, and the J-hook catches the majority of the sharks in the corner or side of the mouth, similar to circle hooks. The commenter noted that with circle hooks, bycatch rates of other non-HMS (snapper, snapper, etc.) rises dramatically no matter what size hook is used. That commenter further stated that in his experience sharks that swallow J-hooks are always sharks that can be kept legally. In addition, that commenter noted that sharks are easier to release on a J-hook than when on a circle hook; when on a J-hook, the sharks tend to release themselves if given enough line slack and are easier to dehook. The commenter is concerned

that sharks caught on circle hooks are harder to release or cut off, and that the added time in releasing the shark could cause more stress on the shark.

*Response:* NMFS disagrees. Recent research on pelagic longline and rod and reel indicate that circle hooks could reduce post-release mortality by approximately 40–63 percent. If those rates are comparable bottom longline gear, then that mortality reduction could occur in the portion of the bottom longline fishery that is converted from J-hooks to circle hooks (25 percent). Because the bottom longline fishery is observed to interact with hundreds of dusky sharks per year, then this measure is expected to significantly contribute to the overall mortality reduction of 35 percent. Gulack et al., suggests that the typical large J-hook used in commercial shark fishing keeps sharks from easily swallowing the hooks, resulting in no significant difference in shark mortality when compared to circle hooks. However, because circle hook use did not reduce the catchability of sharks compared to J-hooks, the requirement of circle hooks in the shark bottom longline fishery could prevent commercial fishermen from using smaller J-hooks that could be swallowed by sharks. This research also showed that keeping sharks in the water that are not retained would likely increase post-release survival.

In addition, data from the observer program in 2015 indicate that 11 directed shark trips with 16 observed shark hauls resulted in only 22 non-HMS fish caught (3 percent of total catch) and 75 percent of these sets used circle hooks. In 2014, 22 hauls on 14 directed shark trips were observed targeting coastal sharks in the southern Atlantic. During those trips only 11 non-HMS fish were caught (less than 1 percent) and 63.6 percent of these sets used circle hooks. Thus, bycatch of non-target species when using circle hooks does not seem to be a significant issue and would not offset the potential conservation benefit to dusky sharks and other non-target species.

Finally, in terms of removing circle hooks versus J-hooks from sharks, the current dehooking devices required to be carried by bottom longline fishermen are designed to work well for circle hooks when used properly. When the hook is in the jaw, it may be easier to remove a J-hook, but when J-hooks end up in the throat or gut of the animal, they are more difficult to remove than circle hooks.

*Comment 61:* Numerous commenters expressed support for the relocation protocol in Alternative B6, but several, including the States of North Carolina,

South Carolina, and Texas, and the SAFMC, questioned whether the one nautical mile minimum relocation distance was far enough to effectively avoid a highly migratory species like dusky sharks. Some commenters also stated that the relocation protocol was unenforceable. NMFS received a comment suggesting that a better approach would be to form a working group of fishermen, researchers, non-governmental organizations, and NMFS staff to develop a more scientifically sound, practical approach. This group could also work towards developing strategies to collect and analyze dusky shark interaction data, along with oceanographic data, that could be used to develop predictive models for dusky presence/absence.

*Response:* HMS pelagic and bottom longline fishermen currently have to relocate one nautical mile when they interact with marine mammals or sea turtles, and bottom longline fishermen need to relocate one nautical mile when they interact with smalltooth sawfish. The decision to have these and gillnet fishermen move one nautical mile if they interact with dusky sharks mirrors the current regulations for marine mammals and sea turtles, which are also pelagic and capable of moving long distances, in the Atlantic HMS pelagic and bottom longline fisheries. These species tend to aggregate along discrete water temperature fronts or near certain bathymetric features, so moving away from these features or water conditions, even relatively short distances (e.g., 1 nm), can reduce the potential for additional interactions. Like dusky sharks, sea turtles, marine mammals, and sawfish can also move large distances in short periods of time; however, the direction of the relocation away from the conditions where an interaction took place is likely more important than the distance alone (e.g., moving 1 nm to a deeper depth would likely have more effect than moving 1 nm along the same depth where an interaction occurred). Based on this information, we expect 1 nm will also be appropriate for dusky sharks, while maintaining consistency with existing relocation regulations for other species and therefore encouraging compliance. We are encouraging fishermen to move more than 1 nm when appropriate given the local conditions as an additional precautionary measure.

*Comment 62:* One commenter suggested the relocation protocol should also be extended to non-HMS fisheries that also interact with dusky sharks.

*Response:* As detailed in Section 1.2 of the FEIS, there are very small amounts of dusky shark bycatch in non-



HMS fisheries. Implementing relocation protocols in those fisheries would provide very little conservation benefit for dusky sharks. However, NMFS will work with states and Fishery Management Councils, and Commissions, as appropriate, to suggest commensurate changes in other fisheries that interact with dusky sharks.

*Comment 63:* A commenter expressed opposition to Alternative B6 on the grounds that the relocation protocol would be too burdensome on longline fishing vessels, and would ultimately require them to move so far away from where they are fishing that it would negatively impact them economically. Conversely, other commenters indicated that commercial fishers already practice a relocation protocol within the fleet and that they actively avoid sharks, such as dusky sharks, as the sharks tend to tear up their gear.

*Response:* NMFS anticipates that the relocation protocol should have minimal costs to fishermen given it only requires them to move one nautical mile after a set is complete, and this requirement is similar to the requirement already in place for several protected species. Several fishermen commented that many members of the HMS commercial fleet are already practicing dusky shark avoidance so the costs to them should be neutral. Furthermore, the outlined communications protocol that will be required by this alternative should help many fishermen avoid setting their gear in areas containing dusky shark in the first place. Finally, the costs associated with Alternative B6 should be minimal when compared to other alternatives that were considered (e.g., hotspot closures, closing the pelagic longline fishery, etc.).

*Comment 64:* A commenter suggested that NMFS and fishermen should collaborate with the U.S. Coast Guard to broadcast the presence of dusky sharks in an area to other vessels to help facilitate the fleet communication and relocation protocol.

*Response:* Several fishermen commented that many members of the HMS commercial fleet are already practicing dusky shark avoidance as interacting with the sharks tends to tear up their gear. In addition, the availability of satellite phones has allowed the fleet to communicate effectively with one another. Other fisheries have developed more formal protocols for fleet avoidance of certain species, such as yellowtail flounder. However, they use third-party vendors to disseminate such notifications, not the U.S. Coast Guard. If the current communication and relocation protocol

proves to be ineffective, then NMFS can reevaluate a more structured approach in the future. However, at this time, it likely that fishermen would have more immediate information as to where dusky sharks are interacting with fishing gear and are thus the best source of information on dusky presence.

*Comment 65:* Commenters provided broad support for the addition of a shark identification and safe handling section to the current protected species safe handling workshops under Alternative B5. Some commenters suggested the workshops should also be required of state-licensed commercial shark fishermen, and that opportunities to participate in the workshops should be made available to recreational shark anglers as well.

*Response:* Both recreational and commercial fishers are welcome to attend the safe handling, release, and identification workshops held by NMFS. NMFS recommends that all fishermen register to check for availability ahead of a workshop, especially if they are not required to take such a workshop. More information on the safe handling, release, and identification workshops can be found at: [http://www.nmfs.noaa.gov/sfa/hms/compliance/workshops/protected\\_species\\_workshop/requirements.html](http://www.nmfs.noaa.gov/sfa/hms/compliance/workshops/protected_species_workshop/requirements.html).

#### **Changes From the Proposed Rule (81 FR 71672; October 18, 2016)**

As described above, as a result of public comment and additional analyses, NMFS made changes from the proposed rule, as described below.

1. Circle hook requirement in the recreational shark fishery (§§ 635.4(b)(1), (c)(1), and (c)(5); 635.21 (f)(2), (f)(3), (k)(1), and (k)(2); 635.22(c)(1); 635.71 (d)(22) and (d)(23)). NMFS proposed to require the use of circle hooks by all HMS permit holders fishing for sharks recreationally, which the proposed rule defined as when using natural baits and using wire or heavy (200 lb or greater test) monofilament or fluorocarbon leaders. Based on public comment and updated analyses regarding dusky shark distribution, NMFS modified this measure in three ways: First, the final rule now specifies the type of circle hook required, which is non-offset, non-stainless steel circle hooks; second, the final rule now specifies that this measure only applies south of 41°43' N. latitude, which includes the geographic range of dusky sharks but does apply the requirement to fishermen north of the dusky shark's range; and third, it now removes the gear-based definition of shark fishing. Under the modified measure, all HMS permitted fishermen

within the specified geographic area who wish to fish for or retain sharks must use circle hooks, regardless of hook size or leader material, with limited exceptions when fishing with artificial lures or flies. Artificial flies and lures were excluded because fishing with those gears are not likely to gut-hook sharks, the result that the measure is designed to avoid.

2. Shark endorsement requirement in the recreational shark fishery (§ 635.4(j)(4)). In the proposed rule, NMFS clearly indicated that fishermen could add the shark endorsement to their recreational permit at any time during the fishing year. As a result of public comment, in the final rule, NMFS is also allowing fishermen to remove the shark endorsement from their recreational permit at any time during the fishing year. Removal of the shark endorsement would mean that sharks could no longer be fished for, retained, or landed by persons aboard that vessel.

3. Dusky shark release methods in the pelagic longline fishery (§ 635.21(c)(6)(i)). NMFS proposed the requirement that fishermen with an Atlantic shark limited access permit with pelagic longline gear onboard must release all sharks not being retained using a dehooker or cutting the gangion less than three feet from the hook. During the public comment period, NMFS heard from some commercial fishermen that this requirement could raise safety at sea concerns because gangions can sometimes snap back and hit crew when the gangion is cut while under tension. In response, NMFS has slightly modified the requirement to specify that if the fisherman chooses to cut the gangion rather than use a dehooker, they should cut the gangion less than three feet from the hook, as safely as practicable.

4. Fleet communication and relocation protocol (§ 635.21(c)(6)(ii), (d)(2)(iii), and (g)(5)). NMFS proposed the requirement that fishermen with an Atlantic shark limited access permit using pelagic longline, bottom longline, or gillnet gear that catch a dusky shark must both broadcast the location of the dusky shark over the radio to other fishing vessels in the surrounding area and move at least 1 nmi from the reported location of the dusky shark catch. As a result of public comment that questioned whether 1 nmi was far enough to effectively avoid a highly migratory species like dusky sharks, the final rule still specifies that vessels must move at least 1 nmi but encourages fishermen to move more than 1 nmi when appropriate given the local conditions as an additional

precautionary measure. Additionally, in the regulations, NMFS has clarified that the requirement to broadcast the location of the dusky shark over the radio should be done as soon as practicable, whereas the proposed rule did not specify anything related to timing of the broadcast.

5. Workshop title clarification (§ 635.8(a)). In this final rule, NMFS clarifies that the name of a required workshop is “Safe Handling, Release, and Identification Workshop.” In the proposed rule, this workshop was erroneously titled the “Safe Handling, Release, Disentanglement, and Identification Workshop.” Although this correction was not included in the proposed rule, it is an administrative change and will not have any practical environmental, social, or economic impacts and is included for clarity to the regulated community.

#### Classification

The Assistant Administrator for Fisheries (AA) determined that Amendment 5b to the 2006 Consolidated HMS FMP is necessary for the conservation and management of Atlantic dusky sharks and that it is consistent with the Magnuson-Stevens Act and other applicable laws.

NMFS prepared an FEIS for Amendment 5b to the 2006 Consolidated HMS FMP. The FEIS was filed with the Environmental Protection Agency on February 17, 2017. A Notice of Availability was published on February 24, 2017 (82 FR 11574). In approving Amendment 5b to the 2006 Consolidated HMS FMP on March 28, 2017, NMFS issued a ROD identifying the selected alternatives. A copy of the ROD is available from the HMS Management Division (see **ADDRESSES**).

This final rule has been determined to be not significant under E.O. 12866.

#### Paperwork Reduction Act

This final rule contains a collection-of-information requirement subject to the Paperwork Reduction Act (PRA) that has been approved by OMB under control number 0648-0327. Public reporting burden for Atlantic HMS Permit Family of Forms is estimated to average 34 minutes per respondent for initial permit applicants, and 10 minutes for permit renewals, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding these burden estimates or any other aspect of this data collection, including suggestions for reducing the burden, to NMFS (see

**ADDRESSES**) and by email to [OIRA\\_Submission@omb.eop.gov](mailto:OIRA_Submission@omb.eop.gov), or fax to 202-395-7285.

Notwithstanding any other provision of the law, no person is required to respond to, and no person shall be subject to penalty for failure to comply with, a collection of information subject to the requirements of the PRA, unless that collection of information displays a currently valid OMB control number.

#### Summary of the Final Regulatory Flexibility Analysis

A final regulatory flexibility analysis (FRFA) was prepared for this rule. The FRFA incorporates the initial regulatory flexibility analysis (IRFA), a summary of the significant issues raised by the public comments in response to the IRFA, our responses to those comments, and a summary of the analyses completed to support the action. The full FRFA is available from NMFS (see **ADDRESSES**). A summary is provided below.

##### A. Statement of the Need for and Objectives of This Final Rule

Section 604(a)(1) of the Regulatory Flexibility Act (RFA) requires a succinct statement of the need for and objectives of the rule. Chapter 1.0 of the Amendment 5b FEIS fully describes the need for and objectives of this final rule. In general, the objective of this final rule is to end overfishing of dusky sharks and to rebuild the stock in the timeframe recommended by the assessment update.

Under the Magnuson-Stevens Act, NMFS must, consistent with ten National Standards, manage fisheries to prevent overfishing while achieving, on a continuing basis, the optimum yield for each fishery. Additionally, any management measures must be consistent with other laws including, but not limited to, NEPA, the ESA, the MMPA, and the CZMA.

##### B. A Summary of the Significant Issues Raised by the Public Comments in Response to the Initial Regulatory Flexibility Analysis, a Summary of the Agency's Assessment of Such Issues, and a Statement of Any Changes Made in the Rule as a Result of Such Comments

Section 604(a)(2) of the RFA requires a summary of the significant issues raised by the public comments in response to the IRFA, a summary of the assessment of the Agency of such issues, and a statement of any changes made in the rule as a result of such comments. Section 604(a)(3) of the RFA requires a response to any comments filed by the Chief Counsel for Advocacy of the Small

Business Administration in response to the proposed rule, and a statement of any changes made to the proposed rule as a result of the comments. NMFS received many comments on the proposed rule and DEIS during the public comment period. Summarized public comments and the Agency's responses to them, including changes as a result of public comment, are included above. The general economic concerns raised can be found in comments 33, 41, 44, 53, and 63. NMFS did not receive comments specifically on the IRFA. NMFS did not receive any comments filed from the Chief Council for Advocacy in response to the proposed rule.

##### C. A Description and an Estimate of the Number of Small Entities to Which the Final Rule Would Apply

Section 604(a)(4) of the RFA requires a description and estimate of the number of small entities to which the final rule would apply. For RFA purposes only, NMFS has established a small business size standard for businesses, including their affiliates, whose primary industry is commercial fishing (see 50 CFR 200.2). A business primarily engaged in commercial fishing (NAICS code 11411) is classified as a small business if it is independently owned and operated, is not dominant in its field of operation (including its affiliates), and has combined annual receipts not in excess of \$11 million for all its affiliated operations worldwide. The Small Business Administration (SBA) has established size standards for all other major industry sectors in the U.S., including the scenic and sightseeing transportation (water) sector (NAICS code 487210, for-hire), which includes charter/party boat entities. The Small Business Administration (SBA) has defined a small charter/party boat entity as one with average annual receipts (revenue) of less than \$7.5 million.

This final rule is expected to directly affect commercial pelagic longline, bottom longline, shark gillnet, and recreational shark fishing vessels that possess HMS permits and are actively fishing. For the pelagic longline vessels, these are vessels that possess an Atlantic shark limited access permit, an Atlantic swordfish limited access permit, and an Atlantic Tunas Longline category permit. Because pelagic longline fishermen must hold all three permits in order to fish, for the purposes of this discussion, NMFS will focus on Atlantic Tunas Longline category permit holders. Regarding those entities that would be directly affected by the preferred commercial management

measures, the average annual revenue per active pelagic longline vessel is estimated to be \$187,000 based on the 170 active vessels between 2006 and 2012 that produced an estimated \$31.8 million in revenue annually. The maximum annual revenue for any pelagic longline vessel between 2006 and 2015 was less than \$1.9 million, well below the NMFS small business size standard for commercial fishing businesses of \$11 million. Other non-longline HMS commercial fishing vessels typically generally earn less revenue than pelagic longline vessels. Therefore, NMFS considers all Atlantic HMS commercial permit holders to be small entities (*i.e.*, they are engaged in the business of fish harvesting, are independently owned or operated, are not dominant in their field of operation, and have combined annual receipts not in excess of \$11 million for all its affiliated operations worldwide). The preferred commercial alternatives would apply to the 280 Atlantic tunas Longline category permit holders and 224 directed shark permit holders. Of these 280 permit holders, 136 have Individual Bluefin Quotas (IBQ) shares, although all properly permitted vessels may lease quota through the IBQ system to go commercial pelagic longline fishing.

For the recreational management measures, most commonly, the preferred management measures would only directly apply to small entities that are Charter/Headboat permit holders that provide for-hire trips that target or retain sharks. Other HMS recreational fishing permit holders are considered individuals, not small entities for purposes of the RFA because they are not engaged in commercial fishing. Additionally, while Atlantic Tunas General category and Swordfish General commercial permit holders hold commercial permits and are usually considered small entities, the preferred management measures would only affect them when they are fishing under the recreational regulations for sharks during a registered tournament, and NMFS is not considering them small entities for this rule because they are not engaged in commercial activity during those tournaments.

Vessels with the HMS Charter/Headboat category permit are for-hire vessels. These permit holders can be regarded as small entities for RFA purposes (*i.e.*, they are engaged in the business of fish harvesting, are independently owned or operated, are not dominant in their field of operation, and have average annual revenues of less than \$7.5 million). Overall, the recreational alternatives would impact

the portion of the 3,596 HMS Charter/Headboat permit holders who fish for or retain sharks.

NMFS has determined that the measures in Amendment 5b will not likely directly affect any small organizations or small government jurisdictions defined under RFA, nor will there be disproportionate economic impacts between large and small entities. Furthermore, there will be no disproportionate economic impacts among the universe of vessels based on gear, home port, or vessel length.

More information regarding the description of the fisheries affected, and the categories and number of permit holders, can be found in Chapter 3.0 of the Amendment 5b FEIS.

#### D. Description of the Projected Reporting, Record-Keeping, and Other Compliance Requirements of the Proposed Rule, Including an Estimate of the Classes of Small Entities Which Would Be Subject to the Requirements of the Report or Record

Section 604(a)(5) of the RFA requires Agencies to describe any new reporting, record-keeping, and other compliance requirements. One of the measures in Amendment 5b will result in reporting, record-keeping, and compliance requirements that may require new Paperwork Reduction Act (PRA) filings and two of the measures would modify compliance requirements. NMFS estimates that the number of small entities that would be subject to these requirements would include the Atlantic tuna Longline category (280), Directed and Incidental Shark Limited Access (224 and 275, respectively), and HMS Charter/Headboat category (3,596) permit holders.

#### Recreational Alternatives

Alternative A2 will require recreational fishermen targeting shark to obtain a shark endorsement in addition to other existing permit requirements. Obtaining the shark endorsement will be included in the online HMS permit application and renewal processes and will require the applicant to complete a quiz focusing on shark species identification. The applicant will simply need to indicate the desire to obtain the shark endorsement after which he or she will be directed to an online quiz that will take minimal time to complete. Adding the endorsement to the permit and requiring applicants to take the online quiz to obtain the endorsement will require a modification to the existing PRA for the permits.

#### Commercial Measures Alternatives

Alternative B5 will require completion of shark identification and fishing regulation training as a new part of the Safe Handling and Release Workshops for HMS pelagic longline, bottom longline, and shark gillnet vessel owners and operators that they are already required to take on a 3-year basis. The training course will provide information regarding shark identification and regulations, as well as best practices to avoid interacting with dusky sharks and how to minimize mortality of dusky sharks caught as bycatch. Compliance with this course requirement will be mandatory as a condition for permit renewal. Certificates will be issued to all commercial pelagic longline, bottom longline, and gillnet vessel owners and operators indicating compliance with this requirement, and the certificates will be required for permit renewal.

Alternative B6 will require that all vessels with an Atlantic shark commercial permit and fishing with pelagic longline, bottom longline, or shark gillnet gear abide by a dusky shark fleet communication and relocation protocol. The protocol will require vessels to report the location of dusky shark interactions over the radio as soon as practicable to other pelagic longline, bottom longline, or shark gillnet vessels in the area and that subsequent fishing sets on that fishing trip could be no closer than 1 nautical mile (nm) from where the encounter took place.

#### E. Description of the Steps the Agency Has Taken To Minimize the Significant Economic Impact on Small Entities Consistent With the Stated Objectives of Applicable Statutes, Including a Statement of the Factual, Policy, and Legal Reasons for Selecting the Alternative Adopted in the Final Rule and the Reason That Each One of the Other Significant Alternatives to the Rule Considered by the Agency Which Affect Small Entities Was Rejected

Section 604(a)(6) of the RFA requires Agencies to describe any alternatives to the preferred alternatives which accomplish the stated objectives and which minimize any significant economic impacts. The implementation of this action should not result in significant adverse economic impacts to individual vessels. These impacts are discussed below and in Chapter 4.0 of the FEIS. Additionally, the Regulatory Flexibility Act (5 U.S.C. 603(c)(1)–(4)) lists four general categories of “significant” alternatives that would assist an agency in the development of significant alternatives. These categories

of alternatives are: (1) Establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) clarification, consolidation, or simplification of compliance and reporting requirements under the rule for such small entities; (3) use of performance rather than design standards; and, (4) exemptions from coverage of the rule for small entities.

In order to meet the objectives of this amendment, consistent with all legal requirements, NMFS cannot exempt small entities or change the reporting requirements only for small entities because all the entities affected are considered small entities. Thus, there are no alternatives discussed that fall under the first and fourth categories described above. Under the third category, "use of performance rather than design standards," NMFS considers Alternative B5, which will provide additional training to pelagic longline, bottom longline, and shark gillnet fishermen, to be a performance standard rather than a design standard. As described below, NMFS analyzed several different alternatives in this proposed rulemaking and provides the rationale for identifying the preferred alternative to achieve the desired objective.

In this rulemaking, NMFS considered two different categories of alternatives. The first category, recreational alternatives, covers seven main alternatives that address various strategies of reducing dusky shark mortality in the recreational fishery. The second category of alternatives, commercial measures, considers nine main alternatives that address various strategies of reducing dusky shark mortality in the commercial fishery.

The potential impacts these alternatives may have on small entities have been analyzed and are discussed in the following sections. The preferred alternatives include: Alternative A2, Alternative A6d, Alternative B3, Alternative B5, Alternative B6, and Alternative B9. The economic impacts that would occur under these preferred alternatives were compared with the other alternatives to determine if economic impacts to small entities could be minimized while still accomplishing the stated objectives of this rule.

## 1. Recreational Alternatives

### *Alternative A1*

Alternative A1, the no action alternative, would not implement any management measures in the recreational shark fishery to decrease

mortality of dusky sharks, likely resulting in direct, short- and long-term neutral economic impacts. Because there would be no changes to the fishing requirements, there would be no economic impacts on small entities. If more restrictive measures are required in the long-term under MSA or other statutes such as the Endangered Species Act, moderate adverse economic impacts may occur. However, overfishing would continue under this alternative, thus, NMFS does not prefer this alternative at this time.

### *Alternative A2—Preferred Alternative*

Under Alternative A2, a preferred alternative, HMS Angling and Charter/Headboat permit holders would be required to obtain a shark endorsement, which requires completion of a short online shark identification and fishing regulation training course in order to retain sharks. Obtaining the shark endorsement would be included in the online HMS permit application and renewal processes and would require the applicant to complete a training course focusing on shark species identification and fishing regulations. This alternative would likely result in no substantive economic impacts because there would be no additional cost to the applicant and only a small additional investment in time. Obtaining the shark endorsement would be a part of the normal HMS permit application or renewal. The applicant would simply need to indicate the desire to obtain the shark endorsement after which he or she would be directed to a short online training course that would take minimal time to complete. The goal of the training course is to help prevent anglers from landing prohibited or undersized sharks, and thus, help rebuild stocks. Furthermore, the list of shark endorsement holders would allow for more targeted surveys and outreach, likely increasing the reliability of recreational shark catch estimates. This preferred alternative helps achieve the objectives of this rule while minimizing any significant economic impacts on small entities.

### *Alternative A3*

Alternative A3 would have required participants in the recreational shark fishery (Angling and Charter/Headboat permit holders) to carry an approved shark identification placard on board the vessel when fishing for sharks. This alternative would likely result in short- and long-term minor economic impacts. The cost of obtaining a placard, whether by obtaining a pre-printed one or self-printing, would be modest. To comply with the requirement of this alternative,

the angler would need to keep the placard on board the vessel when fishing for sharks and, because carrying other documents such as permits and boat registration is already required, this is unlikely to be a large inconvenience. This alternative would have slightly more economic impacts than Alternative A2 on small entities and would likely be less effective than the training course in Alternative A2.

### *Alternative A4*

Under Alternative A4, NMFS would extend the prohibition on the retention of ridgeback sharks to include the rest of the ridgeback sharks, namely oceanic whitetip, tiger sharks, and smoothhound sharks, all of which are currently allowed to be retained by recreational shark fishermen (HMS Angling and Charter/Headboat permit holders). While this alternative would simplify compliance for the majority of fishermen targeting sharks, it could also potentially have adverse economic impacts for a small subset of fishermen that target oceanic whitetip, tiger, and smoothhound sharks. These adverse impacts would be quite small, however, for oceanic whitetip and tiger sharks. However, based on MRIP data, this alternative could have considerable impacts on fishermen targeting smoothhound sharks. Presumably, state-permitted anglers that do not hold an HMS federal permit are responsible for some of the catch and, for species such as smooth dogfish that are often found almost exclusively in state waters, anglers with only state permit may be responsible for most of the catch. Recreational fishermen with only state-issued permits would still be able to retain smoothhound sharks (those that hold an HMS permit must abide by federal regulations, even in state waters). Thus, Alternative A4 would likely result in both direct short- and long-term, minor adverse economic impacts on HMS Charter/Headboat operators if prohibiting landing of additional shark species reduces demand for fishing charters. While this alternative may have greater economic impacts than Alternative A3, it may be effective at achieving the objective of reducing dusky shark mortality in the recreational fishery.

### *Alternative A5*

Under Alternative A5, the minimum recreational size limit for authorized shark species, except for Atlantic sharpnose, bonnethead, and hammerhead (great, scalloped, and smooth) sharks, would increase from 54 to 89 inches fork length. Under this alternative, increasing the recreational

size limit would likely result in both direct short- and long-term, moderate adverse economic impacts for recreational fishermen, charter/headboat operators, and tournament operators. Because many shark species have a maximum size below an 89-inch size limit, there could be reduced incentive to fish recreationally for sharks due to the decreased potential to legally land these fish. Increasing the minimum size for retention would also impact the way that tournaments and charter vessels operate. While the impacts of an 89-inch fork length minimum size on tournaments awarding points for pelagic sharks may be lessened because these tournament participants target larger sharks, such as shortfin mako, blue, and thresher, that grow to larger than 89 inches fork length, this may not be the case for tournaments targeting smaller sharks. Tournaments that target smaller sharks, especially those that target shark species that do not reach sizes exceeding 89 inches fork length such as blacktip sharks, may be heavily impacted by this alternative. Reduced participation in such tournaments could potentially decrease the amount of monetary prizes offered to winners. Thus, implementation of this management measure could significantly alter the way some tournaments and charter vessels operate, or reduce opportunities to fish for sharks and drastically reduce general interest and demand for recreational shark fishing, which could create adverse economic impacts. For the aforementioned reasons, NMFS does not prefer this alternative at this time.

#### *Alternative A6*

Under Alternative A6, circle hooks would be required for either all HMS permit holders fishing recreationally for sharks and all Atlantic HMS permit holders participating in fishing tournaments when targeting or retaining Atlantic sharks.

#### *Alternative A6a*

Sub-alternative A6a would require the use of circle hooks by HMS permit holders with a shark endorsement whenever fishing with natural bait and wire or (200-pound test or greater) monofilament or fluorocarbon leader. Relative to the total cost of gear and tackle for a typical fishing trip, the cost associated with switching from J hooks to circle hooks is negligible. Thus, the immediate cost in switching hook type is likely minimal. However, there is conflicting indication that the use of circle hooks may reduce or increase CPUE resulting in lower catch of target species. In the event that CPUE is

reduced, some recreational fishermen may choose not to fish for sharks or to enter tournaments that offer awards for sharks. Additionally, this alternative would also effectively require HMS permit holders with shark endorsements to use circle hooks when fishing for many non-shark species because wire and heavy monofilament leaders are commonly also used when fishing for swordfish, billfish, tuna, wahoo, mackerel, and other marine species. These missed recreational fishing opportunities could result in minor adverse economic impacts in the short- and long-term. Given the effects this alternative would have on HMS permit holders while targeting non-shark species, NMFS does not prefer this alternative at this time.

#### *Alternative A6b*

Sub-Alternative A6b is similar to A6a, but instead of requiring circle hooks when deploying natural bait while using a wire or heavy (200-pound test or greater) monofilament or fluorocarbon leader outside of a fishing tournament, it instead requires circle hooks when deploying a 5/0 or greater size hook to fish with natural bait outside of a fishing tournament. This use of the hook size standard to determine if the trip could be targeting sharks may result in more recreational trips requiring circle hooks than under alternative A6a, but many more of those trips might actually not be targeting sharks, but instead other large pelagic fish. The use of a heavy leader would be more correlated with angling activity that is targeting sharks.

#### *Alternative A6c*

Sub-Alternative A6c is similar to A6a and A6b, but restricted to requiring the use of circle hooks by all HMS permit holders participating in fishing tournaments that bestow points, prizes, or awards for sharks. This alternative would impact a smaller universe of recreational fishermen, so the adverse impacts are smaller. However, given the limited scope of this requirement, the benefits to reducing dusky shark mortality via the use of circle hooks are also more limited.

#### *Alternative A6d—Preferred Alternative*

Sub-Alternative A6d, a preferred alternative, is a new alternative similar to the above sub-alternatives that was formulated based in response to numerous public comments regarding the previously preferred alternative A6a. A6d would require the use of non-offset, non-stainless steel circle hooks by all HMS permit holders with a shark endorsement when fishing for sharks recreationally south of 41°43' N.

latitude, except when fishing with flies or artificial lures. On the one hand, this alternative would have less impact on HMS permit holders as it would limit the circle hook requirement to only those trips in which sharks are the target species, and would limit the requirement to waters south of Cape Cod so that it does not affect HMS permit holders fishing outside the dusky sharks known range. On the other hand, it would likely affect more HMS permit holders south of Cape Cod as fewer permit holders would be discouraged from acquiring the shark endorsement to avoid the circle hook requirement when fishing with wire or heavy monofilament or fluorocarbon leaders for non-shark species. Overall, the new alternative A6d is expected to have minor adverse economic impacts in the short- and long-term. However, A6d is the preferred alternative as it would restrict impacts to recreational fishing trips targeting sharks within the range of the dusky shark, and minimize unintended impacts that are not needed to meet the objectives of this rulemaking.

#### *Alternative A7*

Alternative A7 would prohibit HMS permit holders from retaining any shark species. Recreational fishermen may still fish for and target authorized shark species for catch and release. The large number of fishermen who already practice catch and release and the catch and release shark fishing tournaments currently operating would not be impacted. However, prohibiting retention of sharks could have major impacts on fishing behaviors and activity of other recreational shark fishermen and reduce their demand for charter/headboat trips. Only allowing catch and release of authorized sharks in the recreational fishery could impact some fishermen that retain sharks recreationally and tournaments that award points for landing sharks. Thus, prohibiting retention of Atlantic sharks in the recreational shark fisheries could drastically alter the nature of recreational shark fishing and reduce incentives to fish for sharks.

Additionally, with reduced incentive to fish for sharks, this could negatively impact profits for the HMS Charter/Headboat industry. Because there could be major impacts to the recreational shark fisheries from this management measure, Alternative A7 would likely have direct short- and long-term, moderate adverse economic impacts on small business entities.

## 2. Commercial Alternatives

### *Alternative B1*

Under Alternative B1, NMFS would not implement any measures to reduce dusky shark mortality in the commercial shark or HMS fisheries. Because no management measures would be implemented under this alternative, NMFS would expect fishing practices to remain the same and economic impacts to be neutral in the short-term. Dusky sharks are a prohibited species and fishermen are not allowed to harvest this species. Thus, even if dusky sharks continue to experience overfishing and the abundance declines as a result of this alternative, there would not be any economic impacts on the fishery in the short-term. If more restrictive measures are required in the long-term under MSA or other statutes such as the Endangered Species Act, moderate adverse economic impacts may occur.

### *Alternative B2*

Under Alternative B2, HMS commercial fishermen would be limited to 750 hooks per pelagic longline set with no more than 800 assembled gangions onboard the vessel at any time. Based on average number of hooks per pelagic longline set data, the hook restriction in this alternative could have neutral economic impacts on fishermen targeting bigeye tuna, mixed tuna species, and mixed HMS species, because the average number of hooks used on pelagic longline sets targeting these species is slightly above or below the limit considered in this alternative. This alternative would likely have adverse economic impacts on fishermen targeting dolphin fish, because these fishermen on average use 1,056 hooks per set. If NMFS implemented this alternative, fishermen targeting dolphin fish with pelagic longline gear would have to reduce their number of hooks by approximately 30 percent per set, which may result in a similar percent reduction in set revenue or could result in increased operating costs if fishermen decide to offset the limited number of hooks with more fishing sets. Overall, Alternative B2 would be expected to have short- and long-term minor adverse economic impacts on the pelagic longline fishery.

### *Alternative B3—Preferred Alternative*

Under Alternative B3, a preferred alternative, HMS commercial fishermen must release all sharks that are not being boarded or retained by using a dehooker, or by cutting the gangion no more than three feet from the hook. This alternative would have neutral to adverse economic impacts on

commercial shark fishermen using pelagic longline gear. Currently, fishermen are required to use a dehooking device if a protected species is caught. This alternative would require this procedure to be used on all sharks that would not be retained, or fishermen would have to cut the gangion to release the shark. Currently, it is common practice in the pelagic longline fishery to release sharks that are not going to be retained (especially larger sharks) by cutting the gangion, but they usually do not cut the gangion so only 3 feet remain, so there might be a slight learning curve. Using a dehooker to release sharks in the pelagic longline fishery is a less common practice, therefore, there may be more of a learning curve that would make using this technique more time consuming and making fishing operations less efficient. Although this may be an initial issue, NMFS expects that these inefficiencies would be minimal and that fishermen would become adept in using a dehooker to release sharks over time given they are all adept at using a dehooker to release protected species. Thus, Alternative B3 would be expected to have short- and long-term neutral economic impacts on the pelagic longline fishery.

### *Alternative B4*

Under Alternative B4, NMFS considered various dusky shark hotspot closures for vessels fishing with pelagic longline gear. The hotspot closures considered are the same areas that were analyzed in Draft Amendment 5 and the A5b Predraft. These hotspot closure alternatives are located where increased levels of pelagic longline interactions with dusky sharks had been identified based on HMS Logbook data. During the months that hotspot closures are effective, Atlantic shark commercial permit holders (directed or incidental) would not be able to fish with pelagic longline gear in these areas.

### *Alternative B4a*

This alternative would define a rectangular area in a portion of the existing Charleston Bump time/area closure area, and prohibit the use of pelagic longline gear by all vessels during the month of May in that area. This alternative is expected to have moderate short- and long-term direct adverse economic impacts on 46 vessels that have historically fished in this Charleston Bump area during the month of May. This closure would result in the loss of approximately \$15,250 in gross revenues per year per vessel assuming no redistribution of effort outside of the closed area.

However, it is likely that some of the vessels that would be impacted by this hotspot closure would redistribute their effort to other fishing areas. Based on natural breaks in the percentage of sets vessels made inside and outside of this alternative's hotspot closure area, NMFS estimated that if a vessel historically made less than 40 percent of its sets in the hotspot closure area, it would likely redistribute all of its effort. If a vessel made more than 40 percent but less than 75 percent of its sets in the hotspot closure area, it would likely redistribute 50 percent of its effort impacted by the hotspot closure area to other areas. Finally, if a vessel made more than 75 percent of its sets solely within the hotspot closure area, NMFS assumed the vessel would not likely shift its effort to other areas. Based on these individually calculated redistribution rates, the percentage of fishing in other areas during the gear restriction time period, the percentage of fishing in other areas during the hotspot closure time period, and the catch per unit effort for each vessel in each statistical area, NMFS estimated the potential landings associated with redistributed effort associated with fishing sets displaced by the hotspot closure area. The net loss in fishing revenues as a result of the Charleston Bump Hotspot May closure after considering likely redistribution of effort is estimated to be \$8,300 per vessel per year. Alternative B4a would result in moderate short- and long-term adverse economic impacts as a result of restricting pelagic longline vessels from fishing in the Charleston Bump Hotspot May area, thus causing decreased revenues and increased costs associated with fishing in potentially more distant waters if vessel operators redistribute their effort.

### *Alternative B4b*

This alternative would prohibit the use of pelagic longline gear in the vicinity of the "Hatteras Shelf" area of the Cape Hatteras Special Research Area during the month of May where elevated levels of dusky shark interactions have been reported. This alternative is expected to have moderate short- and long-term direct adverse economic impacts on 42 vessels that have historically fished in this Hatteras Shelf Hotspot area during the month of May. The average annual revenue per vessel from 2008 through 2014 from all fishing sets made in this hotspot closure area has been approximately \$9,980 during the month of May, assuming that fishing effort does not move to other areas. However, it is likely that some of the vessels that would be impacted by this hotspot closure would redistribute

their effort to other fishing areas. The net impact of the Hatteras Shelf Hotspot May closure on fishing revenues after considering likely redistribution of effort is estimated to be \$5,990 per vessel per year. Alternative B4b would result in moderate adverse economic impacts as a result of restricting pelagic longline vessels from fishing in the Hatteras Shelf Hotspot May area, thus causing decreased revenues and increased costs associated with fishing in potentially more distant waters if vessel operators redistribute their effort.

#### *Alternative B4c*

This alternative would prohibit the use of pelagic longline gear in the vicinity of the "Hatteras Shelf" area of the Cape Hatteras Special Research Area during the month of June where elevated levels of dusky shark interactions have been reported.

This alternative is expected to have moderate short- and long-term direct adverse economic impacts on 37 vessels that have historically fished in this Hatteras Shelf Hotspot area during the month of June. The average annual revenue from 2008 through 2014 from all fishing sets made in this hotspot closure area has been approximately \$7,640 per vessel during the month of June, assuming that fishing effort does not move to other areas. However, it is likely that some of the vessels that would be impacted by this hotspot closure would redistribute their effort to other fishing areas. The net impact of the Hatteras Shelf Hotspot June closure on fishing revenues after considering likely redistribution of effort is estimated to be \$4,010 per vessel per year. Alternative B4c would result in moderate adverse economic impacts as a result of restricting pelagic longline vessels from fishing in the Hatteras Shelf Hotspot June area, thus causing decreased revenues and increased costs associated with fishing in potentially more distant waters if vessel operators redistribute their effort.

#### *Alternative B4d*

This alternative would prohibit the use of pelagic longline gear in the vicinity of the "Hatteras Shelf" area of the Cape Hatteras Special Research Area during the month of November where elevated levels of dusky shark interactions have been reported. This alternative is expected to have minor short- and long-term direct adverse economic impacts on 23 vessels that have historically fished in this Hatteras Shelf Hotspot area during the month of November. The average annual revenue from 2008 through 2014 from all fishing sets made in this hotspot closure area

has been approximately \$5,230 per vessel during the month of November, assuming that fishing effort does not move to other areas. However, it is likely that some of the vessels that would be impacted by this hotspot closure would redistribute their effort to other fishing areas. The net impact of the Hatteras Shelf Hotspot November closure on fishing revenues after considering likely redistribution of effort is estimated to be \$3,540 per vessel per year. Alternative B4d would result in minor adverse economic impacts as a result of restricting pelagic longline vessels from fishing in the Hatteras Shelf Hotspot November area, thus causing decreased revenues and increased costs associated with fishing in potentially more distant waters if vessel operators redistribute their effort.

#### *Alternative B4e*

This alternative would prohibit the use of pelagic longline gear by all U.S. flagged-vessels permitted to fish for HMS in the three distinct closures in the vicinity of the Mid-Atlantic Canyons during the month of October where elevated levels of dusky shark interactions have been reported. This alternative is expected to have moderate short- and long-term direct adverse economic impacts on 64 vessels that have historically fished in this Canyons Hotspot October area. The average annual revenue from 2008 through 2014 from all fishing sets made in this hotspot closure area has been approximately \$9,950 per vessel during the month of October, assuming that fishing effort does not move to other areas. However, it is likely that some of the vessels that would be impacted by this hotspot closure would redistribute their effort to other fishing areas. The net impact of the Canyons Hotspot October closure on fishing revenues after considering likely redistribution of effort is estimated to be \$3,720 per vessel per year. Alternative B4e would result in moderate adverse economic impacts as a result of restricting pelagic longline vessels from fishing in the Canyons Hotspot October area, thus causing decreased revenues and increased costs associated with fishing in potentially more distant waters if vessel operators redistribute their effort.

#### *Alternative B4f*

This alternative would prohibit the use of pelagic longline gear by all U.S. flagged-vessels permitted to fish for HMS in July in an area adjacent to the existing Northeastern U.S. closure which is currently effective for the month of June, where elevated levels of dusky shark interactions have been

reported. This alternative is expected to have moderate short- and long-term direct adverse economic impacts on 35 vessels that have historically fished in this Southern Georges Banks Hotspot area during the month of July. The average annual revenue from 2008 through 2014 from all fishing sets made in this hotspot closure area has been approximately \$14,230 per vessel during the month of July, assuming that fishing effort does not move to other areas. However, it is likely that some of the vessels that would be impacted by this hotspot closure would redistribute their effort to other fishing areas. The net impact of the Southern Georges Banks Hotspot July closure on fishing revenues after considering likely redistribution of effort is estimated to be \$8,290 per vessel per year. Alternative B4f would result in moderate adverse economic impacts as a result of restricting longline vessels from fishing in the Southern Georges Banks Hotspot July area, thus causing decreased revenues and increased costs associated with fishing in potentially more distant waters if vessel operators redistribute their effort.

#### *Alternative B4g*

This alternative would prohibit the use of pelagic longline gear by all U.S. flagged-vessels permitted to fish for HMS in August in an area adjacent to the existing Northeastern U.S. closure, which is currently effective for the month of June, where elevated levels of dusky shark interactions have been reported. This alternative is expected to have moderate short- and long-term direct adverse economic impacts on 35 vessels that have historically fished in this Southern Georges Banks Hotspot area during the month of August. The average annual revenue from 2008 through 2014 from all fishing sets made in this hotspot closure area has been approximately \$12,260 per vessel during the month of August, assuming that fishing effort does not move to other areas. However, it is likely that some of the vessels that would be impacted by this hotspot closure would redistribute their effort to other fishing areas. The net impact of the Southern Georges Banks Hotspot August closure on fishing revenues after considering likely redistribution of effort is estimated to be \$5,990 per vessel per year. Alternative B4g would result in moderate adverse economic impacts as a result of restricting pelagic longline vessels from fishing in the Southern Georges Banks Hotspot August area, thus causing decreased revenues and increased costs associated with fishing

in potentially more distant waters if vessel operators redistribute their effort.

#### *Alternative B4h*

This alternative would prohibit the use of pelagic longline gear by all U.S. flagged-vessels permitted to fish for HMS in a portion of the existing Charleston Bump time/area closure during the month of November where elevated levels of dusky shark interactions have been reported. This alternative is expected to have minor short- and long-term direct adverse economic impacts on 32 vessels that have historically fished in this Charleston Bump Hotspot area during the month of November. The average annual revenue from 2008 through 2014 from all fishing sets made in this hotspot closure area has been approximately \$7,030 per vessel during the month of November, assuming that fishing effort does not move to other areas. However, it is likely that some of the vessels that would be impacted by this hotspot closure would redistribute their effort to other fishing areas. The net impact of the Charleston Bump Hotspot November closure on fishing revenues after considering likely redistribution of effort is estimated to be \$2,720 per vessel per year. Alternative B4h would result in minor adverse social and economic impacts as a result of restricting pelagic longline vessels from fishing in the Charleston Bump Hotspot November area, thus causing decreased revenues and increased costs associated with fishing in potentially more distant waters if vessel operators redistribute their effort.

#### *Alternative B4i*

This alternative would provide strong incentives to avoid dusky sharks and to reduce interactions by modifying fishing behavior. Participants in the pelagic longline fleet have requested increased individual accountability within the fishery in light of several management issues facing the fishery (*e.g.*, bluefin tuna, dusky sharks). NMFS first developed the use of conditional access under Draft Amendment 7, in part due to the public comments and feedback received regarding the original dusky hotspot closures proposed in Draft Amendment 5. This approach would address the fact that, according to HMS logbook data, relatively few vessels have consistently accounted for the majority of the dusky shark interactions. Conditional access would not impact the entire fleet for interactions made by a relatively small proportion of vessels. Therefore, depending on the metrics selected and fishery participant behavior, this alternative could have

adverse socioeconomic effects on certain vessels that are both poor avoiders of dusky sharks and are non-compliant with the regulations. NMFS would analyze the socioeconomic impact by using similar fishing effort redistribution proposed in Draft Amendment 7. Overall, the adverse socioeconomic effects of dusky shark hotspot closures are expected to be less if a conditional access alternative is implemented because some vessels would still be able to access and fish the hotspot closures. This alternative would have neutral to beneficial effects for vessels that are still authorized to fish in these regions, as they would not be held accountable for the behavior of other individuals and would not have to change their current fishing operations.

#### *Alternative B4j*

This alternative would implement bycatch caps on dusky shark interactions in hotspot areas. Under this alternative, NMFS would allow pelagic longline vessels limited access to high dusky shark interaction areas with an observer onboard while limiting the number of dusky shark interactions that could occur in these areas. Once the dusky shark bycatch cap for an area is reached, that area would close until the end of the three-year bycatch cap period. This alternative could lead to adverse economic impacts by reducing annual revenue from fishing in the various hot spot areas depending on the number of hotspots where bycatch cap limits are reached, the timing of those potential closures during the year, and the amount of effort redistribution that occurs after the closures. In addition to direct impacts to vessels owners, operators, and crew members, this alternative would have moderate, adverse indirect impacts in the short- and long-term on fish dealers, processors, bait/gear suppliers, and other shore-based businesses impacted by reduced fishing opportunities for pelagic longline vessel owners that would have fished in the hotspot area.

#### *Alternative B5—Preferred Alternative*

Alternative B5, a preferred alternative, would provide additional training to pelagic longline, bottom longline, and shark gillnet vessel owners and operators as a new part of all Safe Handling and Release Workshops. The course would be taught in conjunction with the current Protected Species Safe Handling, Release, and Identification workshops that HMS pelagic longline, bottom longline, and shark gillnet vessel owners and operators are already required to attend. The training course would provide information regarding

shark identification and regulations, as well as best practices to avoid interacting with dusky sharks and how to minimize mortality of dusky sharks caught as bycatch. This training course would provide targeted outreach on dusky shark identification and regulations, which should decrease interactions with dusky sharks. This alternative would have neutral economic impacts because the fishermen are already required to attend a workshop, incur some travel costs, and would not be fishing while taking attending the workshop. Given the neutral economic impacts and this alternative's potential to decrease dusky interactions and mortality, NMFS prefers this alternative.

#### *Alternative B6—Preferred Alternative*

The economic impacts associated with Alternative B6, which would increase dusky shark outreach and awareness through development of additional commercial fishery outreach materials and establish a communication and fishing set relocation protocol for HMS commercial fishermen following interactions with dusky sharks and increase outreach to the pelagic longline fleet, are anticipated to be neutral. These requirements would not cause a substantial change to current fishing operations, but have the potential to help fishermen become more adept in avoiding dusky sharks. If fishermen become better at avoiding dusky sharks, there is the possibility that target catch could increase. On the other hand, the requirement to move the subsequent fishing set one nautical mile from where a previous dusky shark interaction occurred could move fishermen away from areas where they would prefer to fish and it could increase fuel usage and fuel costs. Given the neutral economic impacts of this alternative and its expectation to decrease dusky shark interactions, NMFS prefers this alternative.

#### *Alternative B7*

NMFS would seek, through collaboration with the affected states and the ASMFC, to extend the end date of the existing state shark closure from July 15 to July 31. Currently, the states of Virginia, Maryland, Delaware, and New Jersey have a state-water commercial shark closure from May 15 to July 15. In 2014, 621 lb dw of aggregated LCS and 669 lb dw of hammerhead sharks were landed by commercial fishermen in Virginia, Maryland, and New Jersey from July 15 to July 31. Based on 2014 ex-vessel prices, the annual gross revenues loss



for aggregated LCS and hammerhead shark meat to the regional fleet in revenues due to an extended closure date would be \$847, while the shark fins would be \$207. Thus the total loss annual gross revenue for aggregated LCS and hammerhead sharks would be \$1,054. Extending this closure by 16 days could cause a reduction of commercial fishing opportunity, likely resulting in minor adverse economic impacts due to reduced opportunities to harvest aggregated LCS and hammerhead sharks. In the long-term, this reduction would be neutral since fishermen would be able to adapt to the new opening date.

#### *Alternative B8*

Under Alternative B8, NMFS would remove pelagic longline gear as an authorized gear for Atlantic HMS. All commercial fishing with pelagic longline gear for HMS in the Atlantic, Gulf of Mexico, and Caribbean would be prohibited. This would greatly reduce fishing opportunities for pelagic longline fishing vessel owners. Prohibiting the use of pelagic longline fishing gear would result in direct and indirect, major adverse economic impacts in the short- and long-term for pelagic longline vessel owners, operators, and crew.

Between 2008 and 2014, 168 different vessels reported using pelagic longline fishing gear in Atlantic HMS Logbooks. Average annual revenues were estimated to be approximately \$34,322,983 per year based on HMS logbook records, bluefin tuna dealer reports, and the eDealer database. In 2014, there were 110 active pelagic longline vessels which produced approximately \$33,293,118 in revenues. The 2014 landings value is in line with the 2008 to 2014 average. Therefore, NMFS expects future revenues forgone revenue on a per vessel basis to be approximately \$309,000 per year based on 110 vessels generating an estimated \$34 million in revenues per year. This displacement of fishery revenues would likely cause business closures for a majority of these pelagic longline vessel owners. Given the magnitude of the economic impact of this alternative, it is not a preferred alternative.

#### *Alternative B9—Preferred Alternative*

Under Alternative B9, NMFS would require the use of circle hooks by all HMS directed shark permit holders in the bottom longline fishery. This requirement is expected to reduce the mortality associated with catch of dusky shark in the bottom longline fishery.

There is negligible cost associated with switch from J-hooks to circle

hooks. However, there is some indication that the use of circle hooks may reduce catch per unit effort (CPUE) resulting in lower catch of target species. To the extent that CPUE is reduced, some commercial fishermen using BLL gear may experience reduced landings and associated revenue with the use of circle hooks. This alternative would require the 224 vessels that hold a shark directed limited access permit as of 2015 to use circle hooks. However, 104 of the 224 vessels have an Atlantic tunas longline permit, which requires fishermen to use circle hooks with pelagic longline gear. Thus, those vessels would already possess and use circle hooks. The remaining 120 permit holders would be required to use circle hooks when using bottom longline gear. Given the low switching costs from J-hooks to circle hooks and the potential to reduce dusky shark mortality, NMFS prefers this alternative.

#### *Alternative B10*

Under this alternative, NMFS would annually allocate a certain number of allowable dusky shark interactions to each individual shark directed or incidental limited access permit holder in the HMS pelagic and bottom longline fisheries. These allocations would be transferable between permit holders. When each vessel's individual dusky shark bycatch quota (IDQ) is reached, the vessel would no longer be authorized to fish for HMS for the remainder of the year. The concept of this alternative is similar to the Individual Bluefin Tuna Quota (IBQ) Program implemented in Amendment 7 to the 2006 Consolidated HMS FMP (79 FR 71510), which established individual quotas for bluefin tuna bycatch in the pelagic longline fishery and authorized retention and sale of such bycatch. We would not, however, anticipate authorizing retention and sale of dusky sharks, because they remain a prohibited species.

The goal of this alternative would be to provide strong individual incentives to reduce dusky shark interactions while providing flexibility for vessels to continue to operate in the fishery, however, several unique issues associated with dusky sharks would make these goals difficult to achieve.

In order to achieve the mortality reductions based upon the 2016 SEDAR 21 dusky shark assessment update, the number of dusky shark interactions may need to be substantially reduced. NMFS expects the allocations to each vessel may be extremely low and highly inaccurate/uncertain. It is not clear that an IDQ system without a supportable scientific basis would actually reduce

interactions with dusky sharks. To the extent that any reduction actually occurred, some vessels would be constrained by the amount of individual quota they are allocated and this could reduce their annual revenue. If a pelagic longline vessel interacts with dusky sharks early in the year and uses their full IDQ allocation, they may be unable to continue fishing with pelagic longline or bottom longline gear for the rest of the year if they are unable to lease quota from other IDQ holders. This would result in reduced revenues and potential cash flow issues for these small businesses.

If vessel owners are only allocated a very low amount of IDQ, it is very unlikely that an active trading market for IDQs will emerge. The initial allocations could be insufficient for many vessels to maintain their current levels of fishing activity and they may not be able to find IDQs to lease or have insufficient capital to lease a sufficient amount of IDQs. Some vessel owners may view the risk of exceeding their IDQ allocations and the associated costs of acquiring additional quota to outweigh the potential profit from fishing, so they may opt to not continue participating in the fishery.

The annual transaction costs associated with matching lessor and lessees, the costs associated with drafting agreements, and the uncertainty vessel owners would face regarding quota availability would reduce some of the economic benefits associated with leasing quota and fishing.

There would also be increased costs associated with bottom longline vessels obtaining and installing EM and VMS units. Some bottom longline vessel owners might have to consider obtaining new vessels if their current vessels cannot be equipped with EM and VMS. There would be increased costs associated with VMS reporting of dusky interactions. Some fishermen would also need to ship EM hard drives after each trip and they may need to consider acquiring extra hard drives to avoid not having one available when they want to go on a subsequent trip.

Given the challenges in properly identifying dusky sharks, every shark would need to be brought on board the vessel and ensure an accurate picture of identifying features was taken by the EM cameras. Such handling would likely increase dusky shark and other shark species mortality and thus not fully achieve the stated objectives of this rule. This alternative is also unlikely to minimize the economic impact of this rule as compared to the preferred alternatives given the potential for

reduced fishing revenues, monitoring equipment costs, and transaction costs.

**Small Entity Compliance Guide**

Section 212 of the Small Business Regulatory Enforcement Fairness Act of 1996 states that, for each rule or group of related rules for which an agency is required to prepare a FRFA, the agency shall publish one or more guides to assist small entities in complying with the rule, and shall designate such publications as “small entity compliance guides.” The agency shall explain the actions a small entity is required to take to comply with a rule or group of rules. Copies of this final rule and the compliance guide are available upon request from NMFS (see ADDRESSES). Copies of the compliance guide will be available from the Highly Migratory Species Management Division Web site at <http://www.nmfs.noaa.gov/sfa/hms/>.

**List of Subjects**

15 CFR Part 902

Reporting and recordkeeping requirements.

50 CFR Part 635

Fisheries, Fishing, Fishing vessels, Foreign relations, Imports, Penalties, Reporting and recordkeeping requirements, Treaties.

Dated: March 30, 2017.

**Alan D. Risenhoover,**

*Acting Deputy Assistant Administrator for Regulatory Programs, National Marine Fisheries Service.*

For reasons set out in the preamble, NMFS amends 15 CFR part 902 and 50 CFR part 635 as follows:

**Title 15—Commerce and Foreign Trade**

**PART 902—NOAA INFORMATION COLLECTION REQUIREMENTS UNDER THE PAPERWORK REDUCTION ACT: OMB CONTROL NUMBERS**

■ 1. The authority citation for part 902 continues to read as follows:

**Authority:** 44 U.S.C. 3501 *et seq.*

■ 2. In § 902.1, in the table in paragraph (b) under “50 CFR”, add entries for “635.2”, “635.4(c)”, and “635.4(j)” in numerical order to read as follows:

**§ 902.1 OMB control numbers assigned pursuant to the Paperwork Reduction Act.**

\* \* \* \* \*

(b) \* \* \*

CFR part or section where the information collection requirement is located	Current OMB control No. (all numbers begin with 0648–)
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50 CFR: \* \* \* \*

635.2 ..... \* \* \* \* -0327

635.4(c) ..... \* \* \* \* -0327

635.4(j) ..... \* \* \* \* -0327

\* \* \* \* \*

**Title 50—Wildlife and Fisheries**

**PART 635—ATLANTIC HIGHLY MIGRATORY SPECIES**

■ 3. The authority citation for part 635 continues to read as follows:

**Authority:** 16 U.S.C. 971 *et seq.*; 16 U.S.C. 1801 *et seq.*

■ 4. In § 635.2:

■ a. Remove the definition of “Protected species safe handling, release, and identification workshop certificate”; and

■ b. Add new definitions for “Safe handling, release, and identification workshop certificate” and “Shark endorsement” in alphabetical order to read as follows:

**§ 635.2 Definitions.**

\* \* \* \* \*

*Safe handling, release, and identification workshop certificate* means the document issued by NMFS, or its designee, indicating that the person named on the certificate has successfully completed the Atlantic HMS safe handling, release, and identification workshop.

\* \* \* \* \*

*Shark endorsement* means an authorization added to an HMS Angling, HMS Charter/Headboat, Atlantic Tunas General, or Swordfish General Commercial permit that allows for the retention of authorized Atlantic sharks consistent with all other applicable regulations in this part.

\* \* \* \* \*

■ 5. In § 635.4, revise paragraphs (b)(1), (c)(1), and (c)(2), and add paragraphs (c)(5) and (j)(4) to read as follows:

**§ 635.4 Permits and fees.**

\* \* \* \* \*

(b) \* \* \*

(1) The owner of a charter boat or headboat used to fish for, retain,

possess, or land any Atlantic HMS must obtain an HMS Charter/Headboat permit. In order to fish for, retain, possess, or land Atlantic sharks, the owner must have a valid shark endorsement issued by NMFS. A vessel issued an HMS Charter/Headboat permit for a fishing year shall not be issued an HMS Angling permit, a Swordfish General Commercial permit, or an Atlantic Tunas permit in any category for that same fishing year, regardless of a change in the vessel’s ownership.

\* \* \* \* \*

(c) \* \* \*

(1) The owner of any vessel used to fish recreationally for Atlantic HMS or on which Atlantic HMS are retained or possessed recreationally, must obtain an HMS Angling permit, except as provided in paragraph (c)(2) of this section. In order to fish for, retain, possess, or land Atlantic sharks, the owner must have a valid shark endorsement issued by NMFS. Atlantic HMS caught, retained, possessed, or landed by persons on board vessels with an HMS Angling permit may not be sold or transferred to any person for a commercial purpose. A vessel issued an HMS Angling permit for a fishing year shall not be issued an HMS Charter/Headboat permit, a Swordfish General Commercial permit, or an Atlantic Tunas permit in any category for that same fishing year, regardless of a change in the vessel’s ownership.

(2) A vessel with a valid Atlantic Tunas General category permit issued under paragraph (d) of this section or with a valid Swordfish General Commercial permit issued under paragraph (f) of this section may fish in a recreational HMS fishing tournament if the vessel has registered for, paid an entry fee to, and is fishing under the rules of a tournament that has registered with NMFS’ HMS Management Division as required under § 635.5(d). When a vessel issued a valid Atlantic Tunas General category permit or a valid Swordfish General Commercial permit is fishing in such a tournament, such vessel must comply with HMS Angling category regulations, except as provided in paragraphs (c)(3) through (c)(5) of this section.

\* \* \* \* \*

(5) In order to fish for, retain, possess, or land sharks, the owner of a vessel fishing in a registered recreational HMS fishing tournament and issued either an Atlantic Tunas General category or Swordfish General Commercial permit must have a shark endorsement.

\* \* \* \* \*

(j) \* \* \*

(4) In order to obtain a shark endorsement to fish for, retain, possess, or land sharks, a vessel owner with a vessel fishing in a registered recreational HMS fishing tournament and issued or required to be issued either an Atlantic Tunas General category or Swordfish General Commercial permit or a vessel owner of a vessel issued or required to be issued an HMS Angling or HMS Charter/Headboat permit must take a shark endorsement online quiz. After completion of the quiz, NMFS will issue the vessel owner a new or revised permit with the shark endorsement for the vessel. The vessel owner can take the quiz at any time during the fishing year, but his or her vessel may not leave the dock on a trip during which sharks will be fished for, retained, possessed, or landed unless a new or revised permit with a shark endorsement has been issued by NMFS for the vessel. The addition of a shark endorsement to the permit does not constitute a permit category change and does not change the timing considerations for permit category changes specified in paragraph (j)(3) of this section. Vessel owners may request that NMFS remove the shark endorsement from the permit at any time. If NMFS removes the shark endorsement from the vessel permit, no person on board the vessel may fish for, retain, possess, or land sharks.

\* \* \* \* \*

■ 6. In § 635.8, revise paragraphs (a), (c)(2), (c)(3), (c)(5), (c)(6), and (c)(7) as follows:

**§ 635.8 Workshops.**

(a) *Safe handling, release, and identification workshops.* (1) Both the owner and operator of a vessel that fishes with Longline or gillnet gear must be certified by NMFS, or its designee, as having completed a safe handling, release, and identification workshop before a shark or swordfish limited access vessel permit, pursuant to § 635.4(e) and (f), is renewed. For the purposes of this section, it is a rebuttable presumption that a vessel fishes with longline or gillnet gear if: Longline or gillnet gear is onboard the vessel; logbook reports indicate that longline or gillnet gear was used on at least one trip in the preceding year; or, in the case of a permit transfer to new owners that occurred less than a year ago, logbook reports indicate that longline or gillnet gear was used on at least one trip since the permit transfer.

(2) NMFS, or its designee, will issue a safe handling, release, and identification workshop certificate to

any person who completes a safe handling, release, and identification workshop. If an owner owns multiple vessels, NMFS will issue a certificate for each vessel that the owner owns upon successful completion of one workshop. An owner who is also an operator will be issued multiple certificates, one as the owner of the vessel and one as the operator.

(3) The owner of a vessel that fishes with longline or gillnet gear, as specified in paragraph (a)(1) of this section, is required to possess on board the vessel a valid safe handling, release, and identification workshop certificate issued to that vessel owner. A copy of a valid safe handling, release, and identification workshop certificate issued to the vessel owner for a vessel that fishes with longline or gillnet gear must be included in the application package to renew or obtain a shark or swordfish limited access permit.

(4) An operator that fishes with longline or gillnet gear as specified in paragraph (a)(1) of this section must possess on board the vessel a valid safe handling, release, and identification workshop certificate issued to that operator, in addition to a certificate issued to the vessel owner.

\* \* \* \* \*

(c) \* \* \*

(2) If a vessel fishes with longline or gillnet gear as described in paragraph (a)(1) of this section, the vessel owner may not renew a shark or swordfish limited access permit, issued pursuant to § 635.4(e) or (f), without submitting a valid safe handling, release, and identification workshop certificate with the permit renewal application.

(3) A vessel that fishes with longline or gillnet gear as described in paragraph (a)(1) of this section and that has been, or should be, issued a valid limited access permit pursuant to § 635.4(e) or (f), may not fish unless a valid safe handling, release, and identification workshop certificate has been issued to both the owner and operator of that vessel.

\* \* \* \* \*

(5) A vessel owner, operator, shark dealer, proxy for a shark dealer, or participant who is issued either a safe handling, release, and identification workshop certificate or an Atlantic shark identification workshop certificate may not transfer that certificate to another person.

(6) Vessel owners issued a valid safe handling, release, and identification workshop certificate may request, in the application for permit transfer per § 635.4(l)(2), additional safe handling, release, and identification workshop

certificates for additional vessels that they own. Shark dealers may request from NMFS additional Atlantic shark identification workshop certificates for additional places of business authorized to receive sharks that they own as long as they, and not a proxy, were issued the certificate. All certificates must be renewed prior to the date of expiration on the certificate.

(7) To receive the safe handling, release, and identification workshop certificate or Atlantic shark identification workshop certificate, persons required to attend the workshop must first show a copy of their HMS permit, as well as proof of identification to NMFS or NMFS' designee at the workshop. If a permit holder is a corporation, partnership, association, or any other entity, the individual attending on behalf of the permit holder must show proof that he or she is the permit holder's agent and provide a copy of the HMS permit to NMFS or NMFS' designee at the workshop. For proxies attending on behalf of a shark dealer, the proxy must have documentation from the shark dealer acknowledging that the proxy is attending the workshop on behalf of the Atlantic shark dealer and must show a copy of the Atlantic shark dealer permit to NMFS or NMFS' designee at the workshop.

■ 7. In § 635.19, revise paragraph (d) to read as follows:

**§ 635.19 Authorized gears.**

\* \* \* \* \*

(d) *Sharks.* (1) No person may possess a shark without a permit issued under § 635.4.

(2) No person issued a Federal Atlantic commercial shark permit under § 635.4 may possess a shark taken by any gear other than rod and reel, handline, bandit gear, longline, or gillnet, except that smoothhound sharks may be retained incidentally while fishing with trawl gear subject to the restrictions specified in § 635.24(a)(7).

(3) No person issued an HMS Commercial Caribbean Small Boat permit may possess a shark taken from the U.S. Caribbean, as defined at § 622.2 of this chapter, by any gear other than with rod and reel, handline or bandit gear.

(4) Persons on a vessel issued a permit with a shark endorsement under § 635.4 may possess a shark only if the shark was taken by rod and reel or handline, except that persons on a vessel issued both an HMS Charter/Headboat permit (with or without a shark endorsement) and a Federal Atlantic commercial shark permit may possess sharks taken by rod and reel, handline, bandit gear, longline,

or gillnet if the vessel is engaged in a non for-hire fishing trip and the commercial shark fishery is open pursuant to § 635.28(b).

\* \* \* \* \*

■ 8. In § 635.21:

■ a. Add paragraph (c)(6);

■ b. Revise the introductory text for paragraph (d)(2);

■ c. Add paragraphs (d)(2)(iii) and (d)(4);

■ d. Revise paragraph (f); and

■ e. Add paragraphs (g)(5) and (k).

The additions and revisions read as follows:

**§ 635.21 Gear operation and deployment restrictions.**

\* \* \* \* \*

(c) \* \* \*

(6) The owner or operator of a vessel permitted or required to be permitted under this part and that has pelagic longline gear on board must undertake the following shark bycatch mitigation measures:

(i) *Handling and release requirements.* As safely as practicable, any hooked or entangled sharks that are not being retained must be released using dehookers or line clippers or cutters. If using a line clipper or cutter, the gangion must be cut so that less than three feet (91.4 cm) of line remains attached to the hook.

(ii) *Fleet communication and relocation protocol.* The owner or operator of any vessel that catches a dusky shark must, as quickly as practicable, broadcast the location of the dusky shark interaction over the radio to other fishing vessels in the surrounding area. Subsequent fishing sets by that vessel on that trip must be at least 1 nmi from the reported location of the dusky shark catch. Vessel owners and operators are encouraged to move the vessel further away than 1 nmi if conditions (e.g., water temperature, depth, tide, etc.) indicate that moving a greater distance is warranted to avoid additional dusky shark interactions.

(d) \* \* \*

(2) The operator of a vessel required to be permitted under this part and that has bottom longline gear on board must undertake the following bycatch mitigation measures:

\* \* \* \* \*

(iii) *Fleet communication and relocation protocol.* The owner or operator of any vessel that catches a dusky shark must, as quickly as practicable, broadcast the location of the dusky shark interaction over the radio to other fishing vessels in the surrounding area. Subsequent fishing sets by that vessel on that trip must be at least 1 nmi

from the reported location of the dusky shark catch. Vessel owners and operators are encouraged to move the vessel further away than 1 nmi if conditions (e.g., water temperature, depth, tide, etc.) indicate that moving a greater distance is warranted to avoid additional dusky shark interactions.

\* \* \* \* \*

(4) Vessels that have bottom longline gear on board and that have been issued, or are required to have been issued, a directed shark limited access permit under § 635.4(e) must have only circle hooks as defined at § 635.2 on board.

\* \* \* \* \*

(f) *Rod and reel.* (1) Persons who have been issued or are required to be issued a permit under this part and who are participating in a "tournament," as defined in § 635.2, that bestows points, prizes, or awards for Atlantic billfish must deploy only non-offset circle hooks when using natural bait or natural bait/artificial lure combinations, and may not deploy a J-hook or an offset circle hook in combination with natural bait or a natural bait/artificial lure combination.

(2) A person on board a vessel that has been issued or is required to be issued a permit with a shark endorsement under this part and who is participating in an HMS registered tournament that bestows points, prizes, or awards for Atlantic sharks must deploy only non-offset, corrodible circle hooks when fishing for, retaining, possessing, or landing sharks south of 41°43' N. latitude, except when fishing with flies or artificial lures. Any shark caught south of 41°43' N. latitude on non-circle hooks must be released, unless the shark was caught when fishing with flies or artificial lures.

(3) A person on board a vessel that has been issued or is required to be issued an HMS Angling permit with a shark endorsement or an HMS Charter/Headboat permit with a shark endorsement must deploy only non-offset, corrodible circle hooks when fishing for, retaining, possessing, or landing sharks south of 41°43' N. latitude, except when fishing with flies or artificial lures. Any shark caught south of 41°43' N. latitude on non-circle hooks must be released, unless the shark was caught when fishing with flies or artificial lures.

(g) \* \* \*

(5) *Fleet communication and relocation protocol.* The owner or operator of any vessel issued or required to be issued a Federal Atlantic commercial shark limited access permit that catches a dusky shark must, as quickly as practicable, broadcast the

location of the dusky shark interaction over the radio to other fishing vessels in the surrounding area. Subsequent fishing sets by that vessel that trip must be at least 1 nmi from the reported location of the dusky shark catch. Vessel owners and operators are encouraged to move the vessel further away than 1 nmi if conditions (e.g., water temperature, depth, tide, etc.) indicate that moving a greater distance is warranted to avoid additional dusky shark interactions.

\* \* \* \* \*

(k) *Handline.* (1) A person on board a vessel that has been issued or is required to be issued a permit with a shark endorsement under this part and who is participating in an HMS registered tournament that bestows points, prizes, or awards for Atlantic sharks must deploy only non-offset, corrodible circle hooks when fishing for, retaining, possessing, or landing sharks south of 41°43' N. latitude, except when fishing with flies or artificial lures. Any shark caught south of 41°43' N. latitude on non-circle hooks must be released, unless the shark was caught when fishing with flies or artificial lures.

(2) A person on board a vessel that has been issued or is required to be issued an HMS Angling permit with a shark endorsement or a person on board a vessel with an HMS Charter/Headboat permit with a shark endorsement must deploy only non-offset, corrodible circle hooks when fishing for, retaining, possessing, or landing sharks south of 41°43' N. latitude, except when fishing with flies or artificial lures. Any shark caught south of 41°43' N. latitude on non-circle hooks must be released, unless the shark was caught when fishing with flies or artificial lures.

■ 9. In § 635.22, revise paragraph (c)(1) to read as follows:

**§ 635.22 Recreational retention limits.**

(c) \* \* \*

(1) The recreational retention limit for sharks applies to any person who fishes in any manner, except to persons aboard a vessel that has been issued a Federal Atlantic commercial shark vessel permit under § 635.4. The retention limit can change depending on the species being caught and the size limit under which they are being caught as specified under § 635.20(e). If a commercial Atlantic shark quota is closed under § 635.28, the recreational retention limit for sharks and no sale provision in paragraph (a) of this section may be applied to persons aboard a vessel issued a Federal Atlantic commercial shark vessel permit under § 635.4, only if that vessel has also been issued an HMS Charter/Headboat permit with a shark

endorsement under § 635.4 and is engaged in a for-hire fishing trip. A person on board a vessel that has been issued or is required to be issued a permit with a shark endorsement under § 635.4 may be required to use non-offset, corrodible circle hooks as specified in § 635.21(f) and (k) in order to retain sharks per the retention limits specified in this section.

\* \* \* \* \*

■ 10. In § 635.71, revise paragraphs (a)(50) through (52), and add paragraphs (d)(21) through (d)(26) to read as follows:

**§ 635.71 Prohibitions.**

\* \* \* \* \*

(a) \* \* \*

(50) Fish without a NMFS safe handling, release, and identification workshop certificate, as required in § 635.8.

(51) Fish without having on board the vessel a valid safe handling, release, and identification workshop certificate issued to the vessel owner and operator as required in § 635.8.

(52) Falsify a NMFS safe handling, release, and identification workshop certificate or a NMFS Atlantic shark identification workshop certificate as specified at § 635.8.

\* \* \* \* \*

(d) \* \* \*

(21) Fish for, retain, possess, or land sharks without a shark endorsement, as specified in § 635.4(b) and (c).

(22) Except when fishing only with flies or artificial lures, fish for, retain, possess, or land sharks south of 41°43' N. latitude without deploying non-offset, corrodible circle hooks when fishing at a registered recreational HMS fishing tournament that has awards or prizes for sharks, as specified in § 635.21(f) and (k).

(23) Except when fishing only with flies or artificial lures, fish for, retain, possess, or land sharks south of 41°43' N. latitude without deploying non-offset, corrodible circle hooks when issued an Atlantic HMS Angling permit or HMS Charter/Headboat permit with a shark endorsement, as specified in § 635.21(f) and (k).

(24) Release sharks with more than 3 feet (91.4 cm) of trailing gear, as specified in § 635.21(c)(6).

(25) Fail to follow the fleet communication and relocation protocol for dusky sharks as specified at § 635.21(c)(6), (d)(2), and (g)(5).

(26) Deploy bottom longline gear without circle hooks, or have on board both bottom longline gear and non-circle hooks, as specified at § 635.21(d)(4).

\* \* \* \* \*

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BILLING CODE 3510-22-P

removed from the net. This transit exemption is expected to reduce the time at sea required for some shrimpers while still allowing enforcement to verify that they have not been fishing in the EEZ.

A proposed rule that would implement measures outlined in Amendment 17B has been drafted. In accordance with the Magnuson-Stevens Act, NMFS is evaluating the proposed rule to determine whether it is consistent with the FMP, the Magnuson-Stevens Act, and other applicable law. If that determination is affirmative, NMFS will publish the proposed rule in the **Federal Register** for public review and comment.

### Consideration of Public Comments

The Council has submitted Amendment 17B for Secretarial review, approval, and implementation. Comments on Amendment 17B must be received by October 23, 2017. Comments received during the respective comment periods, whether specifically directed to the amendment or the proposed rule, will be considered by NMFS in its decision to approve, disapprove, or partially approve the amendment and will be addressed in the final rule.

All comments received by NMFS on the amendment or the proposed rule during their respective comment periods will be addressed in the final rule.

**Authority:** 16 U.S.C. 1801 *et seq.*

Dated: August 16, 2017.

**Alan D. Risenhoover,**

*Director, Office of Sustainable Fisheries,  
National Marine Fisheries Service.*

[FR Doc. 2017-17635 Filed 8-21-17; 8:45 am]

**BILLING CODE 3510-22-P**

## DEPARTMENT OF COMMERCE

### National Oceanic and Atmospheric Administration

#### 50 CFR Part 635

[Docket No. 170605543-7737-01]

RIN 0648-XF486

### Atlantic Highly Migratory Species; 2018 Atlantic Shark Commercial Fishing Season

**AGENCY:** National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

**ACTION:** Proposed rule; request for comments.

**SUMMARY:** This proposed rule would establish quotas, opening dates, and retention limits for the 2018 fishing season for the Atlantic commercial shark fisheries. Quotas would be adjusted as required or allowable based on any over- and/or underharvests experienced during 2017 and previous fishing seasons. In addition, NMFS proposes season opening dates and commercial retention limits based on adaptive management measures to provide, to the extent practicable, fishing opportunities for commercial shark fishermen in all regions and areas. The proposed measures could affect fishing opportunities for commercial shark fishermen in the northwestern Atlantic Ocean, including the Gulf of Mexico and Caribbean Sea.

**DATES:** Written comments must be received by September 21, 2017.

**ADDRESSES:** You may submit comments on this document, identified by NOAA-NMFS-2017-0069, by any of the following methods:

- **Electronic Submission:** Submit all electronic public comments via the Federal e-Rulemaking Portal. Go to [www.regulations.gov/#!docketDetail;D=NOAA-NMFS-2017-0069](http://www.regulations.gov/#!docketDetail;D=NOAA-NMFS-2017-0069), click the "Comment Now!" icon, complete the required fields, and enter or attach your comments.

- **Mail:** Submit written comments to Margo Schulze-Haugen, NMFS/SF1, 1315 East-West Highway, National Marine Fisheries Service, SSMC3, Silver Spring, MD 20910.

**Instructions:** Comments sent by any other method, to any other address or individual, or received after the end of the comment period, may not be considered by NMFS. All comments received are a part of the public record and will generally be posted for public viewing on [www.regulations.gov](http://www.regulations.gov) without change. All personal identifying information (*e.g.*, name, address, etc.), confidential business information, or otherwise sensitive information submitted voluntarily by the sender will be publicly accessible. NMFS will accept anonymous comments (enter "N/A" in the required fields if you wish to remain anonymous).

Copies of this proposed rule and supporting documents are available from the HMS Management Division Web site at [www.nmfs.noaa.gov/sfa/hms/](http://www.nmfs.noaa.gov/sfa/hms/) or by contacting Guý DuBeck by phone at 301-427-8503.

**FOR FURTHER INFORMATION CONTACT:** Guý DuBeck or Karyl Brewster-Geisz at 301-427-8503.

**SUPPLEMENTARY INFORMATION:**

### Background

The Atlantic commercial shark fisheries are managed under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). The 2006 Consolidated Highly Migratory Species (HMS) Fishery Management Plan (FMP) and its amendments are implemented by regulations at 50 CFR part 635. For the Atlantic commercial shark fisheries, the 2006 Consolidated HMS FMP and its amendments established, among other things, commercial shark retention limits, commercial quotas for species and management groups, accounting measures for under- and overharvests for the shark fisheries, and adaptive management measures such as flexible opening dates for the fishing season and inseason adjustments to shark trip limits, which provide management flexibility in furtherance of equitable fishing opportunities, to the extent practicable, for commercial shark fishermen in all regions and areas.

#### 2018 Proposed Quotas

This proposed rule would adjust the quota levels for the different shark stocks and management groups for the 2018 Atlantic commercial shark fishing season based on over- and underharvests that occurred during 2017 and previous fishing seasons, consistent with existing regulations at 50 CFR 635.27(b). Over- and underharvests are accounted for in the same region, sub-region, and/or fishery in which they occurred the following year, except that large overharvests may be spread over a number of subsequent fishing years up to a maximum of 5 years. Shark stocks or management groups that contain one or more stocks that are overfished, have overfishing occurring, or have an unknown status, will not have underharvest carried over in the following year. Stocks that are not overfished and have no overfishing occurring may have any underharvest carried over in the following year, up to 50 percent of the base quota.

The quotas in this proposed rule are based on dealer reports received as of July 14, 2017. In the final rule, NMFS will adjust the quotas as needed based on dealer reports received as of a date in mid-October 2017. Thus, all of the 2018 proposed quotas for the respective stocks and management groups will be subject to further adjustment after NMFS considers the dealer reports through mid-October. All dealer reports that are received after the October date will be used to adjust the 2019 quotas, as appropriate.

For the sandbar shark, aggregated large coastal share (LCS), hammerhead shark, non-blacknose small coastal share (SCS), blacknose shark, blue shark, porbeagle shark, and pelagic shark (other than porbeagle or blue sharks) management groups, the 2017 underharvests cannot be carried over to the 2018 fishing season because those stocks or management groups have been determined to be overfished, overfished with overfishing occurring, or have an

unknown status. Thus, for all of these management groups, the 2018 proposed quotas would be equal to the applicable base quota minus any overharvests that occurred in 2017 and/or previous fishing seasons, as applicable.

Because the Gulf of Mexico blacktip shark management group and smoothhound shark management groups in the Gulf of Mexico and Atlantic regions have been determined not to be overfished and to have no overfishing

occurring, available underharvest (up to 50 percent of the base quota) from the 2017 fishing season for these management groups may be applied to the respective 2018 quotas, and NMFS proposes to do so.

The proposed 2018 quotas by species and management group are summarized in Table 1; the description of the calculations for each stock and management group can be found below.

**TABLE 1—2018 PROPOSED QUOTAS AND OPENING DATES FOR THE ATLANTIC SHARK MANAGEMENT GROUPS**  
 [All Quotas and Landings Are Dressed Weight (dw), in Metric Tons (mt), Unless Specified Otherwise. Table Includes Landings Data as of July 14, 2017; Final Quotas Are Subject to Change Based on Landings as of October 2017. 1 mt = 2,204.6 lb]

Region or sub-region	Management group	2017 annual quota (A)	Preliminary 2017 landings <sup>1</sup> (B)	Adjustments <sup>2</sup> (C)	2018 base annual quota (D)	2018 proposed annual quota (D+C)	Season opening dates
Western Gulf of Mexico.	Blacktip Sharks ..	331.6 mt dw (730,425 lb dw).	206.6 mt dw (455,535 lb dw).	<sup>3</sup> 115.7 mt dw (255,131 lb dw).	231.5 mt dw (510,261 lb dw).	347.2 mt dw (765,392 lb dw).	January 1, 2018.
	Aggregated Large Coastal Sharks.	72.0 mt dw (158,724 lb dw).	65.8 mt dw (145,098 lb dw).	.....	72.0 mt dw (158,724 lb dw).	72.0 mt dw (158,724 lb dw).	
	Hammerhead Sharks.	11.9 mt dw (26,301 lb dw).	2.5 mt dw (5,490 lb dw).	.....	11.9 mt dw (26,301 lb dw).	11.9 mt dw (26,301 lb dw).	
Eastern Gulf of Mexico.	Blacktip Sharks ..	36.0 mt dw (79,359 lb dw).	15.3 mt dw (33,788 lb dw).	<sup>3</sup> 12.6 mt dw (27,719 lb dw).	25.1 mt dw (55,439 lb dw).	37.7 mt dw (83,158 lb dw).	January 1, 2018.
	Aggregated Large Coastal Sharks.	85.5 mt dw (188,593 lb dw).	42.0 mt dw (92,617 lb dw).	.....	85.5 mt dw (188,593 lb dw).	85.5 mt dw (188,593 lb dw).	
	Hammerhead Sharks.	13.4 mt dw (29,421 lb dw).	6.4 mt dw (14,151 lb dw).	.....	13.4 mt dw (29,421 lb dw).	13.4 mt dw (29,421 lb dw).	
Gulf of Mexico .....	Non-Blacknose Small Coastal Sharks.	112.6 mt dw (248,215 lb dw).	36.2 mt dw (79,779 lb dw).	.....	112.6 mt dw (248,215 lb dw).	112.6 mt dw (248,215 lb dw).	January 1, 2018.
	Smoothhound Sharks.	504.6 mt dw (1,112,441 lb dw).	0 mt dw (0 lb dw)	168.2 mt dw (370,814 lb dw).	336.4 mt dw (741,627).	504.6 mt dw (1,112,441 lb dw).	
Atlantic .....	Aggregated Large Coastal Sharks.	168.9 mt dw (372,552 lb dw).	55.2 mt dw (121,791 lb dw).	.....	168.9 mt dw (372,552 lb dw).	168.9 mt dw (372,552 lb dw).	January 1, 2018.
	Hammerhead Sharks.	27.1 mt dw (59,736 lb dw).	5.0 mt dw (10,973 lb dw).	.....	27.1 mt dw (59,736 lb dw).	27.1 mt dw (59,736 lb dw).	
	Non-Blacknose Small Coastal Sharks.	264.1 mt dw (582,333 lb dw).	60.9 mt dw (134,202 lb dw).	.....	264.1 mt dw (582,333 lb dw).	264.1 mt dw (582,333 lb dw).	
	Blacknose Sharks (South of 34 ° N. lat. only).	17.2 mt dw (37,921 lb dw).	5.2 mt dw (11,373 lb dw).	.....	17.2 mt dw (37,921 lb dw).	17.2 mt dw (37,921 lb dw).	
	Smoothhound Sharks.	1,802.6 mt dw (3,973,902 lb dw).	166.9 mt dw (367,933 lb dw).	600.9 mt dw (1,324,634 lb dw).	1,201.7 mt dw (2,649,268 lb dw).	1,802.6 mt dw (3,973,902 lb dw).	
No regional quotas	Non-Sandbar LCS Research.	50.0 mt dw (110,230 lb dw).	10.1 mt dw (22,157 lb dw).	.....	50.0 mt dw (110,230 lb dw).	50.0 mt dw (110,230 lb dw).	January 1, 2018.
	Sandbar Shark Research.	90.7 mt dw (199,943 lb dw).	38.4 mt dw (84,619 lb dw).	.....	90.7 mt dw (199,943 lb dw).	90.7 mt dw (199,943 lb dw).	
	Blue Sharks .....	273.0 mt dw (601,856 lb dw).	< 2.3 mt dw (< 5,000 lb dw) ...	.....	273.0 mt dw (601,856 lb dw).	273.0 mt dw (601,856 lb dw).	
	Porbeagle Sharks	1.7 mt dw (3,748 lb dw).	0 mt dw (0 lb dw)	.....	1.7 mt dw (3,748 lb dw).	1.7 mt dw (3,748 lb dw).	
	Pelagic Sharks Other Than Porbeagle or Blue.	488.0 mt dw (1,075,856 lb dw).	64.9 mt dw (143,137 lb dw).	.....	488.0 mt dw (1,075,856 lb dw).	488.0 mt dw (1,075,856 lb dw).	

<sup>1</sup> Landings are from January 1, 2017, through July 14, 2017, and are subject to change.

<sup>2</sup> Underharvest adjustments can only be applied to stocks or management groups that are not overfished and have no overfishing occurring. Also, the underharvest adjustments cannot exceed 50 percent of the base quota.

<sup>3</sup> This adjustment accounts for underharvest in 2017. This proposed rule would increase the overall Gulf of Mexico blacktip shark quota by 128.3 mt dw (282,850 lb dw). Since any underharvest would be divided based on the sub-regional quota percentage split, the western Gulf of Mexico blacktip shark quota would be increased by 115.7 mt dw, or 90.2 percent of the underharvest, while the eastern Gulf of Mexico blacktip shark quota would be increased by 12.6 mt dw, or 9.8 percent of the underharvest.

**1. Proposed 2018 Quotas for the Gulf of Mexico Region Shark Management Groups**

The 2018 proposed commercial quota for blacktip sharks in the western Gulf of Mexico sub-region is 347.2 mt dw

(765,392 lb dw) and the eastern Gulf of Mexico sub-region is 37.7 mt dw (83,158 lb dw). As of July 14, 2017, preliminary reported landings for blacktip sharks in the western Gulf of Mexico sub-region were at 62 percent (206.6 mt dw) of

their 2017 quota levels (331.6 mt dw), while the blacktip sharks in the eastern Gulf of Mexico sub-region were at 43 percent (15.3 mt dw) of their 2017 quota levels (36.0 mt dw). Reported landings have not exceeded the 2017 quota to

date, and the western Gulf of Mexico sub-region fishery was closed on May 2, 2017 (82 FR 20447). Gulf of Mexico blacktip sharks have not been declared to be overfished, to have overfishing occurring, or to have an unknown status. Pursuant to § 635.27(b)(2)(ii), underharvests for blacktip sharks within the Gulf of Mexico region therefore could be applied to the 2018 quotas up to 50 percent of the base quota. Any underharvest would be split based on the sub-regional quota percentages of 90.2 percent for western Gulf of Mexico blacktip sharks and 9.8 percent for eastern Gulf of Mexico blacktip sharks (§ 635.27(b)(1)(ii)). To date, the overall Gulf of Mexico blacktip shark management group was underharvested by 148.0 mt dw (325,665 lb dw); however, NMFS can only apply up to 50 percent of the base quota or 128.3 mt dw (282,850 lb dw). Accordingly, NMFS proposes to increase the 2018 western Gulf of Mexico blacktip shark quota by 115.7 mt dw (128.3 mt dw underharvest in 2017 \* 90.2 percent = 115.7 mt dw western sub-region underharvest) and increase the 2018 eastern Gulf of Mexico blacktip shark quota by 12.6 mt dw (128.3 mt dw underharvest in 2017 \* 9.8 percent = 12.6 mt dw eastern sub-region underharvest). Thus, the proposed western sub-regional Gulf of Mexico blacktip shark commercial quota is 347.2 mt dw and the proposed eastern sub-regional Gulf of Mexico blacktip shark commercial quota is 37.7 mt dw.

The 2018 proposed commercial quota for aggregated LCS in the western Gulf of Mexico sub-region is 72.0 mt dw (158,724 lb dw) and the eastern Gulf of Mexico sub-region is 85.5 mt dw (188,593 lb dw). As of July 14, 2017, preliminary reported landings for aggregated LCS in the western Gulf of Mexico sub-region were at 91 percent (65.8 mt dw) of their 2017 quota levels (72.0 mt dw), while the aggregated LCS in the eastern Gulf of Mexico sub-region were at 49 percent (42.0 mt dw) of their 2017 quota levels (85.5 mt dw). Reported landings have not exceeded the 2017 quota to date, and the western aggregated LCS sub-region fishery was closed on May 2, 2017 (82 FR 20447). Given the unknown status of some of the shark species within the Gulf of Mexico aggregated LCS management group, underharvests cannot be carried over pursuant to § 635.27(b)(2)(ii). Therefore, based on preliminary estimates and consistent with the current regulations at § 635.27(b)(2), NMFS proposes that the 2018 quotas for aggregated LCS in the western Gulf of Mexico and eastern Gulf of Mexico sub-regions be equal to their annual base

quotas without adjustment, because there have not been any overharvests and because underharvests cannot be carried over due to stock status.

In the Gulf of Mexico, hammerhead shark quotas are divided into two sub-regions: Western and eastern. The 2018 proposed commercial quotas for hammerhead sharks in the western Gulf of Mexico sub-region and eastern Gulf of Mexico sub-region are 11.9 mt dw (23,301 lb dw) and 13.4 mt dw (29,421 lb dw), respectively. As of July 14, 2017, preliminary reported landings for hammerhead sharks in the western Gulf of Mexico sub-region were at 24 percent (2.5 mt dw) of their 2017 quota levels (11.9 mt dw), while landings of hammerhead sharks in the eastern Gulf of Mexico sub-region were at 48 percent (6.4 mt dw) of their 2017 quota levels (13.4 mt dw). Reported landings have not exceeded the 2017 quota to date, and the western hammerhead shark sub-region fishery was closed on May 2, 2017 (82 FR 20447). Therefore, based on preliminary estimates and consistent with the current regulations at § 635.27(b)(2), at this time, NMFS proposes that the 2018 quotas for hammerhead sharks in the western Gulf of Mexico and eastern Gulf of Mexico sub-regions be equal to their annual base quotas without adjustment, because there have not been any overharvests and because underharvests cannot be carried over due to stock status.

The 2018 proposed commercial quota for non-blacknose SCS in the Gulf of Mexico region is 112.6 mt dw (248,215 lb dw). As of July 14, 2017, preliminary reported landings of non-blacknose SCS were at 32 percent (36.2 mt dw) of their 2017 quota level (112.6 mt dw) in the Gulf of Mexico region. Reported landings have not exceeded the 2017 quota to date. Given the unknown status of bonnethead sharks within the Gulf of Mexico non-blacknose SCS management group, underharvests cannot be carried forward pursuant to § 635.27(b)(2)(ii). Therefore, based on preliminary estimates and consistent with the current regulations at § 635.27(b)(2), NMFS proposes that the 2018 quota for non-blacknose SCS in the Gulf of Mexico region be equal to the annual base quota without adjustment, because there have not been any overharvests and because underharvests cannot be carried over due to stock status.

The 2018 proposed commercial quota for smoothhound sharks in the Gulf of Mexico region is 504.6 mt dw (1,112,441 lb dw). As of July 14, 2017, there are no preliminary reported landings of smoothhound sharks in the Gulf of Mexico region. Gulf of Mexico

smoothhound sharks have not been declared to be overfished, to have overfishing occurring, or to have an unknown status. Pursuant to § 635.27(b)(2)(ii), underharvests for smoothhound sharks within the Gulf of Mexico region therefore could be applied to the 2018 quotas up to 50 percent of the base quota. Accordingly, NMFS proposes to increase the 2018 Gulf of Mexico smoothhound shark quota to adjust for anticipated underharvests in 2017 as allowed. The proposed 2018 adjusted base annual quota for Gulf of Mexico smoothhound sharks is 504.6 mt dw (1,112,441 lb dw) (336.4 mt dw annual base quota + 168.2 mt dw 2017 underharvest = 504.6 mt dw 2018 adjusted annual quota).

## 2. Proposed 2018 Quotas for the Atlantic Region Shark Management Groups

The 2018 proposed commercial quota for aggregated LCS in the Atlantic region is 168.9 mt dw (372,552 lb dw). As of July 14, 2017, the aggregated LCS fishery in the Atlantic region is still open and preliminary landings indicate that only 33 percent of the quota, or 55.2 mt dw (121,791 lb dw), has been harvested. Given the unknown status of some of the shark species within the Atlantic aggregated LCS management group, underharvests cannot be carried over pursuant to § 635.27(b)(2)(ii). Therefore, based on preliminary estimates and consistent with current regulations at § 635.27(b)(2), NMFS proposes that the 2018 quota for aggregated LCS in the Atlantic region be equal to the annual base quota without adjustment, because there have not been any overharvests and underharvests cannot be carried over due to stock status.

The 2018 proposed commercial quota for hammerhead sharks in the Atlantic region is 27.1 mt dw (59,736 lb dw). Currently, the hammerhead shark fishery in the Atlantic region is still open and preliminary landings as of July 14, 2017, indicate that only 18 percent of the quota, or 5.0 mt dw (10,973 lb dw), has been harvested. Given the overfished status of hammerhead sharks, underharvests cannot be carried forward pursuant to § 635.27(b)(2)(ii). Therefore, based on preliminary estimates and consistent with the current regulations at § 635.27(b)(2), NMFS proposes that the 2018 quota for hammerhead sharks in the Atlantic region be equal to the annual base quota without adjustment, because there have not been any overharvests and because underharvests cannot be carried over due to stock status.



The 2018 proposed commercial quota for non-blacknose SCS in the Atlantic region is 264.1 mt dw (582,333 lb dw). As of July 14, 2017, preliminary reported landings of non-blacknose SCS were at 23 percent (60.9 mt dw) of their 2017 quota level (264.1 mt dw) in the Atlantic region. Reported landings have not exceeded the 2017 quota to date. Given the unknown status of bonnethead sharks within the Atlantic non-blacknose SCS management group, underharvests cannot be carried forward pursuant to § 635.27(b)(2)(ii). Therefore, based on preliminary estimates and consistent with the current regulations at § 635.27(b)(2), NMFS proposes that the 2018 quota for non-blacknose SCS in the Atlantic region be equal to the annual base quota without adjustment, because there have not been any overharvests and because underharvests cannot be carried over due to stock status.

The 2018 proposed commercial quota for blacknose sharks in the Atlantic region is 17.2 mt dw (37,921 lb dw). As of July 14, 2017, preliminary reported landings of blacknose sharks were at 30 percent (5.2 mt dw) of their 2017 quota levels (17.2 mt dw) in the Atlantic region. Reported landings have not exceeded the 2017 quota to date. Pursuant to § 635.27(b)(2), because blacknose sharks have been declared to be overfished with overfishing occurring in the Atlantic region, NMFS could not carry forward the remaining underharvest. Therefore, NMFS proposes that the 2018 Atlantic blacknose shark quota be equal to the annual base quota without adjustment. (**NOTE:** The blacknose shark quota is available in the Atlantic region only for those vessels operating south of 34° N. latitude; north of 34° N. latitude, retention, landing, and sale of blacknose sharks are prohibited.)

The 2018 proposed commercial quota for smoothhound sharks in the Atlantic region is 1,802.6 mt dw (3,973,902 lb dw). As of July 14, 2017, preliminary reported landings of smoothhound sharks were at 9 percent (166.9 mt dw) of their 2017 quota levels (1,802.6 mt dw) in the Atlantic region. Atlantic smoothhound sharks have not been declared to be overfished, to have overfishing occurring, or to have an unknown status. Pursuant to § 635.27(b)(2)(ii), underharvests for smoothhound sharks within the Atlantic region therefore could be applied to the 2018 quotas up to 50 percent of the base quota. Accordingly, NMFS proposes to increase the 2018 Atlantic smoothhound shark quota to adjust for anticipated underharvests in 2017 as allowed. The proposed 2018 adjusted base annual

quota for Atlantic smoothhound sharks is 1,802.6 mt dw (1,323,862 lb dw) (1,201.7 mt dw annual base quota + 600.9 mt dw 2017 underharvest = 1,802.6 mt dw 2018 adjusted annual quota).

### *3. Proposed 2018 Quotas for Shark Management Groups With No Regional Quotas*

The 2018 proposed commercial quotas within the shark research fishery are 50.0 mt dw (110,230 lb dw) for research LCS and 90.7 mt dw (199,943 lb dw) for sandbar sharks. Within the shark research fishery, as of July 14, 2017, preliminary reported landings of research LCS were at 20 percent (10.1 mt dw) of their 2017 quota levels (50.0 mt dw), and sandbar shark reported landings were at 42 percent (38.4 mt dw) of their 2017 quota levels (27.1 mt dw). Reported landings have not exceeded the 2017 quotas to date. Under § 635.27(b)(2)(ii), because sandbar sharks and scalloped hammerhead sharks within the research LCS management group have been determined to be either overfished or overfished with overfishing occurring, underharvests for these management groups cannot be carried forward to the 2018 quotas. Therefore, based on preliminary estimates and consistent with the current regulations at § 635.27(b)(2), NMFS proposes that the 2018 quota in the shark research fishery be equal to the annual base quota without adjustment because there have not been any overharvests and because underharvests cannot be carried over due to stock status.

The 2018 proposed commercial quotas for blue sharks, porbeagle sharks, and pelagic sharks (other than porbeagle or blue sharks) are 273 mt dw (601,856 lb dw), 1.7 mt dw (3,748 lb dw), and 488 mt dw (1,075,856 lb dw), respectively. As of July 14, 2017, there are no preliminary reported landings of porbeagle sharks. The preliminary reported landings of blue sharks were at less than 1 percent (less than 2.3 mt dw) of their 2017 quota level (273.0 mt dw), while preliminary reported landings of pelagic sharks (other than porbeagle and blue sharks) were at 13 percent (64.9 mt dw) of their 2017 quota level (488.0 mt dw). Given that these pelagic species are overfished, have overfishing occurring, or have an unknown status, underharvests cannot be carried forward pursuant to § 635.27(b)(2)(ii). Therefore, based on preliminary estimates and consistent with the current regulations at § 635.27(b)(2), NMFS proposes that the 2018 quotas for blue sharks, porbeagle sharks, and pelagic sharks (other than porbeagle and blue sharks)

be equal to their annual base quotas without adjustment, because there have not been any overharvests and because underharvests cannot be carried over due to stock status.

### *Proposed Opening Dates and Retention Limits for the 2018 Atlantic Commercial Shark Fishing Season*

For each fishery, NMFS considered the seven “Opening Commercial Fishing Season Criteria” listed at § 635.27(b)(3). The “Opening Fishing Season” criteria consider factors such as the available annual quotas for the current fishing season, estimated season length and average weekly catch rates from previous years, length of the season and fishermen participation in past years, impacts to accomplishing objectives of the 2006 Consolidated HMS FMP and its amendments, temporal variation in behavior or biology target species (e.g., seasonal distribution or abundance), impact of catch rates in one region on another, and effects of delayed season openings.

Specifically, as described above and below, NMFS examined the 2017 and previous fishing years’ over- and/or underharvests of the different management groups to determine the effects of the 2018 proposed commercial quotas on the shark stocks and fishermen across regional and sub-regional fishing areas. NMFS also examined the potential season length and previous catch rates to ensure, to the extent practicable, that equitable fishing opportunities be provided to fishermen in all areas. Lastly, NMFS examined the seasonal variation of the different species/management groups and the effects on fishing opportunities.

As described below, NMFS also considered the six “Inseason trip limit adjustment criteria” listed at § 635.24(a)(8) for directed shark limited access permit holders intending to land LCS other than sandbar sharks. Those criteria are: The amount of remaining shark quota in the relevant area or region, to date, based on dealer reports; the catch rates of the relevant shark species/complexes, to date, based on dealer reports; estimated date of fishery closure based on when the landings are projected to reach 80 percent of the quota given the realized catch rates; effects of the adjustment on accomplishing the objectives of the 2006 Consolidated HMS FMP and its amendments; variations in seasonal distribution, abundance, or migratory patterns of the relevant shark species based on scientific and fishery-based knowledge; and/or effects of catch rates in one part of a region precluding vessels in another part of that region

from having a reasonable opportunity to harvest a portion of the relevant quota. After considering these criteria, NMFS is proposing that the 2018 Atlantic commercial shark fishing season for all shark management groups in the northwestern Atlantic Ocean, including the Gulf of Mexico and the Caribbean Sea, open on or about January 1, 2018, after the publication of the final rule for this action (Table 2). NMFS is

also proposing to start the 2018 commercial shark fishing season with the commercial retention limit of 45 LCS other than sandbar sharks per vessel per trip in the western Gulf of Mexico sub-region, 50 LCS other than sandbar sharks per vessel per trip in the eastern Gulf of Mexico sub-region, and 25 LCS other than sandbar sharks per vessel per trip in the Atlantic region (Table 2). However, at the time of

writing this proposed rule, some management groups remain open and, for those management groups that are already closed, landings are still being calculated and checked for quality control and assurance. Thus, NMFS may implement different opening dates and commercial retention limits in the final rule if there are underharvested quotas or quota exceedances in 2017 that are not accounted for in this proposed rule.

TABLE 2—QUOTA LINKAGES, SEASON OPENING DATES, AND COMMERCIAL RETENTION LIMIT BY REGIONAL OR SUB-REGIONAL SHARK MANAGEMENT GROUP

Region or sub-region	Management group	Quota linkages	Season opening dates	Commercial retention limits for directed shark limited access permit holders (inseason adjustments are possible)
Western Gulf of Mexico ..	Blacktip Sharks .....	Not Linked	January 1, 2018 .....	45 LCS other than sandbar sharks per vessel per trip.
	Aggregated Large Coastal Sharks. Hammerhead Sharks.	Linked.		
Eastern Gulf of Mexico ...	Blacktip Sharks .....	Not Linked	January 1, 2018 .....	50 LCS other than sandbar sharks per vessel per trip.
	Aggregated Large Coastal Sharks. Hammerhead Sharks.	Linked.		
Gulf of Mexico .....	Non-Blacknose Small Coastal Sharks. Smoothhound Sharks .....	Not Linked ..	January 1, 2018 .....	N/A.
	Aggregated Large Coastal Sharks.	Not Linked ..	January 1, 2018 .....	
Atlantic .....	Aggregated Large Coastal Sharks.	Linked .....	January 1, 2018 .....	25 LCS other than sandbar sharks per vessel per trip. If quota is landed quickly (e.g., if approximately 20 percent of quota is caught at the beginning of the year), NMFS anticipates an inseason reduction (e.g., to 3 or fewer LCS other than sandbar sharks per vessel per trip), then an inseason increase to 36 LCS other than sandbar sharks per vessel per trip around July 15, 2018. Hammerhead Sharks
	Non-Blacknose Small Coastal Sharks.	Linked (South of 34° N. lat. only).	January 1, 2018 .....	N/A.
	Blacknose Sharks (South of 34° N. lat. only). Smoothhound Sharks .....	Not Linked ..	January 1, 2018 .....	N/A.
No regional quotas .....	Non-Sandbar LCS Research. Sandbar Shark Research	Linked .....	January 1, 2018 .....	N/A.
	Blue Sharks .....	Not Linked ..	January 1, 2018 .....	N/A.
	Porbeagle Sharks Pelagic Sharks Other Than Porbeagle or Blue	Not Linked ..	January 1, 2018 .....	N/A.

In the Gulf of Mexico region, we are opening the fishing season on or about January 1, 2018, for the aggregated LCS, blacktip sharks, and hammerhead shark management groups with the commercial retention limits of 45 LCS other than sandbar sharks per vessel per trip for directed shark permit holders in the western sub-region—and 50 LCS other than sandbar sharks per vessel per trip for directed shark permit holders in the eastern sub-region. This would provide, to the extent practicable,

equitable opportunities across the fisheries management sub-regions. This opening date takes into account all the season opening criteria listed in § 635.27(b)(3), and particularly the criteria that NMFS consider the length of the season for the different species and/or management group in the previous years (§ 635.27(b)(3)(ii) and (iii)) and whether fishermen were able to participate in the fishery in those years (§ 635.27(b)(3)(v)). The proposed commercial retention limits take into

account the criteria listed in § 635.24(a)(8), and particularly the criterion that NMFS consider the catch rates of the relevant shark species/complexes based on dealer reports to date (§ 635.24(a)(8)(ii)). Similar to the retention limit adjustment process described for the Atlantic region, NMFS may consider adjusting the retention limit in the Gulf of Mexico region throughout the season to ensure fishermen in all parts of the region have an opportunity to harvest aggregated

LCS, blacktip sharks, and hammerhead sharks (see the criteria listed at § 635.27(b)(3)(v) and § 635.24(a)(8)(ii), (v), and (vi)). In 2017, the management groups in the western Gulf of Mexico sub-region were closed on May 2, 2017 (82 FR 20447). As such, in 2018, NMFS is proposing the same commercial trip limit for these management groups that was set in 2017 in order to ensure the management group is open until at least April 2017, which is when the State of Louisiana closes state waters to shark fishing and when that State has previously asked that NMFS close Federal shark fisheries to match state regulations if quotas are limited (see the criteria listed at § 635.27(b)(3)(vii) and § 635.24(a)(8)(iii)). In the eastern Gulf of Mexico, NMFS is proposing a slightly higher trip limit in order to increase the harvest levels. Currently, the aggregated LCS, blacktip shark, and hammerhead shark management groups are still open in the eastern Gulf of Mexico sub-region (see the criteria listed at § 635.27(b)(3)(i) through (v), § 635.24(a)(8)(i) through (iii), and § 635.24(a)(8)(v) and (vi)). Fishermen fishing for these management groups in the eastern Gulf of Mexico did not fully land available quota in 2016 (fishing with the same retention limit as in 2017), and, if fishing rates remain similar to those in 2016, are not expected to fully land available quotas in 2017. Thus, NMFS believes that a small increase in retention limit in this sub-region could allow fishermen additional opportunities to fully land available quotas while not exceeding them. However, if catch rates increase and the eastern Gulf of Mexico sub-regional management groups close this year, NMFS could make changes to the 2018 opening dates and commercial retention limits if necessary to ensure equitable fishing opportunities.

In the Atlantic region, NMFS proposes opening the aggregated LCS and hammerhead shark management groups on or about January 1, 2018. This opening date is the same date that these management groups opened in 2017. As described below, this opening date also takes into account all the criteria listed in § 635.27(b)(3), and particularly the criterion that NMFS consider the effects of catch rates in one part of a region precluding vessels in another part of that region from having a reasonable opportunity to harvest a portion of the different species and/or management quotas (§ 635.27(b)(3)(v)). In 2017, the data indicate that an opening date of January 1 provided a reasonable opportunity for every part of each region to harvest a portion of the available quotas (§ 635.27(b)(3)(i)) while

accounting for variations in seasonal distribution of the different species in the management groups (§ 635.27(b)(3)(iv)). When the aggregated LCS quota was harvested too quickly to allow fishermen in the North Atlantic area an opportunity to fish, NMFS reduced the retention limit to three sharks per trip on April 13, 2017 (82 FR 17765). NMFS then increased the retention limit to 36 sharks per trip on July 16, 2017 (82 FR 32490), to allow for equitable fishing opportunities across the Atlantic region. Because the quotas in 2018 are proposed to be the same as the quotas in 2017, NMFS expects that the season lengths and therefore the participation of various fishermen throughout the region, would be similar in 2018 (§ 635.27(b)(3)(ii) and (iii)). Based on the recent performance of the fishery, the January 1 opening date appears to be meet the objectives of the 2006 Consolidated HMS FMP and its amendments (§ 635.27(b)(3)(vi)). Therefore, there is no information that indicates changing the opening date is necessary.

In addition, for the aggregated LCS and hammerhead shark management groups in the Atlantic region, NMFS is proposing that the commercial retention trip limit for directed shark limited access permit holders on the proposed opening date be 25 LCS other than sandbar sharks per vessel per trip. This retention limit should allow fishermen to harvest some of the 2018 quota at the beginning of the year when sharks are more prevalent in the South Atlantic area (see the criteria at § 635.24(a)(3)(i), (ii), (v), and (vi)). As was done in 2017, if it appears that the quota is being harvested too quickly (*i.e.*, about 20 percent) to allow directed fishermen throughout the entire region an opportunity to fish and ensure enough quota remains until later in the year, NMFS would reduce the commercial retention limits to incidental levels (3 LCS other than sandbar sharks per vessel per trip) or another level calculated to reduce the harvest of LCS taking into account § 635.27(b)(3) and the inseason trip limit adjustment criteria listed in § 635.24(a)(8), particularly the consideration of whether catch rates in one part of a region or sub-region are precluding vessels in another part of that region or sub-region from having a reasonable opportunity to harvest a portion of the relevant quota (§ 635.24(a)(8)(vi)). If the quota continues to be harvested quickly, NMFS could reduce the retention limit to 0 LCS other than sandbar sharks per vessel per trip to ensure enough quota remains until later in the year. If either

situation occurs, NMFS would publish in the **Federal Register** notification of any inseason adjustments of the retention limit to an appropriate limit of sharks per trip. In 2017, NMFS reduced the retention limit to 3 LCS other than sandbar sharks on April 13, 2017 (82 FR 17765) when the aggregated LCS landings reached approximately 20 percent of the aggregated LCS quota, and did not need to reduce it further.

Also, as was done in 2017, NMFS will consider increasing the commercial retention limits per trip at a later date if necessary to provide fishermen in the northern portion of the Atlantic region an opportunity to retain aggregated LCS and hammerhead sharks after considering the appropriate inseason adjustment criteria. Similarly, at some point later in the year (*e.g.*, July 15), potentially equivalent to how the 2017 fishing season operated, NMFS may consider increasing the retention limit to 36 LCS other than sandbar sharks per vessel per trip or another amount, as deemed appropriate, after considering the inseason trip limit adjustment criteria. If the quota is being harvested too quickly or too slowly, NMFS could adjust the retention limit appropriately to ensure the fishery remains open most of the rest of the year. Since the fishery is still open with majority of the quota available, NMFS will monitor the rest of the fishing season and could make changes to the proposed 2018 opening date if necessary to ensure equitable fishing opportunities.

All of the shark management groups would remain open until December 31, 2018, or until NMFS determines that the fishing season landings for any shark management group have reached, or are projected to reach, 80 percent of the available quota. If NMFS determines that a non-linked shark species or management group must be closed, then, consistent with § 635.28(b)(2) for non-linked quotas (*e.g.*, eastern Gulf of Mexico blacktip, western Gulf of Mexico blacktip, Gulf of Mexico non-blacknose SCS, pelagic sharks, or the Atlantic or Gulf of Mexico smoothhound sharks), NMFS will publish in the **Federal Register** a notice of closure for that shark species, shark management group, region, and/or sub-region that will be effective no fewer than 5 days from the date of filing. For the blacktip shark management group, regulations at § 635.28(b)(5)(i) through (v) authorize NMFS to close the management group before landings reach, or are expected to reach, 80 percent of the quota after considering the following criteria and other relevant factors: season length based on available sub-regional quota and average sub-regional catch rates;

variability in regional and/or sub-regional seasonal distribution, abundance, and migratory patterns; effects on accomplishing the objectives of the 2006 Consolidated HMS FMP and its amendments; amount of remaining shark quotas in the relevant sub-region; and regional and/or sub-regional catch rates of the relevant shark species or management groups. From the effective date and time of the closure until NMFS announces, via the publication of a notice in the **Federal Register**, that additional quota is available and the season is reopened, the fisheries for the shark species or management group are closed, even across fishing years.

If NMFS determines that a linked shark species or management group must be closed, then, consistent with § 635.28(b)(3) for linked quotas, NMFS will publish in the **Federal Register** a notice of closure for all of the species and/or management groups in a linked group that will be effective no fewer than 5 days from date of filing. From the effective date and time of the closure until NMFS announces, via the publication of a notice in the **Federal Register**, that additional quota is available and the season is reopened, the fisheries for all linked species and/or management groups are closed, even across fishing years. The linked quotas of the species and/or management groups are Atlantic hammerhead sharks and Atlantic aggregated LCS; eastern Gulf of Mexico hammerhead sharks and eastern Gulf of Mexico aggregated LCS; western Gulf of Mexico hammerhead sharks and western Gulf of Mexico aggregated LCS; and Atlantic blacknose and Atlantic non-blacknose SCS south of 34° N. latitude. NMFS may close the fishery for the Gulf of Mexico blacktip shark before landings reach, or are expected to reach, 80 percent of the quota, after considering the criteria listed at § 635.28(b)(5).

#### Request for Comments

Comments on this proposed rule may be submitted via [www.regulations.gov](http://www.regulations.gov) or by mail. NMFS solicits comments on this proposed rule by September 21, 2017 (see **DATES** and **ADDRESSES**).

#### Classification

The NMFS Assistant Administrator has determined that the proposed rule is consistent with the 2006 Consolidated HMS FMP and its amendments, the Magnuson-Stevens Act, and other applicable law, subject to further consideration after public comment.

These proposed specifications are exempt from review under Executive Order 12866.

NMFS determined that the final rules to implement Amendment 2 to the 2006 Consolidated HMS FMP (June 24, 2008, 73 FR 35778; corrected on July 15, 2008, 73 FR 40658), Amendment 5a to the 2006 Consolidated HMS FMP (78 FR 40318; July 3, 2013), Amendment 6 to the 2006 Consolidated HMS FMP (80 FR 50073; August 18, 2015), and Amendment 9 to the 2006 Consolidated HMS FMP (80 FR 73128; November 24, 2015) are consistent to the maximum extent practicable with the enforceable policies of the approved coastal management program of coastal states on the Atlantic including the Gulf of Mexico and the Caribbean Sea as required under the Coastal Zone Management Act. Pursuant to 15 CFR 930.41(a), NMFS provided the Coastal Zone Management Program of each coastal state a 60-day period to review the consistency determination and to advise the Agency of their concurrence. NMFS received concurrence with the consistency determinations from several states and inferred consistency from those states that did not respond within the 60-day time period. This proposed action to establish opening dates and adjust quotas for the 2018 fishing season for the Atlantic commercial shark fisheries does not change the framework previously consulted upon; therefore, no additional consultation is required.

An initial regulatory flexibility analysis (IRFA) was prepared, as required by section 603 of the Regulatory Flexibility Act (RFA). The IRFA describes the economic impact this proposed rule, if adopted, would have on small entities. The IRFA analysis follows.

Section 603(b)(1) of the RFA requires agencies to explain the purpose of the rule. This rule, consistent with the Magnuson-Stevens Act and the 2006 Consolidated HMS FMP and its amendments, is being proposed to establish the 2018 commercial shark fishing quotas, retention limits, and fishing seasons. Without this rule, the commercial shark fisheries would close on December 31, 2017, and would not open until another action was taken. This proposed rule would be implemented according to the regulations implementing the 2006 Consolidated HMS FMP and its amendments. Thus, NMFS expects few, if any, economic impacts to fishermen other than those already analyzed in the 2006 Consolidated HMS FMP and its amendments, based on the quota adjustments.

Section 603(b)(2) of the RFA requires agencies to explain the rule's objectives. The objectives of this rule are to: Adjust the baseline quotas for all Atlantic shark

management groups based on any over- and/or underharvests from the previous fishing year(s); establish the opening dates of the various management groups; and establish the retention limits for the blacktip shark, aggregated large coastal shark, and hammerhead shark management groups in order to provide, to the extent practicable, equitable opportunities across the fishing management regions and/or sub-regions while also considering the ecological needs of the different shark species.

Section 603(b)(3) of the RFA requires agencies to provide an estimate of the number of small entities to which the rule would apply. The Small Business Administration (SBA) has established size criteria for all major industry sectors in the United States, including fish harvesters. Provision is made under SBA's regulations for an agency to develop its own industry-specific size standards after consultation with Advocacy and an opportunity for public comment (see 13 CFR 121.903(c)). Under this provision, NMFS may establish size standards that differ from those established by the SBA Office of Size Standards, but only for use by NMFS and only for the purpose of conducting an analysis of economic effects in fulfillment of the agency's obligations under the RFA. To utilize this provision, NMFS must publish such size standards in the **Federal Register**, which NMFS did on December 29, 2015 (80 FR 81194). In this final rule effective on July 1, 2016, NMFS established a small business size standard of \$11 million in annual gross receipts for all businesses in the commercial fishing industry (NAICS 11411) for RFA compliance purposes. NMFS considers all HMS permit holders to be small entities because they had average annual receipts of less than \$11 million for commercial fishing.

As of July 2017, the proposed rule would apply to the approximately 206 directed commercial shark permit holders, 244 incidental commercial shark permit holders, 142 smoothhound shark permit holders, and 112 commercial shark dealers. Not all permit holders are active in the fishery in any given year. Active directed commercial shark permit holders are defined as those with valid permits that landed one shark based on HMS electronic dealer reports. Of the 450 directed and incidental commercial shark permit holders, only 28 permit holders landed sharks in the Gulf of Mexico region and only 78 landed sharks in the Atlantic region. Of the 142 smoothhound shark permit holders, only 26 permit holders landed

smoothhound sharks in the Atlantic region and none landed smoothhound sharks in the Gulf of Mexico region. NMFS has determined that the proposed rule would not likely affect any small governmental jurisdictions.

This proposed rule does not contain any new reporting, recordkeeping, or other compliance requirements (5 U.S.C. 603(b)(4)). Similarly, this proposed rule would not conflict, duplicate, or overlap with other relevant Federal rules (5 U.S.C. 603(b)(5)). Fishermen, dealers, and managers in these fisheries must comply with a number of international agreements as domestically implemented, domestic laws, and FMPs. These include, but are not limited to, the Magnuson-Stevens Act, the Atlantic Tunas Convention Act, the High Seas Fishing Compliance Act, the Marine Mammal Protection Act, the Endangered Species Act, the National Environmental Policy Act, the Paperwork Reduction Act, and the Coastal Zone Management Act.

Section 603(c) of the RFA requires each IRFA to contain a description of any significant alternatives to the proposed rule which would accomplish the stated objectives of applicable statutes and minimize any significant economic impact of the proposed rule on small entities. Additionally, the RFA (5 U.S.C. 603(c)(1)–(4)) lists four general categories of significant alternatives that would assist an agency in the development of significant alternatives. These categories of alternatives are: (1) Establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) clarification, consolidation, or simplification of compliance and

reporting requirements under the rule for such small entities; (3) use of performance rather than design standards; and, (4) exemptions from coverage of the rule for small entities. In order to meet the objectives of this proposed rule, consistent with the Magnuson-Stevens Act, NMFS cannot exempt small entities or change the reporting requirements only for small entities because all the entities affected are considered small entities; therefore, there are no alternatives discussed that fall under the first, second, and fourth categories described above. NMFS does not know of any performance or design standards that would satisfy the aforementioned objectives of this rulemaking while, concurrently, complying with the Magnuson-Stevens Act; therefore, there are no alternatives considered under the third category.

This rulemaking does not establish management measures to be implemented, but rather implements previously adopted and analyzed measures with adjustments, as specified in the 2006 Consolidated HMS FMP and its amendments and the Environmental Assessment (EA) that accompanied the 2011 shark quota specifications rule (75 FR 76302; December 8, 2010). Thus, NMFS proposes to adjust quotas established and analyzed in the 2006 Consolidated HMS FMP and its amendments by subtracting the underharvest or adding the overharvest as allowable. Thus, NMFS has limited flexibility to modify the quotas in this rule, the impacts of which were analyzed in previous regulatory flexibility analyses.

Based on the 2016 ex-vessel price, fully harvesting the unadjusted 2018 Atlantic shark commercial baseline

quotas could result in total fleet revenues of \$7,779,285 (see Table 3). For the Gulf of Mexico blacktip shark management group, NMFS is proposing to increase the baseline sub-regional quotas due to the underharvests in 2017. The increase for the western Gulf of Mexico blacktip shark management group could result in a \$218,647 gain in total revenues for fishermen in that sub-region, while the increase for the eastern Gulf of Mexico blacktip shark management group could result in a \$32,902 gain in total revenues for fishermen in that sub-region. For the Gulf of Mexico and Atlantic smoothhound shark management groups, NMFS is proposing to increase the baseline quotas due to the underharvest in 2017. This would cause a potential gain in revenue of \$581,718 for the fleet in the Gulf of Mexico region and a potential gain in revenue of \$1,083,926 for the fleet in the Atlantic region.

All of these changes in gross revenues are similar to the changes in gross revenues analyzed in the 2006 Consolidated HMS FMP and its amendments. The final regulatory flexibility analyses for those amendments concluded that the economic impacts on these small entities are expected to be minimal. In the 2006 Consolidated HMS FMP and its amendments and the EA for the 2011 shark quota specifications rule, NMFS stated it would be conducting annual rulemakings and considering the potential economic impacts of adjusting the quotas for under- and overharvests at that time.

TABLE 3—AVERAGE EX-VESSEL PRICES PER LB DW FOR EACH SHARK MANAGEMENT GROUP, 2016

Region	Species	Average ex-vessel meat price	Average ex-vessel fin price
Western Gulf of Mexico	Blacktip Shark	\$0.56	\$11.00
	Aggregated LCS	0.52	11.06
	Hammerhead Shark	0.83	11.08
Eastern Gulf of Mexico	Blacktip Shark	0.89	10.67
	Aggregated LCS	0.56	11.23
	Hammerhead Shark	0.25	15.95
Gulf of Mexico	Non-Blacknose SCS	0.38	8.68
	Smoothhound Shark	1.50	1.91
	Aggregated LCS	0.79	5.54
Atlantic	Hammerhead Shark	0.38	5.73
	Non-Blacknose SCS	0.71	2.92
	Blacknose Shark	0.98	2.92
	Smoothhound Shark	0.75	1.91
No Region	Shark Research Fishery (Aggregated LCS)	0.70	9.47
	Shark Research Fishery (Sandbar only)	0.68	9.47
	Blue shark	0.75	3.58
	Porbeagle shark *	1.54	3.58
	Other Pelagic sharks	1.54	3.58

\* Used other pelagic shark ex-vessel prices for porbeagle sharks ex-vessel prices since there currently are no landings of porbeagle sharks.

For this rule, NMFS also reviewed the criteria at § 635.27(b)(3) to determine when opening each fishery would provide equitable opportunities for fishermen, to the extent practicable, while also considering the ecological needs of the different species. The opening dates of the fishing season(s) could vary depending upon the available annual quota, catch rates, and number of fishing participants during the year. For the 2018 fishing season, NMFS is proposing to open all of the shark management groups on the effective date of the final rule for this action (expected to be on or about January 1). The direct and indirect economic impacts would be neutral on a short- and long-term basis because NMFS is not proposing to change the opening dates of these fisheries from the status quo.

**Authority:** 16 U.S.C. 971 *et seq.*; 16 U.S.C. 1801 *et seq.*

Dated: August 15, 2017.

**Samuel D. Rauch, III,**

*Deputy Assistant Administrator for Regulatory Programs, National Marine Fisheries Service.*

[FR Doc. 2017-17575 Filed 8-21-17; 8:45 am]

**BILLING CODE 3510-22-P**

## DEPARTMENT OF COMMERCE

### National Oceanic and Atmospheric Administration

#### 50 CFR Parts 679 and 680

[Docket No. 170412391-7391-01]

RIN 0648-BG84

#### Fisheries of the Exclusive Economic Zone Off Alaska; Bering Sea and Aleutian Islands Management Area; American Fisheries Act; Bering Sea and Aleutian Islands Crab Rationalization Program

**AGENCY:** National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

**ACTION:** Proposed rule; request for comments.

**SUMMARY:** NMFS issues a proposed rule to implement Amendment 48 to the Fishery Management Plan for Bering Sea/Aleutian Islands King and Tanner Crabs (Crab FMP) and a regulatory amendment to revise regulations implementing the American Fisheries Act (AFA) Program and the Crab Rationalization (CR) Program. This proposed rule would revise how NMFS determines the amount of limited access privileges held and used by groups in

the Western Alaska Community Development Quota Program (CDQ Program) for the purposes of managing the excessive share limits under the AFA Program and the CR Program. This proposed rule is necessary to align regulations and the Crab FMP to be consistent with an amendment to the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) and NMFS' current method of managing excessive share limits for CDQ groups in the AFA Program and the CR Program. This proposed rule is intended to promote the goals and objectives of the Magnuson-Stevens Act, the Crab FMP, and other applicable law.

**DATES:** Submit comments on or before September 21, 2017.

**ADDRESSES:** Submit comments, identified by docket number NOAA-NMFS-2017-0038, by either of the following methods:

- *Federal e-Rulemaking Portal:* Go to [www.regulations.gov/#/docketDetail;D=NOAA-NMFS-2017-0038](http://www.regulations.gov/#/docketDetail;D=NOAA-NMFS-2017-0038), click the "Comment Now!" icon, complete the required fields, and enter or attach your comments.

- *Mail:* Submit written comments to Glenn Merrill, Assistant Regional Administrator, Sustainable Fisheries Division, Alaska Region NMFS, Attn: Ellen Sebastian. Mail comments to P.O. Box 21668, Juneau, AK 99802-1668.

*Instructions:* Comments sent by any other method, to any other address or individual, or received after the end of the comment period may not be considered by NMFS. All comments received are a part of the public record and will be posted for public viewing on [www.regulations.gov](http://www.regulations.gov) without change. All personal identifying information (*e.g.*, name, address), confidential business information, or otherwise sensitive information submitted voluntarily by the sender will be publicly accessible. NMFS will accept anonymous comments (enter "N/A" in the required fields if you wish to remain anonymous).

Electronic copies of Amendment 48 to the Crab FMP, the Regulatory Impact Review (RIR), and the Categorical Exclusion prepared for this proposed action are available from <http://www.regulations.gov> or from the NMFS Alaska Region Web site at <http://alaska.fisheries.noaa.gov>.

The CR Program Environmental Impact Statement (EIS), RIR, and Final Regulatory Flexibility Analysis, as well as the AFA Program EIS and RIR, are available from the NMFS Alaska Region Web site at <http://alaska.fisheries.noaa.gov>.

#### FOR FURTHER INFORMATION CONTACT:

Keeley Kent, 907-586-7228.

#### SUPPLEMENTARY INFORMATION:

##### Authority for Action

NMFS manages the pollock fisheries in the exclusive economic zone (EEZ) off Alaska under the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area (BSAI FMP). NMFS manages the king and Tanner crab fisheries in the U.S. EEZ of the Bering Sea and Aleutian Islands (BSAI) under the Crab FMP. The North Pacific Fishery Management Council (Council) prepared, and NMFS approved, the BSAI FMP and the Crab FMP under the authority of the Magnuson-Stevens Act, 16 U.S.C. 1801 *et seq.* Regulations governing and implementing the BSAI FMP appear at 50 CFR parts 600 and 679. Regulations governing and implementing the Crab FMP appear at 50 CFR parts 600 and 680.

A notice of availability for Amendment 48 to the Crab FMP was published in the **Federal Register** on August 3, 2017. Comment on Amendment 48 is invited through October 2, 2017. All relevant written comments received by the end of the comment period, whether specifically directed to the FMP amendment, this proposed rule, or both, will be considered in the approval/disapproval decision for Amendment 48 and addressed in the response to comments in the final rule.

##### Background

This proposed rule would modify regulations that specify how NMFS determines holding and use of limited access privileges (LAPs) for the purposes of managing excessive share limits for CDQ groups under the AFA Program and the CR Program. The Magnuson-Stevens Act requires NMFS to establish excessive share limits to prevent excessive consolidation of harvesting and processing LAPs in order to maintain an appropriate distribution of economic and social benefits for fishery participants and communities. NMFS has adopted regulations under its LAP programs to ensure that no person holds or uses more LAPs than authorized under excessive share limits established for each LAP program. Section 305(i) of the Magnuson-Stevens Act describes the Western Alaska Community Development Quota Program (CDQ Program) (16 U.S.C. 1855(i)). Regulations at 50 CFR 679.2 define the term "CDQ group" as an entity identified as eligible for the CDQ Program under 16 U.S.C. 1855(i)(1)(D).

# Atlantic States Marine Fisheries Commission

## American Eel Management Board

*October 17, 2017*

*2:30 – 4:30 p.m.*

*Norfolk, Virginia*

### Draft Agenda

The times listed are approximate; the order in which these items will be taken is subject to change; other items may be added as necessary.

- |   |           |
|---|-----------|
| 1. Welcome/Call to Order ( <i>J. Clark</i> )  | 2:30 p.m. |
| 2. Board Consent  | 2:30 p.m. |
| • Approval of Agenda  |           |
| • Approval of Proceedings from August 2017  |           |
| 3. Public Comment   | 2:35 p.m. |
| 4. 2017 American Eel Stock Assessment Update  | 2:45 p.m. |
| • Presentation of Assessment Update ( <i>J. Brust</i> )   |           |
| • Consider Management Response to Stock Assessment Update ( <i>J. Clark</i> )   |           |
| <b>Possible Action</b>  |           |
| 5. Consider 2018 Glass Eel Quota for Maine ( <i>J. Clark</i> ) <b>Possible Final Action</b>                           | 3:30 p.m. |
| 6. American Eel Allocation Working Group Report and Recommendations ( <i>K. Rootes-Murdy</i> ) <b>Possible Action</b> | 3:55 p.m. |
| 7. Other Business/Adjourn   | 4:30 p.m. |

The meeting will be held at the Waterside Marriott Hotel, 253 East Main Street Norfolk, Virginia; 757.627.4200

# Atlantic States Marine Fisheries Commission

## MEETING OVERVIEW

### American Eel Management Board Meeting

October 17, 2017

2:30 – 4:30 p.m.

Norfolk, Virginia

Chair: John Clark Assumed Chairmanship: 8/15	Technical Committee Chair: Tim Wildman (CT)	Law Enforcement Committee Representative: Cornish
Vice Chair: Martin Gary	Advisory Panel Chair: Mari-Beth Delucia	Previous Board Meeting: August 2, 2017

**Voting Members:** ME, NH, MA, RI, CT, NY, NJ, PA, DE, MD, VA, NC, SC, GA, FL, D.C., PRFC, USFWS, NMFS (19 votes)

#### 2. Board Consent:

- Approval of Agenda
- Approval of Proceedings from August 2017 Board Meeting

#### 3. Public Comment:

At the beginning of the meeting, public comment will be taken on items not on the Agenda. Individuals that wish to speak at this time must sign-up at the beginning of the meeting. For agenda items that have already gone out for public hearing and/or have had a public comment period that has closed, the Board Chair may determine that additional public comment will not provide additional information. In this circumstance the Board Chair will not allow additional public comment. For agenda items that the public has not had a chance to provide input, the Board Chair may allow limited opportunity for comment. The Board Chair has the discretion to limit the number of speakers and/or the length of each comment.

<b>4. 2017 American Eel Stock Assessment Update (2:45 – 3:30 p.m.) Possible Action</b>
<b>Background</b> <ul style="list-style-type: none"><li>• The 2012 Benchmark Stock Assessment was updated with data through 2016. The assessment includes trend analyses of abundance indices at the regional and coastwide levels. Results of trend analyses and recent trend determinations will be presented. (Briefing Materials)</li></ul>
<b>Presentation</b> <ul style="list-style-type: none"><li>• Overview of the American Eel Stock Assessment Update by J. Brust</li></ul>
<b>Board Actions for Consideration</b> <ul style="list-style-type: none"><li>• Consider Management Response to American Eel Stock Assessment Update</li></ul>



**5. Consider 2018 Glass Eel Quota for Maine (3:30 – 3:55 p.m.) Possible Final Action**

**Background**

- Addendum IV (2014) specified Maine’s Glass Eel Quota for the 2015-2017 commercial fishing seasons at 9,688 pounds, annually. The Addendum also outlined that Maine’s Glass Eel Quota would be re-evaluated prior to the 2018 fishing season.
- Maine’s Quota can be extended for 2018 at 9,688 pounds per the provisions of Addendum IV, but any increase to the quota would require a new addendum.

**Presentation**

- Maine’s Glass Eel Quota for 2018 by K. Rootes-Murdy

**Board Actions for Consideration**

- Consider extending Maine’s current Glass Eel Quota for 2018

**6. American Eel Allocation Working Group Report and Recommendations (3:55-4:30 p.m.) Possible Action**

**Background**

- An Allocation Working Group was formed following the August 2017 Meeting to address concerns regarding allocation and management triggers in Addendum IV.
- The Allocation Working Group met twice in September to discuss concerns on the current allocations and develop recommendations. **(Briefing Materials)**

**Presentation**

- Allocation Working Group Report by K. Rootes-Murdy

**Board Actions for Consideration**

- Initiate an addendum to explore new allocations and management triggers

**7. Other Business/ Adjourn**

**DRAFT PROCEEDINGS OF THE  
ATLANTIC STATES MARINE FISHERIES COMMISSION  
AMERICAN EEL MANAGEMENT BOARD**

**The Westin Alexandria**  
Alexandria, Virginia  
**August 2, 2017**

These minutes are draft and subject to approval by the American Eel Management Board.  
The Board will review the minutes during its next meeting.

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INDEX OF MOTIONS

1. **Approval of Agenda by Consent** (Page 1).
2. **Approval of Proceedings of January, 2017** by Consent (Page 1).
3. **Motion to approve the revised North Carolina Aquaculture Plan as submitted on July 25, 2017** (Page 9). Motion by Michelle Duval; second by James Gilmore. Motion carried (Page 13).
4. **Motion to approve the 2016 FMP review of the 2015 fishing year and approve de minimis requests for New Hampshire, Massachusetts, Pennsylvania, District of Columbia, South Carolina and Georgia for yellow eel** (Page 19). Motion by Cheri Patterson; second by Emerson Hasbrouck. Motion carried (Page 20).
5. **Move to adjourn** by consent (Page 20).

**ATTENDANCE**

**Board Members**

Pat Keliher, ME (AA)	Craig Pugh, DE, proxy for Rep. Carson (LA)
Dennis Abbott, NH, proxy for Sen. Watters (LA)	Roy Miller, DE (GA)
Cheri Patterson, NH, proxy for D. Grout (AA)	Rachel Dean, MD (GA)
G. Ritchie White, NH (GA)	Ed O'Brien, MD, proxy for Del. Stein (LA)
Sarah Ferrara, MA, proxy for Rep. Peake (LA)	Lynn Fegley, MD, proxy for D. Blazer (AA)
Dan McKiernan, MA, proxy for D. Pierce (AA)	Rob O'Reilly, VA, proxy for J. Bull (AA)
Raymond Kane, MA (GA)	Cathy Davenport, VA (GA)
Robert Ballou, RI, proxy for J. Coit (AA)	David Bush, NC, proxy for Rep. Steinburg (LA)
David Borden, RI (GA)	Michelle Duval, NC, proxy for B. Davis (AA)
Eric Reid, RI, proxy for Sen. Sosnowski (LA)	Ross Self, SC, proxy for R. Boyles (AA)
Colleen Giannini, CT, proxy for M. Alexander (AA)	Malcolm Rhodes, SC (GA)
Sen. Craig Miner, CT (LA)	Sen. Ronnie Cromer, SC (LA)
Jim Gilmore, NY (AA)	Pat Geer, GA, proxy for Rep. Nimmer (LA)
Emerson Hasbrouck, NY (GA)	Spud Woodward, GA (AA)
John McMurray, NY, proxy for Sen. Boyle (LA)	Rep. Thad Altman, FL (LA)
Adam Nowalsky, NJ, proxy for Asm. Andrzejczak (LA)	Jim Estes, FL, proxy for J. McCawley (AA)
Russ Allen, NJ, proxy for L. Herrighty (AA)	Sherry White, USFWS
Loren Lustig, PA (GA)	Derek Orner, NMFS
Andrew Shiels, PA, proxy for J. Arway (AA)	Martin Gary, PRFC
John Clark, DE, proxy for D. Saveikis (AA)	

**(AA = Administrative Appointee; GA = Governor Appointee; LA = Legislative Appointee)**

**Ex-Officio Members**

Jordan Zimmerman, Technical Committee Vice-Chair

**Staff**

Bob Beal	Kirby Rootes-Murdy
Toni Kerns	Mark Robson

**Guests**

Purcie Bennett-Nickerson, PEW	Deb Hahn, AFWA, DC
Kelly Cates, NOAA	Marin Hawk, MSC
Brad Chase, MA DMF	Arnold Leo, E. Hampton, NY
Kevin Chu, NMFS	Jeffrey Pierce, MEFA
Heather Corbett, NJ DFW	Jon Siemien, USFWS
Justin Davis, CT DEEP	Mike Thalhauser, MCCF
Jeff Deem, VMRC	Darrel Young, MEFA
Shaun Gehen, Omega Protein	Angela Young, MEFA
Jennifer Goebel, NOAA	

The American Eel Management Board of the Atlantic States Marine Fisheries Commission convened in the Edison Ballroom of the Westin Hotel, Alexandria, Virginia, August 2, 2017, and was called to order at 9:22 o'clock a.m. by Chairman John Clark.

#### **CALL TO ORDER**

CHAIRMAN JOHN CLARK: Good morning and welcome to the Eel Board meeting for the summer meeting. The agenda for the Eel meeting, everybody has that.

#### **APPROVAL OF AGENDA**

CHAIRMAN CLARK: Are there any changes to the agenda? Seeing none; the agenda is approved.

#### **APPROVAL OF PROCEEDINGS**

CHAIRMAN CLARK: Everybody has the chance to look at the proceedings from the January, 2017 meeting. Are there any changes to that? Seeing none; the proceedings are approved.

#### **PUBLIC COMMENT**

CHAIRMAN CLARK: Now we move on to Item 3; Public Comment. We have one person who has signed up; Jeff Pierce.

MR. JEFFREY PIERCE: Good morning again, Chairman Clark and distinguished members of the American Eel Board. My name is Jeffrey Pierce. I am here on behalf of the Maine Elver Fishermen's Association; and thank you for allowing me to make public comment. First I would like to comment on the positive things that have been going on in the state of Maine's glass eel fishery.

As many of you know, in 2011 and '12, Maine's glass eel fishery had a serious problem with poaching. Maine Department of Marine Resources, in conjunction with the Maine Marine Patrol, Maine Warden Service and the

Maine State Police, Sherriff and elver fishermen, worked diligently to correct and stamp out poaching; with the aid and issuance of the first ever swipe card system, which was able to account for every eel harvested.

This was instrumental in compiling harvester data. The following season, because of the new quota implemented, Maine went to an individual quota system; again the first on the eastern seaboard. With the swipe card and the IQS, every harvester was able to manage their quota to ensure compliance with the new quota imposed by this Board.

To commit to the best management of the glass eel fishery, the Maine Department of Marine Resources, the Maine Elver Fishermen Association worked with the state legislature to enact an export license to close the loop on poaching. Now every glass eel in Maine is tracked from harvester to dealer to exporter to its final destination.

Maine, like many states, has been working on habitat restoration, fish passage, and in some cases dam removal. For example, Maine has removed several large dams in recent years; resulting in the opening of over thousands of acres of habitat. Maine glass eel fishery starts March 22. Most fishermen start catching elvers by the first week in April. Even last year's harsh winter in the last two years, 80 percent of Maine's glass eel quota has been caught by the first week in May. The season ends June 7. The yellow eel fishery south of Maine has been doing extremely well; with a number of states exceeding their quota allocated by Addendum IV. These are just a few reasons why we hope this Board would consider new quota allocations on an addendum if needed, for the yellow and glass eel fishery for the upcoming season. Thank you and I would happily answer any questions.

CHAIRMAN CLARK: Thank you, Jeff. Pat Keliher.

MR. PATRICK C. KELIHER: Not to this point, but there was another individual from Maine who was supposed to be here; and since we started early she may just be running late. Her intent was under public comment to talk about possible glass eel quota for aquaculture in the state of Maine. I just wanted to preserve her ability to speak later in the meeting if she does come.

CHAIRMAN CLARK: Got it. Maybe we could put her down under Other Business toward the end of the meeting.

**CONSIDER NORTH CAROLINA GLASS EEL  
AQUACULTURE PLAN FOR 2018**

CHAIRMAN CLARK: Okay, we're going to move on to Item Number 4; and that is Consider the North Carolina Glass Eel Aquaculture Plan for 2018. This is an action item. I'm going to turn it over to Kirby; and we'll have reports from the Technical Committee and the Law Enforcement Committee.

MR. KIRBY ROOTES-MURDY: I'm going to walk you all through the aquaculture plan that North Carolina has submitted; and specifically the revised plan. There were two versions of it; one that was submitted in June, and one that was submitted last week. I'm going to try to make note of where those changes are.

I've also asked Dr. Duval to be ready to answer any additional questions if I'm not able to answer them; regarding the plan. Just in terms of an outline. I'm going to give you all a little bit of background on the plan process; how it's worked in recent years, the 2017 season results, the proposed plan for 2018 and beyond, highlight these changes as I said, and try to answer your questions.

North Carolina aquaculture plans for the American eel farm have been submitted in 2015 and 2016 previously. Both were reviewed by

the Technical Committee; as you are all aware, with recommended changes, and both were approved by the Board. North Carolina submitted a new plan this year for 2018 and beyond on June 1.

In July of this year the Technical Committee reviewed that plan; as well as the 2017 results; and made recommendations to North Carolina in turn, then submitted a revised version of the plan that was seeking to address some of those recommended changes. That revised plan was submitted on the same day that the Law Enforcement Committee reviewed the plan.

I tried to provide that information to the LEC members. Dr. Duval was also on that call as well; to help highlight any changes that there was any confusion on. In terms of this year's season results, 12 out of 17 week's fyke nets were deployed. Fyke nets were fished 44 out of 85 available days. There was no fishing on Saturday or Sundays.

A majority of the fishing effort took place in the White Oak River. In total 775 glass eels; which is approximately a quarter of a pound, were harvested. Fifty-one glass eels were released alive, and 23 elvers were captured and released. In turn there is approximately 199.74 pounds left of the quota that North Carolina has under the Aquaculture Plan. Also to note were some violations that occurred through the efforts to capture glass eels. I'm going to lay out two different sets of citations; and I will just preface it by saying that hearings have not occurred for any of the above violations, so the legal outcome is still unknown. But the first was on January 21. There was a citation for using a stationary net to block more than two-thirds of the waterway; that's a rule violation.

In March and April there was a citation for violating the conditions of the Aquaculture Plan for not fishing gear within the approved timeframe. As you may remember there was a specification in the Aquaculture Plan for fishing

two hours after sunrise, they were supposed to have a rigid device in there to keep the net open. It was placed without that device in there.

Then there were citations issued by the North Carolina Wildlife Resources Commission. All three of those occurred in March. The first was operating a motor vehicle without a proper navigation light; that's a rule violation. There was operating the motor vessel with invalid registration number, and then the last was being charged with taking eels by a method other than hook and line from inland waters of North Carolina; rule and permit violation.

That last one, just to note that was regards to where that fishing was occurring relative to the approved site. I'm going to go through the proposed changes for 2018 and beyond. It's a pretty comprehensive table, so please bear with me. I will point out that this table was included in materials that were submitted to the Board for review; specifically there in the memo.

It's dated July 3, from Todd Mathis to the ASMFC America Eel TC. In going through this, the change in the plan is as follows. The dates of harvest, comparing 2016 to 2017 the new plan extends the season by one month. The duration of the plan, comparing 2016 to 2017 was extended from one year to two years.

Regarding the method of harvest, they've requested to add an additional piece of equipment, an Irish eel ladder in, in addition to the fyke and dip nets that they used in 2016. There is also a requested change in the location of the harvest. In 2016 there were 11 primary sites that were largely in creeks and rivers within the White Oak River; as well as part of the North River.

In 2017 those creeks and rivers have been replaced with sounds and associated tributaries; and those sounds are the Albemarle Sound, the Pamlico Sound, the Newport River,

and the North River. In terms of monitoring program changes, the plan this year is requesting to increase the number of harvesters from one to three, in turn also having two mates for each of those harvesters; so that increases it times three, essentially from what the plan had in place in 2016.

Regarding the pieces of equipment, it increases it from 15 pieces to 30; that is mostly to align with the increase in the number of harvesters. Regarding the time of year harvest specifications, the previous plan had laid out that in 2017 they had to harvest between January 1 and February 28. This extends in the plan they submitted this year, they extend that period by an additional three months.

Getting down to the actual harvest specifications, there were previously a number of requirements regarding when nets could be set, how often they could be fished. In 2016 fyke nets needed to be fished once every 24 hours. Between March 1 through April 30, fyke and dip nets may only be fished and cod ends closed from two hours before sunset to two hours after sunrise; and the tamper evident tags needed to be used to secure the cod ends of the gear, both when it was being used and fished, and also when it was being stored. The 2017 plan, the one that North Carolina submitted this year for 2018 and beyond, removes those requirements. The requirement is removed for fishing it once every 24 hours.

They also have changed so they no longer require removing the nets from the water during weekend periods; and the tamper evident tags have been removed as a requirement as well. In terms of some of the specifications during harvest or before harvest, those have also been changed. There was the previous specification they had to provide the GPS coordinates once the nets were set; that now would be reported after harvest took place, and only once nets have been removed and/or moved to another site.



Daily reporting of individuals involved, and the info on the number of boats and registration, and number of vehicles and license plates, instead of that information being provided before every time they went out and tried to set the nets, that is being provided at the beginning of the season. It's only one time at the beginning of the season that they have to report this information.

During harvest some of the changes are they had to record weight of elvers captured by each piece of equipment. They are moving to wave that requirement in the plan moving forward. Initially there was a request to take out the CPUE data collection that was a component of the plan. The revised version that we received on July 25, added that back in, so there is no change there.

This is the last table; in terms of changes to the plan. For after harvest, previously they required to call into North Carolina DMF of the total harvest. Prior to leaving the last harvest site and report the estimated time of arrival when they were going to get back to the landing site. Once all gear was fished they must travel like directly to the landing site.

Once at the landing site all eels must be offloaded and transported directly to the America Eel Farm facility. Those requirements have been waved in this new version of the plan, in part because of the increase in the area that they are seeking to fish. They pointed out that the time to drive from setting the nets, harvest, and getting back to the facility would be too far of a distance to travel; and that's why they are seeking to wave that.

The last change is requiring them to report by noon of the following day after they have completed harvest. That has been shifted up from noon to five o'clock p.m. the following day. I went through that pretty quickly, but I'm happy to go back through and answer any

questions folks have; or revisit any of those changes. I'm happy to take any questions about the plan now; and then we can get into the Technical Committee report.

CHAIRMAN CLARK: Okay, do we have questions for Kirby, and again just questions. We're not going to discussion right yet. Dan McKiernan.

MR. DAN MCKIERNAN: Two questions, Kirby. The three violations, were those all from one incident?

MR. ROOTES-MURDY: Are you referring to the one from North Carolina Wildlife Resources Commission?

MR. MCKIERNAN: That's right.

MR. ROOTES-MURDY: Yes, I believe that was all in one day, one instance in March, 2017. But Michelle can correct me if I've got it wrong.

MR. MCKIERNAN: All right my second question is what is the rationale for not revealing the information of the net site until after harvest?

MR. ROOTES-MURDY: That's a good question. I can't answer that. Michelle, could you possibly answer that?

DR. MICHELLE DUVAL: Yes, Kirby. I think it really had more to do with the requirement previously that those locations were having to be provided every single time the individual called in; as opposed to being provided once. There might be a little bit of misunderstanding or mischaracterization there.

CHAIRMAN CLARK: Jim Gilmore.

MR. JAMES J. GILMORE, JR.: You may have said it, Kirby, but were all the violations from American Eel Farm or was that other violations? Secondly, just a curiosity question; what the hell is an Irish fish ladder?

MR. ROOTES-MURDY: For the first question. My understanding is they were all the permit holder, so it was I believe Mr. Allen, who the citations were charged to. But Michelle can correct me if I'm wrong there. Then the second question regarding the addition of the new gear. Irish eel ladders are usually used at bottleneck points or approximately where dams are to help transport eels, or use them to collect eels for biological sampling; such as young-of-year surveys.

CHAIRMAN CLARK: Roy Miller.

MR. ROY W. MILLER: I had a question concerning the extension of the fishing season. My recollection is that in our neck of the woods at least, the glass eel run is pretty much over by the end of April. I wanted to maybe direct that to Jordy Zimmerman next to you, Kirby. If that's true, under the assumption that towards the end of the fishing season you get more pigmented eels or elvers, then I'm wondering why they need to extend into the end of May. Jordy, am I right in that?

MR. JORDAN ZIMMERMAN: You're correct in Delaware's young-of-the-year harvest; and when we see the peak of ingress of glass eels. Theoretically North Carolina should occur a little earlier. I don't recall if we discussed that in detail. I would assume that change is just to provide maybe some wiggle room; in case we have a particularly cold winter that extends into the spring season. But maybe Dr. Duval could correct me on that.

CHAIRMAN CLARK: Dr. Duval.

DR. DUVAL: Just a few things. Yes that extra month I think was based on conversations that the applicant had had with folks in Virginia; that indicated that there were certainly some years or seasons in which the run extended later into the year. I did just want to mention, in reference to Jim's question about the violations. Those were against the American Eel Farm, so

you know the Eel Farm is the permit holder. Then one thing, you know when Kirby was going through the table that noted the changes; and noting the change in the harvest season. I think it's a little bit inaccurate to say that it was an extension of three months.

I think it's the way the gear was required to be operated changed. During January and February it was required to be operated one way; and then during March and April, as Kirby indicated, the gear was required to be removed on the weekends, and fished a different way. It's just for this plan the gear would be allowed to be fished the same way consistently throughout the entire January through May timeframe.

CHAIRMAN CLARK: Okay, Ritchie White.

MR. G. RITCHIE WHITE: A question for Michelle. What permits and licenses does the farm need, and did the violations put any of those in jeopardy?

DR. DUVAL: The farm requires an aquaculture operation permit, which they do already have, and then an aquaculture collection permit, which has not been issued this plan, when we need to be approved prior to issuance of the aquaculture collection permit, and then also a commercial fishing license is required to harvest as well as a dealer's license to report that harvest.

CHAIRMAN CLARK: Dr. Rhodes.

DR. MALCOLM RHODES: Along that line, with the small volume harvested this year, did they go ahead and put those into tanks to kind of proof the system; or what happened to the quarter pound harvest this year, or did they buy glass eels to start the grow out?

DR. DUVAL: I would have to go back and check with staff; in terms of whether additional glass eel purchases was made from either South

Carolina or from Maine. But your question is specifically to the eels that were harvested. I don't believe they survived, actually is my understanding. Any harvest that occurs, any mortality also counts against that 200 pound allowance.

CHAIRMAN CLARK: Cheri.

MS. CHERI PATTERSON: I have a question in regards to the permit violations; and I know that these have not gone to court yet. In the event of a conviction, is there in your rules the removal of the permit option? Even though we approve this option, may it not occur because of violation?

DR. DUVAL: There is within our rules that if there are a certain number of convictions that occur, then just by rule, and this would be for any permit, a permit would not be allowed to be renewed; or issued in that case.

#### **TECHNICAL COMMITTEE REPORT**

CHAIRMAN CLARK: Okay, seeing no more questions, we'll move on to the Technical Committee Review of this proposal; and that will be taken by Jordy Zimmerman, thanks Jordy.

MR. ZIMMERMAN: The American Eel Technical Committee met via conference call on July 6. There were a couple of agenda items. The first thing we discussed, well we received an update on the Crassus, the nematode research from Zoemma Warshafsky; who is a grad student at VIMS, doing some very interesting work there.

The North Carolina DMF staff presented the initial North Carolina Aquaculture Plan; as Kirby differentiated, the initial plan and then the follow up to that to some of the TC concerns. I'm only going to comment on the initial plan; as that's all that has been discussed by the TC as a whole. There was a progress report on the stock assessment update given by Kristen.

Kristen also covered American eel aging project. We briefly discussed preliminary 2016 yellow eel landings; and also briefly discussed the North Carolina Senate Bill 410. For the purpose of today, most of our discussion centered around the Aquaculture Plan and that is primarily what this presentation will be regarding.

As Kirby stated, this is the third year reviewing the North Carolina aquaculture proposals. If you all recall, the initial year was approved by the Board too late to be applied for the eel farm to actually start fishing. The second year proceeded under that initial plan proposal that was approved. The TC had a few concerns with this year's proposal, some of which were alleviated through the follow up.

The removal of the monitoring requirements was a big issue for the TC, and Kirby laid that out in the table all the changes. There were some statements in the proposal on the justification and the minimal contribution of 200 pounds of glass eels in North Carolina to the coastwide stock. Some members of the TC thought this was a little bit misleading; without any information to say one way or the other if that was or was not the case.

The expansion of the fishing area from 11 small creeks to larger estuaries, there were a few statements made about the impact this could have on adult eel recruitment from removal of glass eels in those estuaries. Additional gear types, the Irish eel ramp mainly, we thought that was a little bit odd to include that in the proposal; because it's really not conducive that type of gear, to harvest in coastal waters.

In summary, the TC did not support the initial plan as laid out to us in that call. We did produce some recommendations. We felt that the Aquaculture Plan should be for one year only, especially with a lot of unknowns still kind of occurring. We thought once the eel farm comes onboard and starts having a little bit of

success, then maybe in future years there would be the potential to allow for multiple years; so this doesn't come before the Board every year.

It was requested by several TC members to remove the language, on the abundance statement for the reasons I mentioned earlier. It was somewhat misleading in the eyes of the TC. We also wanted to see the continuance of the requirement for net ID numbers, and reporting of the gear specifications.

That was simply from a standpoint of if we were going to eventually use this data for an index of glass eel recruitment in North Carolina, we would need to standardize that by gear, et cetera. The TC also felt that the fyke nets should be fished at least once every 24 hours. This would alleviate the potential unwanted mortality of the target species, glass eels and also any associated bycatch. North Carolina's TC representative stated that they had some issues this year with inclement weather; and that fact could make this requirement difficult for that reason. We also were pretty adamant about requiring the catch-per-unit-effort data collection. When we approved the initial plan, or when it went through TC review that was one of the bright spots we saw in it, from a scientific standpoint is that we would now have more data from the state of North Carolina on young-of-the-year recruitment.

It was also stated the TC fully recognizes that the 200 pounds was granted by the Board. We feel that the expansion of the area and the gear types, within reason, may be needed; especially in light of the results from this past year. As Kirby mentioned, there was a revised plan submitted on July 26, so just a week ago.

It included collection of CPUE data, the gear would continue to be marked with unique ID numbers, and the requested timeframe was reduced from three years to two years. We have not met again as a Technical Committee to

review this. There was one TC member that had responded via e-mail, and they were satisfied with the changes. With that I'll open it up to any questions.

CHAIRMAN CLARK: Thanks, J.Z. Are there any questions for the Technical Committee? Pat Keliher.

MR. KELIHER: In one of the sections you talked about the need for hauling and checking the nets within once every 24 hour period; you referenced bycatch. Do the fyke nets, are they required to have excluder panels to avoid bycatch?

MR. ZIMMERMAN: Not that I am aware of.

MR. KELIHER: It's part of Maine regulations to ensure that fyke nets have excluder panels to help avoid bycatch. It doesn't affect the catchability of the net, but it's going to keep a lot of unwanted species out; so it may be something that should be required.

CHAIRMAN CLARK: Any other questions for Jordy? Okay seeing none; we'll move on to the Law Enforcement Committee's report. What's that? Oh, I'm sorry, Dr. Duval.

DR. DUVAL: Just in reference to Pat's question. The nets do have excluder panels, so I just wanted to confirm that.

#### **LAW ENFORCEMENT COMMITTEE REPORT**

CHAIRMAN CLARK: All right, thank you. Now we'll move on to the Law Enforcement Committee report, Mark.

MR. MARK ROBSON: The Law Enforcement Committee was asked to review the initial plan, and we were updated on the revised plan during our teleconference call of July 25. On that call we also were able to have the input and expertise of North Carolina management; as well as additional law enforcement staff to

answer questions that the Law Enforcement Committee had.

After hearing the changes in the plan from previous iterations, there were some reservations expressed about the changes; particularly with regard to both the combination of well, because of the combination of adding additional, very extensive areas over narrow channel waterways, in addition to that the reduction in the amount of real-time reporting of netting activity and transportation activity. But because of the input from the staff from North Carolina, the members of the LEC really deferred to the expertise and the explanations of the North Carolina staff.

In this particular case they were going to be able to have the resources and particularly the enforcement staff on the waters, to be able to adequately monitor this program; and that they were comfortable that North Carolina has a very cooperative relationship with the facility, and is knowledgeable about the harvesters and their activities.

Nonetheless, and I also failed to mention we have provided you a written memo, trying to summarize the LEC comments; and that has been provided to you. You can refer to that for more details. Given those reservations, because of the confidence that North Carolina can manage this particular permit, they cautiously accepted that proposal with the revisions that Kirby provided to us on the day of our conference call.

I think the concerns and reservations would extend to the point where if this were to be a template, for example for a typical aquaculture program coastwide or in other states, and I think the Law Enforcement Committee would have much more serious concerns about the provisions; particularly where there is a need for more real-time reporting, and monitoring of netting activities for this permit.

That reservation and concern, again in no way reflects on North Carolina's abilities, or on the vendor the facilities abilities to conduct their activities adequately in this permit. But we have a number of states where any harvest of glass eels is illegal. There is a fairly good history, as we all know in the last few years, of substantial illegal activity in certain areas.

I think members were concerned that if this was to become a template for potential aquaculture operations in other states, that we would have to be much more careful about real-time monitoring of activity. In light of that and again I would refer you back to our memo. I've tried to capture the sense of the LEC that it really wasn't a consensus recommendation; other than an acceptance that North Carolina can deal with this permit adequately, with their resources.

CHAIRMAN CLARK: Are there any questions for Mark? Loren.

MR. LOREN W. LUSTIG: Sir, you just used the term adequately, and I appreciate that. Regarding the ways to extract pain for the people who are violating the law, we've spoken of two different things. One would be to simply pull their permits, so they're out of business the next year. Secondly, I would assume citations result in fines. Can you comment about the Law Enforcement Committee's expectation that the penalties are severe enough that it would cause an inclination to abide by the law in the future?

MR. ROBSON: We didn't discuss specifically the violations in North Carolina, and how those fines or penalties were imposed. Typically the Law Enforcement Committee would, I think, be very supportive. When you have a permit, permits are a very powerful enforcement tool; because you can provide very specific conditions and requirements in those permits, including provisions for strict enforcement of any violations, and the potential of losing that

permit with either one or more violations. I am afraid I can't answer your question directly. There were some questions asked about those violations that occurred; but again, it was felt that in part it reflected the ability of the North Carolina Law Enforcement staff to monitor activity and to make those cases, and that that would continue in the future.

CHAIRMAN CLARK: Do we have any other questions for Mark? Seeing none; at this point I would like to recognize Dr. Duval to state North Carolina's position on this proposal, and make a motion to proceed.

DR. DUVAL: **I provided Kirby with a draft motion, if I might, which would be to approve the revised North Carolina Aquaculture Plan as submitted on July 25, 2017.** If I could get a second, I would like to go ahead and provide some discussion to address some of the concerns that were brought up by the Technical Committee, and by the Law Enforcement Committee.

CHAIRMAN CLARK: Second by Jim Gilmore.

DR. DUVAL: First of all, I just want to thank both the Technical Committee and the Law Enforcement Committee for reviewing this plan. Once again it is the third go around, and I certainly appreciate their diligence and patience; and certainly understand the caution, given that this is the first Aquaculture Plan under Addendum IV that is being considered.

In regards to some of the Technical Committee concerns, with regard to the recommendation that this be potentially approved for only one, versus two or three years. Certainly, and I think the justification given the Technical Committee memo was that this would ensure that no one individual or operation would be harvesting the entire 200 pound quota.

I definitely appreciate that the TC is looking out for potential future applicants to ensure some

equity in distribution; but I would just note that I think that is more of a management concern, and more of a North Carolina concern. When I visited the facility and discussed that should there be future applicants with the American Eel Farm staff, you know they understood that decisions would need to be made on resource sharing, and acknowledged this.

I think the other thing I would note is, and I mentioned this earlier when a couple questions came up is that any permit that we issue by rule, has to be renewed on an annual basis. The permit that was issued for harvest this year only applied January through the end of April. A permit that would be issued for this plan would only be issued for January through May of 2018; and then would have to be reviewed and renewed for 2019, you know subject to the rules that we have on the books with regard to any convictions and future issuance of permits.

I just wanted to make sure the Board knew that. Then certainly understand the Technical Committee's concern about the request to remove the statement in regards to, I think it was the contribution, I guess. I would just note that the applicant did not want to remove that statement. It could be argued that the harvest of 200 pounds of glass eels is limited enough to have a minimal impact on a spawning stock of American eel.

I think that was in reference to the high natural mortality of this life stage. That is actually followed by a sentence that says natural mortality is thought to be very high during the early life stages, leptocephalus, glass eel and elver; due to the high fecundity of American eel. That is why the applicant elected to keep that statement in there. With regard to the Irish eel ramp, as Jordy noted, based on our staff's review of the areas where the applicant would like to set, there are no places within joint and coastal waters, which are the only waters where this activity would be allowed; that are suitable for an Irish eel ramp. My

understanding from the applicant is that they agreed they had not scouted for any locations for this gear; but felt that they wanted to be able to have the option to use the gear, should there be suitable locations.

I would just note that one of the conditions is that construction and siting of one of these Irish eel ramps would have to be approved prior to the ramp actually being put in the water. In terms of the requirement that fyke nets be fished every 24 hours, you know I certainly understand that there are concerns about mortality.

As I've noted, there are excluder panels in the throat of the nets. I don't know; my sense is that there are not requirements to fish nets once every 24 hours, in the jurisdictions where there are commercial glass eel fisheries. I understand South Carolina might be considering something like that in the future, and understand that that was meant to ensure that there would not be additional mortality of glass eels.

I guess I would just note that the applicant was only able to harvest a quarter pound of eels this year, with the efforts that went on. Given that the applicant is looking to set nets that are 3.5 hours away from the facility. You know we certainly have concerns regarding inclement weather that would not allow for harvesters to meet this requirement; just given the distance from the facility.

As Jordy noted, this was brought up during the Technical Committee call, and that inclement weather certainly was a challenge. I guess I would also note that it is in the applicant's best interest to ensure that once the run begins and harvest begins that they harvest any available glass eels as quickly as possible; and get all those eels back to the facility as quickly as possible, particularly since any glass eels that are harvested, if there is any mortality of those

eels once harvested, that counts against the 200 pound quota.

Once the run starts I doubt they'll be leaving the site until they've harvested all the eels that they can. Then in terms of providing data and information to calculate the catch-per-unit effort, we've explained the importance of this information. This information is important, not only for future information on glass eel abundance in North Carolina, but we also tried to explain the importance of this to the applicant; in terms of being able to locate sites that are productive.

Then just to address a few of the Law Enforcement Committee concerns. First of all I wanted to give a huge shout out to both Mark and Kirby for getting the Law Enforcement Committee together on such short notice. You know that was very much appreciated; and for the Law Enforcement Committee's thoughtful discussion, and for their deference to the acknowledgement of our enforcement staff's assessment of their ability to enforce the conditions of the Plan.

I think in terms of concerns, with regard to removal of oversight conditions. I think as with any new endeavor there is, whether it's research or otherwise, there is always something of a shakedown period in your initial season. After reviewing the implementation of this year's plan, you know we agreed with the applicant that some of these conditions were duplicative; requiring the applicant to provide description and registration of the boat, and description and registration and license plate of the vehicle, and the names of the individuals that would be involved daily, rather than once prior to the season, doesn't really provide marine patrol with any additional enforcement capability. If any of those items change, and they are not reported that's a permit violation.

Additionally, if Marine Patrol goes to a site and the license plate of the vehicle does not match

the information that was provided previously, then that is a permit violation. Additionally requiring the applicant to call in the total harvest of eels prior to leaving the last harvest site, and then also requiring the applicant to again report that information to the eel biologist the next day, I think is also duplicative.

You know the applicant is still required to call in daily with the landing site, the site from which they will be leaving and returning to. You know the total number of pieces of gears that would be used, and so failure to return to that site or to report a change in site is a permit violation. They are still required to provide GPS coordinates for all the gear, and any failure to report changes in the locations of that gear is a permit violation.

I guess in regards to the expansion of effort. You know the applicant is still bound by the 200 pound limit, with regard to harvest. Certainly the applicant encountered some challenges with equipment damage this year. Having the permit apply or allowing for up to three harvesters on the permit, also would allow them to continue to operate; even if one set of equipment was damaged.

Their boat and trailer was actually run into earlier this year, so they were unable to operate for some period of time. I think I've already noted, just in terms of the length of time that the gear is in the water and the changes, with regard to how the gear would be fished. I've addressed that earlier.

I guess I would just emphasize that our Marine Patrol staff has no concerns about their ability to meticulously enforce the permit conditions, as well as all existing rules that apply to the applicant. Their concern is really about individuals who are not permitted, and who might be engaged in illegal activities.

I think many of the requirements that we're placing on this applicant, are not necessarily

requirements for commercial harvesters of glass eels in other locations. I think we need to be very aware what is being asked of this applicant; versus the requirements of permitted harvesters in other states.

I think the other thing; you know I certainly appreciate the concern that this board, that the Technical Committee and the Law Enforcement Committee have expressed, and understandably so, given that this is the first proposal. My sense is that as Mr. Keliher mentioned, there is likely to be interested parties from other jurisdictions that may come forward.

I think we need to be really attentive to what is being required of this applicant and future applicants; and just take great care in ensuring that we're consistent in how we consider those proposals. I thank you, Mr. Chairman for your indulgence in allowing me to go on like this.

CHAIRMAN CLARK: Thank you, Dr. Duval. Before I open it up, could you just elaborate a little bit more? Addendum IV of course states that the state can objectively show the harvest will occur from a watershed that minimally contributes to the spawning stock of American eel. Of course this is not defined in the Addendum.

I'm sure by expanding the area where the farm can harvest their glass eels; they are going to be hitting a lot more watersheds. Is the position more that the 200 pounds is a minimal effect on eels in North Carolina, given the huge expanse that he is now going to be fishing from, or is he going to be limited in all those different watersheds to certain bodies or certain parts of the watershed?

DR. DUVAL: More the former, Mr. Chairman. Given the fact that 200 pounds is an overall limit, and given the fact that the glass eel population is a panmictic population that I don't believe there is information at this time



indicating that as eels migrate into fresh water, as the glass eels migrate into fresh water that there is any preference for any one location versus another up and down the coast.

CHAIRMAN CLARK: Further discussion on this matter? Jim Gilmore.

MR. GILMORE: Michelle, just in relation to the violations. I guess the concern that maybe I have, and some other people have is that when you're starting out a pilot program, you know we kind of sit down with applicants in similar things and explain to them how they have to be squeaky clean.

Seeing the number of violations maybe in the first year, now understanding growing pains, but still it raises a concern. I support this, however I think what would be helpful, maybe following along with Maine's two-strike rule is that if we could maybe after, it's a multi-year plan, so maybe after the first year sort of have an update on how well the applicant is doing in the second year. Maybe this was just growing pains, and not somebody who is not doing everything he needs to make sure he's not violating the permit.

CHAIRMAN LUISI: Dr. Duval.

DR. DUVAL: Jim, I think we would be happy to provide an update after seeing how things go in the 2018 season, similar to what was provided to the Technical Committee; in terms of how harvest went, how any violations are going. I will note that the applicant is not a commercial fisherman by training by any means. Certainly growing pains have played into this.

CHAIRMAN CLARK: Dan McKiernan.

MR. MCKIERNAN: I am going to channel my inner Tom Fote, and recall that four years ago, I recall the debate when we established this section of the management plan, and I recall Louis Daniel making a very impassioned plea

about glass eels and being eaten by bluegills, and there were some watersheds that clearly you could just clean them out and you weren't going to do any damage to the overall stock.

I am concerned that if this is the first one we're going to do successfully, but we're losing sort of the criteria of assessing that the watersheds are minimally contributing. The sense I got was that there was going to be a qualifying criteria saying, we're not going to take them from the productive watersheds. But you can take them from the unproductive watersheds; and I think we've lost that if this is how I understand it.

CHAIRMAN CLARK: Ritchie White.

MR. WHITE: I think North Carolina has done a great job getting their arms around this issue, and having it go smoothly as it can, so that they need to be applauded for that. I guess where they are permitting annually, and where this is new and changing for the Commission, and where there were violations last year. I guess I would like to see us go to one year, as opposed to two years. Other than that I certainly can support this. But I would like to see that change.

CHAIRMAN CLARK: Further comments. Would you like to amend the motion, Ritchie? I'm sorry, Eric.

MR. ERIC REID: That's okay, Mr. Chairman. I think we should go with the two-year timeframe, only because I think North Carolina has got a pretty good handle on it. Since they only issue their own permit for a year, the eel farm has got a lot at stake. I really don't want to have this conversation next year; and I think the state of North Carolina is more than capable of deciding whether or not it's going to be a year or two years. I think we should go for the two-year program.

CHAIRMAN CLARK: Further discussion. Jim Gilmore.

MR. GILMORE: Yes, I'm in favor of the two years also. Just let me clarify something. My suggestion to bring this up after the first year before the Board again, we would have the opportunity if it turns out they were having more violations; that we could reconsider the terms at that point, I'm assuming. Is that everybody's understanding?

CHAIRMAN CLARK: Pat Keliher.

MR. KELIHER: Just to echo Eric and Jim's comments. I think two years is adequate. I would think though a very quick check in after the first year would be advisable, not to the extent that we've just gone through here, and the last time that this was debated here at this Board. I also, I personally think the issues associated with the enforcement actions against this individual really become a state issue.

I understand that this is an issue associated with an experiment, if you will, associated with the harvest of 200 pounds of elvers. But after talking with Dr. Duval, it's obvious by the amount of enforcement activity associated with this individual that they're keeping a real close eye on him. I'm perfectly comfortable with North Carolina taking the appropriate action if we see continued violations.

CHAIRMAN CLARK: Ritchie.

MR. WHITE: I've been convinced from the other commissioners input that two years does work. But I would like to hear that Jim's comment is doable; that if there were issues that we do have the ability to reconsider if we issue a two-year.

CHAIRMAN CLARK: Kirby, do you want to address that? Could the Board reconsider this is a year if there were problems?

MR. ROOTES-MURDY: Yes. It poses a question in terms of the motion on the Board now. I

mean you're approving right now the plan as submitted, so the plan is submitted as for a two-year period. I'm not sure of how that would work next year, if the Board opted to decide to not allow it moving forward. But maybe Bob or Toni could provide clarity.

CHAIRMAN CLARK: Bob.

EXECUTIVE DIRECTOR ROBERT E. BEAL: The FMP is silent on that level of detail. I think if the discussion around the table is that this is a two-year approval, however there is going to be a quick review, as Pat Keliher put it, after the first year; and then the Board can decide to revoke this.

The Board would need to take action to revoke the second year. If the Board takes no action the second year occurs. If everyone around the table is comfortable with that approach and there is no objection to that approach, that is what the record will show, and I think that is in bounds and definitely within the purview of the Board.

CHAIRMAN CLARK: Dr. Duval, would you like to comment on that also?

DR. DUVAL: Yes, just one quick follow up that as I noted, permits are issued only for a year. This permit would only be issued effective January through May, the harvest period. By rule, if convictions occur that met the penalty schedule within our rules, then we would not be allowed to reissue a permit.

CHAIRMAN CLARK: Any further discussion? Seeing none; I'll read the motion into the record. **Move to approve the revised North Carolina Aquaculture Plan as submitted on July 25, 2017; motion by Dr. Duval, seconded by Mr. Gilmore. Is there any objection to this motion? Seeing no objections; the motion is approved by unanimous consent.**

**CONSIDER 2016 YELLOW EEL LANDINGS  
OVERAGE AND THE COASTWIDE CAP**

CHAIRMAN CLARK: That settles Agenda Item Number 4, now we're going to move on to Agenda Item 5, which Kirby is going to address the 2016 Yellow Eel Landings Overage and the Coastwide Cap. This is something that affects all our states.

MR ROOTES-MURDY: All right, so I'm going to walk through pretty much the memo that I sent to the Board, or included in the meeting materials, excuse me, laying out Addendum IV provisions; the Preliminary 2016 Yellow Eel Landings next steps, and I'll take any questions that Board members have. Addendum IV established a coastwide cap of 907,671 pounds coastwide. Based on average landings from 1998 to 2010, that is what the full coast is evaluated against.

The Addendum lay out that if that cap was exceeded, the accountability measure works in that there are two possible management triggers. If the coastwide cap is exceeded by more than 10 percent in a given year, so approximately 998,000 pounds, then state-by-state quotas will be triggered. The other management trigger would be if the coastwide cap is exceeded for two consecutive years, regardless of whether it's a pound or 700 pounds or 1,000 pounds then state-by-state quotas are implemented. Under the state-by-state quota system, the new coastwide quota would be 907,669 pounds, and the way it would work with state-by-state quotas is that if there was a state quota overage in a given year, the following year there would be a pound for pound payback. It should be also noted that under this provision in the addendum quota transfers are allowed; but they must be submitted to the Commission Executive Director and staff.

I've got up here on the board now what the state-by-state quotas would be; and these were

laid out in Addendum IV. They are included in the back part of the Addendum, and there are a number of columns next to it that lay out how those quotas were derived. I can try to answer those if people have questions, but as many of you probably remember, it was a number of averaging across years, and redistribution of quota; depending upon how states had performed during those periods.

In the memo that I included in meeting materials, I laid out what the coastwide total was; but I didn't include information on the state-by-state landings for 2016. On the screen now I have what the state-by-state landings are; and I just want to reiterate again that these are preliminary landings. What that means is that they're subject to change; they may go up, they may go down from here. But it is important to know that they're not going to likely stay these numbers.

ACCSP staff is here at the meeting today; and happy to answer further questions people have about the timing of when data will be available later this year. But generally speaking, this information is fluid until it's final. Later this year it will become final. In terms of next steps, as I said, 2016 landings will be finalized later this fall.

In terms of looking towards next year, we've got one year right now, based on preliminary data that indicates that we're at kind of 1A of a two-part management trigger. If 2017 landings, which would be reported out next spring, indicate that the coastwide cap has been exceeded again, whether by a pound or more.

Then state-by-state quotas would be implemented, or at least triggered by the Addendum IV provisions. It's important to know that determination of whether state-by-state quotas are to be implemented would be done at that time, so we would be waiting until some point in the spring for that determination;

it wouldn't be something we would know on January 1, of 2018.

Again, those numbers would still be preliminary. In terms of those numbers possibly changing, like we're in the situation right now, we might not know for sure whether the overage, depending on if there was one, the extent of it. We wouldn't know until the fall of 2018. With that I'll take any questions that folks have regarding preliminary data for 2016 and the Addendums provisions.

CHAIRMAN CLARK: Do we have any questions for Kirby on this issue? Rob O'Reilly.

MR. O'REILLY: Thank you, Kirby. Just a great reluctance on this preliminary data, I know in Virginia there have been some occasions. I think it's improved where we've had some double counting. I can see where depending on how narrow an overage would be, and the way you expressed it in the document, or the way it was expressed in the document and the way you expressed it was just one pound would do it. We're sitting here in August, and we don't have final data; but in May of 2018 we'll have preliminary data.

Do we have any idea as to what the process would be if we had some sort of lag built in to this; when we really had final data, and could then take the next step forward? That's a question I guess maybe you've thought about, but I'm kind of curious as to the answer, especially given all the states that don't have the ability to enact regulations quickly. That could be something that even in May that certainly would allow time there; but not if it's just preliminary data.

MR. ROOTES-MURDY: It's a good question, and definitely one that I have thought about, and struggled with. But basically this Board can decide if they want to deviate from the Addendum IV provisions, and try to build in some kind of delay in implementation of state-

by-state quotas. That is a possibility, but that would require Board action. I believe it would require an addendum.

CHAIRMAN CLARK: Pat and then Lynn.

MR. KELIHER: We're in this; I think Rob O'Reilly has kind of brought up the crux of this problem. We're trying to determine how or when this is all going to happen. The timing of the implementation of rules associated with implementation of possible state-by-state quotas. Under Other Business I was going to bring forward the issue of Maine's elver quota as well.

We've just completed the three-year-quota allocation for the state of Maine regarding glass eels. We would like to see a review of that. I am wondering, Mr. Chairman, if it may be a better option to formalize a subcommittee for eels to look at both yellow eel and glass eels; to make a recommendation to this Board at a future meeting on really what the best path forward would be, including deviation from this addendum and the beginning of a new addendum.

CHAIRMAN CLARK: I think that's an excellent idea, Pat. I think at this point though, why don't we save that for Other Business, because I agree with you that first of all we will have to address Maine's glass eel quota for 2018 under Other Business, because the Addendum only goes through 2017. The Addendum does state that the Board can approve Maine getting the same quota for 2018; but for any change in your quota, we would have to go to Addendum.

There is one impetus for a new addendum, and of course this yellow eel cap; which I will go out on a limb and say no state is looking forward to putting yellow eel quotas into place. I think we've got those to look at. As far as a possible action on this, I guess we were thinking in terms of, I know Lynn you had some ideas on that.

MS. LYNN FEGLEY: I completely agree with Mr. Keliher and the issues that we have with the timing of this harvest. If we're in May of 2018, and we are under the cap, what happens if five pounds come in July? Does that mean that we're going to have to go back and implement? The idea of implementing a state-by-state quota in the middle of a fishing season, not every state can do it and it causes chaos on the ground.

I had intended to make a motion to delay implementation until January 1, 2019; if we find ourselves over for 2017. But it sounds like there may be a more comprehensive way to look at this, and maybe look at what we can do through a subcommittee to deal with the state-by-state quota issues; so I'll defer until we get to that conversation.

CHAIRMAN CLARK: Roy.

MR. MILLER: I just wanted to note for the record that Delaware lacks the regulatory authority to impose a quota. If a quota becomes necessary, if the trigger is pulled, then that would require enabling legislation; and we all know that that can be an uncertain process.

CHAIRMAN CLARK: Roy, I need to correct you there. The legislation that brought us back into compliance actually the legislature left it up to themselves to determine how we would meet our eel quota, how that would be divvied up. That would be an interesting process, I agree, but it was addressed when we came back into compliance.

MR. MILLER: Thank you for that correction.

CHAIRMAN CLARK: I think at this time, oh Jim Gilmore.

MR. GILMORE: Yes, I just wanted to add to Pat's suggestion on that subcommittee or whatever. I think it would be also important to have a discussion about, we're going to be

doing transfers, if we go to that how that would all work; because it is a little unclear to me.

Again, if we get into the situation the other quota transfer places, we get to sort of, for lack of a better term, a derby to get to the state that has the most. I think some suggestions about having maybe the Commission mediate that might be a good idea. But anyway, just a little bit more discussion about how that would occur if we did get into the quota management would be helpful.

CHAIRMAN CLARK: It sounds like there is a lot of interest in the Board. Before Addendum IV, the Board put together a working group to develop Addendum IV, which was there to develop the glass eel, the yellow eel quotas, the aquaculture plans et cetera. Perhaps this would be the time for a motion for the Board to put together another working group. Okay, Toni, would you like to address?

MS. TONI KERNS: John, I don't think you need a motion to put together the working group. I think it's clear around the table that that is the interest of this Board. What we can do is have the working group first talk about if there are ways, possibly outside of an addendum process to address the immediate need of dealing with the quotas, if we do go over in 2017 to trigger the state-by-state quotas.

We can do that hopefully before the annual meeting. Then the second thing that working group would be charged to do, which we have promised we would do after the results of the assessment came back is to relook at the state-by-state quotas for yellow eel; as well as Kirby mentioning before, or maybe it was Pat or you that we are obligated to look at the Maine elver quota, because that runs out for next year. We will need to do that.

CHAIRMAN CLARK: Right, but that will require an addendum at that point.

MS. KERNS: We'll look into seeing what we are required to do for Maine.

CHAIRMAN CLARK: Well, it says in this Addendum that if we're to change the Maine glass eel quota, we need a new addendum. We would need to go to an addendum at that point.

MS. KERNS: Most likely.

CHAIRMAN CLARK: Lynn.

MS. FEGLEY: I just want to make sure that I'm clear on the process. Right now under Addendum IV, if we exceed in 2017, I think what the Addendum says is we go to automatic state-by-state quotas. I'm not sure what automatic means; if that means in the same year or if that could mean 2019.

If we need an addendum to change that and we put together a working group to develop a strategy, an addendum, and that working group comes back at the annual meeting. Can we finalize an addendum to get us out of state-by-state quota implementation in 2018 in time; if that makes sense?

MS. KERNS: Lynn, I think what we would do is explore all of our options; and what is the fastest way to get to a solution. I need to read up on the exact provisions of what types of emergency actions we could take; potentially if any of the inabilities of states to be able to respond fast enough, could be justified as an emergency action or not.

Also look at sort of how we went through and implemented the addendum, to see if for example, your idea of doing a motion to delay that until later is something that we could do within the rules of the charter and the plan. We just want to be able to look into what all of our options are, and then bring that back to the Board.

We could fast track an addendum where we would meet via conference call, to get something done so it would be done before the end of the year. It would probably mean limited public hearings. It would only be out for 30 days; that type of methodology to do the addendum. But we would just want to look at what all of our options are, and bring that back to the Board at the annual meeting.

CHAIRMAN CLARK: Toni, we don't need a motion; but at this point is it the Board's desire to reconstitute a working group on eels, to explore possibilities for addressing the coastwide cap, addressing the glass eel quota, addressing aquaculture, all these items? Is there any objection to doing so?

Seeing none; let's form another working group then to address these issues. As long as we're discussing these issues, Pat, would you like to make a motion about Maine's glass eel quota for 2018, under Addendum IV? Maine can request to have the same quota for 2018 as they had for these past three years.

MR. KELIHER: Mr. Chairman, I was prepared to do that; but based on Toni's comments and the potential for fast tracking an addendum in the future. I'm wondering if we shouldn't hold off on that motion until the annual meeting.

CHAIRMAN CLARK: That's fine. As long as that should still give Maine time to, well you would have the same quota in effect for 2018.

MR. KELIHER: Even with changes under the emergency authority bestowed on Maine by the Legislature of the state of Maine, I could implement.

**CONSIDER THE 2016 AMERICAN EEL FMP  
REVIEW AND STATE COMPLIANCE**

CHAIRMAN CLARK: Excellent, thanks, Pat. Do we have any further discussion of this coastwide cap and overage? Okay seeing none;

let's move on to Agenda Item 6, which is Consider the 2016 American Eel FMP Review and State Compliance, and Kirby will take that.

MR. ROOTES-MURDY: I'm going to go through status of the fishery commercial. As you are all aware there are recreational measures in place, but not much of a recreational fishery. The stock status state compliance for the FMP highlights any changes from 2014 to 2015; and go through the Plan Review Team's recommendations.

State reported landings of yellow and silver eels were 1,052,514 pounds in 2014 and 865,070 pounds in 2015; that amounts to an 18 percent decrease from 2014 to 2015. Maryland and Virginia account for 66 percent of that coastwide harvest. Landings of glass eel were reported for Maine and South Carolina.

In 2014 they were over 12,000 pounds. In 2015 they were down to 5,442 pounds. Regarding the recreational fishery, as of 2009 recreational data is no longer provided for American eel in the compliance reports. This is a result of the unreliable design of MRIP to focus on active fishing sites along the coast and estuarine areas; and the high associated proportion standard error associated with those estimates.

As you're all aware, we had a stock assessment completed in 2012. There is no change to that as of yet. The stock status remains depleted. We've in turn had two addenda that came out of that stock assessment; or in response to it, Addendum III and Addendum IV, and as you all are aware we will be getting an assessment update presented to the Board, and it will be completed later this fall.

Regarding the plans requirements, glass eel fishery regulations all states must implement a young-of-year survey and all states must maintain regulations. Those were set in place in 2000; and the maximum amount of pigmented eels is 25 per pound of glass eel, using a one-

eighth mesh to grade eels. Maine self-imposed an involuntary quota in 2014 of 11,479 pounds that was further adjusted through Addendum IV.

Regarding those measures that are in place, harvest of glass eels, as this Board is probably aware, took place in Florida in 2013 and 2014; and following that reporting out the Board exempted implementation of regulations until Florida demonstrated a fishery existed. In turn Florida in 2015 moved to close that loophole and eliminate glass eel harvest by implementing a 9-inch minimum size.

Regarding the yellow eel regulations for both commercial and recreational, it was an increase to a minimum size of 9 inches, and gear specifications were half inch by half inch mesh size for yellow eel pots, and an allowance of a four by four inch escape panel on the mesh. Recreational bag limit is 25 eels per bag, per day, per angler.

Crew and captains are allowed 50 fish possession limit. Regarding those; Connecticut implemented the escape panels as a component of those regulations, and that was done in October of 2015. Regarding silver eel regulations, there is a seasonal closure from September 1 through December 31. There is no take except for baited pots and traps and spears. There was a one-year exemption for the weirs fishery in Delaware River and its tributaries in New York. In terms of the PRTs review of those regulations, Florida does not prohibit pound nets from September 1 through December 31, but has no active fishery for silver eels over the last 10 to 15 years.

Other measures, there are requirement to have trip-level reporting by both harvester and dealers at least monthly. New Hampshire and New Jersey do not have dealer reporting for eels, but harvesters report some of the information on dealers. Delaware, Potomac

River Fisheries Commission, and Florida do not have dealer reporting for eels.

Then regarding de minimis request, the FMP stipulates that states may apply for de minimis for each of the life stages, if for the proceeding two years the average commercial landings constituted less than 1 percent of the coastwide commercial landings for that life stage. New Hampshire, Massachusetts, Pennsylvania, District of Columbia, South Carolina, Georgia all requested de minimis status for their yellow eel fishery.

All those states that applied for yellow eel meet the de minimis status requirement; in that they were less than 1 percent of the previous year's landings. South Carolina put in a request for de minimis status for their glass eel fishery, but does not meet that less than 1 percent of coastwide landings criterion.

Last, the Plan Review Team recommendations, the Plan Review Team considered state compliance and mentioned the following. They wanted to see more highlighted trends in the state compliance reports; and for states to provide estimates of harvest regarding those that are going to food and to bait.

Some states do it better than others; and also asked for states to provide more information regarding law enforcement agencies efforts to collect information on illegal or undocumented fisheries for eel in their states. Then for states to collect harvest data from those that are harvesting eels primarily for personal use.

The Plan Review Team recommends that the Board approve de minimis status requests for New Hampshire, Massachusetts, Pennsylvania, District of Columbia, South Carolina, and Georgia for their yellow eel fisheries. I'll take any questions if Commissioners have it.

CHAIRMAN CLARK: Are there any questions for Kirby on this? Rob O'Reilly.

MR. O'REILLY: Do you have a table of the state-specific landings and even relative to the looming quotas the state-specific quotas that may come to bear fruit soon?

MR. ROOTES-MURDY: Yes. You're asking about a comparison of state landings in 2015, relative to state potential quotas, or 2016 landings relative to potential state quotas?

MR. O'REILLY: Well both would be good, but the reason I brought it up, I want to make sure that folks aren't going to line up for transfers when we get to that system of quotas; because you have Maryland and Virginia at 56 percent of the total. It's been a long time since Virginia has had a fishery like that; and by the time there is a quota, which I've expressed a little concern before, instead of about 98,000 pounds by the third iteration of the Working Group, just bringing it up, we're down to 78,000 pounds. Virginia has been relatively small; you know maybe 9 percent or something like that.

With the 78,000 it will be about 8 percent, a little over 8 percent. It just might be good at some point, since there will be a Working Group. Unless the rules change a little bit, you know we should look forward to a quota at some time. When we do, I think everyone should kind of get an idea of where the fishery is on a state-specific basis.

CHAIRMAN CLARK: Dr. Duval.

DR. DUVAL: Just in regards to the FMP review; under Section 4, the Status of Research and Monitoring. There is a statement there that says that Pennsylvania, D.C., North Carolina and Georgia do not have young-of-the-year surveys; but instead have yellow eel surveys; and we do not have a yellow eel survey in North Carolina. We do have a young-of-the-year survey; it's the Beaufort Bridgenet Survey. I believe the Board approved the use of that as our young-of-the-



year survey back in 2009, so that is provided. I just wanted to make that correction.

CHAIRMAN CLARK: Are there any other questions? Seeing none; can we get a motion to approve the FMP review and state compliance reports? The motion is coming. Emerson Hasbrouck has seconded this motion. Is there any discussion of the motion? Cheri.

MS. PATTERSON: I believe I have to read it, in order to have it a clear motion. **Move to approve the 2016 Fishery Management Plan Review of the 2015 fishing year and approve de minimis requests for New Hampshire, Massachusetts, Pennsylvania, District of Columbia, and Georgia for yellow eel.**

CHAIRMAN CLARK: Dr. Rhodes.

DR. RHODES: **I believe South Carolina was in the yellow eel de minimis also.** Will you accept that addition?

MS. PATTERSON: Yes, I'll accept that addition. Thank you.

CHAIRMAN CLARK: Was South Carolina also in there for glass eel? Okay they didn't meet that. **The revised motion is Move to approve the 2016 FMP Review of the 2015 fishing year and approve de minimis requests for New Hampshire, Massachusetts, Pennsylvania, District of Columbia, South Carolina and Georgia for yellow eel. Are there any objections to this motion? Seeing none it is approved.**

#### **AMERICAN EEL PLAN REVIEW TEAM MEMBERSHIP**

CHAIRMAN CLARK: I just want to turn it over to Kirby about the Plan Review Team.

MR. ROOTES-MURDY: We've been moving through this Board so quickly this morning and well that I forgot to note that we have a pretty small Plan Review Team right now; which is

comprised of basically me and one or two other staffers. It would be great if the states could submit nominations, or at least somebody to take part in that Plan Review Team as well. You know reviewing these compliance reports annually is a little bit of a lift, so we would appreciate the states putting forward somebody; and that can just be done through e-mail, sending that to me afterwards would be great.

CHAIRMAN CLARK: I'm sure he will be flooded with volunteers. Do you have a question, Roy? Okay that should do it for that agenda item.

#### **OTHER BUSINESS**

CHAIRMAN CLARK: We have several other business items. Let me go back to Public Comment. Pat, is your aquaculture person here?

MR. KELIHER: No.

CHAIRMAN CLARK: Okay well, we can put that on hold. Let's see, what else did we have here? Oh, well I guess not all that much, really. We did have an interest from, I've been told the Minister of Canada's Department of Fisheries and Oceans or the Minister rather of the Canadian Department of Fisheries and Oceans would like to address the Eel Board at the annual meeting in Norfolk.

They are very interested in further cooperation on eel issues, and in particular Canada is moving ahead with some fairly large scale efforts in eel aquaculture; and I believe he would like to talk about that. A former member of this board, Mitch Feigenbaum is heavily involved in the Canadian aquaculture effort.

I guess that is more of just an information item there. Is the Board amendable to inviting the Canadian Minister of the Department of Fisheries and Oceans to our annual meeting; should he be able to make it? Seeing no

objections; I'll take that as a yes. Is there any other business to come before the Board? Roy.

MR. MILLER: Regarding an issue I brought up earlier with regard to Delaware's quota system. I would like to read directly from Chapter 18 of 7 Delaware Code. It says; any such quota management system required by the Atlantic States Marine Fishery Commission shall be implemented through legislative action. Thank you.

**ADJOURNMENT**

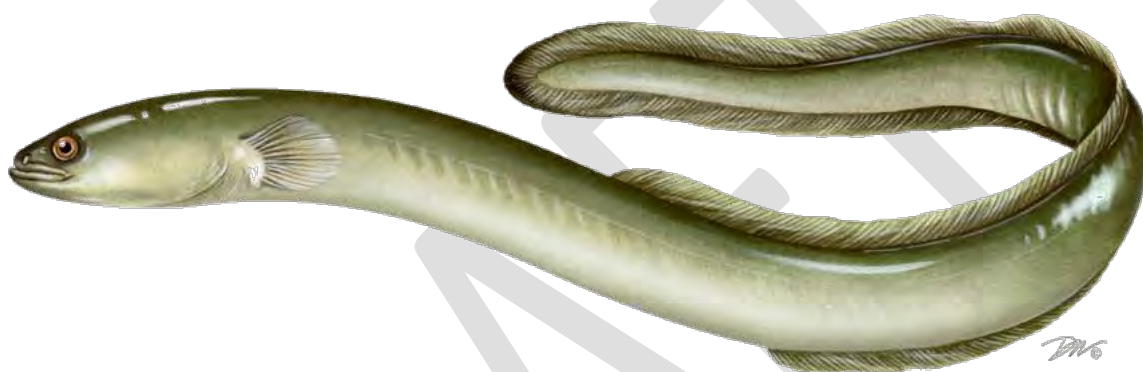
CHAIRMAN CLARK: I stand corrected then; anything else? Seeing no other items; we are adjourned.

(Whereupon, the meeting was adjourned at 10:54 o'clock a.m., August 2, 2017.)

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Atlantic States Marine Fisheries Commission

*American Eel Stock Assessment Update Report*



**October 2017**

**Draft for Peer Review**



**Vision: Sustainably Managing Atlantic Coastal Fisheries**

**Atlantic States Marine Fisheries Commission**

*2017 American Eel Stock Assessment Update*

Prepared by the  
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DRAFT

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## EXECUTIVE SUMMARY

The management unit for American eel under the jurisdiction of ASMFC includes that portion of the American eel population occurring in the territorial seas and inland waters along the Atlantic coast from Maine to Florida. The goal of the American Eel Fishery Management Plan (approved November 1999) is to conserve and protect the American eel resource to ensure ecological stability while providing for sustainable fisheries.

In the U.S., all life stages are subject to fishing pressure, and the degree of fishing varies. Glass eel fisheries are permitted in Maine and South Carolina. Yellow eel fisheries exist in all Atlantic Coast states with the exception of Pennsylvania. Eels are harvested for food, bait, and export markets.

During 1950 to 2016, Atlantic coast-wide U.S. American eel landings ranged between approximately 664,000 pounds in 1962 and 3.67 million pounds in 1979. The highest landings in the time series occurred from the mid-1970s to the early 1980s after which they declined. Since the 1990s, landings have been lower than historical landings but they have been stable in recent decades.

Very few fishery-independent surveys target American eels (with the exception of the state-mandated young-of-year surveys and a few surveys in Maryland). All fishery-independent surveys used in the 2012 benchmark stock assessment were updated for this report, with some noted exceptions, and most were standardized using a generalized linear model to account for changes in catchability of American eels. Regional indices were also developed for both YOY and yellow eel stages.

Trend analyses of abundance indices provided evidence of neutral or declining abundance of American eels in the U.S in recent decades. All three trend analysis methods (Mann-Kendall, Manly, and ARIMA) detected significant downward trends in some indices. The Mann-Kendall test detected a significant downward trend in 6 of the 22 YOY indices, 5 of the 15 yellow eel indices, 3 of the 9 regional trends, and the 30-year and 40-year yellow-phase abundance indices. The remaining surveys tested had no trend, except for two which had positive trends. The Manly meta-analysis showed a decline in at least one of the indices for both yellow and YOY life stages. For the ARIMA results, the probabilities of being less than the 25<sup>th</sup> percentile reference points in the terminal year for each of the surveys were similar to those in ASMFC 2012 and currently 3 of the 14 surveys in the analysis have a greater than 50% probability of being less than the 25<sup>th</sup> percentile reference point. Overall, the occurrence of some significant downward trends in surveys across the coast remains a cause for concern.

Reference points for determining the stock status of American eel in the U.S. in ASMFC 2012 were developed using the Depletion-Based Stock Reduction Analysis (DB-SRA) model which was not accepted for management use by the Peer Review Panel. The DB-SRA was not updated for this report because the Panel recommended it be further developed which was outside the guidelines of a stock assessment update. Therefore neither reference points nor stock status

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could be determined quantitatively by this stock assessment update. Compared to the 2012 benchmark stock assessment, the ARIMA had similar results and there were more significantly downward trends in indices as indicated by the Mann-Kendall test in this update. The trend analysis and stable low landings support the conclusion that the American eel population in the assessment range is similar to five years ago and remains depleted.

DRAFT

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## **1 INTRODUCTION**

The purpose of this assessment was to update the 2012 American eel (*Anguilla rostrata*) benchmark stock assessment (ASMFC 2012) with recent data from 2010-2016. No changes in structure were made to the index standardization or modeling approaches. The 2012 benchmark stock assessment and this stock assessment update for American eel was initiated by the Atlantic States Marine Fisheries Commission (ASMFC or Commission) American Eel Management Board, prepared by the ASMFC American Eel Stock Assessment Subcommittee (SAS), and reviewed and approved by the ASMFC American Eel Technical Committee (TC) as part of the interstate fisheries management process.

### **1.1 Fisheries Management**

The ASMFC American Eel Management Board first convened in November 1995 and finalized the Fishery Management Plan (FMP) for American Eel in November 1999 (ASMFC 2000a). The goal of the FMP is to conserve and protect the American eel resource to ensure ecological stability while providing for sustainable fisheries. The FMP requires all states and jurisdictions to implement an annual young-of-year (YOY) abundance survey to monitor annual recruitment of each year's cohort (ASMFC 2000a, 2000b). In addition, the FMP requires a minimum recreational size and possession limit and a state license for recreational fishermen to sell eels. The FMP requires that states and jurisdictions maintain existing or more conservative American eel commercial fishery regulations for all life stages, including minimum size limits. Each state is responsible for implementing management measures within its jurisdiction to ensure the sustainability of its American eel population.

In August 2005, the American Eel Management Board directed the American Eel Plan Development Team (PDT) to initiate an addendum to establish a mandatory catch and effort monitoring program for American eel. The Board approved Addendum I at the February 2006 Board meeting.

In January 2007, the Management Board initiated a draft addendum with the goal of increasing escapement of silver eels to the spawning grounds. In October 2008, the Management Board approved Addendum II, which placed increased emphasis on improving the upstream and downstream passage of American eel. The Management Board chose to delay action on management measures in order to incorporate the results of the 2012 stock assessment.

In August 2012, the Management Board initiated Draft Addendum III with the goal of reducing mortality on all life stages of American eel. The addendum was initiated in response to the findings of the 2012 Benchmark stock assessment, which declared American eel stock along the US East Coast as depleted. The Management Board approved Addendum III in August 2013.

Addendum III requires states to reduce the yellow eel recreational possession limit to 25 eel/person/day, with the option to allow an exception of 50 eel/person/day for party/charter employees for bait purposes. The recreational and commercial size limit increased to a minimum of 9". Eel pots are required to be constructed with a minimum of ½" by ½" mesh size. The glass eel fishery is required to implement a maximum tolerance of 25 pigmented eels per pound of glass eel catch. The silver eel fishery is prohibited in all states from September 1st to

December 31st from any gear type other than baited traps/pots or spears. The addendum also set minimum monitoring standards for states and required dealer and harvester reporting in the commercial fishery.

In October 2014, the Board approved Addendum IV. The addendum was also initiated in response to 2012 American Eel Benchmark Stock Assessment and the need to reduce mortality on all life stages. The Addendum established a coast-wide cap of 907,671 pounds of yellow eel, reduced Maine's glass eel quota to 9,688 pounds (2014 landings), and allowed for the continuation of New York's silver eel weir fishery in the Delaware River. For yellow eel fisheries, the coast-wide cap was implemented starting in the 2015 fishing year and established two management triggers: (1) if the cap is exceeded by more than 10% in a given year, or (2) the coast-wide quota is exceeded for two consecutive years regardless of the percent overage. If either one of the triggers are met then states would implement state-specific allocation based on average landings from 1998-2010 with allocation percentages derived from 2011-2013.

### **1.1.1 Management Unit Definition**

The American eel is a catadromous species in North America that historically occurred in all major rivers from Canada through Brazil. The management unit for American eels under the jurisdiction of ASMFC includes that portion of the American eel population occurring in the territorial seas and inland waters along the Atlantic coast from Maine to Florida.

#### **1.1.1.1 Commercial Fishery Management**

##### **1.1.1.1.1 Glass Eel / Elver Fishery**

Glass eel and elver harvest along the Atlantic Coast is prohibited in all states except Maine and South Carolina. In recent years, Maine was the only state reporting substantial glass eel or elver harvest. Maine implemented regulatory changes that increased elver and large eel license fees in 1996. In addition to generating revenue for enforcement and eel research, these changes set both a harvest season and closures during the harvest season. The amount of gear, type, and configuration was limited to control fishing effort. Additional measures included restrictions on allowable fishing areas, number of license holders, and a prohibition on fishing within 46 m of a dam (CAEMM 1996). South Carolina could not determine participation in the elver and glass eel fishery in coastal waters until a limited entry permit system was instituted in 1996 (B. McCord, South Carolina Department of Natural Resources, pers. comm.). Ten permits are available to both in-state and out-of-state residents. Permit holders abide by monthly effort controls and must report their harvest. There was interest in developing commercial glass eel fisheries in Connecticut, New Jersey, Virginia, and Florida. Connecticut regulations were minimal until 1996 when the state defined the glass eel as less than 10 cm in length, instituted a glass eel fishing season with a weekly closed period, limited traps, and required monthly catch reporting logbooks. Connecticut prohibited the take or attempted take of glass eels, elvers, and silver eels in 2002. The glass eel and elver fishery in New Jersey was unregulated prior to 1997 when a fishery season was allowed for dip nets only for that one year, followed by full closure in 1998. In Virginia, a six-inch minimum size was passed in 1977. Florida passed regulations in 1998 such that the eel fisheries operate under gear restrictions that prevent the landings of eels under six inches.

Prior to the implementation of the FMP, Maine was the only state compiling glass eel and elver fishery catch statistics. Under the FMP, all states are now required to submit fishery-dependent information. Given the high value, poaching of glass eels and elvers is known to be a serious problem in several states, but enforcement of the regulations is limited due to the nature of the fishery (very mobile, nighttime operation, high value for product, low administrative priority). Addendum IV (ASMFC 2014) to the FMP allows approved Aquaculture Plans from states and jurisdictions to harvest up to 200 pounds of glass eel annually from within their state waters for use in domestic aquaculture activities. The American Eel Farm (AEF) in North Carolina is the only facility to have applied and been approved for domestic aquaculture, which they have done annually since 2016. Fishing did not take place in 2016 due to permitting issues in North Carolina. In 2017, a total of 0.25 pounds of glass eels were harvested of the 200 pound quota. North Carolina Division of Marine Fisheries submitted an amended plan on behalf of AEF for 2018-2020 which was approved by the Board in August 2017.

#### **1.1.1.1.2 Yellow / Silver Eel**

The yellow American eel fishery in Maine occurs in both inland and tidal waters. Large eel fisheries in southern Maine are primarily coastal pot fisheries managed under a license requirement, minimum size limit, and gear and mesh size restrictions. New Hampshire has monitored its yellow eel fishery since 1980; effort reporting in the form of trap haul set-over days for pots or hours for other gears has been mandatory since 1990. Small-scale, commercial eel fisheries occur in Massachusetts and Rhode Island and are mainly conducted in coastal rivers and embayments with pots during May through November. Connecticut has a similar small-scale, seasonal pot fishery for yellow eels in the tidal portions of the Connecticut and Housatonic rivers (S. Gephard, Connecticut Department of Energy and Environmental Protection, pers. comm.). All New England states presently require commercial eel fishing licenses and maintain trip level reporting.

Licensed eel fishing in New York occurred primarily in Lake Ontario (prior to the 1982 closure), the Hudson River, the upper Delaware River (Blake 1982), and in the coastal marine district. A slot limit (greater than 6 inches and less than 14 inches to limit PCB exposure) exists for eels fished in the tidal Hudson River (from the Battery to Troy and all tributaries upstream to the first barrier), strictly for use as bait or for sale as bait only. Due to PCB contamination of the main stem, commercial fisheries have been closed on the freshwater portions of the Hudson River and its tributaries since 1976. The fishery in the New York portion of the Delaware River consists primarily of silver eels collected in a weir fishery. In 1995, New York approved a size limit in marine waters. New Jersey fishery regulations require a commercial license, a minimum mesh, and a minimum size limit. A minimum size limit was set in Delaware in 1995. Delaware mandated catch reporting in 1999 and more detailed effort reporting in 2007.

Maryland, Virginia, and Potomac River Fisheries Commission have primarily pot fisheries for American eels in Chesapeake Bay. Large eels are exported whereas small eels are used for bait in the crab trotline fishery. Catch reports were not required in Virginia prior to 1973 and Maryland did not require licenses until 1981. Effort reporting was not required in Maryland until 1990. The Potomac River Fisheries Commission has had harvester reporting since 1964, and has collected eel pot effort since 1988.

North Carolina has a small, primarily coastal pot fishery. A trip ticket system began in 1994 and a commercial logbook system began in 2007. The majority of landings come from the Albemarle Sound area and additional landings reported from the Pamlico Sound and “other areas.” No catch records are maintained for freshwater inland waters. Landings for “other areas” reported by the state come from southern waterbodies under the jurisdiction of NCDMF. South Carolina instituted a permitting system over ten years ago to document total eel gear and commercial harvest. Traps, pots, fyke nets, and dip nets are permitted in coastal waters. Fishing for eels in coastal waters is often conducted under the guise of fishing for crabs.

American eel fishing in Georgia was restricted to coastal waters prior to 1980 when inland fishing was permitted (Helfman et al. 1984). Catch, but not effort, data are available because no specific license is required to fish eels. The Florida pot fishery has a minimum mesh size requirement in the fishery and it is operated under a permit system.

Current commercial fisheries regulations can be found in Table 1.

#### **1.1.1.2 Recreational Fishery**

Few recreational anglers directly target American eels and most landings are incidental when anglers are fishing for other species. Eels are often purchased by recreational fishermen for use as bait for larger sport fish such as striped bass, and some recreational fishermen may catch their own eels to use as bait. Current recreational management regulations can be found in Table 2.

### **1.2 Stock Assessment History**

In 2005, a stock assessment for American eel was conducted by the ASMFC and reviewed by a panel of independent experts (ASMFC 2005). The peer review panel recognized sufficient shortcomings with the assessment to warrant additional action prior to its use for future technical and management purposes (ASMFC 2006a). The 2005 stock assessment was not accepted by the Board; therefore, the stock status of American eel was deemed unknown by the ASMFC.

At the February 22, 2006 meeting of the ASMFC American Eel Management Board, the American Eel Stock Assessment Subcommittee and Technical Committee were tasked with reviewing the recommendations from the peer review advisory report and recommending a follow-up plan. Subsequently, a report was issued in October of 2006 containing updated datasets and the short-term analyses suggested by the review panel (ASMFC 2006b).

The 2012 benchmark stock assessment represented the most recent work performed by the ASMFC to ascertain stock status since 2006. Analyses and results indicated that the American eel stock had declined and that there were significant downward trends in multiple surveys across the coast. It was determined that the stock was depleted but no overfishing determination could be made based on the analyses performed. This report is an update to the 2012 benchmark stock assessment report.

### **1.3 Petitions for ESA Listing**

In response to the extreme declines in American eel abundance in the Saint Lawrence River-Lake Ontario portion of the species' range (personal comm., Dr. John Casselman, DFO), the ASMFC requested that the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) conduct a status review of American eels in 2004. The ASMFC also requested an evaluation of a Distinct Population Segment (DPS) listing under the Endangered Species Act (ESA) for the Saint Lawrence River/Lake Ontario and Lake Champlain/Richelieu River portion of the species range, as well as an evaluation of the entire Atlantic coast American eel population. A preliminary status review conducted by USFWS determined that American eel was not likely to meet the requirements of DPS determinations. However, the USFWS initiated a coast-wide status review of the American eel in coordination with the NMFS and ASMFC. At this same time, two private citizens submitted a petition to the USFWS and NMFS to list American eel under the ESA.

In February 2007, the USFWS announced the completion of a Status Review for American eel (50 CFR Part 17; USFWS 2007). The report concluded that protecting eels as an endangered or threatened species was not warranted. The USFWS did note that while the species' overall population was not in danger of extinction or likely to become so in the foreseeable future, the eel population has "been extirpated from some portions of its historical freshwater habitat over the last 100 years... [and the species abundance has declined] likely as a result of harvest or turbine mortality, or a combination of factors".

In 2010, the Center for Environmental Science Accuracy and Reliability filed a petition to the USFWS to consider listing the American eel on the endangered species list. The proposal was based on new information that had become available since the last status review. In September 2011, the USFWS published a positive 90-Day Finding, which stated that the petition contained enough information to warrant conducting a status review (USFWS 2011).

In 2015, USFWS announced that the American eel population is stable and protection under ESA was not warranted although the agency did recommend continuing efforts to maintain healthy habitats, monitor harvest levels, and improve river passage (USFWS 2015). Conversely, the International Union for the Conservation of Nature (IUCN) listed American eel as "Endangered" on the Red List in 2014 (Jacoby et al. 2014). While this has no legal implications, it is an important metric and the Commission remains committed to closely monitoring this species and making management adjustments as necessary.

## **2 LIFE HISTORY**

American eels are found from the southern tip of Greenland, Labrador and the northern Gulf of St. Lawrence in the north, south along the Atlantic and Gulf coasts of North America and eastern Central America to the northeast coast of South America, and into the inland areas of the Mississippi and Great Lakes drainages (Tesch 1977). The American eel is regarded as a single, panmictic breeding population. American eels are found in a variety of habitats throughout their life cycle, including the open ocean, large coastal tributaries, small freshwater streams, and lakes and ponds. They are opportunistic feeders that will eat, depending on their life stage, phytoplankton, zooplankton, insects, crustaceans, and fish. Individuals grow in

freshwater or estuarine environments for anywhere from 3 to 30 or more years before maturing and returning to the ocean as adults to spawn and die.

American eels are confronted with many environmental and human-induced stressors which affect all life stages and may reduce survival. Since all anthropogenic eel mortality is pre-spawning, reproduction can be reduced by these cumulative pressures. Commercial harvest occurs at all American eel life stages (glass, elver, yellow, and silver). Blockages and obstructions that limit upstream migration of American eels have reduced habitat availability and limited the range of the species. Dams may also limit or delay downstream movements of spawning adults. Additionally, downstream mortality may be caused by hydroelectric facilities by impingement or turbine passage. Freshwater habitat degradation resulting in reduced food productivity increases mortality of the freshwater life stages. Predation by fish, birds, and mammals can impact eel populations during all life stages. The non-native swim bladder parasite, *Anguillicoloides crassus*, can decrease swimming ability and reduce the silver eel's ability to reach the spawning grounds. Contaminants also may reduce the reproductive success of American eels because they have a high contaminant bioaccumulation rate (Couillard et al. 1997). Oceanographic changes influencing larval drift and migration may reduce year-class success. American eel, as a panmictic species, could be particularly vulnerable to drastic oceanic variations. An understanding of the requirements of the American eel's different life stages is needed to protect and manage this species.

The following sections have been condensed and also updated with new research since the 2012 benchmark assessment report. Refer to ASMFC 2012 for more a more detailed discussion of life history.

## **2.1 Stock Definitions**

The American eel is a panmictic species, with a single spawning stock that reproduces in the Sargasso Sea. Eel larvae (leptocephali) are broadly dispersed by ocean currents along the Atlantic coasts of northern South, Central, and North America. Genetic research indicates that there is no reproductive isolation of American eels migrating from the Atlantic Coast. Further, any genetic differentiation is a result of natural selection upon a particular cohort within a geographic area rather than actual genetic differences within the species (Awise et al. 1986; Wirth and Bernatchez 2003; Cote et al. 2009).

## **2.2 Migration Patterns**

American eels may travel thousands of miles in their lifetime. They are a catadromous fish that spawn in the Sargasso Sea, and the larvae drift on ocean currents until they reach the eastern seaboard of North America. Young eels (glass or elver stage) actively swim upstream to reach estuarine and freshwater habitats, sometimes hundreds of miles upriver. The young eels spend between 3 and 30 or more years in estuarine or freshwater habitats before maturing and migrating back downstream and to the Sargasso Sea to spawn. Since the 2012 assessment, a study on chemical cues was published indicating that diluted odors emitted by glass eels were detected by other glass eels in a laboratory setting and suggested coordinated inland migration (Schmucker et al. 2016). This was expanded by Galbraith et al. (2017) to suggest that cues may

be life-stage specific so that one year class of glass eels moving inland may be responding to cues from the previous year class as guidance.

## **2.3 Life Cycle**

American eels undergo six distinct life stages. The life cycle begins when the eggs hatch and leptocephali (larvae) are carried by ocean currents from the spawning grounds in the Sargasso Sea. The prevailing currents along coastal areas disperse the leptocephali, which metamorphose into glass eels on the continental shelf. Glass eels move toward inland areas and become pigmented elvers before or during their entry into coastal estuaries. Elvers and yellow eels settle in habitats ranging from estuaries to far upstream freshwater reaches. Eels reach the silver stage at maturity and return to the Sargasso Sea, where they spawn and die.

## **2.4 Life History Characteristics**

### **2.4.1 Age**

The age of American eels can be determined by taking transverse sections of the sagittal otoliths. Two otolith processing techniques (embedding and sectioning or grinding and polishing) are accepted ageing methods by the ASMFC (ASMFC 2001). American eel otolith ageing methods have been described by Liew (1974), Chisnall and Kalish (1993), and Oliveira (1997). Since the 2012 benchmark stock assessment, the ASMFC organized an American eel otolith sample exchange. This project determined that laboratories and state agencies that age American eel along the Atlantic coast were using different processing and reading methods that resulted in a high degree of imprecision and bias across laboratories and readers (ASMFC 2017). Because of these results, the ASMFC will hold an ageing workshop for American eel in January 2018 to standardize sample preparation and reading protocols for agers.

### **2.4.2 Growth**

Slower growth occurs in more northern portions of the American eel's distribution compared to the south (Helfman et al. 1984; Richkus and Whalen 1999; Jessop 2010). Male maximum size is the same throughout their distribution (Jessop 2010) However, female eels reach a larger maximum size in the northern portion of their range compared to the south (Jessop 2010). Eel growth is related to seasons, with most growth occurring during spring through fall and very little growth in the winter (Helfman et al. 1984). The shorter growing seasons in the higher latitudes may explain why eels experience slower growth in the northern portions of their range. Growth rates are highly variable among fish within the same watershed and of the same sex thus total length is not an accurate predictor of age.

### **2.4.3 Reproduction**

The sex of American eels can be determined by gross morphological examination (Vladykov 1967; Krueger and Oliveira 1997). Differentiation between sexes occurs in the yellow eel stage of American eels and maturity-at-length varies by sex and latitude (Dolan and Power 1977; Oliveira and McCleave 2000; Goodwin and Angermeier 2003; Morrison and Secor 2003; Tremblay 2009). Sex ratios by location are also variable with males found more commonly in



downriver sites and females more common in upriver sites (Facey and Helfman 1985; Helfman et al. 1983; Krueger and Oliveira 1999; Oliveira and McCleave 2000; Goodwin and Angermeier 2003; Davey and Jellyman 2005) and Oliveira and McCleave (2000) found that yellow eels >400 mm and silver eels >425 mm were exclusively female. Sex-linked migration patterns are another possible explanation for why male American eels are typically found in coastal habitats while females tend to be found in more upstream areas (Jessop 2010). Females are found in habitats that are less densely populated with eels so sex may not be a function of density dependence but rather that female eels migrate further upstream than males (Jessop 2010). Fecundity estimates are higher in the northern portion of the eel's range because of the larger sizes of migrating female eels from northern areas (Barbin and McCleave 1998). American eels are thought to spawn in the Sargasso Sea during late winter through spring, but spawning has never been observed. It is also unknown if they have paired or group spawning. Because no spent eel has ever been documented, it is assumed that American eels are semelparous.

#### **2.4.4 Food Habits**

American eel diet varies greatly depending on life stage and habitat. American eel leptocephali and glass eel feeding habits have not been reported. However, the dentition and gape of the mouth suggest that they are capable of feeding on individual zooplankton and phytoplankton. Prey size increases as eels grow, with elvers and small yellow eels consuming mostly benthic macroinvertebrates and larger yellow eels switching primarily to crayfish and fish. Silver eels are thought not to eat during their migration to the Sargasso Sea.

#### **2.4.5 Natural Mortality**

Very little is known about the natural mortality of American eels. Since eels are highly fecund (Wenner and Musick 1974; Barbin et al. 1998; Tremblay 2009), natural mortality is likely very high, particularly during the early life stages. Eel survival is likely impacted by changes in oceanographic conditions, predation, and the spread of the non-native swim bladder nematode *Anguillicoloides crassus*. ASMFC 2012 describes each of these threats to the American eel in detail, with recent studies adding information regarding *A. crassus*. Waldt et al. (2013) found that nearly 50% of American eels in a Hudson River tributary in New York were infected during the fall of 2009. Zimmerman and Welsh (2012) confirmed the presence of *A. crassus* in the upper Potomac River watershed and found that length-at-age was lower in previously infected American eels than those uninfected, potentially reducing reproductive capabilities. Hein et al. (2014) reevaluated *A. crassus* infection in South Carolina where the American eel population has been declining since 2001 and the infection was first reported nearly 20 years ago. That study found that parasite prevalence was higher in South Carolina than in New York and Chesapeake Bay and possibly has been increasing over time. Additionally, the authors suggest that milder winters due to climate change could increase infection.

#### **2.4.6 Incidental Mortality**

Incidental mortality, caused by anthropogenic activities other than harvest, can be attributed to habitat alterations and restrictions as well as mechanical and chemical injuries. Inland habitat alterations and restrictions come primarily in the form of barriers to upstream migration for American eels. These can either be physical (dams) or chemical (areas of poor water quality)

factors that limit habitat use by eels. This compression of range through habitat restrictions may increase the level of predation mortality or contribute to density dependent effects on growth or reproductive success. The location and number of dams may restrict eel distribution by limiting upstream movements (Levesque and Whitworth 1987; Goodwin and Angermeier 2003; Verreault et al. 2004; Machut et al. 2007; Hitt et al. 2012) and could impact the total number, size distribution, and number of eggs produced from a river system (Sweka et al. 2014).

### **3 HABITAT DESCRIPTION**

#### **3.1 Brief Overview**

*Section 3 provides a short description of American eel habitat use. A detailed review of American eel habitat requirements can be found in the Atlantic Coast Diadromous Fish Habitat document (Greene et al. 2009). Habitat descriptions by life history stage can be found in Section 3 of ASMFC 2012.*

American eels exhibit a highly complex catadromous life cycle and are found in marine, brackish, and freshwater habitats (Adams and Hankinson 1928; Facey and LaBar 1981; Facey and Van Den Avyle 1987; Helfman et al. 1984). Habitat types used by different phases of eels include open ocean, estuaries, rivers, streams, lakes (including land-locked lakes), and ponds (Facey and Van Den Avyle 1987).

American eel habitat associations and requirements vary by life stage. After hatching in winter and spring in the Sargasso Sea, larval American eels passively migrate to the continental shelf along the east coast of North America where they metamorphose into glass eels (Greene et al. 2009). After developing pigment (becoming elvers), some eels start migrating upstream into freshwater while others remain in coastal rivers and estuaries. Upstream migration may continue throughout the yellow phase as well. During maturation, silver eels migrate downstream to the ocean and return to the Sargasso Sea to spawn before dying (Haro and Krueger 1991).

### **4 FISHERY DESCRIPTION**

The American eel fishery has a long history in the U.S., and a description of the current and documented historical fisheries can be found in ASMFC 2012. A summary follows and includes any new or updated information.

#### **4.1 Commercial Fisheries**

##### **4.1.1 Glass Eel Fishery**

Glass eel fisheries along the Atlantic coast are prohibited in all states except Maine and South Carolina. Over the last seven years, there has been an increase in the demand for glass eel due to concerns over population levels of European and Japanese eels, as well as tighter restrictions on the export of European eel. Harvest, by dip net or fyke net, has increased as the average market price has risen to over \$1,000 per pound with peaks exceeding \$2,000 per pound. The

highest value reported in Maine in the last five years was \$40.38 million in 2012 for 21,611 pounds (\$1,868 per pound). Since the implementation of Addendum IV (ASMFC 2014), Maine's glass eel quota has been set at 9,688 pounds (a 17.5% reduction from the 2014 quota). In 2017, preliminary landings indicate 9,282 pounds of glass eels were sold for a value of \$12.08 million (\$1,301 per pound).

#### **4.1.2 Yellow Eel Fishery**

Historically and currently, the majority of commercial landings come from the yellow eel fishery. Accounts of eel harvest date back to colonial times, with some commercial fishery harvest records available beginning in the late 1880s, but consistent record keeping began in 1950. After an initial decline in the 1950s, commercial yellow eel landings increased to a peak of 3.67 million pounds in 1979, declined again in the 2000s, and have exceeded one million pounds three times since 2004. Addendum IV (2014) implemented a coast-wide cap of 907,671 pounds and two management triggers: (1) the coast-wide cap is exceeded by more than 10% in a given year and (2) the coast-wide cap is exceeded for two consecutive years, regardless of the percent over. If triggered, there is an automatic implementation of state-by-state quota as laid out in Addendum IV. In 2016, U.S. Atlantic coast preliminary yellow eel landings totaled 928,358 pounds which is above the cap although these landings are not final. Management triggers will be evaluated once landings are final. Eel pots are the typical gear used in the commercial yellow eel fishery; however, weirs, fyke nets, and other fishing methods are also employed. Although yellow eel were harvested for food historically, today's fishery sells yellow eel primarily as bait for recreational fisheries.

#### **4.1.3 Silver Eel Fishery**

Since the approval of Addendum IV (2014), silver eel fisheries are only permitted on a limited basis in the Delaware River (NY). The Delaware River eel weir fishery is restricted to nine annual permits which were initially limited to those who fished and reported landings from 2010 to 2013.

#### **4.1.4 Bait Fishery**

The use of harvested American eels for bait in other fisheries is not well-described, although it does not appear to have been common before the 20th century nor had the relative importance of food markets. Eel harvesting in the South Atlantic Bight prior to the 1970s was focused primarily on harvesting eels for live bait in sport fisheries and secondarily as bait for blue crab pots (Van Den Avyle 1984). Harvesting eels for crab trotline bait was important in the Maryland eel fishery in the 20th century (Foster and Brody 1982). The proportion of the eel harvest sold for bait declined with the advent of the overseas food market in the 1960s, and this disposition declined further as the increased use of crab pots reduced the need for baited trotlines (Lane 1978).

A more recent development in the marketing of U. S. caught American eels is the use of eels as bait in recreational striped bass, cobia, and catfish fisheries. Several references that summarize U.S. eel fisheries prior to the 1990s (Fahay 1978; Lane 1978; Van Den Avyle 1984) do not mention this harvest disposition, and more recent references mention the practice with no

details (Haro et al. 2000; Collette and Klein-MacPhee 2002). It is likely that the practice of rigging eels for striped bass angling originated early in the 20th century but did not become widespread until recently. Presently, the use of eels as striped bass bait is probably the dominant use of harvested eels in New England and comprises a larger proportion of the Chesapeake Bay eel fishery than any time previous. U.S. eel fishery data does not have the resolution to separate striped bass bait from other dispositions. Commercial eel fishery reporting since the implementation of the ASMFC eel management plan in 2001 has improved and could provide information on this recent development.

#### **4.1.5 Exports**

The weight and value of U.S. domestic exports of American eels from selected districts along the Atlantic coast for 1981–2016 were provided by the NMFS (1981–1988; Fisheries Statistics Division, Silver Spring, MD, pers. comm.) and the United States International Trade Commission (USITC) DataWeb (1989–2016; pers. comm.). Export values were converted to 2016 dollar values using conversion factors based on the annual average consumer price index (CPI) values, which were obtained from the U.S. Bureau of Labor Statistics (pers. comm.).

Prior to 1989, exports were classified as either fresh/frozen or live. Since 1989, the fresh/frozen group has been separated into two categories—fresh (or fresh or chilled) and frozen. Live export weight data for American eels were not available for the 1989–1992 time period, likely due to differences in reporting requirements during those years (A. Lowther, NOAA Fisheries, pers. comm.; M. Savage, USITC, pers. comm.).

Domestic exports of American eels from the Atlantic coast ranged from 229,000 to over 6.1 million pounds per year from 1981 through 2016 (Figure 1). Live eels comprised the majority (>50%) of exports in 1983–1988, 1993, 1999, and 2003–2005. From 2006–2011, exports of fresh and frozen eels accounted for an average of 75% of the total eel exports per year. The reason that the magnitude of domestic exports exceeds commercial landings in some years may be that export landings records include significant quantities of hagfish misreported as American eel. Since 2011, there have been no fresh or frozen American eel exports and 100% of the exports came from live American eel.

The value of American eel exports ranged from \$2.0 to \$39.6 million per year over the time series (Figure 1). Export values decreased during the earliest years in the time series and then generally increased to the peak observed in 1997. The value of exports substantially dropped following the 1997 peak but has shown a generally increasing trend through 2011 after which there were no fresh or frozen American eels exported.

The value per pound of exported American eels classified as live was above the value per pound of fresh and frozen eels (combined) throughout the time series (Figure 2). The value per pound of fresh and frozen eels ranged from \$0.81 to \$5.47 per pound per year from 1981 to 2016. The value per pound of fresh and frozen eels has exhibited a general decline over the time series except for one peak in 2003. The value per pound of live exports has varied over the available time series, ranging from \$2.78 to \$73.41 per pound per year.

## **4.2 Commercial Catch-Per-Unit-Effort**

Fishery-dependent catch-per-unit-effort (CPUE) was available in some states, but following a review of these data by the SAS they were not considered indicative of trends in the stock as a whole and therefore were not updated for this stock assessment report. Note that fishery-dependent CPUE is almost exclusively composed of positive trips only; trip reports with zero eels caught are rare because most agencies do not require reports of zero catches. Furthermore, differences in baiting practices and bait preference vary geographically and that can confound the accuracy of commercial CPUE.

## **4.3 Recreational Fisheries**

Studies and reports that summarize U.S. eel fisheries provide little information on targeted recreational eel fisheries (Bigelow and Schroeder 1953; Fahay 1978; Lane 1978; and Van Den Avyle 1984). The practice of spearing or gigging eels buried in the mud during winter is an eel fishing method that was developed for subsistence fishing but came to have both commercial and sportfishing appeal in the 19th century until recently. Eels are encountered over much of their U.S. range by recreational anglers as bycatch. Van Den Avyle (1984) reported that no major sport fishery for American eels occurred in coastal rivers of the South Atlantic Bight, but incidental catches were made by anglers in estuaries and rivers. Despite the incidental nature of eel hook-and-line catches, the Marine Recreational Information Program (MRIP) does encounter enough observations to generate catch estimates that indicate widespread and common presence as a bycatch species. Starting with 1981 estimates, the MRIP survey for all major eastern U.S. regions show higher catch estimates in the 1980s than in the 2000s on average.

There is also a subsistence component to the American eel fishery. The harvest of American eels as a food source for subsistence has been portrayed as having importance for Native Americans and European settlers in North America with declining importance after the 19th century. Most accounts are anecdotal and entail brief references in popular literature. It is likely that changes in eel abundance and demand have diminished this practice in the 20th century resulting in declining cultural importance of eels in coastal communities.

## **4.4 Gulf of Mexico**

A small portion of U.S. landings are attributed to the Gulf of Mexico. Landings records in this region were historically collected by the NMFS but have been administered by the Gulf States Marine Fisheries Commission since 1985 (D. Bellais, GSMFC, pers. comm.). Between 1950 and 1999, landings in the Gulf of Mexico ranged between approximately 200 pounds in 1994 and 28,000 pounds in 1985 (Figure 3). Landings reported since 1999 have been negligible and are thus confidential (R. Maxwell, LA DWF, pers. comm.). Fahay (1978) reported total U.S. landings of American eels during 1955–1973 with minor landings registered from the U.S. Gulf of Mexico region during about half of those years but never exceeded 1% of total U.S. landings. Note that the Gulf States (including western Florida) are under the jurisdiction of the Gulf States Marine Fisheries Commission and are not subject to ASMFC-led interstate fisheries management.

#### **4.5 Fisheries Outside the United States**

Because of the panmictic status of American eel, fisheries outside the jurisdiction of the United States are relevant to ASMFC management efforts, although they are not subject to management regulations implemented through the ASMFC. Brief descriptions of Canadian eel fisheries and fisheries at locations south of the United States are provided below for perspective on activity at the northern and southern ends of American eel's range. Information on commercial eel landings in Canada and other western Atlantic countries was obtained from the Department of Fisheries and Oceans (DFO) Canada (DFO, pers. comm.) and the Fisheries Department of the Food and Agriculture Organization (FAO) of the United Nations (FAO, pers. comm.), respectively.

##### **4.5.1 Commercial Fisheries in Canada**

For a description of American eel fisheries in Canada, refer to ASMFC 2012.

Fisheries and Oceans Canada, or the DFO, Statistical Services Unit maintains fisheries data for Canada. These data were available for 1972–present. Data from Canada's marine and freshwater commercial fisheries are available via online tables that are summarized by species, province, and region (e.g., Scotia-Fundy vs. Gulf). Trends in seafisheries records from 1972 to 2015 indicate a steady decline in commercial eel landings since the early 1990s, with the exception of 2012–2013 (Figure 4). Available freshwater fisheries records cover a shorter time span (1990–2015) during which time there has been a steady decline since 2000, with the exception of 2013–2014 (Figure 5). However, freshwater landings records may be less reliable than seafisheries records and it is unclear whether overlap in reporting between freshwater fisheries and seafisheries occurs.

##### **4.5.2 Commercial Fisheries in Central and South America**

Studies and reports that summarize U.S. American eel fisheries provide no information on commercial eel fisheries in Mexico or the Caribbean Islands other than mentioning that the American eel's range does extend to these regions (Bigelow and Schroeder 1953; Fahay 1978; Lane 1978; and Van Den Avyle 1984). Annual landings between 1950 and 2015 are available by country and major fishing area from the Food and Agriculture Organization (FAO) of the United Nations Fishery Global Statistics Program of the Fisheries Data, Information, and Statistics Unit (FIDI) via online tables. Mexico, the Dominican Republic, and Cuba reported a small amount of landings (primarily from in-river fisheries) from 1975–2010, although there are several missing values or years of no landings (Figure 6). There was an increase in landings, or reported landings, for 2011–2012 from Mexico and the Dominican Republic. From 2013–2015, landings remained high for the Dominican Republic but not Mexico. It is unknown whether these reports are comprehensive.

## **5 DATA SOURCES**

For this assessment update report, the SAS updated the commercial and recreational landings through 2016. Fishery independent survey data that was used in the trend analyses in ASMFC 2012 was also updated, including state-mandated YOY surveys, non-mandated YOY surveys, yellow eel surveys, and biological data sets used in the growth analysis. Efforts were made to

maintain consistency with the benchmark in terms of the data sources and treatment, but this was not always possible. Differences between the benchmark and this update are noted as appropriate.

## **5.1 Fishery-Dependent**

### **5.1.1 Commercial Fisheries**

The FMP for American eel requires states to report commercial harvest by life stage, gear type, month, and region as defined by the states (ASMFC 2000a). During development of the benchmark assessment, not all states were able to provide this level of information, and this remains a challenge for this update.

#### **5.1.1.1 Atlantic Coast**

Historical commercial landings data from 1888 to 1940 were transcribed from online U.S. Fish and Fisheries Commission Annual reports (NOAA Central Library Data Imaging Project, pers. comm.).

Commercial landings data collected since the 1900s were obtained from the Atlantic Coastal Cooperative Statistics Program (ACCSP). Since 1950, most landings information on the East Coast has been collected by NMFS through dealer and/or fisherman reporting under a state-federal cooperative program. All historical NMFS data are now housed at ACCSP. Prior to the 1990s, information was summarized annually or monthly; more detailed information became available as states individually began adopting harvester reports (e.g., trip ticket systems or logbooks).

During 1950 to 2016, Atlantic coast-wide U.S. American eel landings ranged between approximately 664,000 pounds in 1962 and 3.67 million pounds in 1979 (Figure 7). The highest landings in the time series occurred from the mid-1970s to the early 1980s. Beginning in 1984, landings began to steadily decline. While landings since the 1990s have been lower than historical landings, they have been stable in recent decades.

Geographic regions used in the 2005 assessment (North, Mid-, and South Atlantic) exhibited differing trends and magnitudes in their eel fisheries (Figure 8). The majority of landings were reported in the Mid-Atlantic (New Jersey to Virginia), followed by the South Atlantic (North Carolina to Florida) and North Atlantic (Maine to New York). Since the coast-wide landings peak in the 1970s and 1980s, North and South Atlantic landings have been minimal compared with Mid-Atlantic region landings.

A new set of watershed-based geographic regions were created for the 2012 assessment: Gulf of Maine, Southern New England, Hudson River, Delaware Bay/Mid-Atlantic Coast Bays, Chesapeake Bay, and the South Atlantic (Figure 9). The temporal extent to which landings could be assigned by region (i.e., divide landings within a state like Massachusetts or Maryland) could not be replicated for this update from the available commercial landings data set.

The value of U.S. commercial American eel landings as estimated by NMFS has varied between a few hundred thousand dollars (prior to the 1980s) and a peak of \$40.6 million in 2012 (Figure

10). Total landings value declined again in 2014 from the large values from the previous two years but still remained high compared to the rest of the time series.

Since 1950, the majority (79%) of American eel landings were caught in pots and traps (Figure 11). Fixed nets (e.g., weirs, pound nets) accounted for about 7% of the landings. Approximately 5% of landings were caught using other gears (non-pot/trap or fixed net). About 9% of landings are reported with unknown gear type. Throughout the time series, pots and traps were the dominant gear reported for most eel landings (Figure 12).

### Potential Biases

There are several potential biases present in the commercial data set. ACCSP validated the yellow American eel landings with each state partner, although several member states used their compliance reports rather than state data and therefore the numbers were not thoroughly validated in all cases. Additionally, Virginia and Maryland have different methods of dealing with PRFC data where Virginia includes those data and Maryland does not in their totals. As identified in ASMFC 2012, at least a portion of commercial American eel landings typically come from non-marine water bodies. Even in states with mandatory reporting, these requirements may not extend outside the marine district, resulting in a potential underestimate of total landings. Misreporting between conger eel, hagfish, slime eel, and American eel can occur, i.e. bycatch caught and reported from trawl gear. Despite these potential biases, the SAS felt that these landings represented the best data available and were indicative of the trend in total landings over time.

#### **5.1.1.2 State-specific data collection**

Refer to ASMFC 2012 for a description of state-specific data collection for dealer and harvester reporting. Data collection and reporting on commercial landings at the state level have changed since ASMFC 2012 due to recent addenda to the FMP and efforts by the states to improve on the accuracy of landings information. Specifically, Addendum IV (ASMFC 2014) - which stipulated the potential for state by state quota management for yellow eel if the coast wide cap is exceeded by the management triggers- required all states with a yellow eel fishery to develop an implementation plan detailing the 1) current reporting structure for eels, 2) type of reporting used for monitoring quota, 3) a mechanism to account for quota overages, 4) a mechanism for quota transfers, 5) any additional management measures planned to control harvest. Table 3 indicates current reporting structure within states/jurisdictions.

#### **5.1.2 Recreational Fisheries**

##### **5.1.2.1 Data Collection**

The primary source of recreational fishery statistics for the Atlantic coast is the National Marine Fisheries Service's Marine Recreational Information Program (MRIP), formerly the Marine Recreational Fishery Statistics Survey (MRFSS) program. These programs collected data on marine recreational fishing to estimate statistics characterizing the catch and effort in marine recreational fisheries. Recreational fisheries statistics for American eels were obtained from the MRIP online data query. Catch estimates from MRIP have been available since 2004. Previous to



2004, only catch estimates from MRFSS are available. The method developed by MRIP to calibrate 1981-2003 MRFSS estimates was used in this assessment (SEDAR 2016).

### **5.1.2.2 Development of Estimates**

Estimates of harvest in terms of numbers are available for all three catch types (Type A, B1, and B2). Weight estimates are only available for recreational harvest (Type A+B1). Annual length-frequency distributions of American eels sampled by the MRFSS were calculated using the Type A biological sampling data. These data were available for 1981 through 2016.

### **5.1.2.3 Estimates**

Recreational harvest (Type A + B1) of American eels along the Atlantic coast ranged from 3,062 to 220,596 eels per year during 1981 through 2016. In terms of weight, recreational eel harvest ranged from 497 to 218,269 pounds per year during the same time period (Table 6). American eel recreational harvest demonstrated an overall decline over the available time series, with some large peaks in the mid-1980s, early 1990s, and 2010 (Figure 13). The number of American eels released alive by recreational anglers ranged from a low of 26,707 eels in 1997 to a high of 157,189 eels in 2003. Live releases of American eels generally declined from the late 1980s through the late 1990s to early 2000s. Numbers of live releases have since increased from 2002-2014. Both 2015-2016 indicate lower numbers of live releases.

The precision of the estimated harvest numbers, measured as proportional standard error (PSE), exceeded 50% in 29 of the 36 years for which estimates were available (Table 6). The precision of harvest weight estimates exceeded 50% in 18 of the 34 years with PSE calculations. In some years, the sampling data were insufficient to allow calculation of precision of harvest weight. Estimates of the number of American eels released alive had higher precision than the harvest estimates, with PSE values exceeding 50% in 8 of the 36 years.

The low precision associated with the recreational fishery statistics is due to the limited numbers of American eels that have been encountered during surveys of recreational anglers along the Atlantic Coast (Table 4 and Table 5). These limited numbers are partly due to the design of the MRFSS/MRIP survey, which does not include the areas and gears assumed to be responsible for the majority of recreational fishing for American eels. As such, the recreational fishery statistics for American eels provided by MRFSS should be interpreted with caution.

The lengths reported for American eels sampled (Type A catch) ranged from 20 mm to 1,100 mm during 1981 to 2016 (Figure 14). Smaller recorded lengths are likely recording errors or species misidentifications.

## **5.2 Fishery-Independent Surveys and Studies**

This section summarizes survey data and studies used to inform the stock assessment. All fishery-independent surveys used in ASMFC 2012 were evaluated using a standard set of criteria (see Appendix 2 in ASMFC 2012) that resulted in data-based decisions to inform the analytical framework (primary assumptions regarding the error structure) for each survey independently. Application of these criteria resulted in nearly all surveys being standardized (unless otherwise noted) using a generalized linear model (GLM) to account for changes in

catchability of eel. Only the surveys that were used in the trend analyses in the benchmark assessment were updated in this report. Some state-mandated YOY surveys were excluded from trend analysis in ASMFC 2012 because they did not have at least 10 years of data but have been included in this update if the survey met that requirement. The same methods were used as ASMFC 2012, although differences in GLM standardization are described below.

## **5.2.1 Young-of-Year Abundance Surveys**

### **5.2.1.1 Development of Indices**

For a description of the coast-wide mandatory state YOY and non-mandated survey methods, sampling intensity, biological sampling, and potential biases refer to ASMFC 2012 section 5.2.1.1. Annual indices of relative YOY abundance were calculated using the protocol outlined in Appendix 2 of ASMFC 2012. The YOY indices developed for ASMFC 2012 were from surveys that were sampled for at least 10 years as of 2010. For this update, three more surveys had reached the 10 year requirement: Connecticut's Ingham Hill site, Rhode Island's Hamilton Fish Ladder, and Virginia's Wareham's Pond. Conversely, three YOY indices were not updated through 2016 due to the sampling site being moved (PRFC's Clark's Millpond and South Carolina's Goose Creek) or no longer sampled (Georgia's Altamaha Canal). While these sites were not updated, they were still included in analyses and correlations. ASMFC 2012 categorized NC's Beaufort Bridgenet Ichthyoplankton Sampling Program (which ASMFC referred to as the Beaufort Inlet Ichthyoplankton Survey) as non-mandated, when it in fact serves as the state's mandated YOY survey so that has been corrected for this report. Additionally, data was only available through 2007 when it was included in analyses for this update (Figure 31). The data was later updated through 2013 but the analyses were already completed.

The availability of potential covariates varied among sites and years. Though the ASMFC YOY survey protocol requires that states record effort, water temperature, water level, and discharge (ASMFC 2000b), effort and water temperature were the only auxiliary variables consistently available for all sites. Additional variables were considered as covariates in the GLM analysis if the data were available in all years for a particular site.

Spearman's rank correlation coefficient,  $\rho$ , and the associated probability were calculated for all pairs of YOY indices to assess the degree of association among the indices. Indices were considered significantly correlated at  $\alpha = 0.10$ .

### **5.2.1.2 Estimates**

Annual recruitment indices were computed for nineteen sites sampled as part of the ASMFC-mandate, as well as three indices that are not required by ASMFC (Table 7). Water temperature was found to be a significant covariate affecting catchability for most survey sites. Note that effort was not determined to be a significant covariate in the models for any of the survey sites. Most of the survey data were best characterized using a model that had negative binomial errors. For some sites, a stable generalized linear model could not be developed, so arithmetic mean catch per unit effort was used as an index of abundance.

Trends in the YOY indices were variable within and among survey sites (Figure 15–Figure 31). The degree of correlation between survey sites varied and all were either not significant or

were significant and positively correlated (Table 8). While there is still not a lot of agreement among YOY sites, there is an improvement since ASMFC 2012. In this update, of the 22 significant relationships, all were positive. In the benchmark stock assessment, there were 13 significant relationships, ten positive and three negative. In addition, at the regional level there were 5 significant relationships between regions, all of which were positive. It should be noted that ASMFC 2012 incorrectly categorized the Beaufort Bridgenet Ichthyoplankton Sampling Program (BBISP) as non-mandated so it was not included in the correlations at that time but is included in the correlations for this report.

In the Gulf of Maine region, two YOY indices were significantly positively correlated - West Harbor Pond (Maine; Figure 15) and Lamprey River (New Hampshire; Figure 16) (Table 8). Both of these indices show low abundances in the beginning of the time series with peaks in the early 2010s. In the Southern New England region, there were two pairs of sites that were significantly positively correlated — Gilbert Stuart Dam (Rhode Island; Figure 18) and Hamilton Fish Ladder (Rhode Island; Figure 19) and Gilbert Stuart Dam (Rhode Island) and Carman’s River (New York; Figure 21) (Table 8). All three of these indices show low abundances in the early and mid-2000s with small increases in the early and mid-2010s. In the Delaware Bay and Mid-Atlantic Coastal Bays and Chesapeake Bay regions, there were no significant relationships between YOY surveys (Table 8). One significant correlation was detected among the YOY indices in the South Atlantic region. The YOY indices for Goose Creek (South Carolina; Figure 32) and Guana River Dam (Florida; Figure 34) were significantly and positively correlated (Table 8). Both of these indices show a peak in recruitment in 2001 and 2005 and then a decline for the remaining years in the time series.

## **5.2.2 Yearling, Elver, and Yellow Eel Abundance Surveys**

### **5.2.2.1 Development of Indices**

Several surveys were developed into abundance indices for yearling, elver, and yellow American eel life stages from Connecticut to South Carolina. For a full description of these survey methods, sampling intensity, biological sampling, and potential biases refer to ASMFC 2012. Abundance indices from these surveys were standardized using the same methods as the benchmark. During the GLM standardization, there were some differences in the covariates used in the model. Table 9 summarizes the GLM model used and significant covariates. Below are some additional notes on each survey.

#### **CTDEP Electrofishing**

*Elver & yellow eel index:* A population estimate was derived using maximum weighted likelihood by CTDEP. The site was not sampled in 2013 and then moved to a new site for 2015-2016. Due to the change in site, the SAS decided to abbreviate this time series to 2014 (Figure 37).

#### **NY Western Long Island Survey**

*Yellow eel index:* A full model that predicted catch as a function of year, month, and latitude as factors was compared with nested submodels using AIC. The full model with a negative binomial error structure was selected because it produced the lowest AIC. The model was

unchanged from the previous benchmark assessment, although latitude was used instead of system, and updated through 2016. The time series peaked to its highest value in 1985 and has declined since then, remaining low until the terminal year (Figure 38).

#### **NYDEC Alosine Beach Seine Survey**

*Elver & yellow eel index:* A full model that predicted catch as a function of year, month, river mile, water temperature, latitude, and longitude was compared with nested submodels using AIC. The model that included year, month, and river mile with a negative binomial error structure was selected because it produced the lowest AIC. The model was changed from the previous benchmark assessment, which had year, month, river mile, and water temperature as covariates. The index is variable with higher peaks in the early part of the time series and low but stable values in the later part of the time series (Figure 39).

#### **NYDEC Striped Bass Beach Seine Survey**

*Elver & yellow eel index:* A full model that predicted catch as a function of year, month, river mile, water temperature, latitude, and longitude was compared with nested submodels using AIC. The model that included year, month, and longitude with a negative binomial error structure was selected because it produced the lowest AIC. The model was changed from the previous benchmark assessment, which had year, month, river mile, and water temperature as covariates. The index is variable with higher peaks in the early part of the time series and declining but stable values in the later part time series. There was a notable peak in abundance in 2015 which was followed by the lowest point in the time series in 2016 (Figure 40).

#### **HRE Monitoring Program**

*Yearling & older eel index:* A full model that predicted catch as a function of year, month, station, river mile, tide, temperature, depth, tow volume, gear, and strata was compared with nested submodels using AIC. The model that included year, month, strata, river mile, and tow volume with a negative binomial error structure was selected because it produced the lowest AIC and good model diagnostics. The model formula for the previous benchmark assessment was the same but also included gear which was no longer significant for this update.

NYDEC provided the SAS with the HRE Monitoring Program data set through 2013. Because this data set is maintained by a utility company, the SAS submitted an additional request to HRE to obtain 2014-2016 due to data confidentiality concerns. The data set was updated through 2015, although it was received too late to be incorporated into the trend analysis and regional indices. Biologists for the HRE Monitoring Program expressed concern that the length cutoff between YOY and yearling+ was not accurate in the data set provided by NYDEC. Additionally, they were concerned that some of the covariates may not have been converted correctly. The updated data set represents the most complete and accurate data set and is included in this report despite not being used in the analyses. For the analyses and regional indices, the previous data set provided by NYDEC through 2013 was used. The GLM model for both the 1974-2013 and the 1974-2015 data sets was the same, as was the general pattern of the time series, although the scale was different (Figure 41). Abundance was highest during the early years of the time series, after which it dropped abruptly and then rebounded within the first

decade. A more gradual decline followed from the mid-1980s through the early 2000s. Since then, abundance has gradually increased, but is still below levels seen in the mid-1980s.

### **NJDFW Striped Bass Seine Survey**

*Yellow eel index:* A full model that predicted catch as a function of year, month, water temperature, and salinity was compared with nested submodels using AIC. The model that included year, water temperature, and salinity with a negative binomial error structure was selected. The model was unchanged from the previous benchmark assessment although salinity was not significant this time but it was retained for consistency. The index exhibited some high abundance in the early time series but otherwise a stable abundance throughout (Figure 42).

### **Delaware 16' Trawl Survey**

*Elver & yellow eel index:* A full model that predicted catch as a function of year, month, surface temperature, and surface salinity was compared with nested submodels using AIC. The full model that included year, month, surface temperature, and surface salinity with a negative binomial error structure was selected. The model was unchanged from the previous benchmark assessment although surface temperature was not significant this time but it was retained for consistency. Abundance declined in the 1980s, increased in the 1990s, declined until about 2005, after which it has been relatively stable (Figure 43).

### **PSEG Trawl**

*Elver & yellow eel index:* A full model that predicted catch as a function of year, month, bottom salinity, and strata was compared with nested submodels using AIC. Consistent sampling was conducted every year since 1998 so the time series was abbreviated from the previous assessment. Also, the stations have changed over time. Attempts were made to replicate the covariates from ASMFC 2012, but that model used only the months April-June when there are still consistent catches July-October. Additionally, the previous model used strata 7-9, but this update used 6-8. The model that included year, month, and bottom salinity with a negative binomial error structure was selected because it produced the lowest AIC. The model was unchanged from the previous benchmark assessment, although the months and strata used were different. The abundance index was variable in the late 1990s and early 2000s and then steady through mid-2010s. There were peaks in 2013 and 2016 (Figure 44).

### **Pennsylvania Area 6 Electrofishing**

*Elver index:* A full model that predicted catch as a function of year, month, site, and tow duration was compared with nested submodels using AIC. The model that included year and site with a negative binomial error structure was selected because it produced the lowest AIC. The model was unchanged from the previous benchmark assessment. There were peaks of abundance in 2001 and 2015 and low abundance in 2002 and 2016, otherwise the index indicates steady abundance (Figure 45).

### **MDDNR Striped Bass Seine Survey**

*Yellow eel index:* A full model that predicted catch as a function of year, month, and salinity was compared with nested submodels using AIC. The full model that included year, month, and salinity with a negative binomial error structure was selected because it produced the lowest

AIC. The model was unchanged from the previous benchmark assessment. Abundance was high in 1965, 1975, 2003, and 2005 and low in the early 1970s, early and mid-1990s, mid-2000s, and early 2010s (Figure 46).

#### **VIMS Juvenile Striped Bass Seine Survey**

*Yellow eel index:* A full model that predicted catch as a function of year, month, station type, system, and salinity was compared with nested submodels using AIC. This data set was analyzed for two time periods: long (1967-2016; Figure 47) and short (1989-2016; Figure 48). The model with a negative binomial error structure was selected because it produced the lowest AIC for both long and short indices. The long model was unchanged from the previous benchmark assessment with only system as a covariate. The short model used station type whereas the benchmark assessment also had salinity as a significant covariate. Both indices are variable. The longer time series shows high abundance in 1968 and 1971, followed by low abundance and some missing values. The index is low through the late 1980s and early 1990s and then variable with some peaks in abundance in the last decade (Figure 47). The shorter time series shows a more stable abundance through time with some peaks in 1997, 2009, and 2012 and low values in 1996, 2003, 2005, and 2013 (Figure 48).

#### **North Anna Electrofishing Survey**

*Elver and yellow eel index:* Updated data through 2016 from this survey was not provided for this assessment and therefore the index from the benchmark was used in analyses and regional indices. The abundance index indicates low values through the 1990s to 2002. Following a missing value point in 2003, the index shows increased abundance, ending with the highest value in the terminal year of 2009 (Figure 49).

#### **NCDMF Estuarine Trawl Survey**

*Elver & yellow eel index:* A full model that predicted catch as a function of year, month, water temperature, salinity, dissolved oxygen, depth, latitude, longitude, and bottom type was compared with nested submodels using AIC. The model that included year, latitude, longitude, and bottom type with a negative binomial error structure was selected. The model was unchanged from the previous benchmark assessment. The abundance index shows a lot of variability with the highest values in 1990-1991 and 2011-2012 and the lowest values in 2000, 2009, 2013, and 2016 (Figure 50).

#### **SC Electrofishing Survey**

*Elver & yellow eel index:* A full model that predicted catch as a function of year, month, strata, water temperature, salinity, and tide was compared with nested submodels using AIC. The full model with a negative binomial error structure was selected. The model was unchanged from the previous benchmark assessment. The abundance index indicates steady abundance throughout the time series with one larger peak in 2003 (Figure 51).

Spearman's rank correlation coefficient,  $\rho$ , and the associated probability were calculated for all pairs of yellow American eel indices to assess the degree of association among the indices. Indices were considered significantly correlated at  $\alpha=0.10$ . The degree of correlation between survey sites varied and all were either not significant or were significant and positively

correlated (Table 10). Surveys in the Hudson River region were positively correlated with many Southern New England and other Hudson River surveys. Only the New Jersey Striped Bass Seine Survey and the Delaware trawl were positively correlated with each other in the Delaware Bay/Mid-Atlantic region. In the Chesapeake Bay region, only the MDDNR Striped Bass Seine Survey and North Anna Electrofishing survey were positively correlated while the other surveys did not have a significant relationship. The two surveys available in the South Atlantic region were not significantly correlated with each other.

## **6 ASSESSMENT**

### **6.1 Coast-wide Abundance Indices**

Indices of coast-wide abundance for YOY and yellow-phase American eel were developed by combining data from multiple surveys along the coast. Detailed information describing the surveys included in the coast-wide indices and the methods for calculating them can be found in ASMFC 2012.

#### **6.1.1 Development of Estimates**

##### *Coast-wide Recruitment*

All ASMFC-mandated YOY abundance surveys and the two non-mandated YOY abundance surveys were used to assess coast-wide recruitment. Two coast-wide indices of American eel recruitment were computed—a short-term index and a long-term index. The short- and long-term indices were developed by combining individual standardized indices into a single, coast-wide index using the generalized linear modeling approach (ASMFC 2012 Appendix 2). The short-term recruitment index was based on the standardized indices developed from the ASMFC-mandated annual YOY surveys. The time period used for generating the short-term coast-wide recruitment index was 2000 to 2016. The long-term recruitment index was based on the Beaufort Bridgenet Ichthyoplankton Sampling Program (referred to incorrectly as the Beaufort Inlet Ichthyoplankton Survey and miscategorized as non-mandated in ASFMC 2012) and the non-mandated HRE Monitoring Program and Little Egg Inlet Ichthyoplankton Survey standardized indices. The covariates considered for inclusion in the model for the short- and long-term indices were year, region, and survey site. The time period used for generating the long-term coast-wide recruitment index was 1988 to 2013. This time period was selected so that index values from at least two of the long-term YOY surveys were available for every year included in the combined index.

##### *Coast-wide Yellow-Phase Abundance*

The surveys used to develop the coast-wide yellow-phase abundance indices were: NY Western Long Island Survey, HRE Monitoring Program, NYDEC Alosine and Striped Bass Beach Seine Surveys, New Jersey Striped Bass Seine Survey, Delaware Juvenile Finfish Trawl Survey, PSEG Trawl Survey, Pennsylvania's Area 6 Electrofishing Survey, Maryland Striped Bass Seine Survey, North Anna Electrofishing Survey, VIMS Juvenile Striped Bass Seine Survey, NCDMF Estuarine Trawl Survey, and South Carolina's Electrofishing Survey. Although these surveys catch yellow

stage eels, it should be noted that some portion of the catch in these surveys may include elvers as well.

Three indices of coast-wide, yellow-phase abundance were computed using different time series lengths—twenty, thirty, and forty-plus years. The indices were developed by combining individual standardized indices into coast-wide indices using the generalized linear modeling approach (ASMFC 2012 Appendix 2). The 40-plus-year coast-wide index of yellow-phase abundance was based on the HRE Monitoring Program, MDDNR Striped Bass Seine Survey, and VIMS Juvenile Striped Bass Seine Survey (long time series) standardized indices. In ASMFC 2012, PSEG trawl was included in this index but it was omitted for this update because the time series length changed due to data concerns. Conversely, the HRE Monitoring Program survey was added since it now has enough years of data to be included in the 40-year index. The 1974–2016 time period was used for the 40-plus index because it was the longest time series that could be used for which at least two of the 40-plus-year indices were available for every year included.

The 30-year coast-wide, yellow-phase abundance index included the same survey indices as the 40-plus index as well as the NY Western Long Island Survey, NYDEC Alosine Beach Seine Survey, NYDEC Striped Bass Beach Seine, New Jersey Striped Bass Seine Survey, and Delaware Trawl Survey. The 20-year index included the same survey indices as the 30-year index except for the VIMS Juvenile Striped Bass Seine Survey long time series index. Instead, the 20-year yellow-phase abundance index included the short time series index developed from the VIMS Juvenile Striped Bass Seine Survey. In addition, the 20-year index included the PSEG Trawl Survey, Pennsylvania’s Area 6 Electrofishing Survey, North Anna Electrofishing Survey, NCDMF Estuarine Trawl Survey, and SC Electrofishing Survey standardized indices.

### **6.1.2 Estimates**

#### *Coast-wide Recruitment*

The short- and long-term YOY recruitment indices were developed assuming a lognormal error structure. The final model for both indices included year and region as covariates.

The short-term, coast-wide recruitment index was variable (Figure 52). The index begins with low abundance and then increases to a high in 2002. Following that peak, the index declines through 2004 and then has a slight uptick and remained stable through the mid and late-2000s. Abundance increased from 2009 to the highest value in the series in 2012 and has declined slightly since then.

The long-term, coast-wide index was variable, with low values in 1991 and 2010 and high values in 1988, the mid-1990s, and 2008 (Figure 53).

#### *Coast-wide Yellow-Phase Abundance*

The coast-wide, yellow-phase abundance indices were developed assuming a lognormal error structure. The final model for all three indices included year and survey site as covariates.

The 40-plus yellow-phase index for the coast began with higher abundances in the mid-1970s and a decline through the 1980s (Figure 54). Abundance has been stable since the 1990s. The



time series demonstrates inter-annual variability and while values have been lower since the mid-1970s, the trend appears stable in recent decades. The 30-year coast-wide index of yellow-phase American eel abundance also exhibits a decline from the beginning of the time series to the early 1990s (Figure 55). The 30-year index show little variability or trend throughout the rest of the time series. The 20-year index of yellow-phase abundance shows limited variability and a no discernable trend (Figure 56). Of the three coast-wide, yellow-phase abundance indices, the 20-year and 40-year indices were negatively correlated with each other but not significantly ( $\rho=-0.152$ ;  $P=0.742$ ). The 30-year index was positively correlated with both of the 20-year ( $\rho=0.383$ ;  $P<0.10$ ) and 40-year ( $\rho=0.493$ ;  $P<0.10$ ) indices.

## 6.2 Regional Abundance Indices

Indices of regional abundance for YOY and yellow-stage American eel were developed for each of the regions by combining data from relevant surveys within each region (Table 11). Note that the regional indices labeled as yellow-stage indices actually reflect the relative abundance of both yellow-stage eels and elvers, in most cases (see Table 9).

### 6.2.1 Development of Estimates

Region-specific indices of YOY and yellow-stage relative abundance were computed for each of the six geographic regions where data were available. Indices of YOY and yellow-stage American eel abundance were developed by combining individual standardized indices (Table 7 and Table 9) using the generalized linear modeling approach (ASMFC 2012 Appendix A). The time period for each regional index was selected so that index values from at least two of the surveys included were available for every year included in the combined index. The surveys used in the development of the regional YOY and yellow-stage indices and the time periods of those indices are listed in Table 11.

Spearman's rank correlation coefficient,  $\rho$ , and the associated probability were calculated for all pairs of regional YOY indices and all pairs of regional yellow-stage indices to assess the degree of association among the indices. The correlation analysis was also applied to evaluate the degree of association between the yellow-stage indices and the YOY indices within each region. The YOY indices were lagged by 0–4 years for comparison to the yellow-stage indices. Indices were considered significantly correlated at  $\alpha = 0.10$ .

### 6.2.2 Estimates

All region-specific YOY and yellow-stage indices of American eel abundance were modeled assuming lognormal error structures and the final models all included year and state as covariates. The Chesapeake Bay's yellow eel index also included gear. The Hudson River region YOY index was based on a single recruitment index because only one such index was available for the region (Table 11). No yellow-stage indices of American eel abundance were available for the Gulf of Maine so a yellow-stage index could not be developed for the Gulf of Maine. There were two yellow eel abundance indices in the Southern New England region, CTDEP Electrofishing Survey and the NY Western Long Island Survey, but a regional yellow eel abundance survey was not developed due to concerns using a population estimate (CTDEP

Electrofishing) and a standardized abundance index (NY Western Long Island Survey) together. Additionally, the CTDEP Electrofishing Survey had an abbreviated time series due to a year that wasn't sampled and then a change in the site location.

The regional YOY and yellow-stage indices of American eel abundance are depicted in Figure 57 and Figure 58. Both the YOY and yellow-stage regional indices are variable among years. All the YOY indices, except in the Delaware Bay and Hudson River regions, are characterized by relatively large standard errors. This is partly due to the differences in the magnitudes of the index values among surveys that were combined in developing the region-specific indices.

Among the regional YOY indices for American eel, the Hudson River and Delaware Bay/Mid-Atlantic Coastal Bays indices were found to be significantly and positively correlated with Gulf of Maine indices (Table 12). Significant, positive correlations were also detected between the Delaware Bay/Mid-Atlantic Coastal Bay regional index and the Southern New England and Hudson River YOY regional indices. The Hudson River was also positively correlated with the South Atlantic YOY regional index. There were no statistically significant correlations detected among the region-specific yellow-stage indices (Table 13). Some significant correlations were detected between the region-specific yellow-stage and lagged YOY indices (Table 14). The Hudson River yellow-stage index was significantly correlated with the Hudson River YOY index that was lagged by one, two, three, and four years. The Chesapeake Bay yellow-stage index was significantly and positively correlated with the Chesapeake Bay YOY index that was lagged by two years. The South Atlantic yellow-stage index was significantly and positively correlated with the South Atlantic YOY index that was lagged one, two, and four years.

## **6.3 Analyses of Life History Data**

### **6.3.1 Growth Meta-Analysis**

#### **6.3.1.1 Methods**

Biological data for American eel were compiled from a number of past and on-going research programs along the Atlantic Coast and classified into one of the six geographic regions used in the assessment. These data, updated through 2016, were used to model both the length-weight and age-length relationship for American eel. The relation of length in millimeters to weight in grams was modeled using the allometric length-weight function. Length-weight parameters were estimated by region, sex, and for all data pooled together. The analysis of the residual sum of squares (ARSS) method was performed to compare the length-weight curves among regions and between sexes (Chen et al. 1992; Haddon 2001). The ARSS method provided a procedure for testing whether two or more nonlinear curves are coincident (i.e., not statistically different). Values were considered statistically significant at  $\alpha < 0.05$ .

Linear regression was used to model the relation of age in years to length in millimeters by region, sex, and for all data pooled together. A test for coincident regressions was applied to test for differences in the regressions among regions and between sexes (Zar 1999). Values were considered statistically significant at  $\alpha < 0.05$ . The age-length relationship for American eel was also described through the von Bertalanffy model, which is given by:

$$Lt = L\infty [1 - e^{-K(t-t_0)}]$$

where  $Lt$  is length at age  $t$ ,  $L\infty$  is the theoretical asymptotic average length (if  $K > 0$ ),  $K$  is growth rate at which the asymptote is approached, and  $t_0$  is the hypothetical age at which length is zero. Model fits were first evaluated based on convergence status; models that did not successfully converge were removed from consideration for the associated dataset.

### 6.3.1.2 Results

The length-weight model successfully converged and parameters estimated for each of the six regions, by sex, and for all data pooled (Table 15; Figure 59). The results of the ARSS indicated that there were statistically significant differences in the length-weight relationship between at least two regions ( $F_{10, 68,276} = 293$ ,  $P < 0.001$ ). However, parameter estimates were very similar in five of the six regions particularly in the Delaware Bay/ Mid Atlantic Coastal Bays, Chesapeake Bay, and South Atlantic. Parameter estimates were most different in the Southern New England region, which may be due to an extremely small sample size ( $N=166$ ) and range of length-weights available in the dataset. The fit of the length-weight function to all pooled data was dominated by data from the Chesapeake Bay region, which was the source of more than 55% of the length and weight biological samples. The results of the ARSS indicated no sex specific significance between estimated length-weight parameters ( $F_{2, 6,687} = 0.91$ ,  $P = 0.40$ ; Figure 60).

The parameters estimated from the linear regression of length on age for the various dataset configurations are presented in Table 16. There are statistically significant differences in the age-length relation among regions based on the results of the test for coincident regressions ( $F_{10, 17,402} = 754$ ,  $P < 0.0001$ ). The final parameter estimates suggested distinct differences in growth patterns between the northernmost regions (Hudson River, Southern New England, Gulf of Maine) and southernmost regions (Del Bay/Mid-Atlantic Coastal Bays, Chesapeake Bay, South Atlantic) (Table 16; Figure 61). The fastest growth in length with age occurred in the Delaware Bay/Mid-Atlantic Coastal Bays region. The test for coincident regressions also detected significant differences in the age-length regressions between sexes ( $F_{2, 5,932} = 1,520$ ,  $P < 0.0001$ ; Figure 62). The results suggested the rate of growth in length with age is faster in females than males (Table 16; Figure 62).

Parameters were estimated from the von Bertalanffy model to further examine the age-length relationship of American eel by region and by sex (Table 17). The model failed to converge for the Southern New England region and for males. The clear differences in growth between the northernmost and southernmost regions determined from the linear regression analysis were not apparent in the parameter estimates derived from the von Bertalanffy model. However, the growth coefficient ( $K$ ) was the highest in the South Atlantic region and the lowest in the Gulf of Maine.

Significant variation in length at age and a broad overlap in lengths across multiple age groups were observed in the data even within a regional analysis. Pooled data for all regions amplified these variations in length at age. These analyses confirm the relationship between age and length for American eel is not well defined and that age is a poor predictor of length for American eel. Ageing error and uncertainty around ageing estimates may also play an additional role in the weak relationship of length and age.

## 6.4 Trend Analyses

### 6.4.1 Power Analysis

Power analysis was performed on all fishery-independent American eel surveys as a means to evaluate the precision of abundance indices.

#### 6.4.1.1 Methods

Power analysis followed methods described in Gerrodette (1987) for both potential linear and exponential trends. A linear trend can be modeled as  $A_i = A_1[1+r(i-1)]$  and an exponential trend as  $A_i = A_1(1+r)^{i-1}$  where  $A_i$  is the abundance index in year  $i$ ,  $A_1$  is the abundance index in year 1, and  $r$  is a constant increment of change as a fraction of the initial abundance index  $A_1$ . The overall fractional change in abundance over  $n$  years can be expressed as  $R = r(n - 1)$ .

If  $\alpha$  and  $\beta$  are the probabilities of type 1 and type 2 errors respectively, the power of a linear trend  $(1 - \beta)$  assuming  $CV \sim 1/\sqrt{A}$  can be determined by satisfying the equation:

$$r^2 n(n-1)(n+1) \geq 12 CV_1^2 (z_\alpha + z_\beta)^2 \left\{ 1 + \frac{3r}{2}(n-1) \left[ 1 + \frac{r}{3}(2n-1) + \frac{r^2}{6}n(n-1) \right] \right\}$$

and the power of an exponential trend can be determined by satisfying the equation:

$$[\ln(1+r)]^2 n(n-1)(n+1) \geq 12 (z_\alpha + z_\beta)^2 \left\{ \frac{1}{n} \sum \ln[CV_1^2 (1+r)^{i-1} + 1] \right\}$$

where  $CV_1$  is an estimate of the coefficient of variation of the survey. For each of the surveys, the median CV of the survey was calculated over the entire time series of the survey and used as an estimate of  $CV_1$ . Power was then calculated for an overall change ( $R$ ) of  $\pm 50\%$  over a 10 year time period ( $r = 0.056$ ) for both a linear and exponential trend.

#### 6.4.1.2 Results

Median CVs of the surveys ranged from 0.04 to 5.50. Resulting estimates of power were a function of CVs with those surveys having low CVs having high power, and those surveys having high CVs having low power. Power values ranged from 0.06 to 1.00 (Table 18). For all surveys, there is greater power to detect a decreasing trend compared to an increasing trend which is a property of surveys whose  $CV \sim 1/\sqrt{A}$ . There was very little difference in power between linear and exponential trends. The values of power presented in Table 18 can be interpreted as the probability of detecting a given linear or exponential trend of  $\pm 50\%$  over a ten year period if it actually occurs. Many surveys decreased the median CV values with the additional years of data since ASMFC 2012 and therefore increased the power associated with that survey. These values do not reflect a retrospective power analysis and a survey with a low power value may still be capable of detecting a statistically significant trend if given enough years of data or the change over time is very large.

## 6.4.2 Mann-Kendall Analysis

### 6.4.2.1 Methods

The Mann-Kendall trend analysis is a non-parametric test for monotonic trend in time-ordered data (Gilbert 1987). The null hypothesis is that the time series is independent and identically distributed—there is no significant trend across time. The test allows for missing values and can account for tied values if present.

The Mann-Kendall test was applied to all local, regional, and coast-wide indices of relative abundance computed in this assessment. This included four new local YOY indices; Hamilton Fish Ladder, Gilbert Stuart Dam, Ingham Hill, Carman's River, HRE Monitoring Program, and Little Egg Inlet Ichthyoplanton. There were no new yellow eel indices. Two regional indices were not analyzed because only one index in the region had been updated to 2016.

A two-tailed test was used to test for the presence of either an upward or downward trend over the entire time series. Trends were considered statistically significant at  $\alpha = 0.05$ .

### 6.4.2.2 Results

#### *Local Indices*

No significant temporal trends were detected among the YOY indices developed from the ASMFC-mandated recruitment surveys when the analysis was done in the last benchmark (Table 19). Of the two YOY surveys that are not ASMFC-mandated, the Little Egg Inlet had no trend and the HRE Monitoring Program had a declining trend in ASMFC 2012. In this update, six of the 22 indices showed significant negative trends. This included many of the new indices, of which 3 showed significant declining trends.

The Mann-Kendall test found statistically significant trends in six of the 15 other individual yellow eel indices evaluated; all but one of which was negative (Table 20). Since the last benchmark two significant downward trends became non-significant, while two significant upward trends also became non-significant.

#### *Regional Indices*

Of the nine regional indices, significant trends were seen in four; one positive and 3 negative (Table 21). One of the negative trends, the YOY for the South Atlantic, was not significant during the last benchmark, but is now a significantly declining trend with this update.

#### *Coast-wide Indices*

The Mann-Kendall test detected two significant trends among the coast-wide indices (Table 21). Both the 30-year and 40-year yellow-phase abundance indices exhibited a significant downward trend. The 40 year was not significantly declining in the last benchmark, but is with this update. The starting year of this index was 1967 in ASMFC and it is now 1974 for this update, so the loss of the beginning years may influence this declining trend.

### 6.4.3 Manly Analysis

A meta-analysis was conducted to determine if there was consensus among fishery-independent survey indices for a coast-wide decline in American eel. Meta-analysis is a statistical approach that combines the results from independent datasets to determine if the datasets are showing the same patterns. The meta-analysis techniques employed in this analysis are described by Manly (2001).

#### 6.4.3.1 Methods

American eel surveys were grouped according to life stages (yellow vs. YOY) and one-tailed  $p$ -values from the Mann-Kendall test for trend were used in the meta-analysis (Manly 2001). Two meta-analysis techniques were used.

Fisher's method tests the hypothesis that at least one of the indices showed a significant decline through time. The test statistic was calculated as  $S_1 = -2\sum \log_e(p_i)$ , where  $p_i$  is the one-tailed  $p$ -value that tests for a negative trend from the  $i$ th index. The one-tailed  $p$ -value is used because we are interested in whether the index has declined through time. If the null hypothesis is true for a test of significance, then the  $p$ -value from the test has a uniform distribution between 0 and 1, and if  $p$  has a uniform distribution, then  $-2\log_e(p)$  has a chi-square distribution with 2 degrees of freedom. The test statistic,  $S_1$ , is then compared to a chi-square distribution with  $2n$  degrees of freedom, where  $n$  equals the number of independent surveys considered.

The Liptak-Stouffer method tests the hypothesis that there is consensus for a decline supported by the entire set of indices. The individual one-tailed  $p$ -values were converted to  $z$ -scores. If the null hypothesis is true for all indices, the  $z$ -scores are distributed as a normal random variable with mean equal to 0 and variance equal to  $1/\sqrt{n}$ . This allows for weighting the results from the indices differently. The test statistic is  $S_2 = \sum w_i z_i / \sqrt{\sum w_i^2}$  where  $w_i$  is the weight of the  $i$ th index. In this analysis, the number of years of survey data was used as the weight for the  $i$ th index. A level of  $\alpha = 0.05$  was used in meta-analyses for tests of significance.

#### 6.4.3.2 Results

At least one of the indices for both life stages showed a decline through time (yellow eels:  $S_1 = 115.88$ ,  $P < 0.01$ ; YOY eels:  $S_1 = 95.22$ ,  $P < 0.01$ ; Table 22). Also, there was consensus for a decline for both life stages through time (yellow eels:  $S_2 = -5.05$ ,  $P < 0.01$ ; YOY eels:  $S_2 = -16.03$ ,  $P < 0.01$ ).

### 6.4.4 ARIMA

Fishery-independent surveys for American eel can be quite variable, making inferences about population trends uncertain. Time series of abundance indices can be influenced by true changes in abundance, within survey sampling error, and varying catchability over time. One approach to minimize measurement error in the survey estimates is by using autoregressive integrated moving average models (ARIMA, Box and Jenkins 1976). The ARIMA approach derives fitted estimates of abundance over the entire time series whose variance is less than the variance of the observed series (Pennington 1986). This approach is commonly used to gain

insight in stock assessments where enough data for size or age-structured assessments (e.g., yield per recruit, catch at age) is not yet available.

Helser and Hayes (1995) extended Pennington's (1986) application of ARIMA models to fisheries survey data to infer population status relative to an index-based reference point. This methodology yields a probability of the fitted index value of a particular year being less than the reference point [ $p(\text{index}_t < \text{reference})$ ]. Helser et al. (2002) suggested using a two-tiered approach when evaluating reference points whereby not only is the probability of being below (or above) the reference point estimated, the statistical level of confidence is also specified. The confidence level can be thought of as a one-tailed  $\alpha$ -probability from typical statistical hypothesis testing. For example, if the  $p(\text{index}_t < \text{reference}) = 0.90$  at an 80% confidence level, there is strong evidence that the index of the year in question is less than the reference point. This methodology characterizes both the uncertainty in the index of abundance and in the chosen reference point. Helser and Hayes (1995) suggested the lower quartile (25<sup>th</sup> percentile) of the fitted abundance index as the reference point in an analysis of Atlantic wolfish (*Anarhichas lupus*) data. The use of the lower quartile as a reference point is arbitrary, but does provide a reasonable reference point for comparison for data with relatively high and low abundance over a range of years.

#### **6.4.4.1 Methods**

The purpose of this analysis was to fit ARIMA models to time series of eel abundance indices to infer the status of the population(s). The ARIMA model fitting procedure of Pennington (1986) and bootstrapped estimates of the probability of being less than an index-based reference point (25<sup>th</sup> percentile, Helser and Hayes 1995) were coded in R (R code developed by Gary Nelson, Massachusetts Division of Marine Fisheries). Index values were loge transformed ( $\text{loge}[\text{index} + 0.01]$  in cases where "0" values were observed) prior to ARIMA model fitting. The reported probabilities of being less than the 25<sup>th</sup> percentile reference point correspond to 80% confidence levels. Only time series with 20 or more years of index values were used in ARIMA modeling because the 25<sup>th</sup> percentile reference point can be unstable with few observations. The one exception to the 20 year criteria was the PSEG trawl survey which had 19 years of data included. In the previous 2012 stock assessment, the PSEG trawl survey had 38 years of data at that time, but it was truncated for this assessment update to account for methodology and sampling changes over the years.

#### **6.4.4.2 Results**

Fourteen surveys were used in ARIMA modeling (Table 23). Two surveys that were included in this assessment update that were not included in the 2012 stock assessment were the Little Egg Inlet and the Beaufort Bridgenet Ichthyoplankton surveys. These surveys were added to the ARIMA modeling because they now each had >20 years of data available.

Trends in fitted ARIMA values varied both within and among regions. In the Chesapeake Bay region, the long VIMS Juvenile Striped Bass Seine Survey for yellow eels showed a consistent increase since 2008, but the short VIMS Juvenile Striped Bass Seine Survey and the Maryland Striped Bass Seine Survey showed stable trends in recent years (Figure 63). Trends in the

Delaware Bay/Mid-Atlantic region did not show any directional trends in recent years (Figure 64). Surveys in the Hudson River region generally showed continued decreasing trends except for the Hudson River Estuary Monitoring Program which has shown a consistent increase since the early 2000's (Figure 65). Both surveys in the South Atlantic region showed somewhat decreasing trends, but there was also a relatively high degree of annual variation in these surveys (Figure 66).

Overall, the probabilities of being less than the 25<sup>th</sup> percentile reference points in the terminal year (2016 in most cases) for each of the surveys were similar to those probabilities found for year 2010 (the last year of data used in the 2012 stock assessment; Table 23). This indicates relatively stable indices. One large difference between 2010 and 2016 was the NYDEC Alosine Beach Seine survey in which the probability of being less than the 25<sup>th</sup> percentile reference point increased from 0.344 in 2010 to 0.720 in 2016. This is indicative of the continued decline of elver and yellow eels in this survey since the last stock assessment. In total, 3 of the 14 surveys included in the ARIMA modeling had greater than a 0.50 probability of being less than the 25<sup>th</sup> percentile reference point in the terminal year of the survey.

The 2012 Peer Review Panel noted that ARIMA is sensitive to the first data point in the time series and they suggested that trends be interpreted with caution, which is why this analysis is not used for developing reference points for American eel management but rather as one of the trend analyses used to draw general conclusions about the status of the stock.

## **6.5 Other Modeling Approaches**

Several other modeling approaches were explored in ASMFC 2012 that were not updated for this report including a suite of models used by ICES (Study Leading to Informed Management of Eels or SLIME), Surplus Production Models (SPM; both age-structured and catch-free), Traffic Light Analysis (TLA), and Depletion-Based Stock Reduction Analysis (DB-SRA). The SLIME model was deemed inappropriate to the needs of the ASMFC for managing American eel. The SPMs did not find stable solutions and the TLA produced results that were difficult to interpret and therefore were not endorsed for management use by the Peer Review Panel in 2012. The Panel suggested that the TLA continue to be explored to incorporate more data, so while it could inform management decision-making in the future additional work on that model would require a peer review so it was not updated for this report. The Peer Review Panel endorsed the DB-SRA model for assessing American eel but had a number of concerns about the model (American Eel Stock Assessment Peer Review Report in ASMFC 2012). The Panel was impressed with the development of DB-SRA but ultimately were not comfortable using it to develop reference points or determine stock status without further refinements. Because further developing the DB-SRA would require a peer review for it to be used for management, the SAS did not update the model for this update report.



## **7 STOCK STATUS DETERMINATION**

### **7.1 Status Determination Criteria and Current Stock Status**

Reference points for determining the stock status of American eel in the U.S. in ASMFC 2012 were developed using the DB-SRA model which was not accepted for management use by the Peer Review Panel. The American Eel Technical Committee recommended that stock status was declared depleted based on trend analysis and the biomass trends estimated by the DB-SRA as recommended by the Peer Review Panel. The DB-SRA was not updated for this report because the Panel recommended it be further developed which was outside the guidelines of a stock assessment update. Therefore neither reference points nor stock status could be determined quantitatively by this stock assessment update. The trend analyses were updated and a discussion of overall trends follows in Section 8. Overall, the results in this update are very similar to the results in ASMFC 2012 and therefore the SAS and TC concluded the stock remains depleted.

## **8 DISCUSSION AND CONCLUSIONS**

The data evaluated in this assessment provide evidence of neutral or declining abundance of American eel in the U.S in recent decades. All three trend analysis methods (Mann-Kendall, Manly, and ARIMA) detected significant declining trends in some indices over the time period examined. The Mann-Kendall test detected a significant declining trend in six of the 22 YOY indices, five of the 15 yellow eel indices, three of the nine regional trends, and the 30-year and 40-year yellow-phase abundance index. The remaining surveys tested had no trend, except for the North Anna Electrofishing and the regional Chesapeake Bay yellow eel indices which had a positive trend (although it should be noted that the North Anna Electrofishing survey was not updated from ASMFC 2012). These two surveys also had an increasing trend in ASMFC 2012, but the other two surveys that had an increasing trend in ASMFC 2012 (CTDEP Electrofishing Survey and PSEG Trawl Survey) now have no significant trend, noting that the time frame for the PSEG Trawl Survey changed since ASMFC 2012. The Manly meta-analysis showed a decline in at least one of the indices for both yellow and YOY life stages. Also, there was consensus for a decline for both life stages through time. Conclusions from the Manly meta-analysis results were the same as those in ASMFC 2012.

In ASMFC 2012, the ARIMA results indicated decreasing trends in the Hudson River and South Atlantic regions. For this update, the results of the ARIMA are the same except for the HRE Monitoring Program in the Hudson River region which has been increasing in recent years. Survey indices from the Chesapeake Bay and Delaware Bay/Mid-Atlantic Coastal Bays regions showed no consistent increasing or decreasing trends in ASMFC 2012, but now the Chesapeake Bay region surveys have increasing or stable trends and the Delaware Bay exhibits no directional trends in recent years. The probabilities of being less than the 25<sup>th</sup> percentile reference points in the terminal year for each of the surveys were similar to those in ASMFC 2012 and currently 3 of the fourteen surveys in the analysis have a greater than 50% probability of being less than the 25<sup>th</sup> percentile reference point.

ASMFC 2012 concluded that significant downward trends in some surveys across the coast was cause for concern. The trend analysis results in this stock assessment update are consistent with the ASMFC 2012 results, with few exceptions. Despite downward trends in the indices, commercial yellow American eel landings have been stable in the recent decades along the Atlantic coast (U.S. and Canada) although landings still remain much lower than historical landings. Compared to ASMFC 2012, there are more significantly downward trends in indices as indicated by the Mann-Kendall test and similar results for the ARIMA. This trend analysis and stable low landings support the update conclusion that the American eel population in the assessment range is similar to five years ago and remains depleted.

## 9 RESEARCH RECOMMENDATIONS

The following research recommendations are based on input from the ASMFC American Eel TC and SAS during the 2012 benchmark stock assessment and many remain relevant for this update stock assessment. A single asterisk (\*) denotes short-term recommendations and two asterisks (\*\*) denote long-term recommendations. Recommendations formatted in **bold** identify improvements needed for the next benchmark assessment. Notes have been added for this report regarding work that has been addressed or initiated since ASMFC 2012.

### Data Collection

#### *Fisheries Catch and Effort*

- **Improve accuracy of commercial catch and effort data (NOTE: Some progress was made on this recommendation through Addenda III and IV)**
  - Compare buyer reports to reported state landings\* (NOTE: Initiated in NY by NYDEC)
  - Improve compliance with landings and effort reporting requirements as outlined in the ASMFC FMP for American eel (see ASMFC 2000a for specific requirements)\* (NOTE: Initiated in NY by NYDEC and NJ by NJDFW)
  - Require standardized reporting of trip-level landings and effort data for all states in inland waters; data should be collected using the ACCSP standards for collection of catch and effort data (ACCSP 2004 and initiated in NY by NYDEC)\*
- Estimate catch and effort in personal-use and bait fisheries (NOTE: Initiated in NJ by NJDFW)
  - Monitor catch and effort in personal-use fisheries that are not currently covered by the MRFSS or commercial fisheries monitoring programs\*
  - Implement a special-use permit for use of commercial fixed gear (e.g., pots and traps) to harvest American eels for personal use; special-use permit holders should be subject to the same reporting requirements for landings and effort as the commercial fishery\*\*
  - Improve monitoring of catch and effort in bait fisheries (commercial and personal-use)\*
- Estimate non-directed fishery losses
  - Recommend monitoring of discards in targeted and non-targeted fisheries\*
  - Continue to require states to report non-harvest losses in their annual compliance reports\*

- **Characterize the length, weight, age, and sex structure of commercially harvested American eels along the Atlantic Coast over time**
  - Require that states collect biological information by life stage (potentially through collaborative monitoring and research programs with dealers) including length, weight, age, and sex through fishery-dependent sampling programs; biological samples should be collected from gear types that target each life stage; at a minimum, length samples should be routinely collected from commercial fisheries\* (NOTE: Initiated in Chesapeake Bay sites (VMRC) and in NY, NJ, DE, MD by NYDEC, NJDFW, DEDFW, and MDDNR respectively)
  - Finish protocol for sampling fisheries; SASC has draft protocol in development\*
- Improve estimates of recreational catch and effort
  - Collect site-specific information on the recreational harvest of American eels in inland waters; this could be addressed by expanding the MRIP into inland areas\*\*
- Improve knowledge of fisheries occurring south of the U.S. and within the species' range that may affect the U.S. portion of the stock (i.e., West Indies, Mexico, Central America, and South America)\*\*

#### *Socioeconomic Considerations*

- Perform economics studies to determine the value of the fishery and the impact of regulatory management\*\*
- Improve knowledge regarding subsistence fisheries
  - Review the historic participation level of subsistence fishers and relevant issues brought forth with respect to those subsistence fishers involved with American eel\*\*
  - Investigate American eel harvest and resource by subsistence harvesters (e.g., Native American tribes, Asian and European ethnic groups)\*\*

#### *Distribution, Abundance, & Growth*

- **Improve understanding of the distribution and frequency of occurrence of American eels along the Atlantic Coast over time** (see Cairns et al. 2017 for a description of the distribution of American eels from Canada to Florida)
  - Maintain and update the list of fisheries-independent surveys that have caught American eels and note the appropriate contact person for each survey\* (NOTE: Work being done in NY by NYDEC and NJ by NJDFW)
  - Request that states record the number of eels caught by fishery-independent surveys; recommend states collect biological information by life stage including length, weight, age, and sex of eels caught in fishery-independent sampling programs; at a minimum, length samples should be routinely collected from fishery-independent surveys\* (NOTE: NYDEC began this in 2014; NJDFW collects numbers and lengths; VIMS collects numbers,

- lengths, weights, ages, and disease status; NCDMF collects numbers and lengths; work being done through FL FWC and a freshwater electrofishing survey)
- Encourage states to implement surveys that directly target and measure abundance of yellow- and silver-stage American eels, especially in states where few targeted eel surveys are conducted\*\* (NOTE: MA, MD, and NJ yellow eel survey began in 2015 by MADMF, MDDNR, and NJDFW)
  - A coast-wide sampling program for yellow and silver American eels should be developed using standardized and statistically robust methodologies\*\*
- Improve understanding of coast-wide recruitment trends
    - Continue the ASMFC-mandated YOY surveys; these surveys could be particularly valuable as an early warning signal of recruitment failure\* (NOTE: All states have a state-mandated YOY survey except for GA)
    - Develop proceedings document for the 2006 ASMFC YOY Survey Workshop; follow-up on decisions and recommendations made at the workshop\*
    - Examine age at entry of glass eel into estuaries and freshwater\*\* (NOTE: see Pratt et al. 2014)
    - Develop monitoring framework to provide information for future modeling on the influence of environmental factors and climate change on recruitment\*\*
  - Improve knowledge and understanding of the portion of the American eel population occurring south of the U.S. (i.e., West Indies, Mexico, Central America, and South America)\*\*

## Future Research

### *Biology*

- Improve understanding of the leptocephalus stage of American eel
  - Examine the mechanisms for exit from the Sargasso Sea and transport across the continental shelf\*\* (NOTE: see Rypina et al 2014)
  - Examine the mode of nutrition for leptocephalus in the ocean\*\*
- Improve understanding of impact of contaminants as sources of mortality and non-lethal population stressors
  - Investigate the effects of environmental contaminants on fecundity, natural mortality, and overall health\*\*
  - Research the effects of bioaccumulation with respect to impacts on survival and growth (by age) and effect on maturation and reproductive success\*\*
- **Improve understanding of impact of *Anguillicoloides crassus* on American eel**
  - Investigate the prevalence and incidence of infection by the nematode parasite *A. crassus* across the species range\* (NOTE: Initiated in NC with a Roanoke study and in FL,

work currently underway in the Chesapeake Bay through Z. Warshafsky's graduate work at VIMS, see also Zimmerman and Welsh 2012, Campbell et al. 2013, Denny et al. 2013, Waldt et al. 2013, Hein et al. 2014)

- Research the effects of the swim bladder parasite *A. crassus* on the American eel's growth and maturation, migration to the Sargasso Sea, and the spawning potential\* (NOTE: work currently underway in the Chesapeake Bay through Z. Warshafsky's graduate work at VIMS, see also Zimmerman and Welsh 2012)
- Investigate the impact of the introduction of *A. crassus* into areas that are presently free of the parasite\*\*
- **Improve understanding of spawning and maturation**
  - Investigate relation between fecundity and length and fecundity and weight for females throughout their range\*\*
  - Identify triggering mechanism for metamorphosis to mature adult, silver eel life stage, with specific emphasis on the size and age of the onset of maturity, by sex; a maturity schedule (proportion mature by size or age) would be extremely useful in combination with migration rates\*\*
  - Research mechanisms of recognition of the spawning area by silver eel, mate location in the Sargasso Sea, spawning behavior, and gonadal development in maturation\*\*
  - Examine migratory routes and guidance mechanisms for silver eel in the ocean\*\*
- Improve understanding of predator-prey relationships\*\*
- Investigating the mechanisms driving sexual determination and the potential management implications\*\*

### *Passage & Habitat*

- **Improve upstream and downstream passage for all life stages of American eels (NOTE: Initiated in ME, also see Hitt et al. 2012, Gardner et al. 2013)**
  - Develop design standards for upstream passage devices for eels. The ASMFC 2011 Eel Passage Workshop (ASMFC 2013) made contributions to this goal.
  - Investigate, develop, and improve technologies for American eel passage upstream and downstream at various barriers for each life stage; in particular, investigate low-cost alternatives to traditional fishway designs for passage of eel\*\* (NOTE: MADMF designed and deployed a gravity fed eel pass)
- Improve understanding of the impact of barriers on upstream and downstream movement (NOTE: Sweka et al. 2014 used an egg per recruit model to evaluate the costs/benefits to reproductive output with transport of eels upstream of hydroelectric dams and found that without downstream passage, transporting eels upstream resulted in a net loss of reproductive output.)

- Evaluate the impact, both upstream and downstream, of barriers to eel movement with respect to population and distribution effects; determine relative contribution of historic loss of habitat to potential eel population and reproductive capacity\*\*
  - Recommend monitoring of upstream and downstream movement at migratory barriers that are efficient at passing eels (e.g., fish ladder/lift counts); data that should be collected include presence/absence, abundance, and biological information; provide standardized protocols for monitoring eels at passage facilities; coordinate compilation of these data; provide guidance on the need and purpose of site-specific monitoring\*\*
  - Use the information gained from the above evaluation and monitoring of barriers to American eel passage to develop metrics for prioritizing passage restoration projects.
- **Improve understanding of habitat needs and availability**
    - Assess characteristics and distribution of American eel habitat and value of habitat with respect to growth and sex determination; develop GIS of American eel habitat in U.S.\*\*
    - Assess available drainage area over time to account for temporal changes in carrying capacity; develop GIS of major passage barriers\*\*
    - Improve understanding of freshwater habitat and water quality thresholds for American eel.
  - Improve understanding of within-drainage behavior and movement and the exchange between freshwater and estuarine systems\*\*
  - Improve estimates of mortality associated with upstream and downstream passage
    - Monitor non-harvest losses such as impingement, entrainment, spill, and hydropower turbine mortality\* (NOTE: Data available for the Susquehanna and Shenandoah Rivers from Eyler et al. 2016 and USFWS 2012.)
  - Evaluate eel impingement and entrainment at facilities with NPDES authorization for large water withdrawals; quantify regional mortality and determine if indices of abundance could be established as specific facilities\*\* (NOTE: Data available for the Delaware River through work done by the Delaware River Basin Fish and Wildlife Management Cooperative)
  - Investigate best methods for reintroducing eels into a watershed; examine approaches for determining optimum density\* (Note: Data available from the Roanoke Rapids and Susquehanna River through a project with Dominion Energy and USFWS-Maryland Fish and Wildlife Conservation Office, respectively)

#### Assessment Methodology & Management Support

- Coordinate monitoring, assessment, and management among agencies that have jurisdiction within the species' range (e.g., ASMFC, GLFC, Canada DFO)\*\*
- Perform a joint U.S.-Canadian stock assessment\*

- Perform periodic stock assessments (every 5–7 years) and establish sustainable reference points for American eel are required to develop a sustainable harvest rate in addition to determining whether the population is stable, decreasing, or increasing
  - Develop new assessment models (e.g., delay-difference model) specific to eel life history and fit to available indices\*\*
  - **Conduct intensive age and growth studies at regional index sites to support development of reference points and estimates of exploitation\* (NOTE: Initiated in the Chesapeake Bay by MDDNR which has collected age information on selected tributaries since 1998)**
  - Develop GIS-type model that incorporates habitat type, abundance, contamination, and other environmental factors\*\*
  - Develop population targets based on habitat availability at the regional and local level\*\*
- Implement large-scale (coast-wide or regional) tagging studies of eels at different life stages; tagging studies could address a number of issues including:
  - Natural, fishing, and discard mortality; survival\*\*
  - Growth\*\*
  - Passage mortality\*\*
  - Movement, migration, and residency\*\*
  - Validation of ageing methods\*\*
  - Reporting rates\*\*
  - Tag shedding or tag attrition rates\*\*

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**11 TABLES**

**Table 1. Commercial fishery regulations for American eels as of 2016, by state. For specifics on licenses, gear restrictions, and area restrictions, please contact the individual state.**

State	Min Size Limit	License/Permit	Other
ME	Glass no min size	Daily dealer reports/swipe card program; monthly harvester report of daily landings. Tribal permit system in place for some Native American groups.	Harvester license lottery system.
	Yellow 9"	Harvester/dealer license and monthly reporting. Tribal permit system in place for some Native American groups.	Seasonal closures. Gear restrictions. Weekly closures.
NH	9"	Commercial saltwater license and wholesaler license. No dealer reports. Monthly harvester reporting includes dealer information.	Gear restrictions in freshwater.
MA	9"	Commercial permit with annual catch report requirement. Registration for dealers with purchase record requirement. Dealer/harvester reporting.	Traps, pots, spears, and angling only. Mesh restrictions.
RI	9"	Commercial fishing license. Dealer/harvester reporting.	Gear restrictions.
CT	9"	Commercial license (not required for personal use). Dealer/harvester reporting.	Gear restrictions.
NY	9"	Harvester/dealer license and reporting.	Gear restrictions. Maximum limit of 14" in some rivers.
NJ	9"	License required. No dealer reports. Monthly harvester reporting includes dealer information.	Gear restrictions.
PA	NO COMMERCIAL FISHERY		
DE	6"	Harvester reporting, no dealer reporting. License required.	Commercial fishing in tidal waters only. Gear restrictions.
MD	9"	Dealer/harvester license and monthly reporting.	Prohibited in non-tidal waters. Gear restrictions. Commercial crabbers may fish 50 pots per day, must submit catch reports.
DC	NO COMMERCIAL FISHERY		
PRFC	9"	Harvester license and daily reporting due weekly. No dealer reporting.	Gear restrictions.
VA	9"	Harvester license required. Dealer/harvester monthly reporting.	Mesh size restrictions on eel pots. Seasonal closures.

**Table 1. Continued.**

<b>State</b>	<b>Min Size Limit</b>	<b>License/Permit</b>	<b>Other</b>
NC	9"	Standard Commercial Fishing License for all commercial fishing. Dealer/harvester monthly combined reports on trip ticket.	Mesh size restrictions on eel pots. Seasonal closures.
SC	Glass no min size	Fyke and dip net only permitted. Dealer/harvester monthly combined reports on trip ticket.	Max 10 individuals. Gear and area restrictions.
	Yellow 9"	Pots only permitted. Dealer/harvester monthly combined reports on trip ticket.	Gear restrictions.
GA	9"	Personal commercial fishing license and commercial fishing boat license. Dealer/harvester monthly combined reports on trip ticket.	Gear restrictions on traps and pots. Area restrictions.
FL	9"	Permits and licenses. Harvester reporting. No dealer reporting.	Gear restrictions.



**Table 2. Recreational fishery regulations for American eels as of 2016, by state. For specifics on licenses, gear restrictions, and area restrictions, please contact the individual state.**

State	Size Limit	Possession Limit	Other
ME	9"	25 eels/person/day	Gear restrictions. License requirement and seasonal closures (inland waters only). Bait limit of 50 eels/day for party/charter boat captain and crew.
NH	9"	25 eels/person/day	Coastal harvest permit needed if taking eels other than by angling. Gear restrictions in freshwater.
MA	9"	25 eels/person/day	Nets, Pots, traps, spears, and angling only; mesh restrictions.
RI	9"	25 eels/person/day	
CT	9"	25 eels/person/day	
NY	9"	25 eels/person/day	Maximum limit of 14" in some rivers. Bait limit of 50 eels/day for party/charter boat captain and crew.
NJ	9"	25 eels/person/day	Bait limit of 50 eels/day for party/charter boat captain and crew.
PA	9"	25 eels/person/day	Gear restrictions. Bait limit of 50 eels/day for party/charter boat captain and crew.
DE	6"	50 eels/person/day	Two pot limit/person.
MD	9"	25 eels/person/day	Gear restrictions.
DC	9"	10 eels/person/day	
PRFC	9"	25 eels/person/day	
VA	9"	25 eels/person/day	Recreational license. Two pot limit. Mandatory annual catch report. Gear restrictions. Bait limit of 50 eels/day for party/charter boat captain and crew.
NC	9"	25 eels/person/day	Gear restrictions. Non-commercial special device license. Two eel pots allowed under Recreational Commercial Gear license. Bait limit of 50 eels/day for party/charter boat captain and crew.
SC	9"	25 eels/person/day	Gear restrictions. Permits and licenses. Two pot limit
GA	9"	25 eels/person/day	
FL	9"	25 eels/person/day	Gear restrictions. Wholesale/Retail purchase exemption applies to possession limit for bait.

**Table 3. Summary of current state/jurisdiction reporting structure for commercial eel landings and quota management per Addendum VI requirements.**

State	Rulemaking Process	Rulemaking Timeframe	Reporting to monitor quota	Overages and Transfers	Additional Measures Planned
Maine	DMR Authority	up to 100 days	Monthly harvester. Likely to use swipe card system	Y	Possible seasons and days out by 2017
New Hampshire	Director Authority	at least 1 month	Monthly harvester	Y	None, but can if needed
Massachusetts	MF Advisory Commission	by March 2016	Weekly dealer (personal bait not counted)	Y	Close H&L gear Sept 1-Dec 31
Rhode Island	Director Authority	30 day public comment	Dealer twice a week	Y	None, but can if needed
Connecticut	DEEP Authority	10 days public notice	Monthly harvester	Y	None, but can if needed
New York	DEC Authority	6 months	Monthly harvester (river/marine) and weekly dealer (marine)	Y	Closed pot fishery on Delaware River. Need adjustment to quota through transfers or management addendum.
New Jersey	Commissioner/Council Rulemaking	3-4 months	Monthly harvester	Y	Limited entry based on 2007-2014 harvest. Possible pot maximum, and seasons. Some through notice process while others up to two years.
Delaware	Legislature (resumes in Jan 2016)	Legislature Session Jan-June	Daily harvester	Legislature	None, but can if needed
Maryland	DNR Authority	100 days or 48h with public notice authority	Daily harvester	Y	Harvester permit by 03/2016 with reporting requirement
PRFC	PRFC Authority	1-2 months	Weekly harvester	Y	None, but can if needed
Virginia	VMRC Authority	1 month	Monthly harvester with dealer check	Y	Possible seasonal closures and possession limits. Quota trigger to implement weekly/daily dealer reports.
North Carolina	NCDMF Authority	Immediate	Monthly dealer and harvester log books	Y	Proactive reporting trigger program to weekly/daily and closure at 85% of quota.
South Carolina	Legislature, but permitting authority	Permit cycle June 30	Monthly harvester and dealer	Y	Possible gear restrictions, seasons, catch limits, or closure
Georgia	Natural Resources Authority	Up to 90 days	Monthly harvester and dealer	Y	Likely close eel commercial fishery if state by state quotas are implemented
Florida	Executive Order Rulemaking	Governor-commission meets 5 times a year	Monthly harvester, weekly harvester when 50% quota is reached	Y	None, but can if needed. Issue of harvester selling to dealers outside the state and potential double counting of quota

**Table 4. Numbers of American eel samples reported by the MRIP/MRFSS angler-intercept survey and at-sea headboat survey, by catch type, 1981–2016.**

Year	Type A	Type B1		Type B2	
	Intercept	Intercept	Headboat	Intercept	Headboat
1981	22	75		94	
1982	75	44		43	
1983	28	19		73	
1984	28	12		26	
1985	53	17		91	
1986	62	41		138	
1987	16	34		49	
1988	35	36		74	
1989	57	31		150	
1990	36	16		154	
1991	113	30		123	
1992	13	25		101	
1993	224	40		101	
1994	98	48		89	
1995	23	6		96	
1996	18	29		77	
1997	9	8		50	
1998	7	3		84	
1999	4	7		70	
2000	7	5		43	
2001	1	8		44	
2002	6	10		79	
2003	16	16		155	
2004	13	16		99	
2005	7	3		65	
2006	7	3		76	
2007	39	7		73	
2008	4	5		66	
2009	9	4		75	
2010	14	22		117	
2011	2	4		91	
2012	11	42		119	
2013	10	5		99	
2014	5	12		99	
2015	1	6		100	
2016	7	20		92	

**Table 5. Numbers of American eels available for biological sampling in the MRIP/ MRFSS angler-intercept survey and at-sea headboat survey, by survey component, 1981–2016.**

Year	Intercept (Type A)		Headboat (Type B2)
	Weighed	Measured	Measured
1981	21	21	
1982	46	49	
1983	16	16	
1984	22	22	
1985	30	27	
1986	25	18	
1987	13	10	
1988	28	27	
1989	47	29	
1990	12	17	
1991	37	35	
1992	3	3	
1993	15	32	
1994	21	13	
1995	2	2	
1996	5	5	
1997	7	7	
1998	3	4	
1999	1	2	
2000	7	7	
2001	0	1	
2002	1	2	
2003	0	2	
2004	11	13	
2005	4	6	1
2006	3	3	1
2007	3	4	6
2008	2	3	8
2009	4	4	1
2010	6	6	2
2011	1	0	1
2012	5	5	1
2013	3	6	2
2014	1	4	0
2015	0	1	0
2016	3	4	2

**Table 6. Estimates of recreational fishery harvest and released alive for American eels along the Atlantic coast, 1981–2015. The precision of each estimate, measured as proportional standard error (PSE), is also given. Estimates for 1981-2003 have been calibrated to MRIP from MRFSS.**

Year	Harvest (Type A+B1)				Released Alive (Type B2)	
	Numbers	PSE[Num]	Weight (lbs)	PSE[Weight]	Numbers	PSE[Num]
1981	117,583	53.6	99,918	46.2	117,131	53.2
1982	197,724	62.6	130,815	44.3	85,001	64.6
1983	120,777	82.8	105,986	60.2	83,688	40.4
1984	81,524	54.1	78,306	47.6	49,277	60.7
1985	220,596	77.8	218,269	30.4	85,031	47.9
1986	138,583	56.6	112,388	39.7	120,993	35.4
1987	51,714	63.8	38,972	51.7	65,609	50.7
1988	85,483	52.3	41,166	32.6	104,581	52.8
1989	68,748	50.7	92,589	34.8	113,377	30.9
1990	33,324	55.9	18,239	45.8	99,998	31.0
1991	106,427	62.9	79,603	42.2	80,022	42.4
1992	42,846	70.7	2,717	28.2	55,788	48.2
1993	97,664	75.1	60,714	61.0	87,265	40.7
1994	67,999	63.1	34,420	53.1	70,089	32.3
1995	12,598	108	1,304	28.2	64,478	45.4
1996	28,149	67.4	8,765	56.9	56,131	34.3
1997	21,256	111	9,118	61.8	26,707	43.3
1998	8,543	80.6	4,625	88.0	57,803	41.8
1999	7,739	87.4	497	28.2	56,574	95.1
2000	37,084	144	18,398	92.2	48,119	52.9
2001	14,798	149			30,739	40.0
2002	7,625	74.7	812	28.2	47,952	31.8
2003	42,582	119			157,189	33.5
2004	41,286	61.4	41,191	65.2	74,653	24.6
2005	5,217	48.4	4,309	54.3	63,939	40.8
2006	19,389	53.6	15,917	49.2	99,974	42.2
2007	40,676	60.1	46,700	85.4	113,424	47.3
2008	3,062	46.0	1,245	61.4	62,625	34.5
2009	9,890	57.6	6,616	62.4	92,399	31.3
2010	129,803	78.7	31,518	64.1	90,437	28.6
2011	6,860	51.4	5,314	73.3	81,848	28.5
2012	38,493	49.0	11,999	52.1	143,868	34.1
2013	8,833	48.9	6,030	36.1	115,359	25.5
2014	5,974	47.6	7,684	61.4	148,598	53.1
2015	4,077	48.7	10,855	59.8	54,227	24.2
2016	63,946	18.8	107,480	18.0	60,589	39.6

**Table 7. Summary of GLM analyses used to standardize YOY indices developed from the ASMFC-mandated and non-mandated (indicated with an \* next to the survey name) recruitment surveys. Phi is the overdispersion parameter. For GLM standardized indices, the response variable was American eel catch. If a GLM wasn't applied, a nominal index was computed; nominal indices computed as ratio estimators.**

Region	State	Site	Years	Gear	GLM?	Error	Predictors	Phi
Gulf of Maine	ME	West Harbor Pond	2001-2016	Irish Elver Ramp	N			
	NH	Lamprey River	2001-2016	Irish Elver Trap	Y	NB	Year+WaterTemp	1.48
	MA	Jones River	2001-2016	Sheldon Elver Trap	Y	NB	Year+Discharge	1.08
Southern New England	CT	Ingham Hill	2007-2016	Irish Elver Ramp	N			
	RI	Gilbert Stuart Dam	2000-2016	Irish Elver Ramp	Y	NB	Year+WaterTemp+WaterLevel	1.38
	RI	Hamilton Fish Ladder	2004-2016	Irish Elver Ramp	Y	NB	Year+WaterLevel	1.43
	NY	Carman's River	2000-2016	Fyke Net	Y	NB	Year+WaterTemp	1.74
Hudson River	NY	HRE Monitoring *	1974-2013	Epibenthic Sled and Tucker Trawl	Y	Delta-gamma	Year + Month + Strata + Rivermile + Volume	0.66
Delaware Bay/ Mid-Atlantic Coastal Bays	NJ	Patcong Creek	2004-2016	Fyke Net	N			
	NJ	Little Egg Inlet Ichthyoplankton *	1992-2015	Plankton Net	Y	NB	Year + Month + Flow meter + River discharge	1.07
	DE	Millsboro Dam	2000-2016	Fyke Net	Y	NB	Year+Discharge	1.76
	MD	Turville Creek	2000-2016	Irish Elver Ramp	N			
Chesapeake Bay	PRFC	Clark's Millpond	2000-2013	Irish Elver Ramp	N			
	PRFC	Gardy's Millpond	2000-2016	Irish Elver Ramp	N			
	VA	Bracken's Pond	2000-2016	Irish Elver Ramp	N			
	VA	Kamp's Millpond	2000-2016	Irish Elver Ramp	N			
	VA	Wareham's Pond	2003-2016	Irish Elver Ramp	Y	NB	Year+WaterTemp	1.31
	VA	Wormley Creek	2001-2016	Irish Elver Ramp	Y	NB	Year+WaterTemp	1.54
South Atlantic	NC	Beaufort Bridgenet Ichthyoplankton	1987-2007	Plankton Net	Y	NB	Year + Month + River discharge	1.27
	SC	Goose Creek	2000-2015	Fyke Net	Y	NB	Year+WaterTemp	1.09
	GA	Altamaha Canal	2001-2010	Fyke Net	Y	LN	Year+WaterTemp	1.11
	FL	Guana River Dam	2001-2016	Dip Net	N			

**Table 8. Spearman's rank correlation between YOY indices developed from the ASMFC-mandated recruitment surveys. Values formatted in bold and italicized font are statistically significant at  $\alpha < 0.10$ . NC's Beaufort Bridgenet Ichthyoplankton Sampling Program (BBISP) and CT's Ingham Hill indices only overlap for one year and therefore are "NA" in the table.**

Region	Survey Site	Gulf of Maine			Southern New England				Delaware Bay/Mid-Atl			Chesapeake Bay					South Atlantic			
		West Harbor Pond (ME)	Lamprey River (NH)	Jones River (MA)	Ingham Hill (CT)	Gilbert Stuart Dam (RI)	Hamilton Ladder (RI)	Carman's River (NY)	Patcong Creek (NJ)	Mills-boro Dam (DE)	Turville Creek (MD)	Clarks Millpond (PRFC)	Gardys Millpond (PRFC)	Brackens Pond (VA)	Kamps Millpond (VA)	Warehams Pond (VA)	Wormley Creek (VA)	BBISP (NC)	Goose Creek (SC)	Altamaha Canal (GA)
Gulf of Maine	Lamprey River (NH)	<b>0.532</b>																		
	Jones River (MA)	-0.362	-0.503																	
Southern New England	Ingham Hill (CT)	0.079	-0.224	<b>0.455</b>																
	Gilbert Stuart Dam (RI)	<b>0.418</b>	<b>0.476</b>	-0.288	0.236															
	Hamilton Fish Ladder (RI)	0.220	0.363	-0.467	-0.030	<b>0.505</b>														
	Carman's River (NY)	<b>0.506</b>	<b>0.535</b>	-0.359	0.127	<b>0.502</b>	0.319													
Delaware Bay/Mid-Atl	Patcong Creek (NJ)	0.343	<b>0.446</b>	0.032	0.183	0.332	-0.266	0.224												
	Millsboro Dam (DE)	<b>0.432</b>	<b>0.585</b>	-0.253	0.042	<b>0.368</b>	<b>0.434</b>	0.294	0.265											
	Turville Creek (MD)	0.029	-0.109	-0.203	0.176	0.157	0.049	-0.233	-0.335	0.294										
Chesapeake Bay	Clarks Millpond (PRFC)	-0.332	-0.326	0.132	0.115	-0.103	-0.462	0.118	0.009	-0.221	-0.005									
	Gardys Millpond (PRFC)	0.276	0.106	0.094	0.188	0.230	0.115	0.324	-0.091	0.211	0.002	-0.235								
	Brackens Pond (VA)	-0.179	-0.321	<b>0.685</b>	<b>0.564</b>	0.228	-0.154	-0.162	-0.029	0.032	0.235	0.208	-0.096							
	Kamps Millpond (VA)	<b>0.597</b>	0.256	-0.132	0.127	0.206	0.093	0.162	0.053	0.145	0.174	0.115	0.061	0.074						
	Warehams Pond (VA)	0.126	0.258	0.005	0.000	0.330	0.126	-0.049	0.343	-0.297	0.126	-0.511	0.077	-0.038	-0.104					
	Wormley Creek (VA)	-0.385	0.171	-0.071	-0.224	0.109	-0.005	-0.218	-0.118	0.206	0.194	0.335	-0.300	0.162	0.103	-0.291				
South Atlantic	BBISP (NC)	<b>0.679</b>	0.107	-0.286	NA	0.214	0.400	0.452	0.071	-0.452	-0.429	0.214	0.119	-0.452	<b>0.786</b>	-0.700	-0.429			
	Goose Creek (SC)	0.021	-0.271	<b>0.496</b>	0.183	-0.288	-0.112	-0.259	-0.132	-0.141	-0.379	-0.144	0.021	0.074	0.221	-0.434	0.061	0.476		
	Altamaha Canal (GA)	-0.079	0.164	0.309	0.600	-0.345	0.107	-0.212	-0.006	<b>0.455</b>	-0.067	-0.442	-0.067	0.236	0.103	0.000	0.297	-0.536	0.394	
	Guana River Dam (FL)	-0.147	-0.456	<b>0.491</b>	-0.455	-0.115	-0.280	-0.371	-0.275	-0.388	-0.094	0.085	0.100	0.203	0.215	-0.115	0.124	0.286	<b>0.629</b>	-0.200

**Table 9. Summary of GLM analyses used to standardize fisheries-independent indices developed from elver and yellow eel American eel surveys. Phi is the overdispersion parameter.**

Region	State	Survey	Location	Years	Gear	Life Stage(s)	GLM ?	Error	Predictors	Phi
Southern New England	CT	CTDEP Electrofishing Survey	Farmill River	2001-2014	Electrofishing	Elver & Yellow	N			
	NY	NY Western Long Island Survey	Western Long Island	1984-2016	Seine	Yellow	Y	NB	Year + Month + Lat	0.48
Hudson River	NY	HRE Monitoring Program	Hudson River	1974-2013	Epidbenthic Sled and Tucker Trawl	Yearling & older	Y	NB	Year + Gear + Month + Strata + Rivermile + Volume	1.91
	NY	NYDEC Alosine Beach Seine Survey	Hudson River	1980-2016	Seine	Elver & Yellow	Y	NB	Year + Month + Rivermile	1.23
	NY	NYDEC Striped Bass Beach Seine Survey	Hudson River	1980-2016	Seine	Elver & Yellow	Y	NB	Year + Month + Longitude	1.31
Delaware Bay/ Mid-Atlantic Coastal Bays	NJ	NJDFW Striped Bass Seine	Delaware River	1980-2016	Seine	Yellow	Y	NB	Year + Water temp + Salinity	1.02
	DE	Delaware Trawl Survey	Delaware River	1982-2016	Trawl	Elver & Yellow	Y	NB	Year + Month + Surf_Temp + Surf_Sal	2.18
	DE	PSEG Trawl Survey	Delaware River	1998-2016	Trawl	Elver & Yellow	Y	NB	Year + Month + Bot_S	1.95
	PA	Area 6 Electrofishing Survey	Delaware River	1999-2016	Electrofishing	Elver	Y	NB	Year + Site	1.16



**Table 9. Continued.**

Region	State	Survey	Location	Years	Gear	Life Stage(s)	GLM ?	Error	Predictors	Phi
Chesapeake Bay	MD	MDDNR Striped Bass Seine	Chesapeake Bay	1966-2016	Seine	Yellow	Y	NB	Year + Month + Salinity	0.95
	VA	North Anna Electrofishing Survey	North Anna River	1990-2009	Electrofishing	Elver & Yellow	Y	NB	Year+GearType+TimePeriod+Station	1.20
	VA	VIMS Juvenile Striped Bass Seine Survey - long	Lower Ches Bay & Trib	1967-2016	Seine	Yellow	Y	NB	Year + SYSTEM	1.69
	VA	VIMS Juvenile Striped Bass Seine Survey - short	Lower Ches Bay & Trib	1989-2016	Seine	Yellow	Y	NB	Year + STATION TYPE	1.38
South Atlantic	NC	NCDMF Estuarine Trawl Survey	NC waters	1989-2016	Trawl	Elver & Yellow	Y	NB	Year + Lat + Lon + Bottomtype	1.29
	SC	SC Electrofishing Survey	SC waters	2001-2016	Electrofishing	Elver & Yellow	Y	NB	Year + Strata + Water temp + Salinity + Tide Stage	1.10

**Table 10. Spearman's rank correlation between yellow American eel indices. Values formatted in bold and italicized font are statistically significant at  $\alpha < 0.10$ .**

	Region	S. New England		Hudson River			Delaware Bay/Mid-Atl				Chesapeake Bay			South Atlantic
Region	Survey Site	CTDEP (CT)	W. Long Island (NY)	HRE Monitoring (NY)	NYDEC Alosine Beach Seine (NY)	NYDEC Striped Bass Beach Seine (NY)	NJDFW Striped Bass Seine (NJ)	Delaware Trawl (DE)	PSEG Trawl Survey (DE)	Area 6 Electrofishing (PA)	MDDNR Striped Bass Seine (MD)	North Anna (VA)	VIMS Juvenile Striped Bass Seine—short (VA)	NCDMF Estuarine Trawl Survey (NC)
S. New England	W. Long Island Study (NY)	-0.254												
Hudson River	HRE Monitoring (NY)	<b>0.406</b>	<b>0.440</b>											
	NYDEC Alosine Beach Seine (NY)	0.091	<b>0.279</b>	<b>0.284</b>										
	NYDEC Striped Bass Beach Seine (NY)	0.168	<b>0.492</b>	<b>0.726</b>	<b>0.290</b>									
Delaware Bay/Mid-Atl	NJDFW Striped Bass Seine (NJ)	0.147	0.129	-0.033	<b>0.237</b>	0.085								
	Delaware Trawl (DE)	-0.063	-0.162	-0.087	0.120	0.171	<b>0.296</b>							
	PSEG Trawl Survey (DE)	-0.217	-0.203	0.158	-0.275	-0.235	-0.226	0.198						
	Survey (PA)	<b>0.706</b>	0.087	<b>0.493</b>	-0.183	0.110	-0.042	-0.187	-0.028					
Chesapeake Bay	Seine (MD)	-0.007	0.105	0.047	0.131	0.184	0.099	<b>0.296</b>	0.096	-0.247				
	North Anna (VA)	<b>0.857</b>	-0.171	-0.337	0.147	-0.377	<b>0.575</b>	-0.107	0.264	<b>0.455</b>	<b>0.389</b>			
	VIMS Juvenile Striped Bass Seine—short (VA)	<b>0.552</b>	-0.077	-0.201	-0.083	0.057	-0.055	0.117	-0.175	0.115	0.139	0.072		
South Atlantic	NCDMF Estuarine Trawl Survey (NC)	0.098	0.024	<b>0.461</b>	0.111	<b>0.426</b>	-0.346	-0.098	-0.056	-0.218	-0.445	-0.491	-0.006	
	SC Electrofishing Survey (SC)	-0.217	<b>0.534</b>	-0.436	0.168	-0.238	<b>0.382</b>	<b>0.468</b>	<b>0.388</b>	-0.174	0.206	-0.167	-0.282	-0.491

**Table 11. Summary of surveys used in development of region-specific indices of American eel relative abundance. Asterisks (\*) denote the ASMFC-mandated recruitment surveys. A Southern New England regional yellow eel index was not developed due to concerns about the indices in that region, see section 6.2.2 for more information.**

Region	Life Stage	Time Period	Survey
Gulf of Maine	YOY	2001–2016	West Harbor Pond (ME) *
			Lamprey River (NH) *
			Jones River (MA) *
	Yellow		<i>none available</i>
Southern New England	YOY	2000–2016	Gilbert Stuart Dam (RI) *
			Hamilton Fish Ladder (RI) *
			Ingham Hill (CT) *
			Carman's River (NY) *
	Yellow	2000–2012	CTDEP Electrofishing Survey (CT)
			NY Western Long Island Survey (NY)
Hudson River	YOY	1974–2013	HRE Monitoring Program (NY)
	Yellow	1980–2015	HRE Monitoring Program (NY)
			NYDEC Alosine Beach Seine Survey (NY)
			NYDEC Striped Bass Beach Seine Survey (NY)
Delaware Bay/ Mid-Atlantic Coastal Bays	YOY	2000–2016	Millsboro Dam (DE) *
			Patcong Creek (NJ) *
			Little Egg Inlet Ichthyoplankton Survey (NJ)
			Turville Creek (MD) *
	Yellow	1999–2015	NJDFW Striped Bass Seine (NJ)
			Delaware Trawl Survey (DE)
			PSEG Trawl Survey (DE)
			Area 6 Electrofishing Survey (PA)
Chesapeake Bay	YOY	2000–2016	Clark's Millpond (PRFC) *
			Gardy's Millpond (PRFC) *
			Bracken's Pond (VA) *
			Kamp's Millpond (VA) *
			Warehams Pond (VA) *
			Wormley Creek (VA) *
	Yellow	1990–2009	MDDNR Striped Bass Seine (MD)
			North Anna Electrofishing Survey (VA)
			VIMS Juvenile Striped Bass Seine Survey—short (VA)
South Atlantic	YOY	2000–2015	Beaufort Bridgenet Ichthyoplankton (NC) *
			Goose Creek (SC) *
			Altamaha Canal (GA) *
			Guana River Dam (FL) *
	Yellow	2001–2016	NCDMF Estuarine Trawl Survey (NC)
			SC Electrofishing Survey (SC)

**Table 12. Spearman's rank correlation between regional YOY indices for American eel. Values formatted in *bold and italicized* font are statistically significant at  $\alpha < 0.10$ .**

	Gulf of Maine	Southern New England	Hudson River	Delaware Bay/Mid-Atlantic	Chesapeake Bay
Southern New England	0.053				
Hudson River	<b><i>0.500</i></b>	0.345			
Delaware Bay/Mid-Atlantic	<b><i>0.535</i></b>	<b><i>0.417</i></b>	<b><i>0.486</i></b>		
Chesapeake Bay	0.050	0.096	0.244	0.029	
South Atlantic	0.221	-0.285	<b><i>0.415</i></b>	-0.141	0.091

**Table 13. Spearman's rank correlation between regional yellow-phase indices for American eel. Values formatted in *bold and italicized* font. None of the values are statistically significant at  $\alpha < 0.10$ .**

	Hudson River	Delaware Bay/ Mid-Atlantic Coastal Bays	Chesapeake Bay
Delaware Bay/ Mid-Atlantic Coastal Bays	-0.026		
Chesapeake Bay	-0.367	0.227	
South Atlantic	-0.372	-0.215	-0.050

**Table 14. Spearman's rank correlation coefficients ( $\rho$ ) and associated  $P$ -values from correlation of region-specific yellow-phase indices and lagged YOY indices for American eel. Values formatted in *bold and italicized* font are statistically significant at  $\alpha < 0.10$ . There was no regional yellow eel index for Gulf of Maine or Southern New England.**

Region	Yellow vs.	Lag (years)	$\rho$	$P >  \rho $
Hudson River	YOY	0	0.011	0.477
		1	<b><i>0.269</i></b>	0.087
		2	<b><i>0.277</i></b>	0.085
		3	<b><i>0.476</i></b>	0.008
		4	<b><i>0.521</i></b>	0.004
Delaware Bay/ Mid-Atlantic Coastal Bays	YOY	0	0.199	0.222
		1	0.194	0.228
		2	-0.126	0.684
		3	0.039	0.446
		4	0.349	0.110
Chesapeake Bay	YOY	0	-0.370	0.861
		1	-0.091	0.612
		2	<b><i>0.734</i></b>	0.005
		3	0.137	0.328
		4	-0.024	0.536
South Atlantic	YOY	0	0.300	0.138
		1	<b><i>0.714</i></b>	0.003
		2	<b><i>0.473</i></b>	0.053
		3	0.364	0.123
		4	<b><i>0.573</i></b>	0.035

**Table 15. Parameter estimates (standard errors in parentheses) of the allometric length (mm)-weight (g) relation fit to available data for American eel by region, sex, and all data pooled. Asterisks (\*) denote standard errors that are  $\geq 30\%$  of the parameter estimate.**

	<b>Subset</b>	<b>n</b>	<b>a</b>	<b>b</b>
None	All	68,334	4.05E-7 (1.324E-8)	3.25 (0.00509)
Region	Gulf of Maine	3,420	6.49E-7 (3.574E-8)	3.17 (0.00843)
	Southern New England	166	5.10E-5 (4.10E-5*)	2.52 (0.1236)
	Hudson River	2,249	1.27E-6 (1.956E-7)	3.06 (0.0240)
	Del Bay/Mid-Atl Coastal Bays	11,270	3.48E-7 (1.972E-8)	3.26 (0.00886)
	Chesapeake Bay	38,161	3.25E-7 (1.589E-8)	3.28 (0.00757)
	South Atlantic	13,068	3.32E-7 (3.403E-8)	3.29 (0.0161)
Sex	Male	2,643	5.81E-7 (3.301E-8)	3.19 (0.00958)
	Female	4,049	6.81E-7 (4.003E-8)	3.16 (0.00912)

**Table 16. Parameter estimates (standard errors in parentheses) for the linear regression of length (mm) on age (years) fit to available data for American eel by region, sex, and all data pooled. Asterisks (\*) denote standard errors that are  $\geq 30\%$  of the parameter estimate.**

<b>Class</b>	<b>Subset</b>	<b>n</b>	<b>Intercept</b>	<b>Slope</b>
None	All	17,414	338 (1.55)	8.77 (0.224)
Region	Gulf of Maine	2,356	87.5 (2.96)	23.5 (0.271)
	Southern New England	475	192 (18.7)	14.5 (1.57)
	Hudson River	875	238 (7.68)	13.7 (0.556)
	Del Bay/Mid-Atl Coastal Bays	4,815	278 (3.61)	29.4 (0.847)
	Chesapeake Bay	7,734	263 (2.85)	28.1 (0.556)
	South Atlantic	1,159	331 (9.47)	26.0 (1.92)
Sex	Male	2,423	295 (1.50)	3.39 (0.172)
	Female	3,513	358 (2.86)	7.65 (0.27)

**Table 17. Parameter estimates (standard errors in parentheses) of the von Bertalanffy age-length model fit to available data for American eel by region, sex, and all data pooled. Values of  $L_{\infty}$  represent length in millimeters. Asterisks (\*) denote standard errors that are  $\geq 30\%$  of the parameter estimate.**

<b>Class</b>	<b>Subset</b>	<b>n</b>	<b><math>L_{\infty}</math></b>	<b><math>K</math></b>	<b><math>T_0</math></b>
None	All	17,414	434 (1.78)	0.515 (0.018)	-0.34 (0.080)
Region	Gulf of Maine	2,356	1,397 (191.1)	0.022 (0.004)	-2.15 (0.254)
	Southern New England	475	<i>failed to converge</i>		
	Hudson River	875	484 (5.36)	0.230 (0.013)	0.35 (0.139*)
	Del Bay/Mid-Atl Coastal Bays	4,815	585 (26.98)	0.179 (0.027)	-2.52 (0.421)
	Chesapeake Bay	7,734	1366 (380.1)	0.030 (0.012*)	-6.84 (0.803)
	South Atlantic	1,159	569.9 (26.31)	0.263 (0.056)	-1.67 (0.623*)
Sex	Male	2,423	<i>failed to converge</i>		
	Female	3,513	668 (85.70)	0.035 (0.013*)	-20.96 (4.645)

**Table 18. Result of power analysis for linear and exponential trends in American eel abundance indices over a ten-year period. Power was calculated according to methods in Gerrodette (1987).**

Region	Life Stage	Survey	State	Median CV	Linear trend		Exponential Trend	
					50%	-50%	50%	-50%
Gulf of Maine	YOY	YOY Survey--Jones River	MA	0.347	0.33	0.46	0.34	0.48
	YOY	YOY Survey--Lamprey River	NH	0.316	0.37	0.52	0.38	0.54
	YOY	YOY Survey - West Harbor Pond	ME	33.245	0.05	0.05	0.07	0.08
Southern New England	Elver & Yellow	CTDEP Electrofishing	CT	0.043	1	1	1	1
	Yellow	NY Western Long Island Survey	NY	1.061	0.1	0.13	0.12	0.16
	YOY	YOY Survey - Carman's River	NY	0.19	0.7	0.87	0.7	0.88
	YOY	YOY Survey - Gilbert Stuart Dam	RI	0.205	0.64	0.83	0.65	0.84
	YOY	Hamilton Fish Ladder	RI	0.205	0.64	0.83	0.65	0.84
	YOY	Ingham Hill	CT	0.455	0.23	0.32	0.24	0.35
Hudson	Elver & Yellow	NYDEC Alosine Beach Seine	NY	0.176	0.76	0.91	0.76	0.92
	Elver & Yellow	NYDEC Striped Bass Beach Seine	NY	0.231	0.56	0.74	0.56	0.76
	Yearling +	HRE Monitoring Program	NY	0.067	1	1	1	1
	YOY	HRE Monitoring Program	NY	0.111	0.98	1	0.98	1
Delaware Bay/Mid-Atlantic Coastal Bays	Elver	Area 6 Electrofishing	PA	0.182	0.73	0.9	0.74	0.9
	Elver & Yellow	Delaware Trawl Survey	DE	0.222	0.58	0.77	0.59	0.78
	Elver & Yellow	PSEG Trawl Survey	DE	0.265	0.47	0.66	0.46	0.64
	Yellow	NJ Striped Bass Seine Survey	NJ	0.501	0.21	0.28	0.22	0.31
	YOY	Little Egg Inlet Ichthyoplankton Survey	NJ	0.18	0.74	0.9	0.74	0.91
	YOY	YOY Survey--Millsboro Dam	DE	0.295	0.4	0.56	0.41	0.58
	YOY	YOY Survey--Patcong Creek	NJ	1.391	0.09	0.1	0.1	0.14
	YOY	YOY Survey--Turville Creek	MD	5.5	0.06	0.06	0.08	0.09



**Table 17. Continued.**

Region	Life Stage	Survey	State	Median CV	Linear trend		Exponential Trend	
					+50%	-50%	+50%	-50%
Chesapeake Bay	Elver & Yellow	North Anna Electrofishing Survey	VA	0.238	0.54	0.72	0.54	0.74
	Yellow	MD Striped Bass Seine Survey	MD	0.621	0.16	0.22	0.18	0.25
	Yellow	VIMS Juvenile SB Seine Survey--long	VA	0.698	0.15	0.19	0.16	0.22
	Yellow	VIMS Juvenile SB Seine Survey--short	VA	0.472	0.22	0.30	0.23	0.33
	YOY	YOY Survey--Brackens Pond	VA	0.638	0.16	0.21	0.17	0.24
	YOY	YOY Survey—Clark’s Millpond	PRFC	0.004	1.00	1.00	1.00	1.00
	YOY	YOY Survey—Gardy’s Millpond	PRFC	0.005	1.00	1.00	1.00	1.00
	YOY	YOY Survey—Kamp’s Millpond	VA	0.052	1.00	1.00	1.00	1.00
	YOY	YOY Survey--Wormley Creek	VA	0.250	0.50	0.69	0.51	0.70
	YOY	Wareham’s Pond	VA	0.246	0.51	0.70	0.52	0.71
South Atlantic	Elver & Yellow	NCDMF Estuarine Trawl Survey	NC	0.507	0.20	0.28	0.22	0.31
	Elver & Yellow	SC Electrofishing Survey	SC	0.131	0.93	0.99	0.93	0.99
	YOY	YOY Beaufort Bridgenet Ichthyo.	NC	0.216	0.60	0.79	0.61	0.80
	YOY	YOY Survey - Altamaha Canal	GA	0.320	0.36	0.50	0.37	0.53
	YOY	YOY Survey--Goose Creek	SC	0.205	0.64	0.83	0.65	0.84
	YOY	YOY Survey--Guana River Dam	FL	0.013	1.00	1.00	1.00	1.00

**Table 19. Results of the Mann-Kendall trend analysis applied to YOY indices. *S* is the Mann-Kendall statistic, *D* is the Denominator, *P*-value is the two-tailed probability for the trend test, and trend indicates the direction of the trend if a statistically significant temporal trend was detected (*P*-value <  $\alpha$ ;  $\alpha = 0.05$ ). NS = not significant. “-” indicates an index which was not available during the last benchmark but was included in the 2017 update because it now has at least 10 years of data.**

Region	State	Location	Gear	Time Period	n	<i>T</i>	<i>D</i>	<i>S</i>	<i>P</i> -value	Trend 2012	Trend 2016
Gulf of Maine	ME	West Harbor Pond	Irish Elver Ramp	2001–2016	16	0.283	120	33.96	0.137	NS	NS
	NH	Lamprey River	Irish Elver Trap	2001–2016	16	0.350	120	42.00	0.065	NS	NS
	MA	Jones River	Sheldon Elver Trap	2001–2016	16	-0.533	120	-63.96	0.005	NS	↓
Southern New England	RI	Hamilton Fish Ladder	Irish Elver Ramp	2004-2016	13	0.282	78	22.00	0.200	-	NS
	RI	Gilbert Stuart Dam	Irish Elver Ramp	2000–2016	17	0.162	136	22.03	0.387	NS	NS
	CT	Ingham Hill	Irish Elver Ramp	2007-2016	10	-0.244	45	-10.98	0.371	-	NS
	NY	Carman's River	Fyke Net	2000–2016	17	0.044	136	6.00	0.840	NS	NS
	NY	HRE Monitoring	Epibenthic sled & tucker trawl	1974-2013	34	-0.422	561	-236.74	0.000	↓	↓
Delaware Bay/ Mid-Atlantic Coastal Bays	NJ	Little Egg	Plankton Net	1992-2015	24	-0.355	276	-97.98	0.016	NS	↓
	NJ	Patcong Creek	Fyke Net	2004–2016	12	0.217	120	26.04	0.260	NS	NS
	DE	Millsboro Dam	Fyke Net	2000–2016	17	0.191	136	25.98	0.303	NS	NS
	MD	Turville Creek	Irish Elver Ramp	2000–2016	17	0.176	136	23.94	0.343	NS	NS

**Table 18. Continued.**

Region	State	Location	Gear	Time Period	n	<i>T</i>	<i>D</i>	<i>S</i>	<i>P</i> -value	Trend 2012	Trend 2016
Chesapeake Bay	PRFC	Clark's Millpond	Irish Elver Ramp	2000–2016	17	-0.147	136	-19.99	0.434	NS	NS
	PRFC	Gardy's Millpond	Irish Elver Ramp	2000–2016	17	-0.191	136	-25.98	0.303	NS	NS
	VA	Warehams Pond	Irish Elver Ramp	2003-2016	13	0.308	78	24.02	0.161	-	NS
	VA	Bracken's Pond	Irish Elver Ramp	2000–2016	17	-0.324	136	-44.06	0.077	NS	NS
	VA	Kamp's Millpond	Irish Elver Ramp	2000–2016	17	-0.044	136	-6.00	0.837	NS	NS
	VA	Wormley Creek	Irish Elver Ramp	2001–2016	17	-0.100	120	-12.00	0.620	NS	NS
South Atlantic	NC	Beaufort Bridgenet Ichthyo	Plankton Net	1987-2007	21	-0.343	210	-72.03	0.032	NS	↓
	SC	Goose Creek	Fyke Net	2000–2015	16	-0.433	120	-51.96	0.022	NS	↓
	GA	Altamaha Canal	Fyke Net	2001–2010	10	-0.333	45	-14.99	0.211	NS	NS
	FL	Guana River Dam	Dip Net	2001–2016	16	-0.343	210	-72.03	0.032	NS	↓

**Table 20. Results of the Mann-Kendall trend analysis applied to yellow eel indices. *S* is the Mann-Kendall statistic, *D* is the Denominator, *P*-value is the two-tailed probability for the trend test, and trend indicates the direction of the trend if a statistically significant temporal trend was detected (*P*-value <  $\alpha$ ;  $\alpha = 0.05$ ). NS = not significant. The length range of observed American eels is shown in parentheses after the life stage if the information was available.**

Region	Survey	Gear	Life Stage	Time Period	n *	<i>T</i>	<i>D</i>	<i>S</i>	<i>P</i> -value	Trend 2012	Trend 2017
Southern New England	CTDEP Electrofishing Survey	Electrofishing	Elver & Yellow (50–590 mm)	2001–2014	11	0.273	66	18.018	0.244	↑	NS
	NY Western Long Island Survey	Seine	Yellow (35–770 mm)	1984–2016	32	-0.49	499.744	-244.87	0.000	↓	↓
Hudson River	HRE Monitoring Program	Epibenthic Sled and Tucker Trawl	Yearling and Older	1974–2013	39	-0.526	780	-410.28	0.000	↓	↓
	NYDEC Alosine Beach Seine	Seine	Elver & Yellow	1980–2016	36	-0.42	666	-410.28	0.000	↓	↓
	NYDEC Striped Bass Beach Seine	Seine	Elver & Yellow	1980–2016	36	-0.523	666	-279.72	0.000	↓	↓
Delaware Bay/ Mid-Atlantic Coastal Bays	NJDFW Striped Bass Seine Survey	Seine	Yellow (50–750 mm)	1980–2016	36	-0.0631	666	-42.025	0.592	NS	NS
	Delaware Trawl Survey	Trawl	Elver & Yellow (55–690 mm)	1982–2016	34	-0.153	595	-91.035	0.201	NS	NS
	PSEG Trawl Survey	Trawl	Elver & Yellow (97–602 mm)	1998–2016	18	0.158	171	27.018	0.363	↑	NS <sup>1</sup>
	Area 6 Electrofishing	Electrofishing	Elver	1999–2016	17	0.216	153	33.048	0.225	NS	NS
	MDDNR Striped Bass Seine Survey	Seine	Yellow (77–687 mm)	1966–2016	50	-0.111	1274.5	-141.47	0.252	NS	NS

**Table 19. Continued.**

Region	Survey	Gear	Life Stage	Time Period	n *	T	D	S	P-value	Trend 2012	Trend 2017
Chesapeake Bay	North Anna Electrofishing Survey	Electrofishing	Elver & Yellow (32–726 mm)	1990–2009	19	0.626	171	107.046	0.000	↑	↑ <sup>1</sup>
	VIMS Juvenile Striped Bass Seine Survey—long	Seine	Yellow	1989–2016	49	0.00753	929.354	6.99803	0.951	NS	NS
	VIMS Juvenile Striped Bass Seine Survey—short	Seine	Yellow	1967–2016	27	-0.135	377.499	-50.962	0.323	↓	NS
South Atlantic	NCDMF Estuarine Trawl Survey	Trawl	Elver & Yellow (26–921 mm)	1989–2016	27	-0.296	378	-111.89	0.028	↓	↓
	SC Electrofishing Survey	Electrofishing	Elver & Yellow (44–890 mm)	2001–2016	15	-0.367	120	-44.04	0.053	↓	NS

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<sup>1</sup> The timeframe for the PSEG trawl survey changed from 1970-2010 in ASFMC 2012 to 1998-2016 in this update report. The North Anna Electrofishing survey was not updated for this report with data from 2010-2016 and therefore the trend remains the same. Refer to Section 5.2.2. for information on survey and standardization changes.

**Table 21. Results of the Mann-Kendall trend analysis applied to regional and coast-wide indices of American eel abundance. S is the Mann-Kendall statistic, D is the Denominator, P-value is the two-tailed probability for the trend test, and trend indicates the direction of the trend if a statistically significant temporal trend was detected (P-value <  $\alpha$ ;  $\alpha$  = 0.05). NS = not significant. “-“ are indices that were not updated.**

Region	Life Stage	Time Period	n	T	D	S	P-value	2012 Trend	2017 Trend
Gulf of Maine	YOY	2001–2016	15	0.017	120	2.004	0.964	NS	NS
Southern New England	YOY	2000–2016	16	0.118	136	16.05	0.537	NS	NS
	Yellow	2001–2010	9			0		NS	-
Hudson River	YOY	1974–2009	35			0		↓	-
	Yellow	1980–2016	36	0.527	665	-351	0.000	↓	↓
Delaware Bay/ Mid-Atlantic Coastal Bays	YOY	2000–2016	16	0.191	136	25.98	0.303	NS	NS
	Yellow	1999–2016	17	0.203	153	31.06	0.256	NS	NS
Chesapeake Bay	YOY	2000–2016	16	0.015	136	1.999	0.967	NS	NS
	Yellow	1990–2009	19	0.621	190	118	0.000	↑	↑
South Atlantic	YOY	2001–2015	14	0.433	120	-52	0.022	NS	↓
	Yellow	2001–2016	15	-0.4	120	-48	0.034	↓	↓
Atlantic Coast	YOY (short-term)	2000–2016	16	0.118	136	16.05	0.537	NS	NS
	YOY (long-term)	1987–2013	26	0.237	325	-77	0.094	NS	NS
	Yellow (40+ year)	1974–2016	42	0.391	903	-353	0.000	NS	↓
	Yellow (30-year)	1987–2016	29	0.333	435	-145	0.010	↓	↓
	Yellow (20-year)	1997–2016	19	0.211	190	-40.1	0.206	NS	NS

**Table 22. Results of the meta-analysis to synthesize trends for American eel. The meta-analysis techniques are from Manly (2001) where  $S_1$  tests whether at least one of the datasets shows a significant decline through time and  $S_2$  tests whether there is consensus among the datasets for a decline.  $S_2$  incorporates a weight equal to the number of years of the survey,  $n$ . The value of  $p$  represents the one-tailed  $p$ -value from the Mann-Kendall nonparametric test for a decreasing trend through time.**

Life Stage	Survey	n	p	Meta-analysis statistics	
Yellow	Area 6 Electrofishing	17	0.887		
	CTDEP Electrofishing Survey	11	0.878		
	NYDEC Alosine Beach Seine	36	0.000	$S_1$ :	115.88
	NYDEC Striped Bass Beach Seine	36	0.000	$df$ :	30
	Delaware Trawl Survey	34	0.101	$P(X^2 > S_1   df)$ :	<0.01
	PSEG Trawl Survey	18	0.819		
	North Anna Electrofishing Survey	19	1.000	$S_2$ :	-5.05
	NCDMF Estuarine Trawl Survey	27	0.142	$P(Z > S_2)$ :	<0.01
	SC Electrofishing Survey	16	0.026		
	HRE Monitoring	39	0.000		
	NY Western Long Island Survey	32	0.000		
	NJDFW Striped Bass Seine Survey	36	0.296		
	MD Striped Bass Seine Survey	50	0.126		
	VIMS Juvenile Striped Bass Seine --short	19	0.476		
VIMS Juvenile Striped Bass Seine--long	49	0.838			
YOY	West Harbor Pond	16	0.932		
	Lamprey River	16	0.968		
	Jones River	13	0.003	$S_1$ :	95.22
	Hamilton Fish Ladder	13	0.900	$df$ :	42
	Gilbert Stuart Dam	17	0.807	$P(X^2 > S_1   df)$ :	<0.01
	Ingham Hill	10	0.186		
	Carman's River	17	0.580	$S_2$ :	-16.03
	HRE Monitoring	34	0.000	$P(Z > S_2)$ :	<0.01
	Little Egg Inlet Ichthyoplankton Survey	24	0.008		
	Patcong Creek	12	0.870		
	Millsboro Dam	17	0.849		
	Turville Creek	17	0.829		
	Clarks Millpond	17	0.217		
	Gardys Millpond	17	0.152		
	Brackens Pond	17	0.039		
	Kamps Millpond	17	0.419		
	Wormley Creek	17	0.310		
	Beaufort Bridgenet Ichthyoplankton	21	0.016		
	Goose Creek	16	0.011		
	Altamaha Canal	10	0.106		
	Guana River Dam	16	0.016		

**Table 23. Summary statistics from ARIMA model fits to American eel surveys with 20 or more years of data.  $Q_{0.25}$  is the 25th percentile of the fitted values;  $P(<0.25)$  is the probability of the of the survey being below  $Q_{0.25}$  in 2010 or in the terminal year with 80% confidence;  $r_1$ – $r_3$  are the first three autocorrelations;  $\theta$  is the moving average parameter; SE is the standard error of  $\theta$ ; and  $\sigma^2_c$  is the variance of the index.  $P(<0.25)$  in 2010 is included for comparison purposes of the status of the survey from the 2012 benchmark assessment.**

Region	Survey	Life Stage	Years	$Q_{0.25}$	$P(<0.25)$ in 2010	$P(<0.25)$ in terminal year	n	r1	r2	r3	$\theta$	SE	$\sigma^2_c$
Hudson River	NY Western Long Island Survey	Yellow	1984 - 2016	-4.27	0.462	0.412	33	-0.26	-0.08	-0.06	0.41	0.15	0.65
	HRE Monitoring Program	YOY	1974 - 2013	-2.23	0.516	0.544	34	-0.06	-0.11	-0.29	0.78	0.14	0.28
	HRE Monitoring Program	Yearling and Older	1974 - 2013	-1.62	0.034	0.003	40	-0.14	-0.28	0.39	0.32	0.14	0.26
	NYDEC Alosine Beach Seine	Elver & Yellow	1980 - 2016	-1.33	0.344	0.72	37	-0.38	0.01	-0.06	0.66	0.13	0.25
	NYDEC Striped Bass Beach Seine	Elver & Yellow	1980 - 2016	-1.37	0.286	0.446	37	-0.08	-0.19	-0.1	0.72	0.11	0.33



**Table 22. Continued.**

Region	Survey	Life Stage	Years	Q <sub>0.25</sub>	P(<0.25) in 2010	P(<0.25) in terminal year	n	r1	r2	r3	θ	SE	σ <sup>2</sup> <sub>c</sub>
Delaware Bay/Mid-Atlantic Coastal Bays	Little Egg Inlet Ichthyoplankton Survey	YOY	1992 - 2015	-0.01	0.722	0.755	24	0.03	-0.51	-0.12	0.25	0.32	0.17
	NJDFW Striped Bass Seine Survey	Yellow	1980 - 2016	-2.75	0	0	37	-0.24	-0.33	0.05	1	0.1	0.59
	Delaware Trawl Survey	Elver & Yellow	1982 - 2016	-1.98	0.479	0.242	35	-0.54	0.43	-0.28	0.54	0.14	0.41
	PSEG Trawl Survey	Elver & Yellow	1998 - 2016	-0.12	0.002	0	19	-0.85	0.7	-0.62	1	0.19	0.28
Chesapeake Bay	MD Striped Bass Seine Survey	Yellow	1966 - 2016	-2.24	0.155	0.202	51	-0.29	0.01	-0.07	0.58	0.17	1
	VIMS Juvenile SB Seine Survey - short	Yellow	1989 - 2016	-2.37	0.085	0.066	28	-0.69	0.23	0.01	1	0.13	0.33
	VIMS Juvenile SB Seine Survey - long	Yellow	1967 - 2016	-3.2	0.006	0.009	44	-0.35	-0.34	0.21	0.63	0.12	0.88
South Atlantic	Beaufort Bridgenet Ichthyoplankton	YOY	1987 - 2007	-1.12		0.454	21	-0.43	-0.12	0.1	0.74	0.17	0.52
	NCDMF Estuarine Trawl Survey	Elver & Yellow	1989 - 2016	-2.09	0.192	0.284	28	-0.28	-0.31	0.18	0.85	0.11	0.64

12 FIGURES

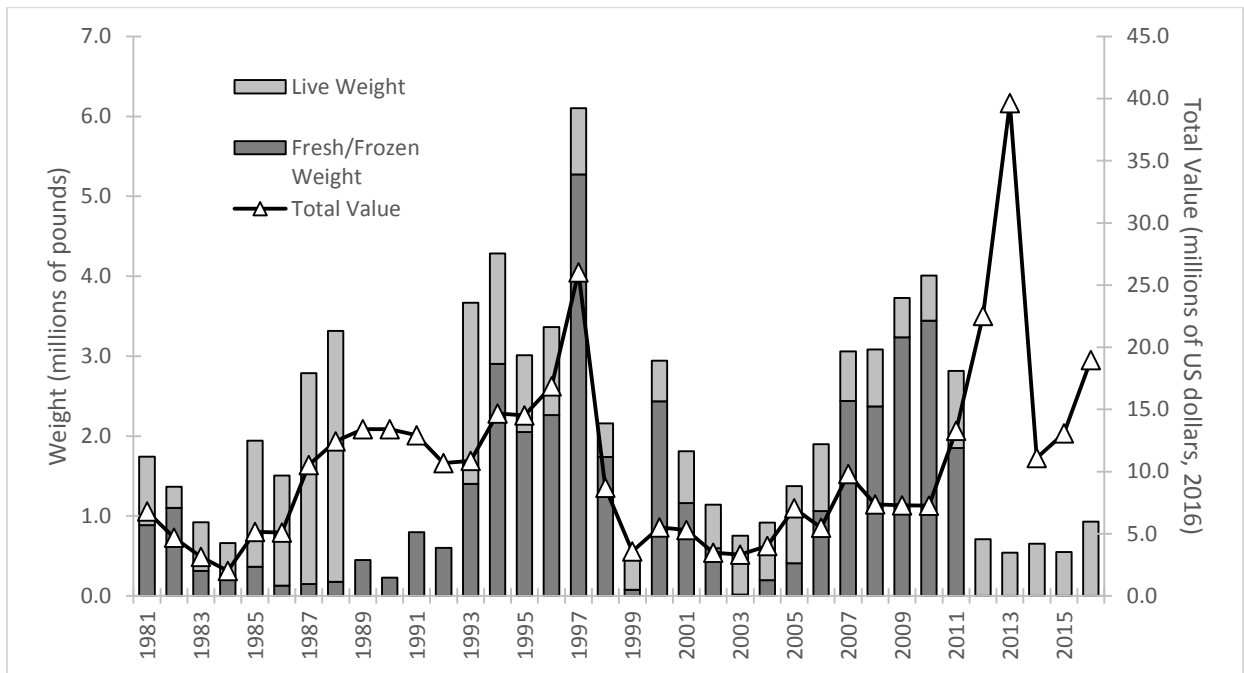


Figure 1. Annual U.S. domestic exports of American eels from districts along the Atlantic coast, 1981–2016. Note that the weights of live exports were not available for 1989 to 1992 and there were no fresh/frozen weight after 2011.

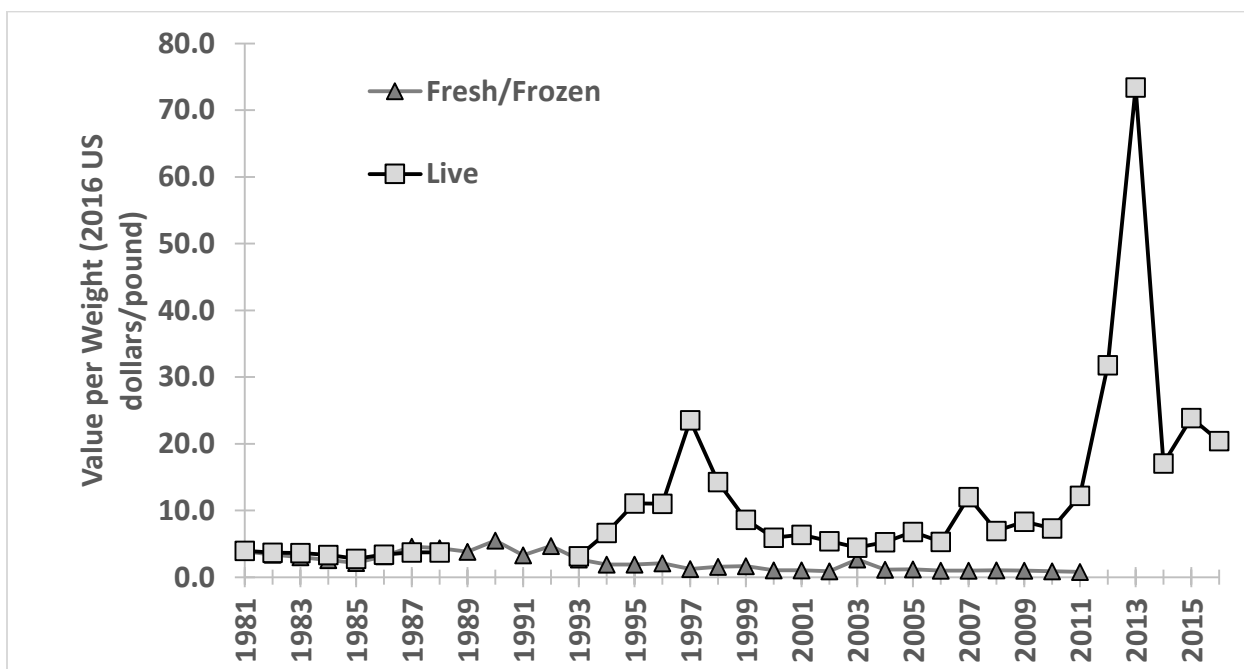


Figure 2. Value per weight of U.S. domestic exports of American eels from districts along the Atlantic Coast, 1981-2016. Note that there was no data for fresh/frozen after 2011.

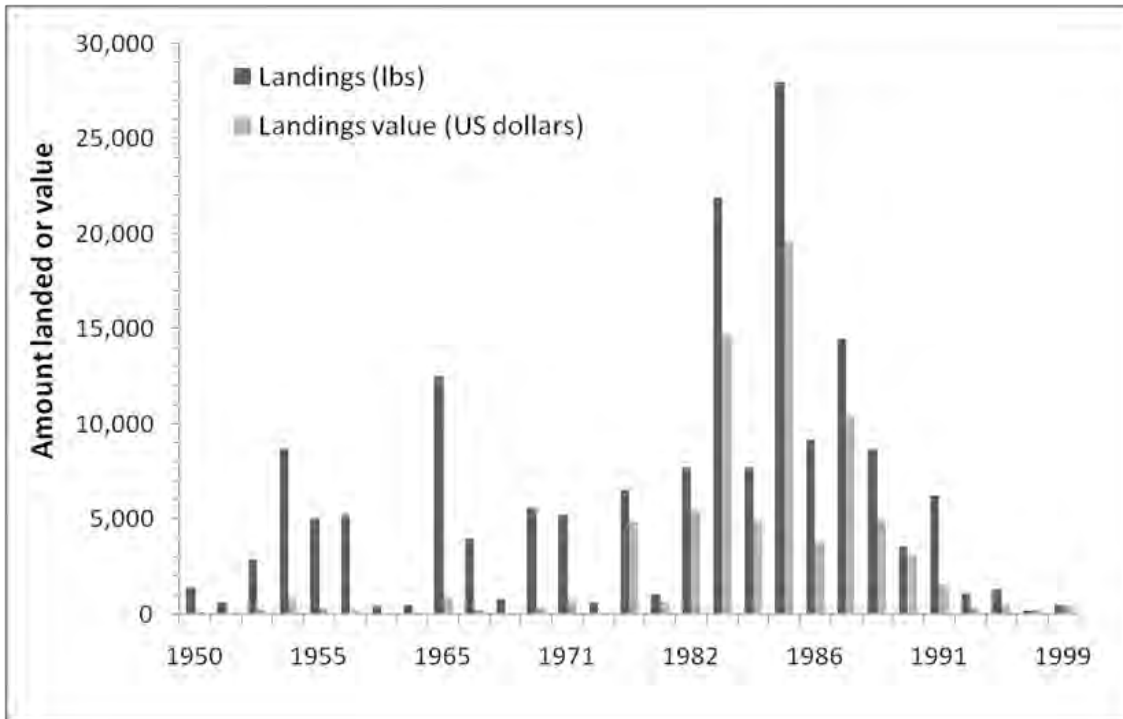


Figure 3. Total weight and value of American eel commercial landings in the Gulf of Mexico, 1950–1999. Recent landings are confidential.

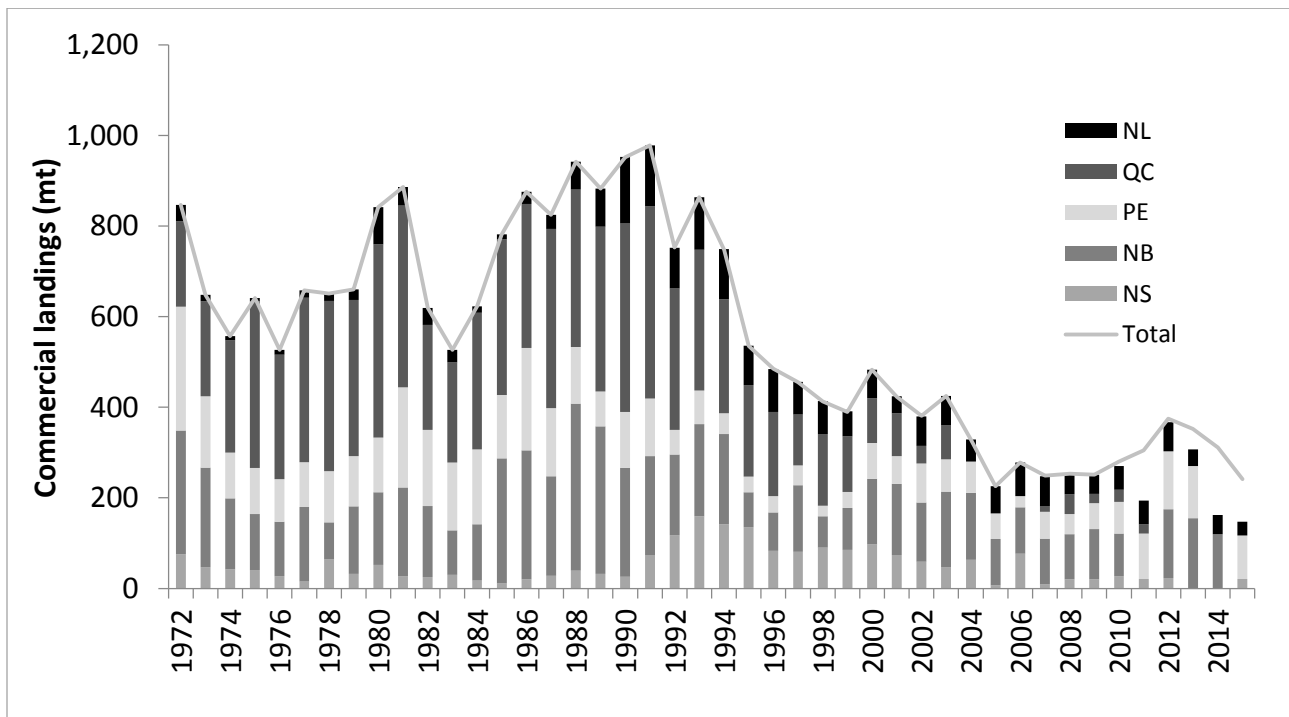


Figure 4. Annual commercial fisheries landings (live weight) of American eel along Canada's Atlantic Coast summarized by province, 1972–2015. In recent years, some provinces' landings have been confidential so total landings has been provided as a line.

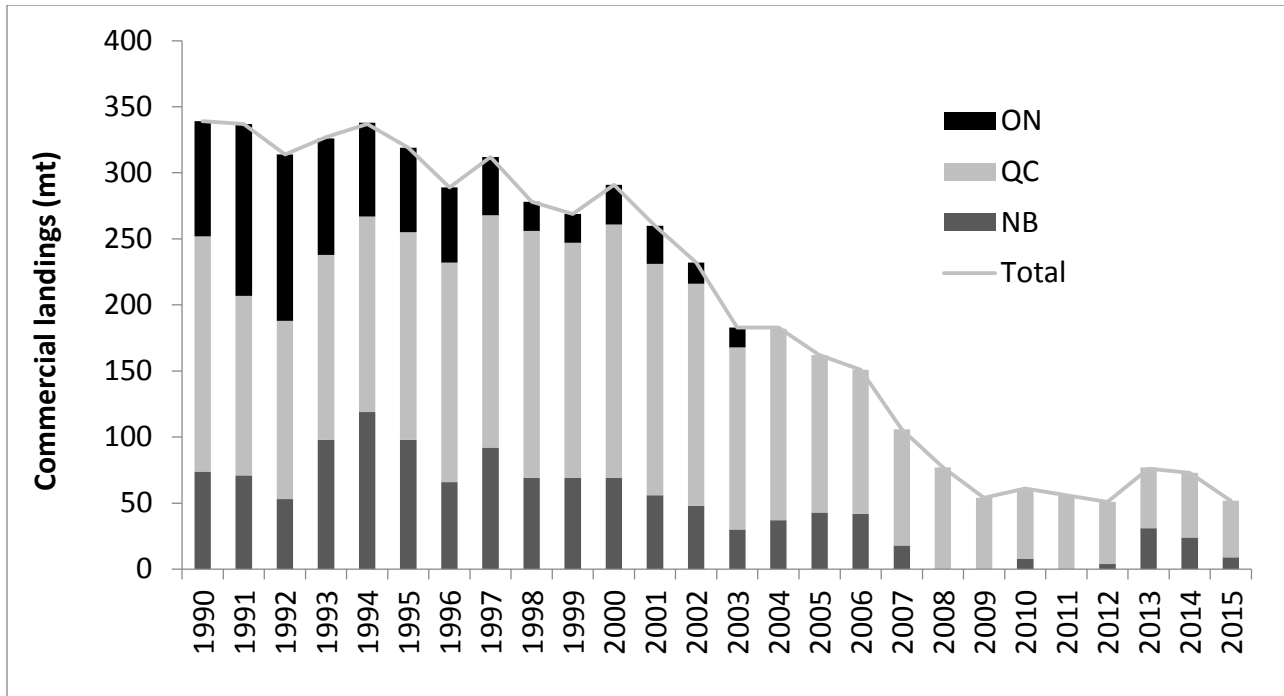


Figure 5. Annual commercial freshwater landings (live weight) of American eel along Canada's Atlantic Coast summarized by province, 1990–2015.

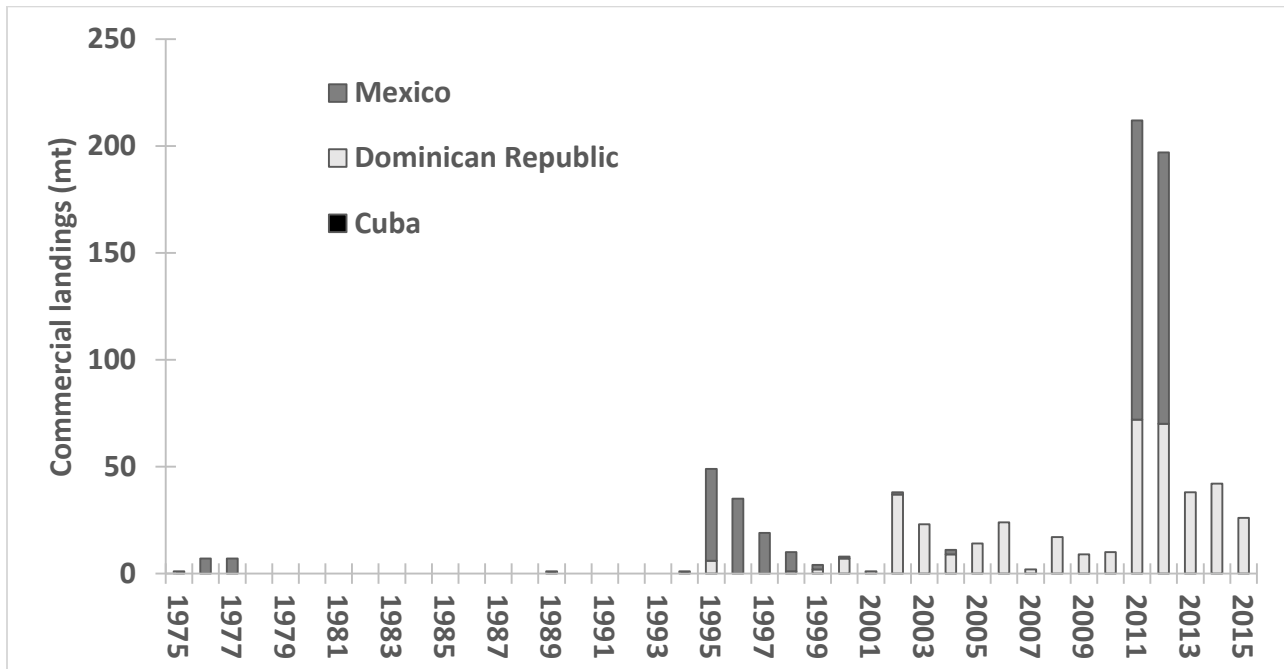


Figure 6. Annual commercial landings (live weight) of American eel reported by the FAO from Central and South America, 1975–2015. No landings were reported between 1975–1977, 1978–1988, and 1990–1993. Cuba's only reported American eel landings were 1 mt in 1989 and 1 mt in 1994.

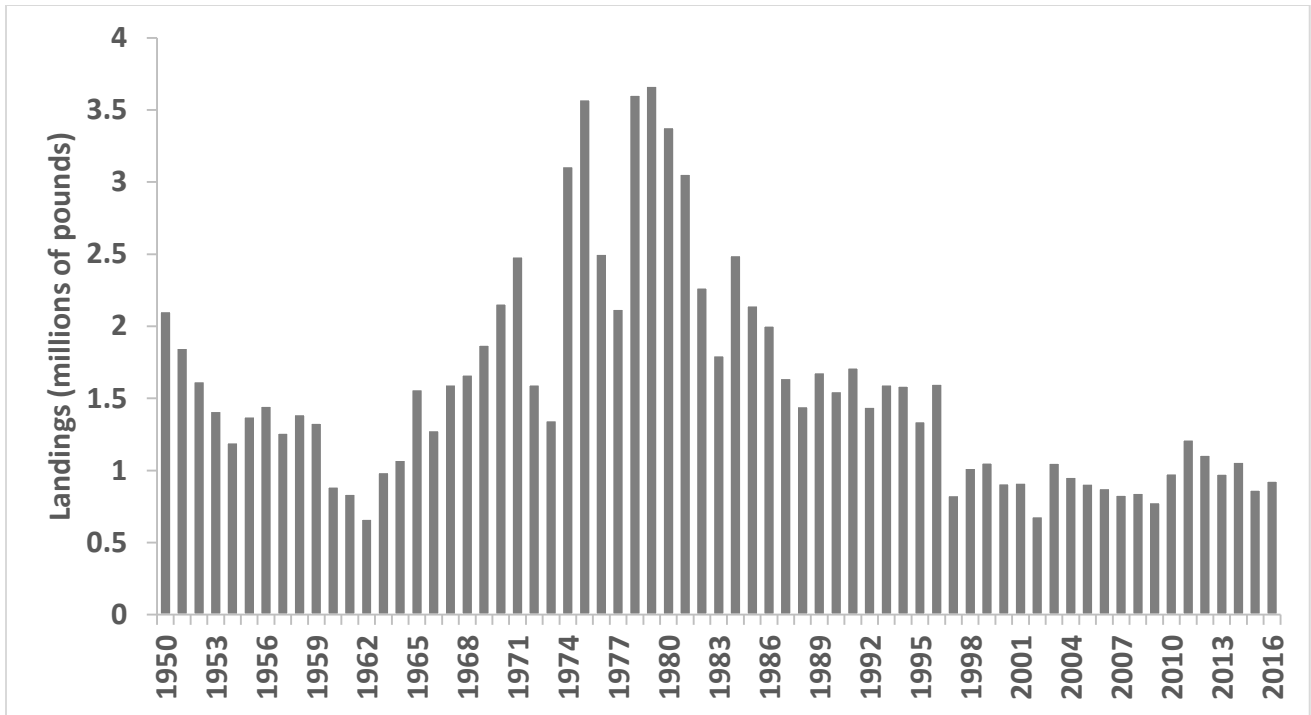


Figure 7. Total commercial landings of American eel along the U.S. Atlantic Coast, 1950–2016. Landings in 2016 are preliminary.

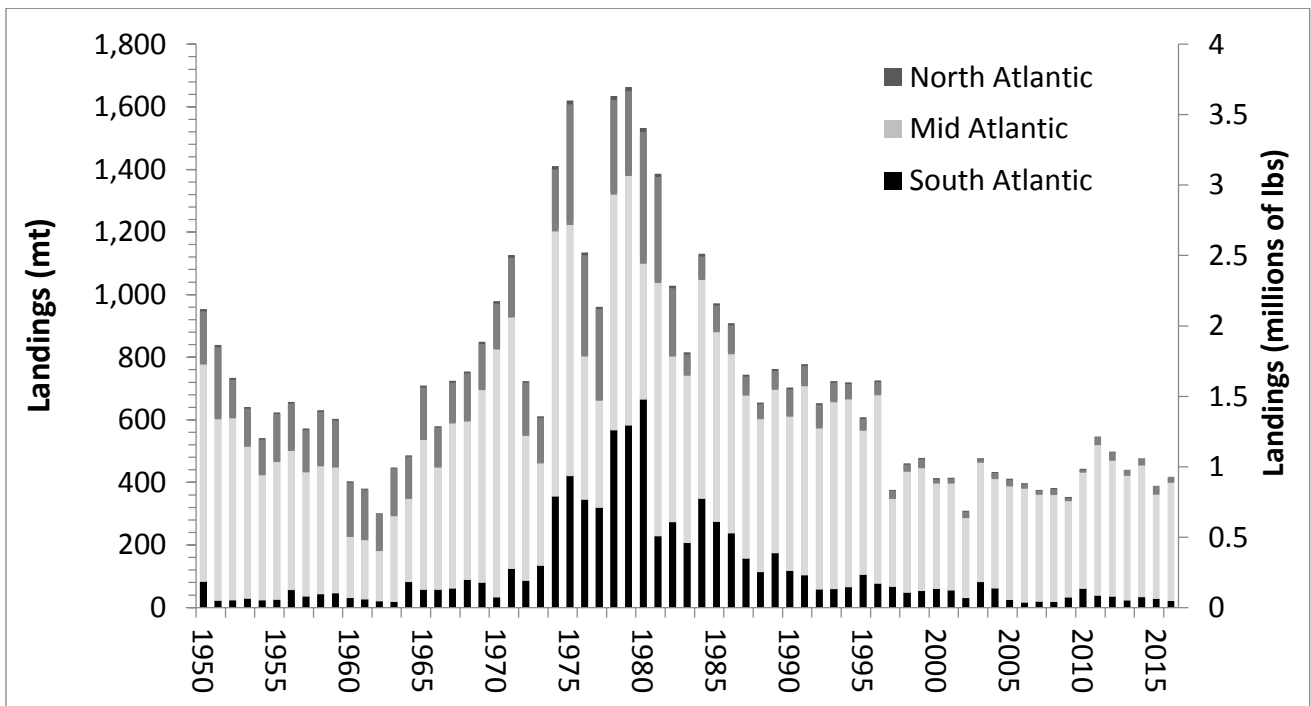
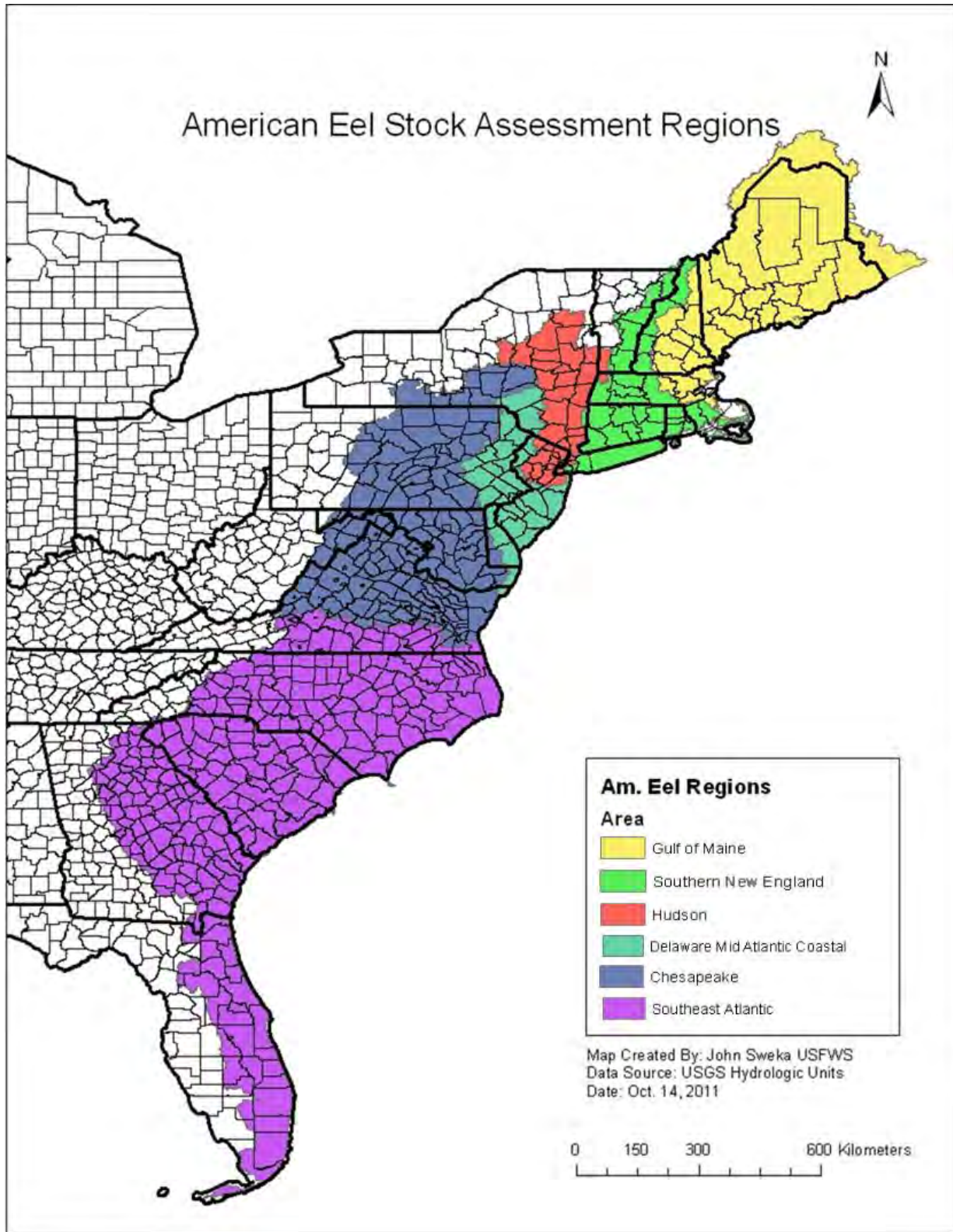


Figure 8. Total commercial landings of American eel by old geographic region along the U.S. Atlantic Coast, 1950–2016. Landings in 2016 are preliminary.



**Figure 9. Watershed-based geographic regions used in the 2012 benchmark stock assessment.**

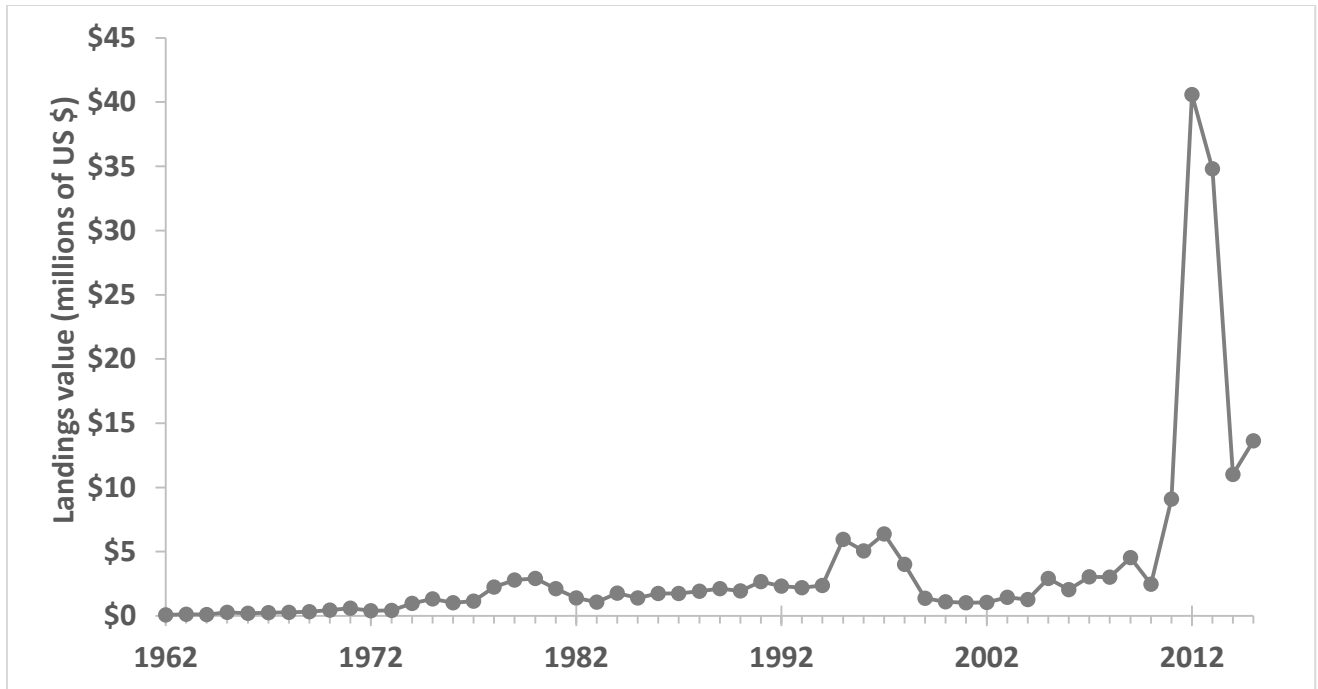


Figure 10. Estimated value of U.S. American eel landings, 1962–2015.

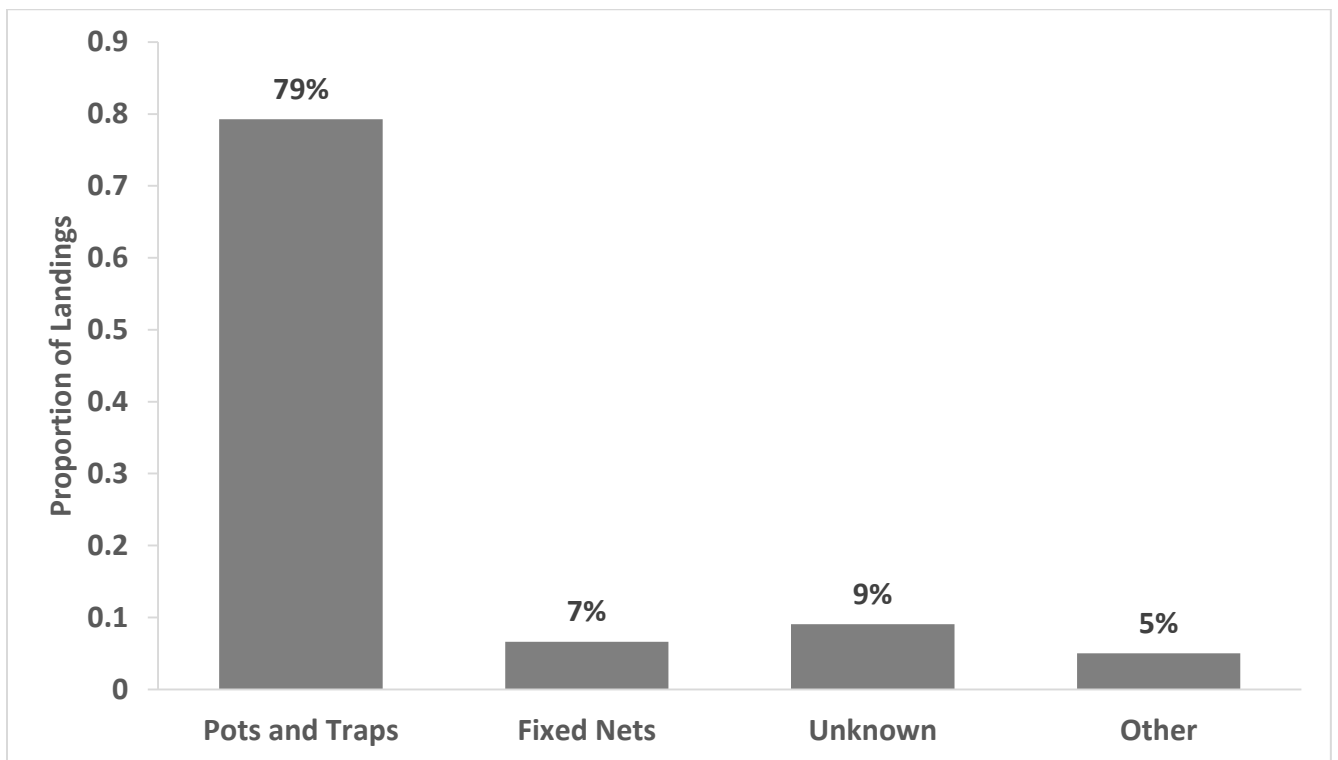


Figure 11. Proportion of Atlantic coast commercial landings by general gear type, 1950–2016.

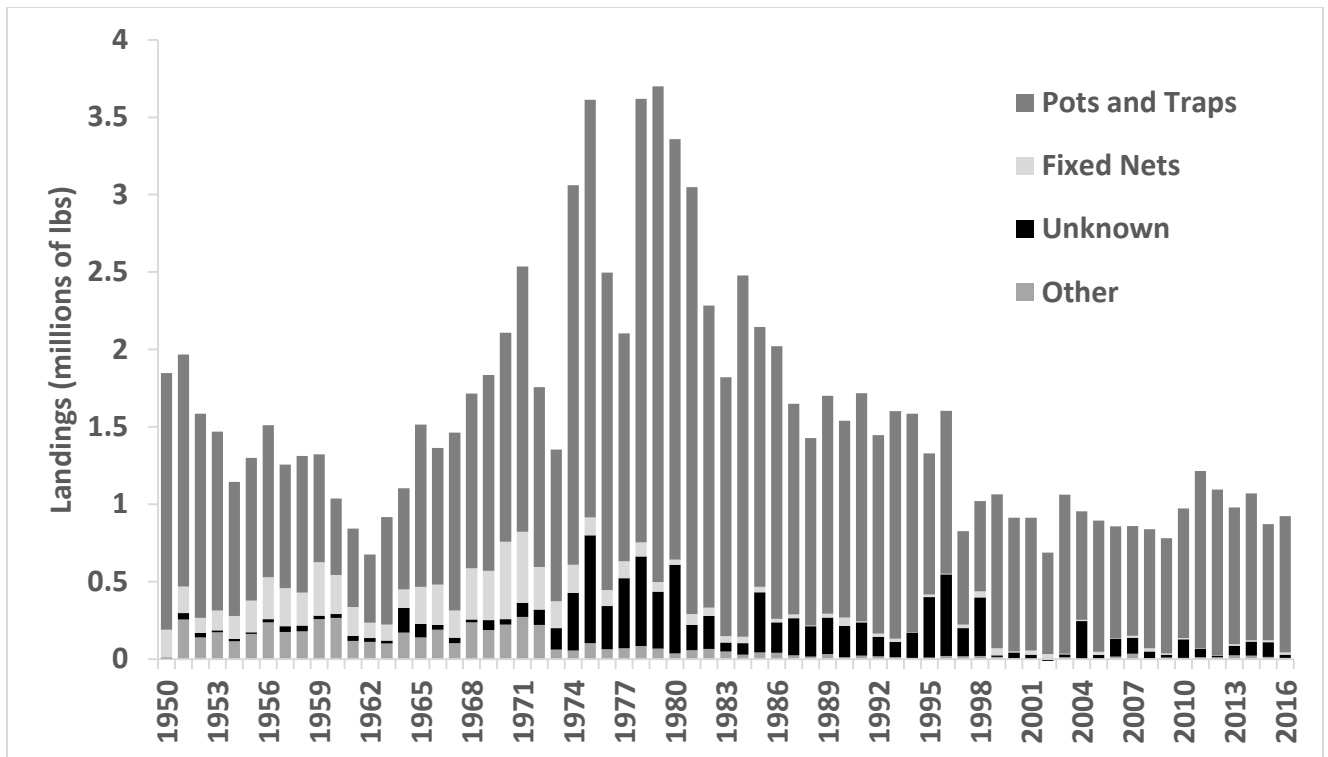


Figure 12. Trends in the proportion of Atlantic coast commercial landings by general gear type, 1950-2016. Landings in 2016 are preliminary.

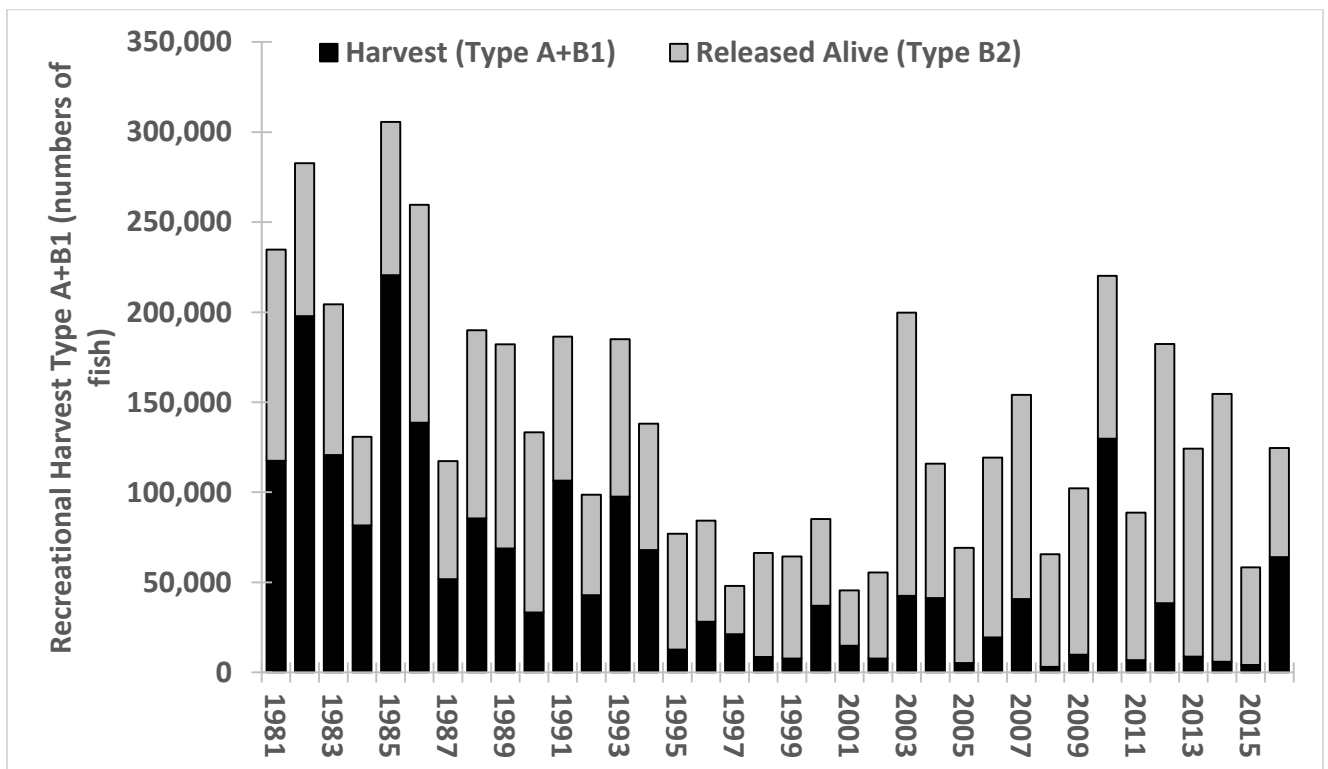
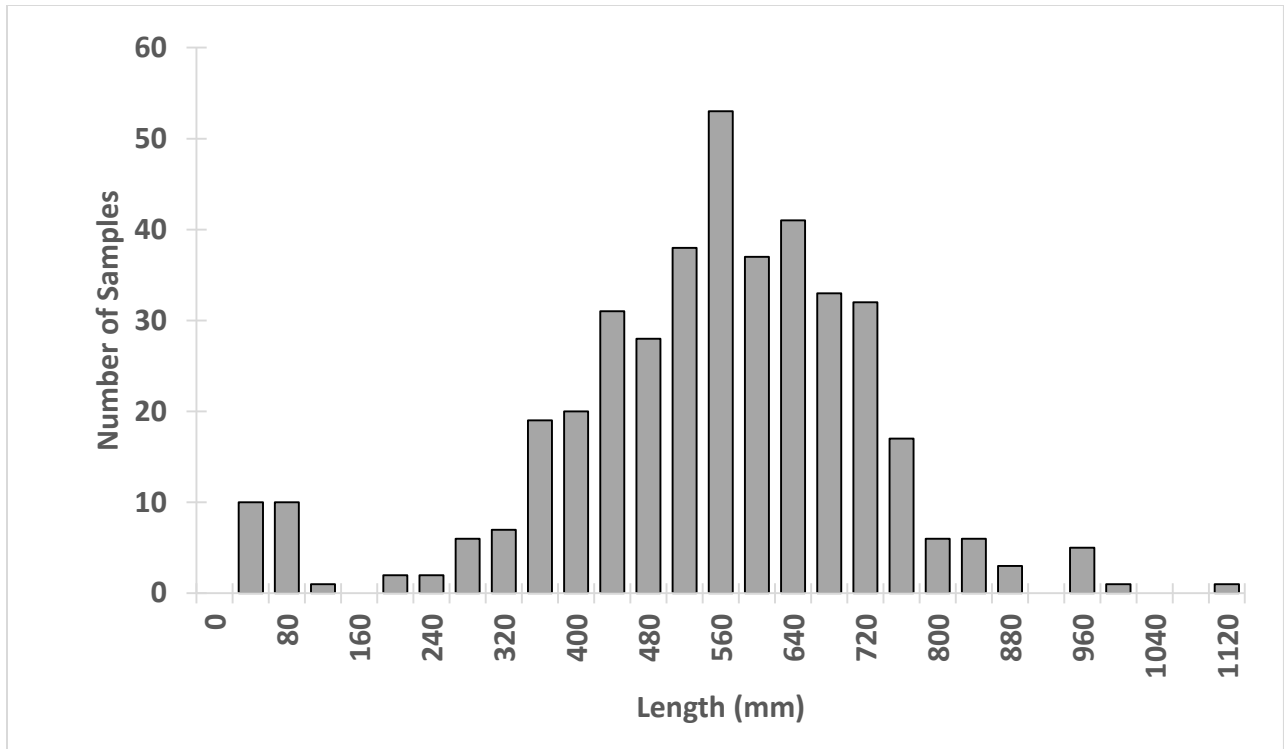
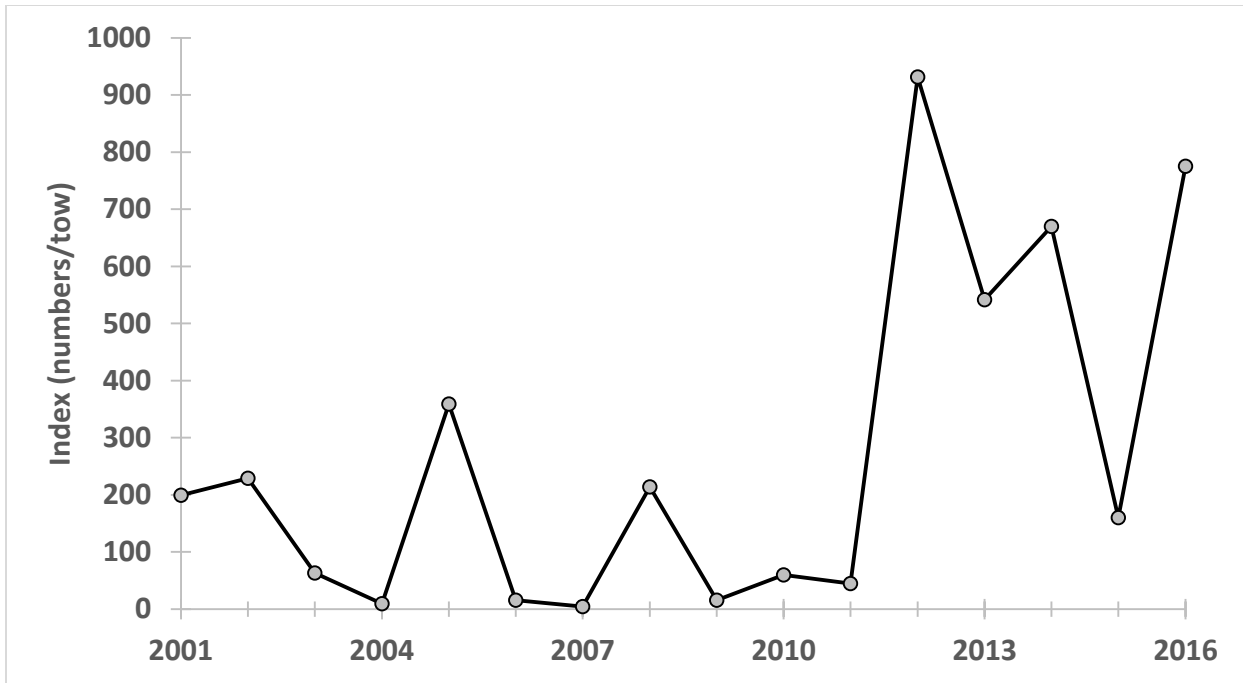


Figure 13. Recreational harvest and releases for American eel 1981-2016. Estimates for 1981-2003 have been calibrated to MRIP from MRFSS.

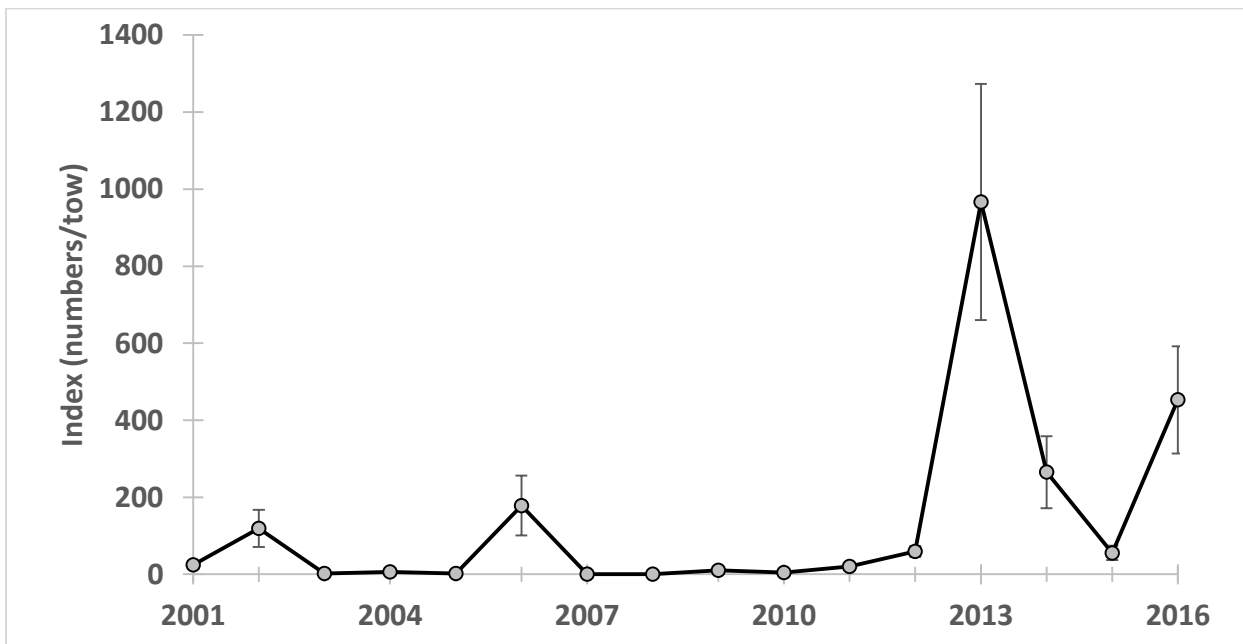




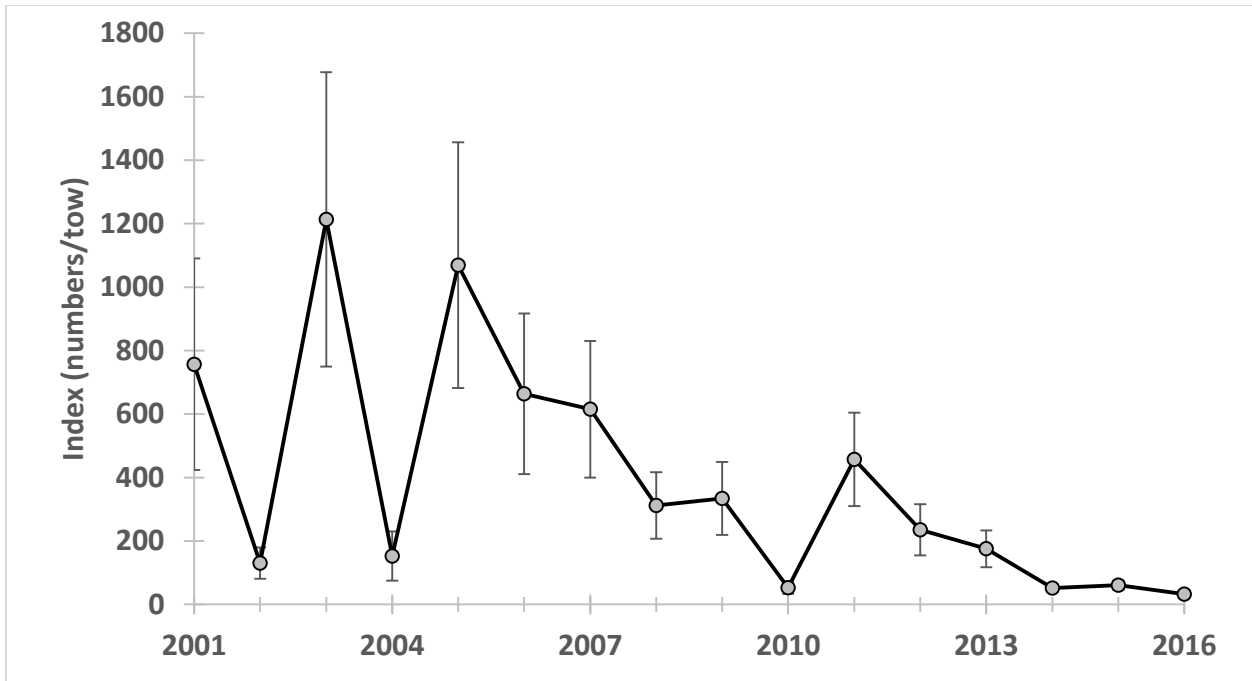
**Figure 14. Length-frequency of American eels sampled by the MRFSS angler-intercept survey (Type A catch), 1981–2016. It was noted by the SAS that small lengths may represent a species misidentification.**



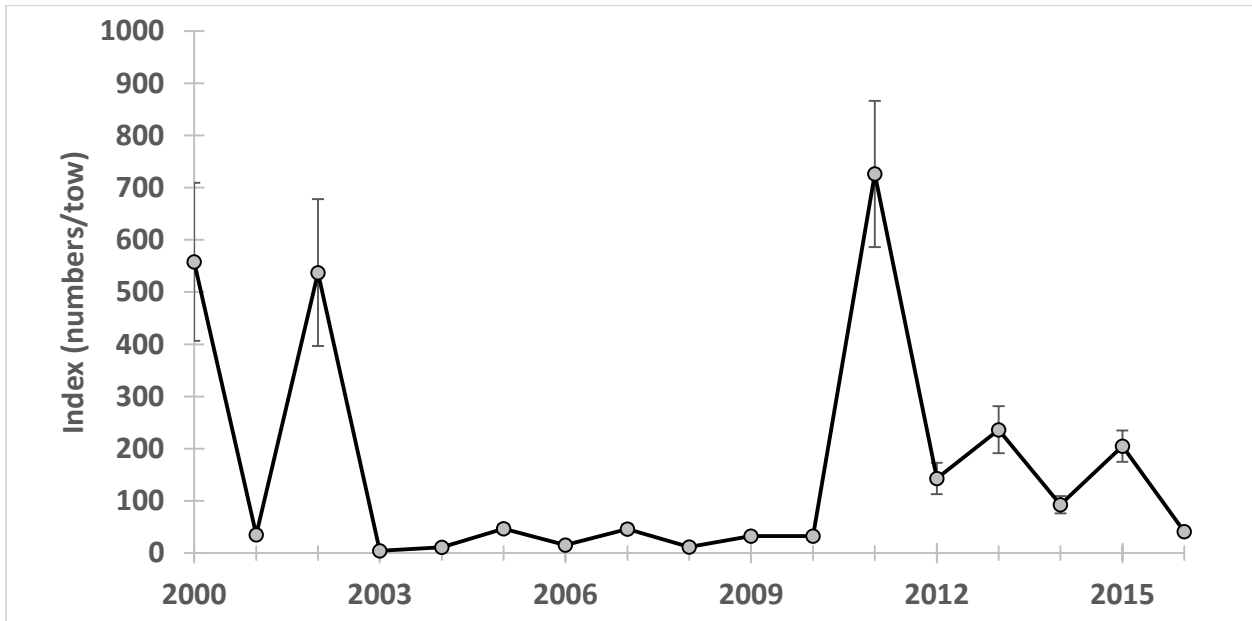
**Figure 15. GLM-standardized index of abundance for YOY American eels caught by Maine's annual YOY survey in West Harbor Pond, 2001–2016. The error bars were omitted from the graph because there were several very large values. See text for more discussion on this.**



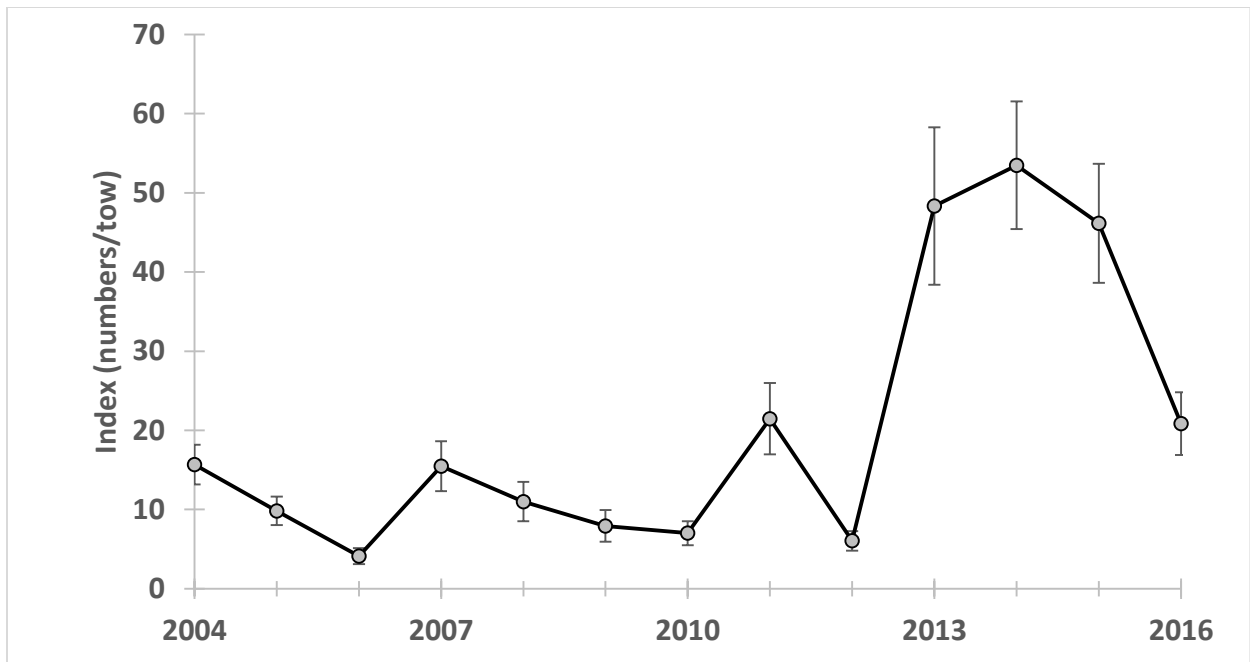
**Figure 16. GLM-standardized index of abundance for YOY American eels caught by New Hampshire's annual YOY survey in the Lamprey River, 2001–2016. The error bars represent the standard errors about the estimates.**



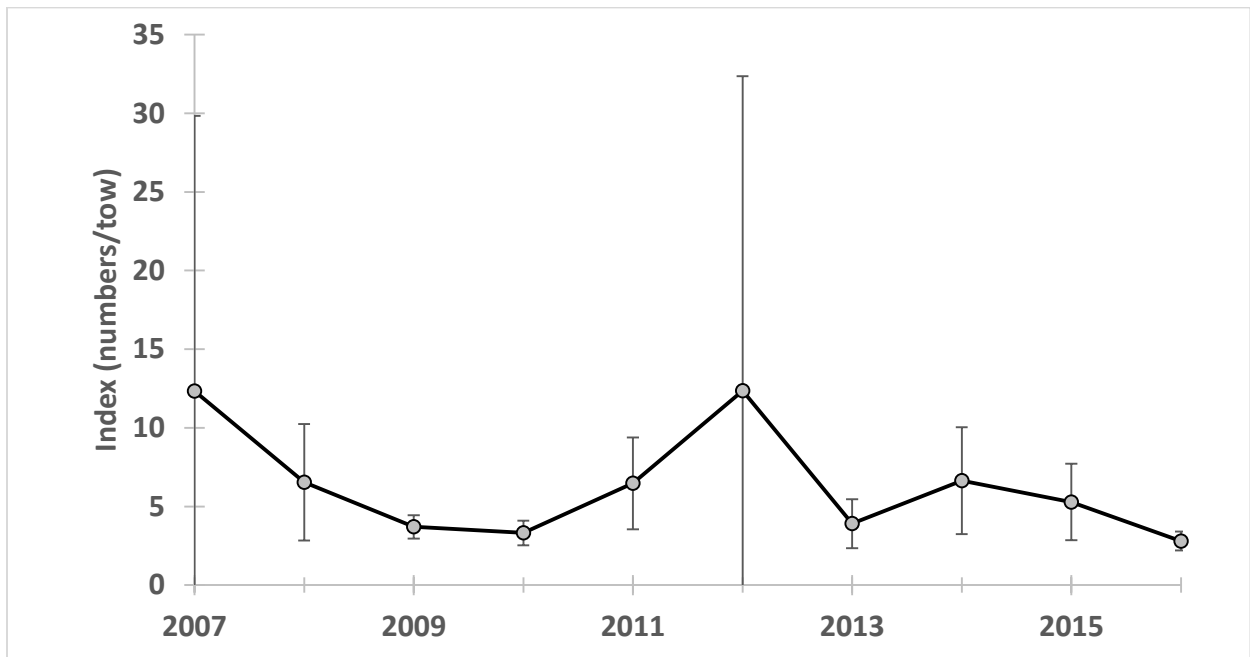
**Figure 17. GLM-standardized index of abundance for YOY American eels caught by Massachusetts' annual YOY survey in the Jones River, 2001–2016. The error bars represent the standard errors about the estimates.**



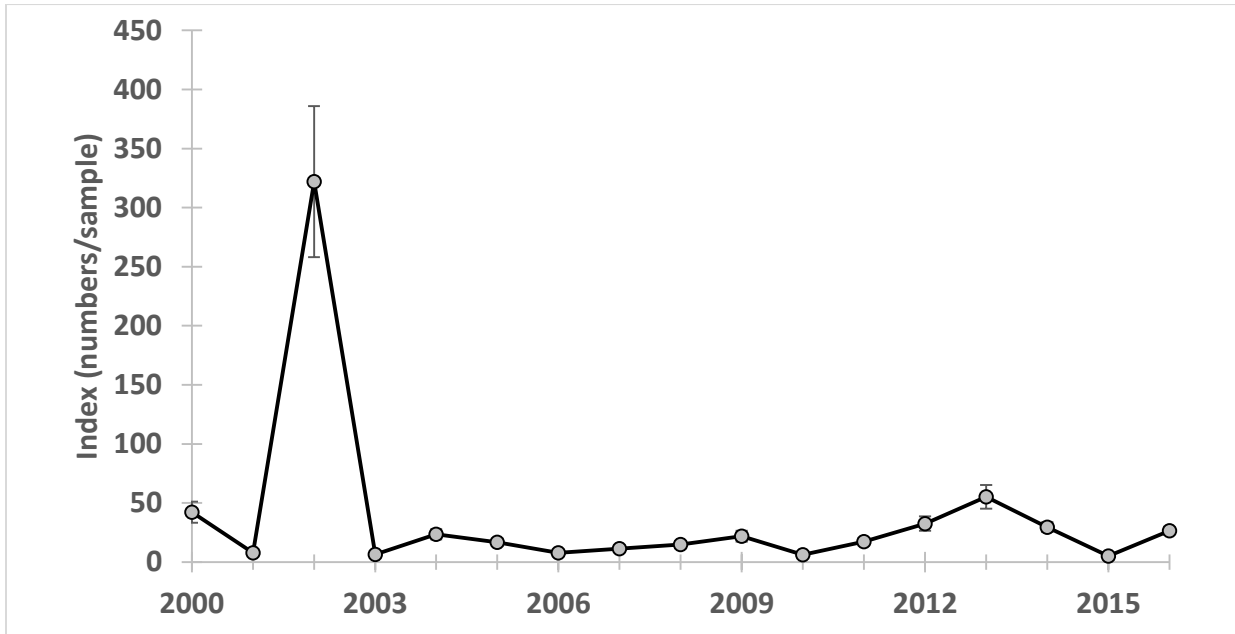
**Figure 18. GLM-standardized index of abundance for American eels caught by Rhode Island's annual YOY survey near Gilbert Stuart Dam, 2000–2016. The error bars represent the standard errors about the estimates.**



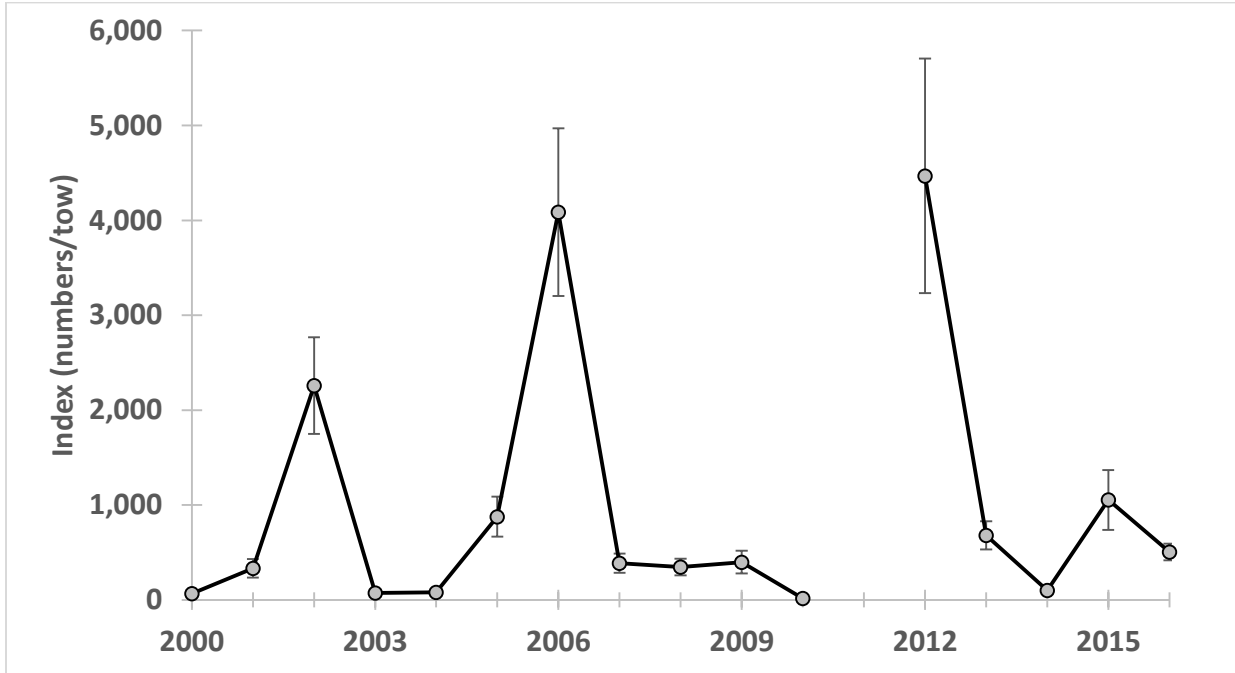
**Figure 19. GLM-standardized index of abundance for American eels caught by Rhode Island's annual YOY survey at Hamilton Fish Ladder, 2004–2016. The error bars represent the standard errors about the estimates.**



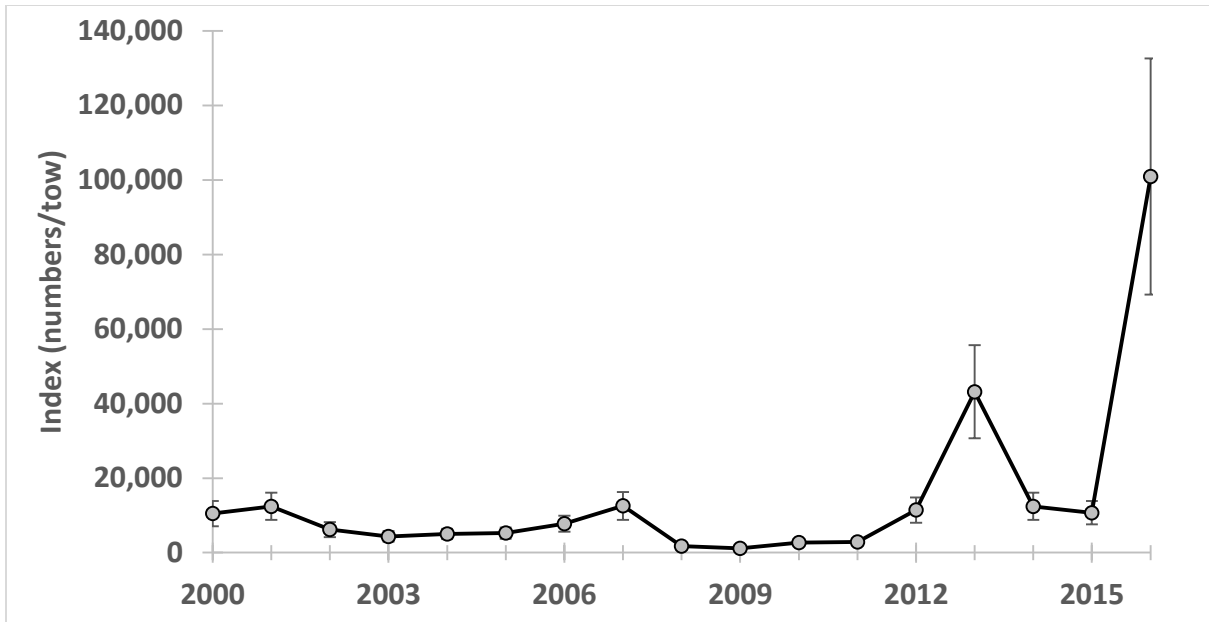
**Figure 20. GLM-standardized index of abundance for American eels caught by Connecticut's annual YOY survey at Ingham Hill, 2007–2016. The error bars represent the standard errors about the estimates.**



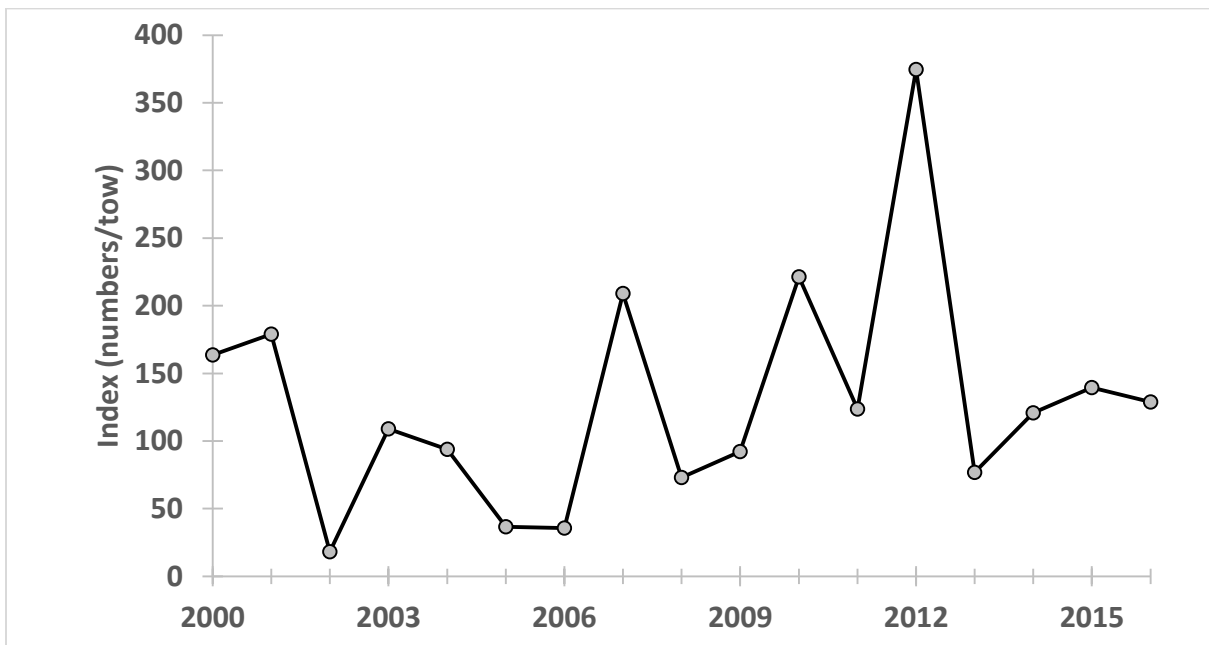
**Figure 21.** GLM-standardized index of abundance for American eels caught by New York's annual YOY survey in Carman's River, 2001–2016. The error bars represent the standard errors about the estimates.



**Figure 22.** GLM-standardized index of abundance for YOY American eels caught by New Jersey's annual YOY survey in Patcong Creek, 2000–2016. The error bars represent the standard errors about the estimates.



**Figure 23. GLM-standardized index of abundance for American eels caught by Delaware's annual YOY survey near the Millsboro Dam, 2000–2016. The error bars represent the standard errors about the estimates.**



**Figure 24. Annual index of abundance for American eels caught by Maryland's annual YOY survey in Turville Creek, 2000–2016. The error bars were omitted from the graph because there were several very large values. See text for more discussion.**

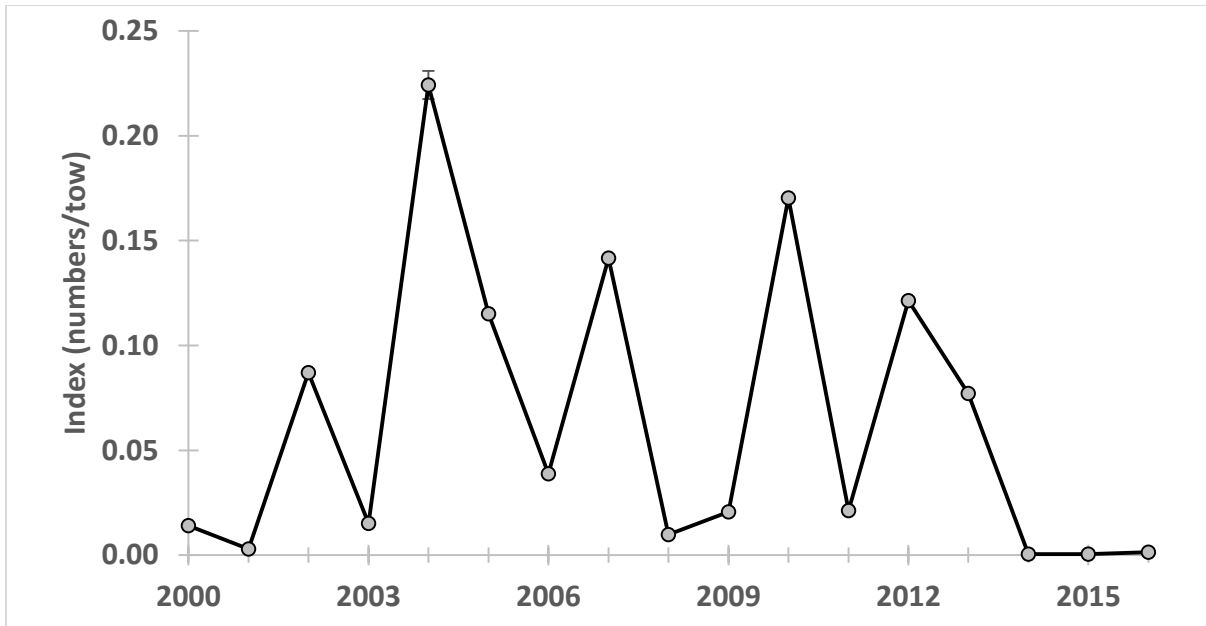


Figure 25. GLM-standardized index of abundance for American eels caught by PRFC's annual YOY survey in Clark's Millpond, 2000–2016. The error bars represent the standard errors about the estimates.

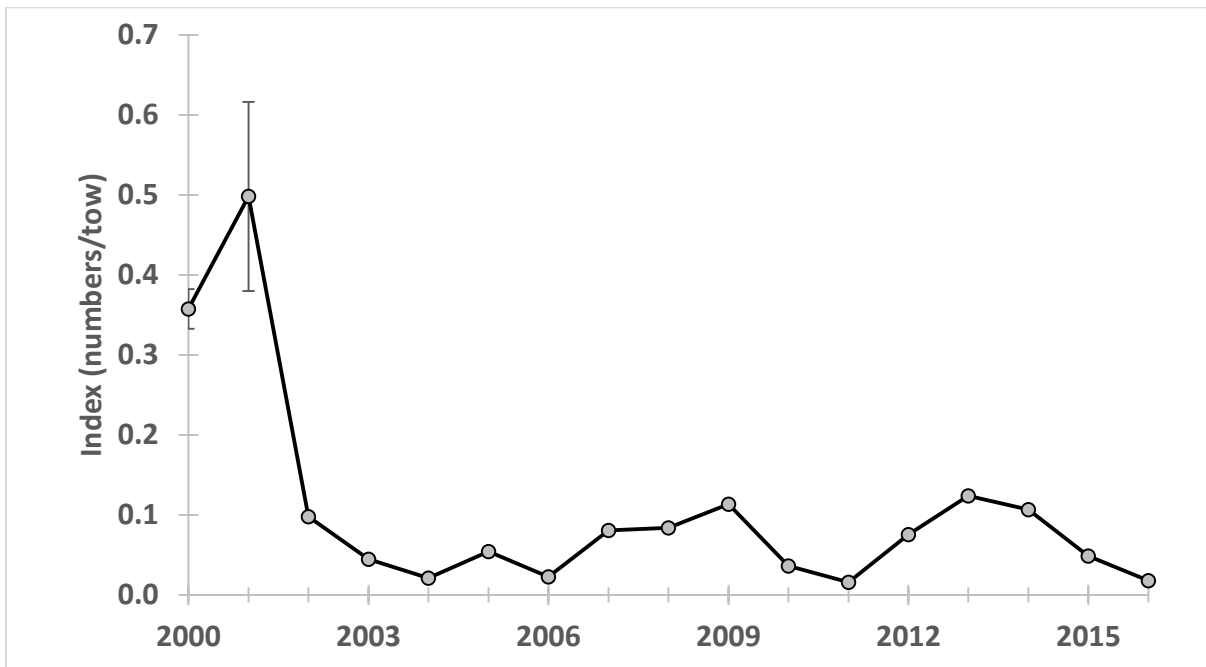
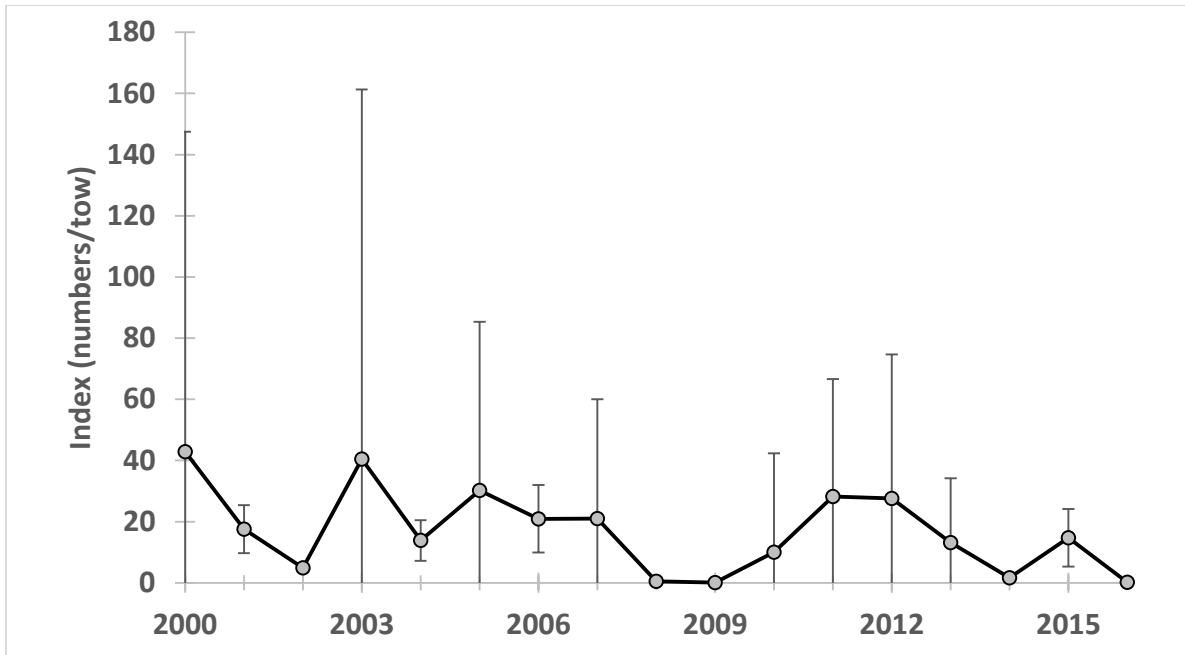
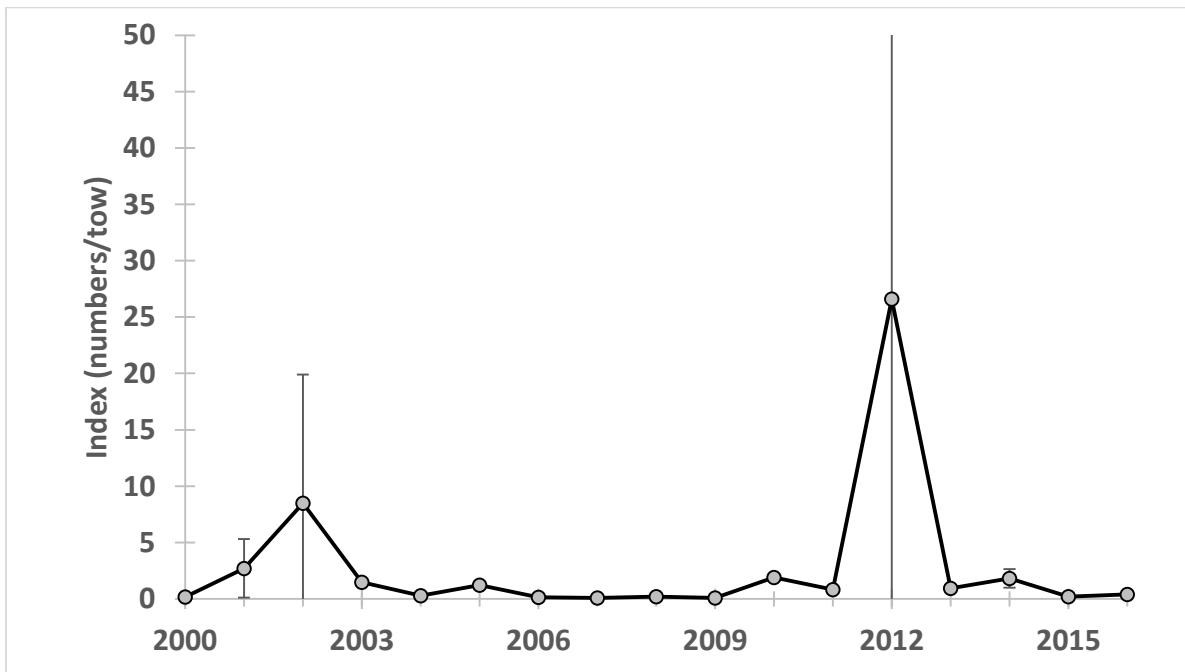


Figure 26. GLM-standardized index of abundance for American eels caught by PRFC's annual YOY survey in Gardy's Millpond, 2000–2016. The error bars represent the standard errors about the estimates.

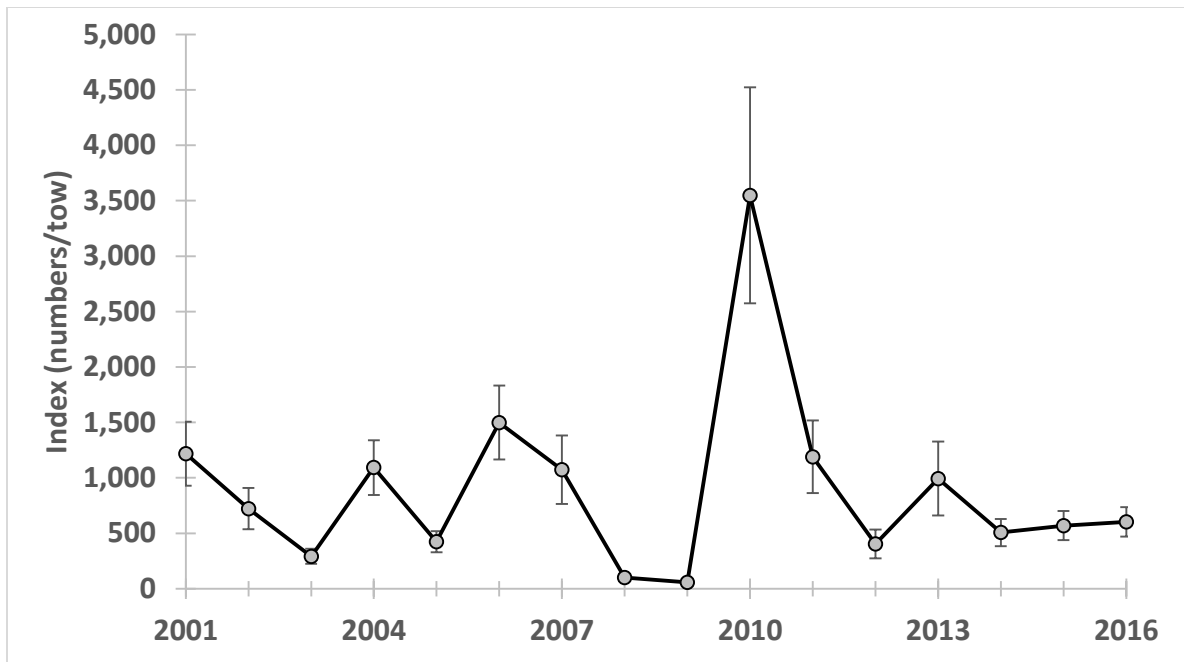


**Figure 27. Annual index of abundance for American eels caught by Virginia's annual YOY survey in Bracken's Pond, 2000–2016. The error bars represent the standard errors about the estimates.**

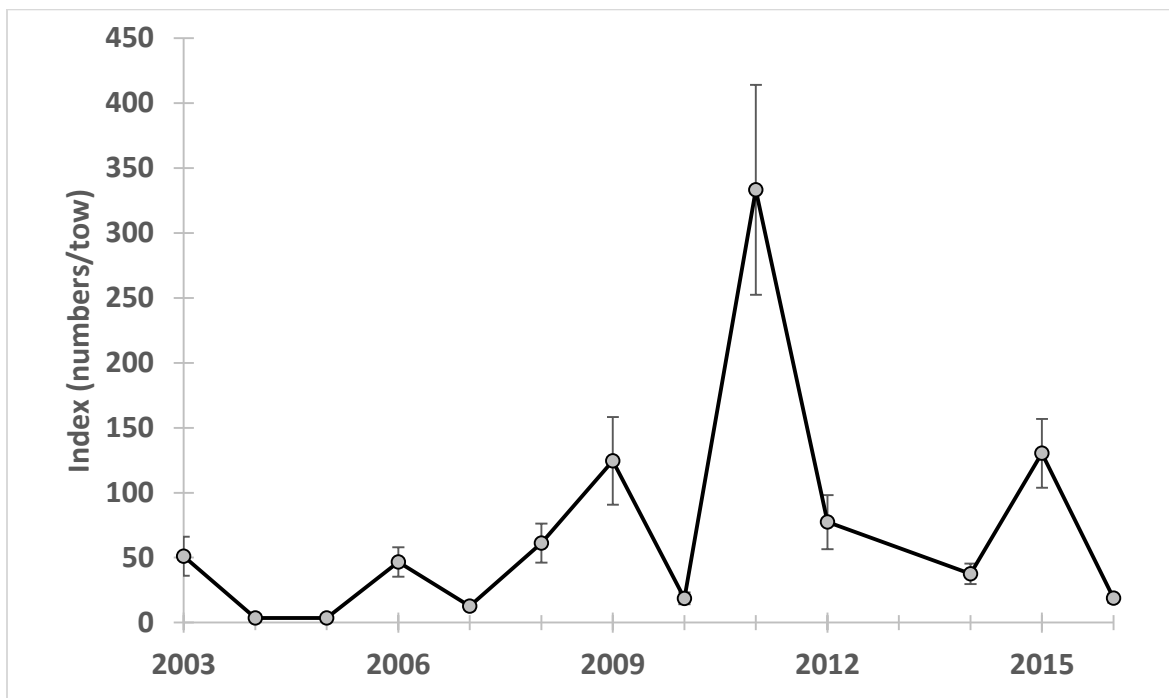


**Figure 28. GLM-standardized index of abundance for American eels caught by Virginia's annual YOY survey in Kamp's Millpond, 2000–2016. The error bars represent the standard errors about the estimates.**

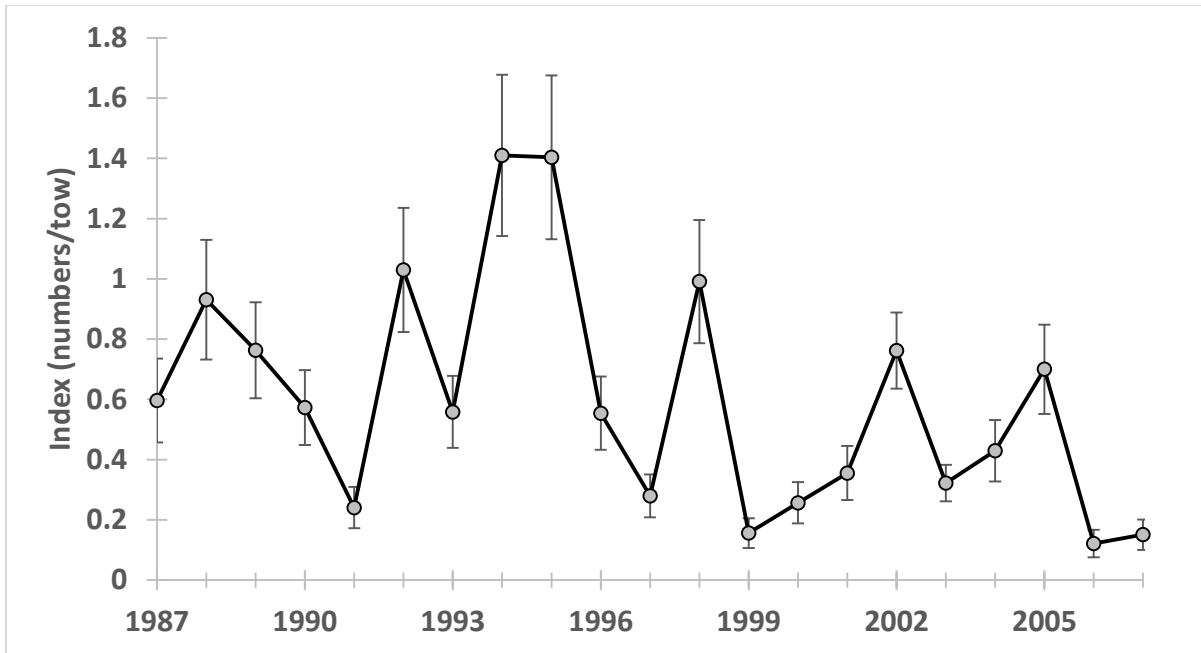




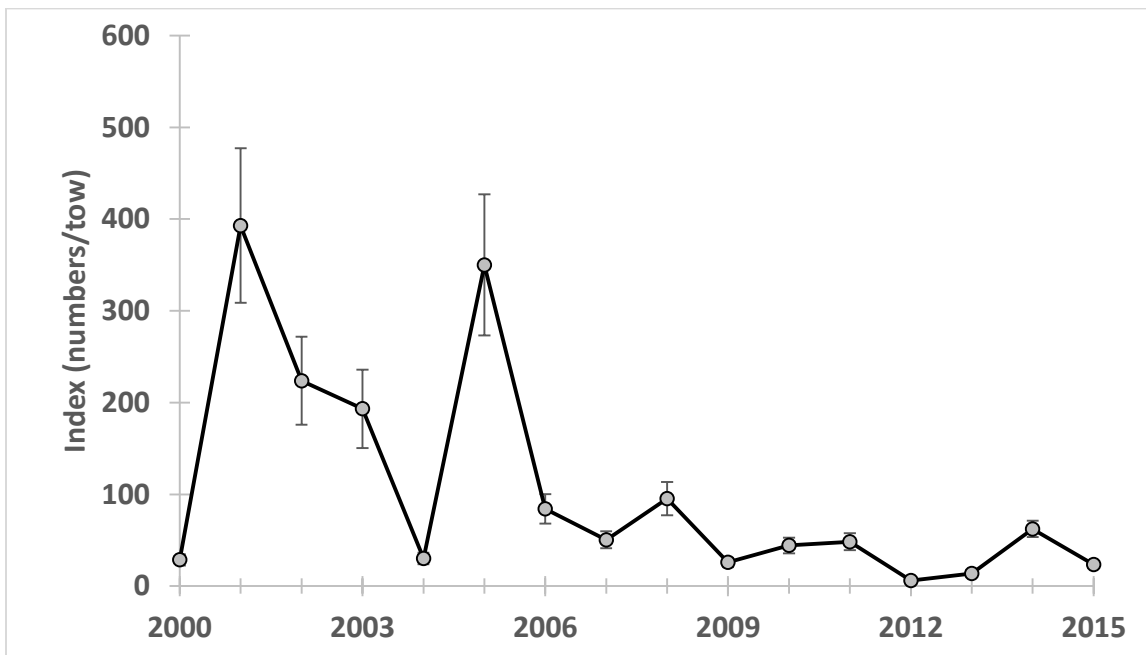
**Figure 29.** GLM-standardized index of abundance for American eels caught by Virginia's annual YOY survey in Wormley Creek, 2001–2016. The error bars represent the standard errors about the estimates.



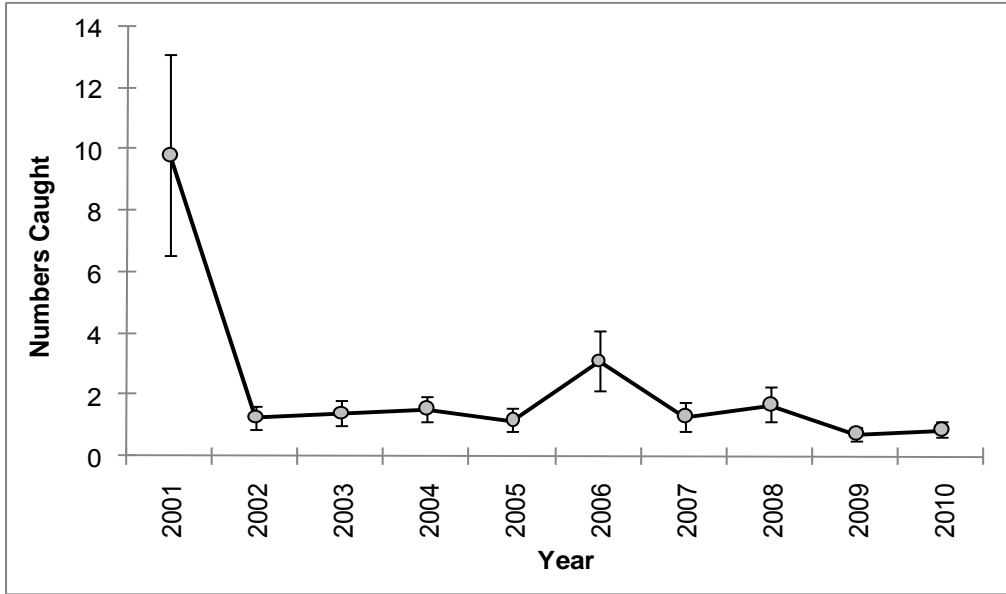
**Figure 30.** GLM-standardized index of abundance for American eels caught by Virginia's annual YOY survey in Wareham's Pond, 2003–2016. The error bars represent the standard errors about the estimates.



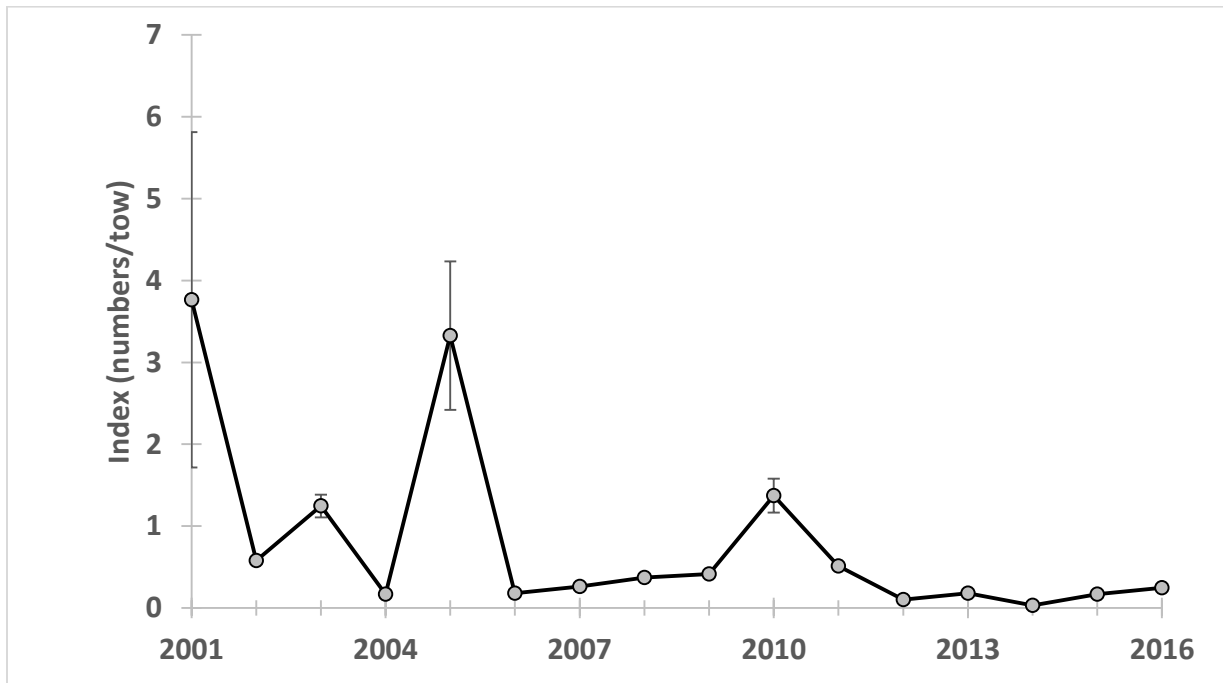
**Figure 31.** GLM-standardized index of abundance for YOY American eels caught by North Carolina’s Beaufort Bridgenet Ichthyoplankton Sampling Program (BBISP) conducted by NOAA, 1987–2007. The error bars represent the standard errors about the estimates.



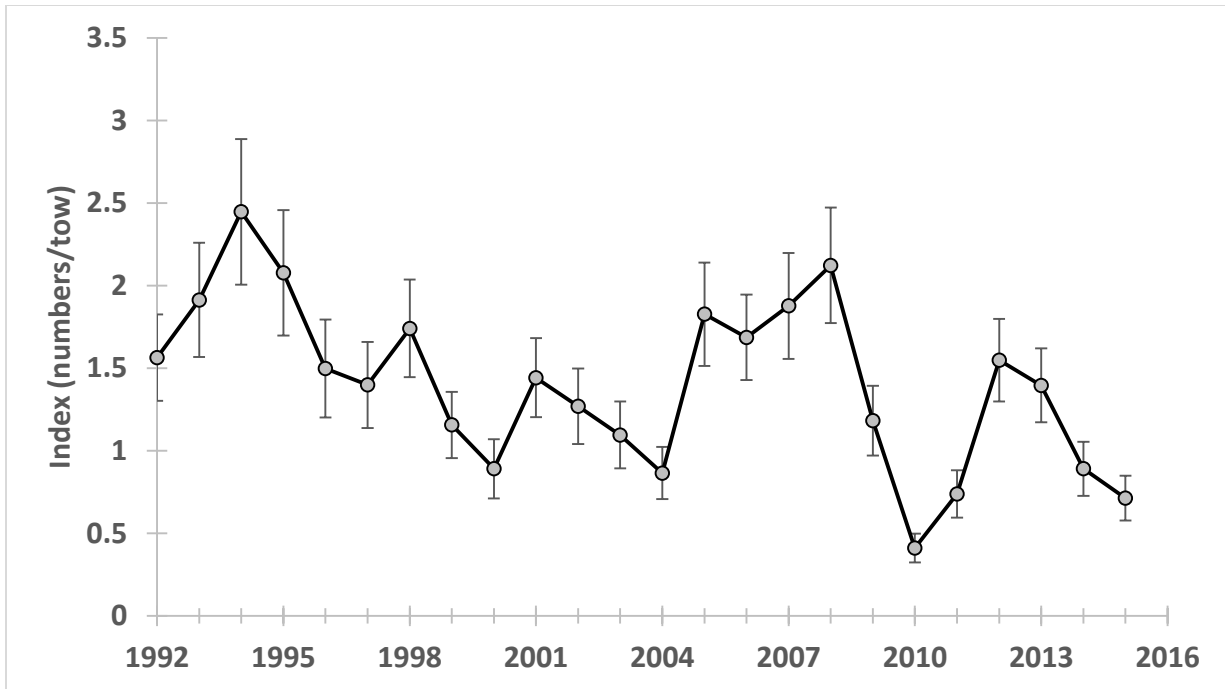
**Figure 32.** GLM-standardized index of abundance for American eels caught by South Carolina's annual YOY survey in Goose Creek, 2000–2015. The error bars represent the standard errors about the estimates.



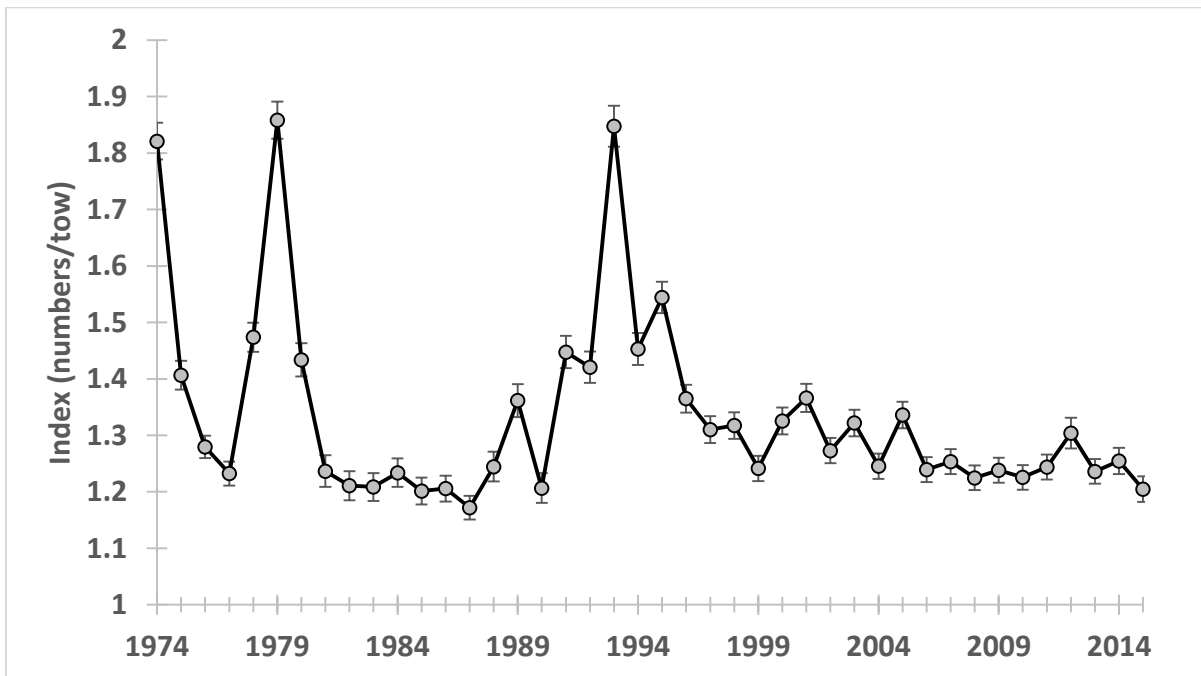
**Figure 33.** GLM-standardized index of abundance for American eels caught by Georgia's annual YOY survey near the Altamaha Canal, 2001–2010. The error bars represent the standard errors about the estimates. This index was not updated because the site was discontinued.



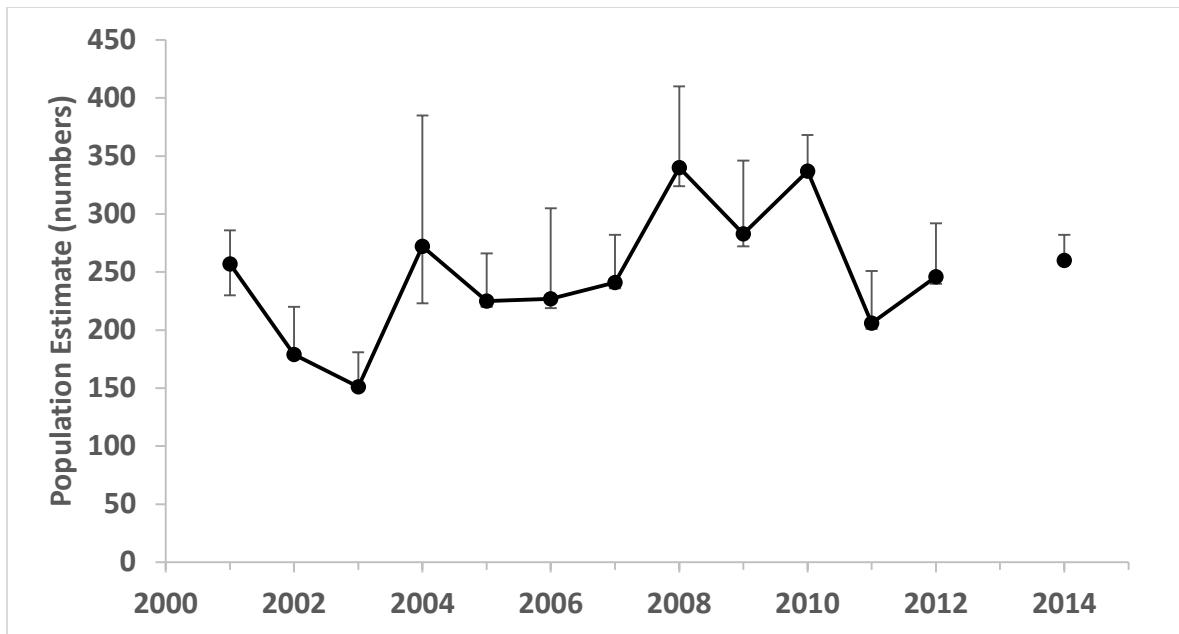
**Figure 34.** Annual index of abundance for American eels caught by Florida's annual YOY survey near Guana River Dam, 2001–2016. The error bars represent the standard errors about the estimates.



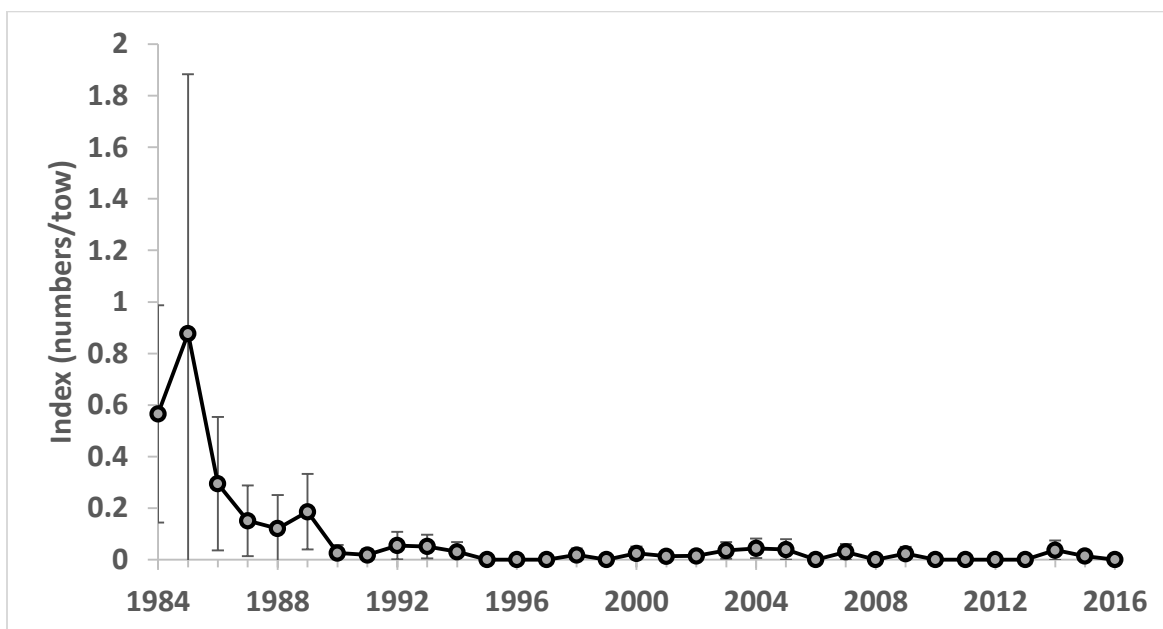
**Figure 35. GLM-standardized index of abundance for YOY American eels caught by the Little Egg Inlet Ichthyoplankton Survey, 1992–2016. The error bars represent the standard errors about the estimates.**



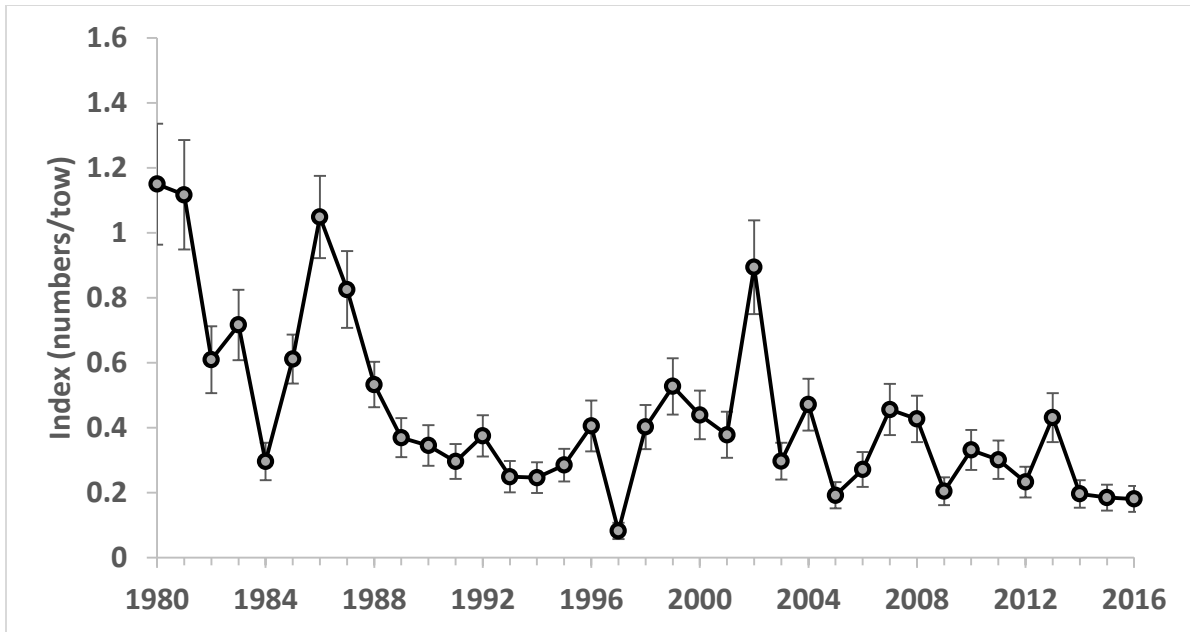
**Figure 36. GLM-standardized index of abundance for YOY American eels caught by the Hudson River Estuary Monitoring Program’s Ichthyoplankton Survey, 1974–2015. The error bars represent the standard errors about the estimates.**



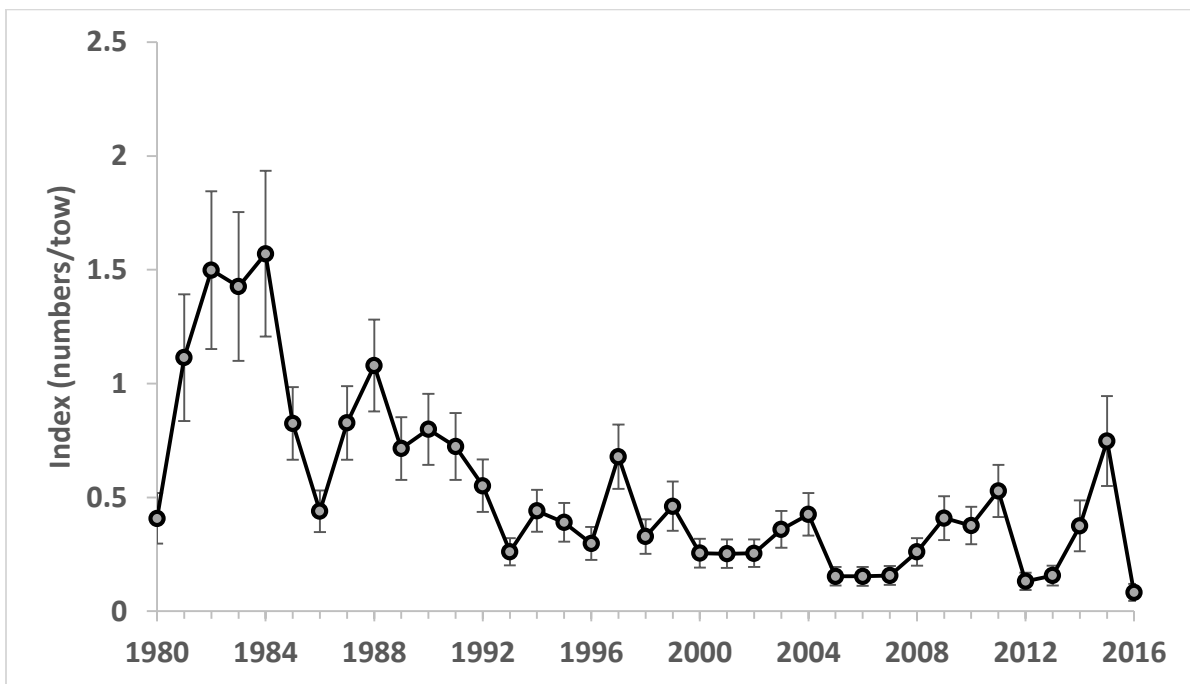
**Figure 37. Annual index of abundance for American eels caught by the CTDEP Electrofishing Survey in the Farmill River, 2001–2014. The error bars represent 95% confidence intervals.**



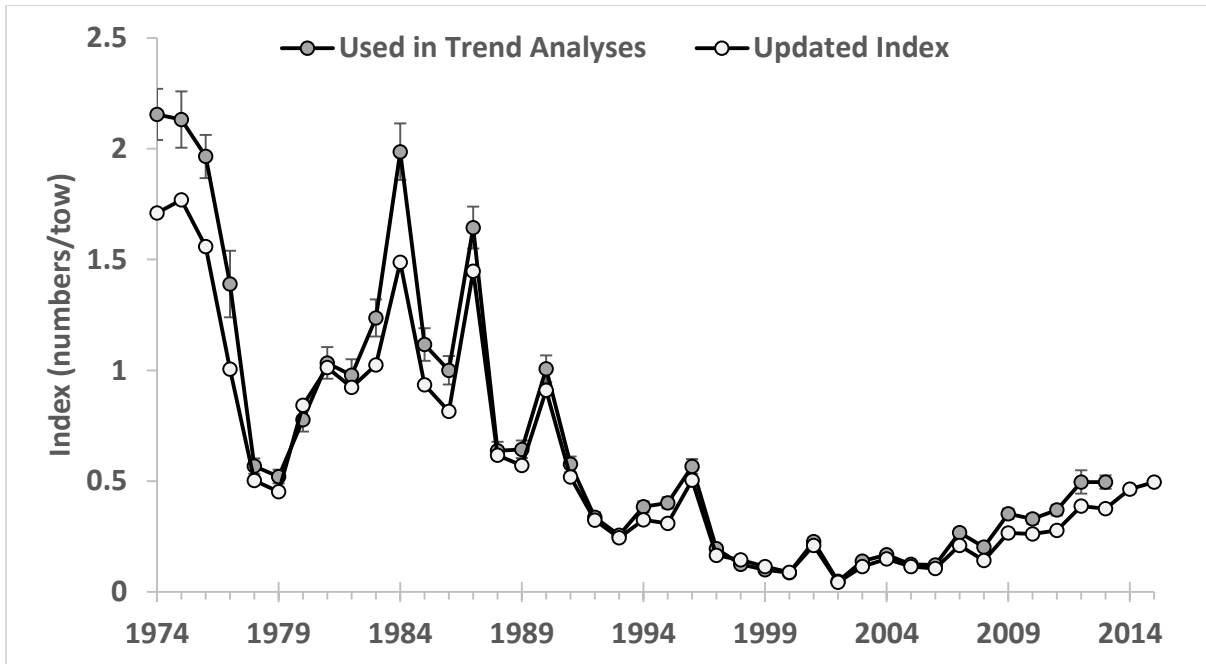
**Figure 38. GLM-standardized index of abundance for American eels caught by the NY Western Long Island Survey, 1984–2016. The error bars represent the standard errors about the estimates.**



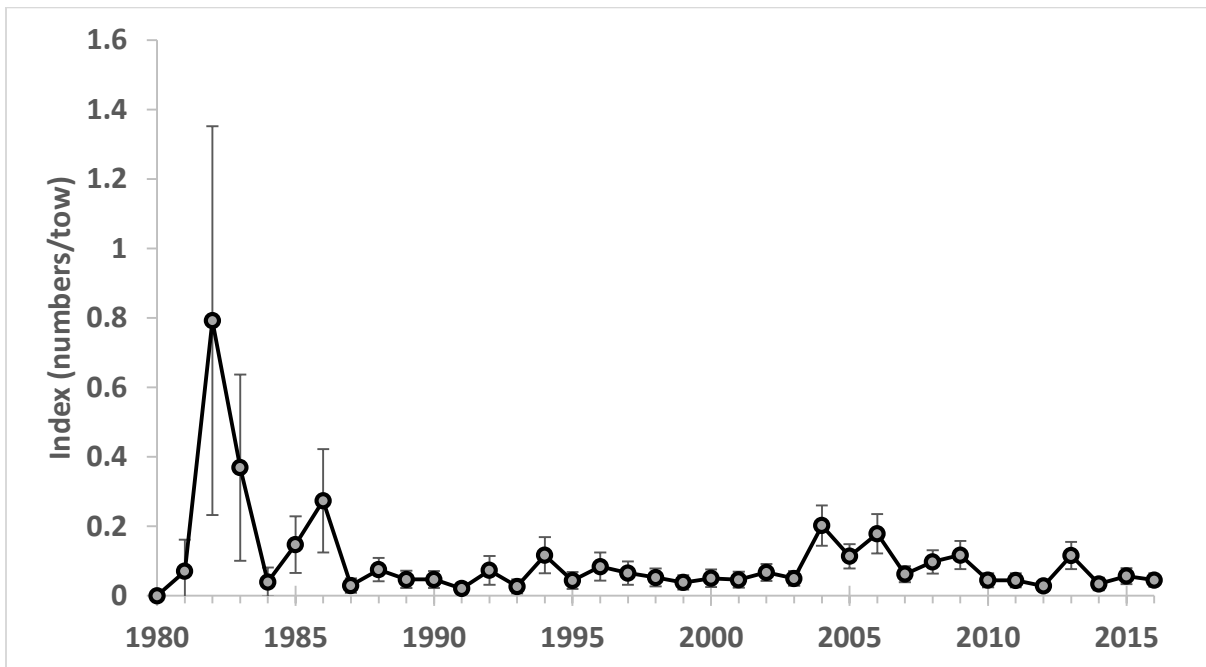
**Figure 39. Annual index of abundance for American eels caught by the NYDEC Alosine Beach Seine Survey, 1980–2016. The error bars represent the standard errors about the estimates.**



**Figure 40. Annual index of abundance for American eels caught by the NYDEC Striped Bass Beach Seine Survey, 1980–2016. The error bars represent the standard errors about the estimates.**



**Figure 41. GLM-standardized index of abundance for yearling and older American eels caught by the HRE Monitoring Program. The error bars represent the standard errors about the estimates. Refer to section 5.2.2.1 for index discussion.**



**Figure 42. GLM-standardized index of abundance for American eels caught by NJDFW's Striped Bass Seine Survey, 1980–2016. The error bars represent the standard errors about the estimates.**

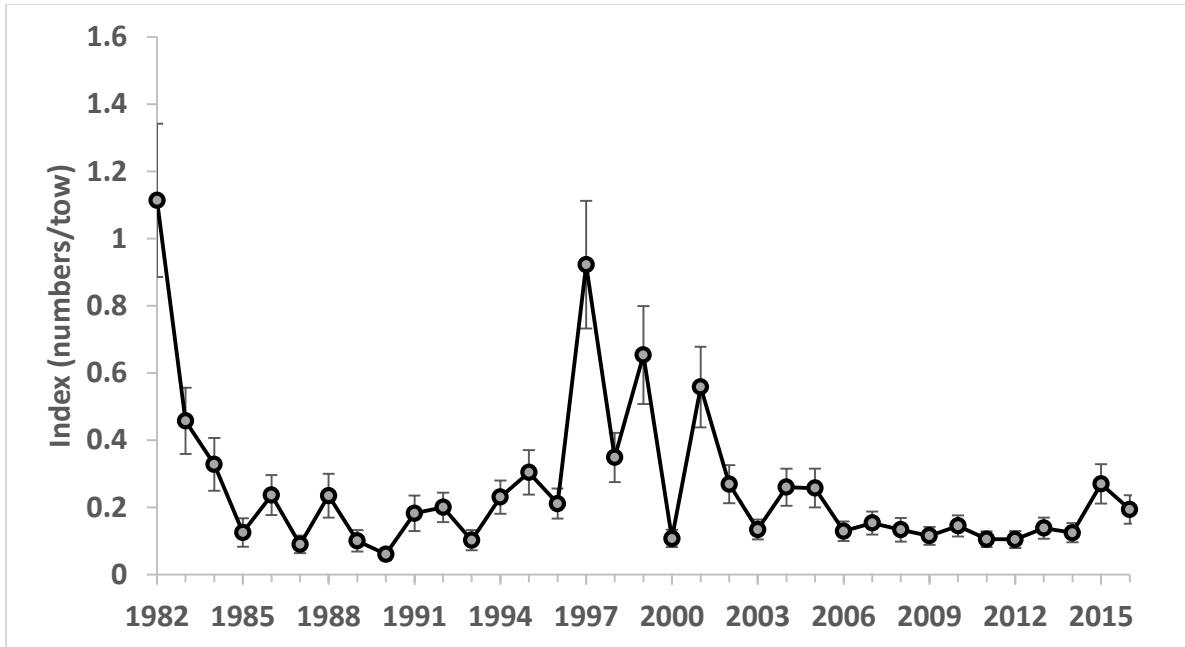


Figure 43. GLM-standardized index of abundance for American eels caught by the Delaware Trawl Survey, 1982–2016. The error bars represent the standard errors about the estimates.

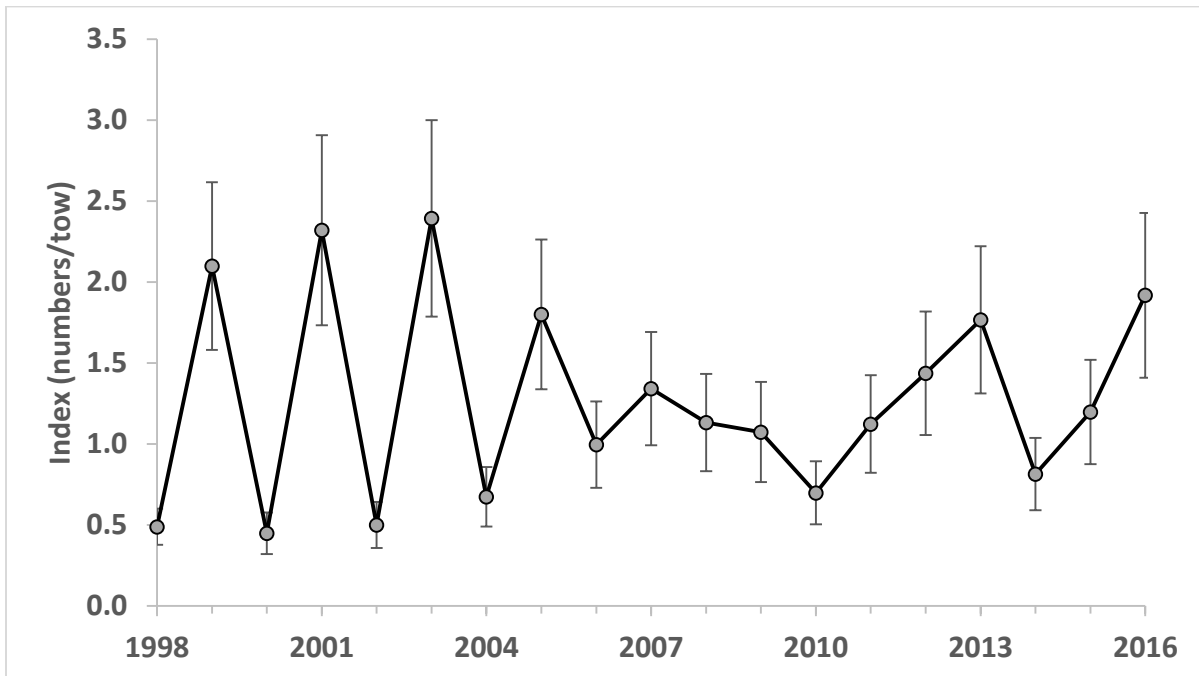
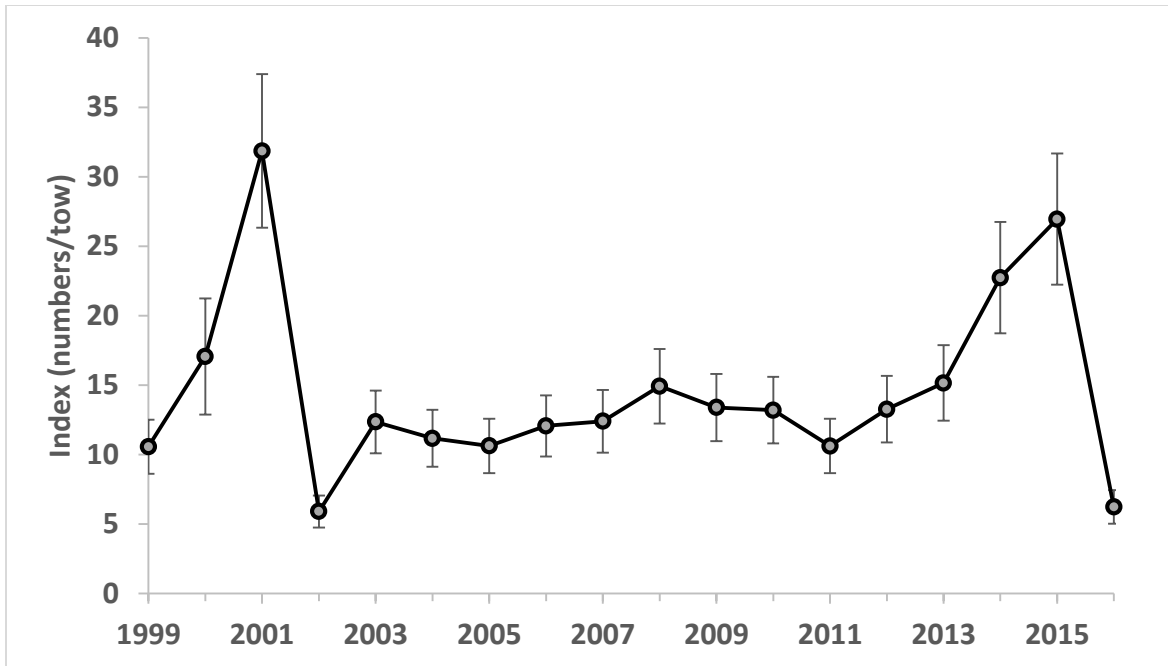
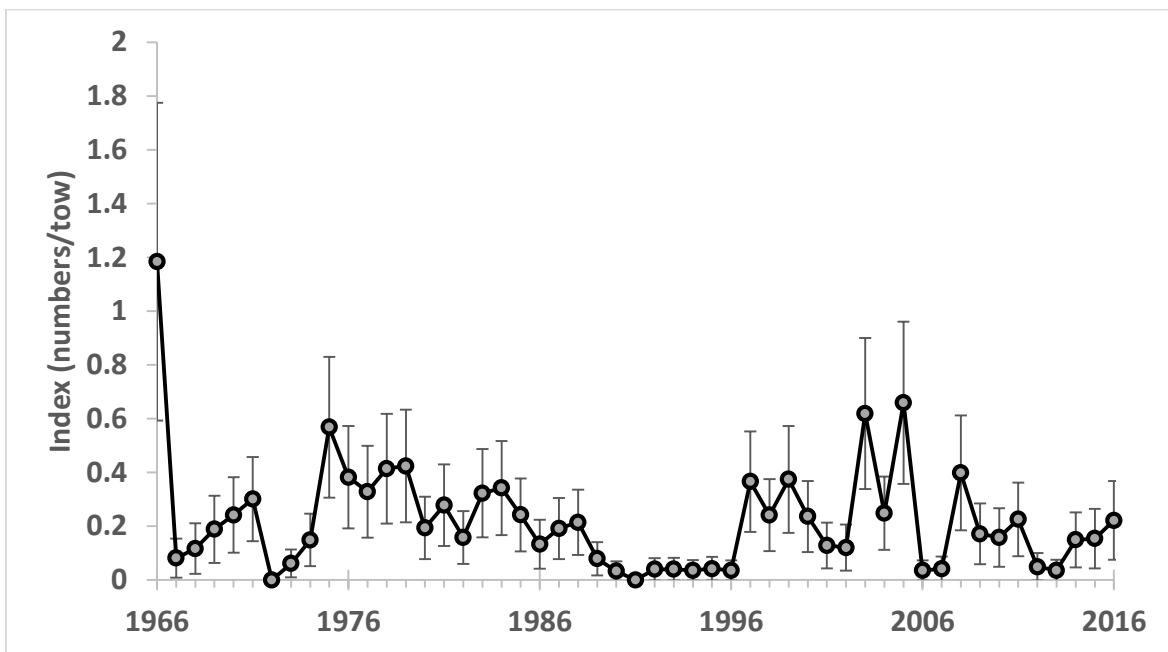


Figure 44. GLM-standardized index of abundance for American eels caught by PSEG's Trawl Survey, 1998-2016. The error bars represent the standard errors about the estimates.

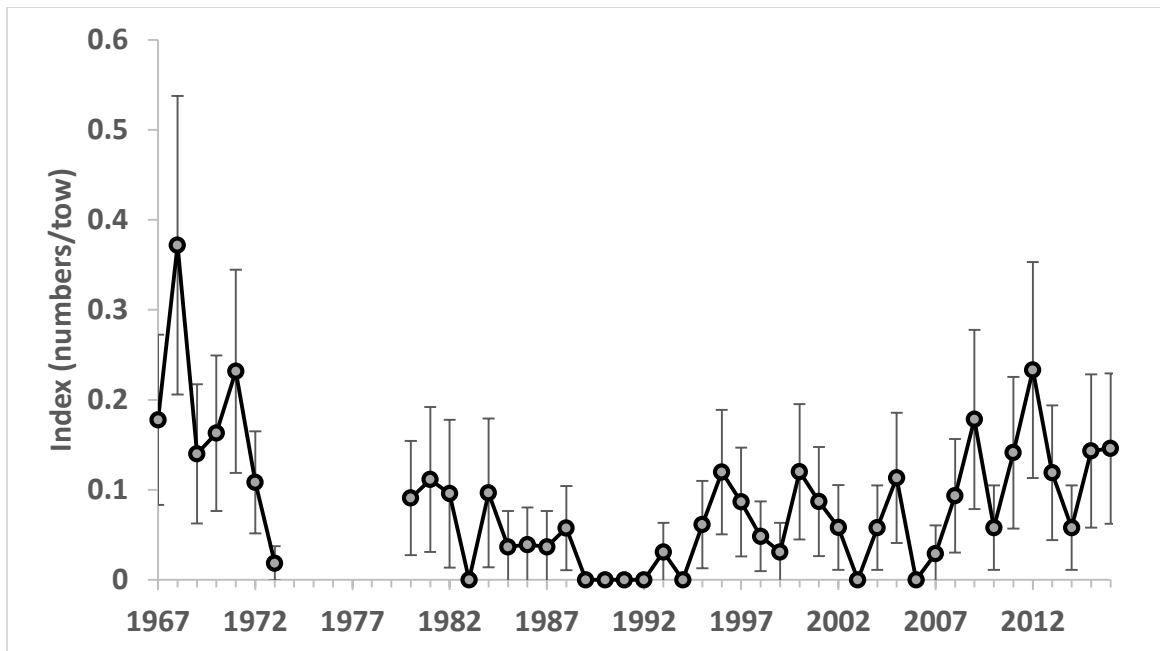




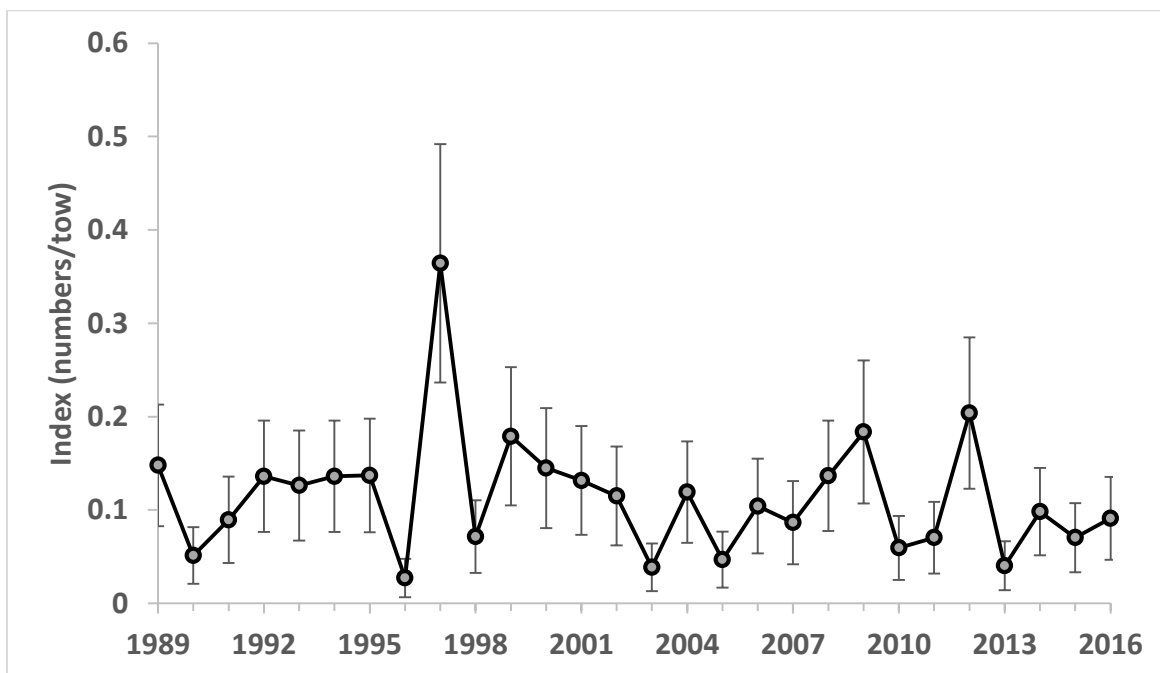
**Figure 45. GLM-standardized index of abundance for American eels caught by the Area 6 Electrofishing Survey, 1999–2016. The error bars represent the standard errors about the estimates.**



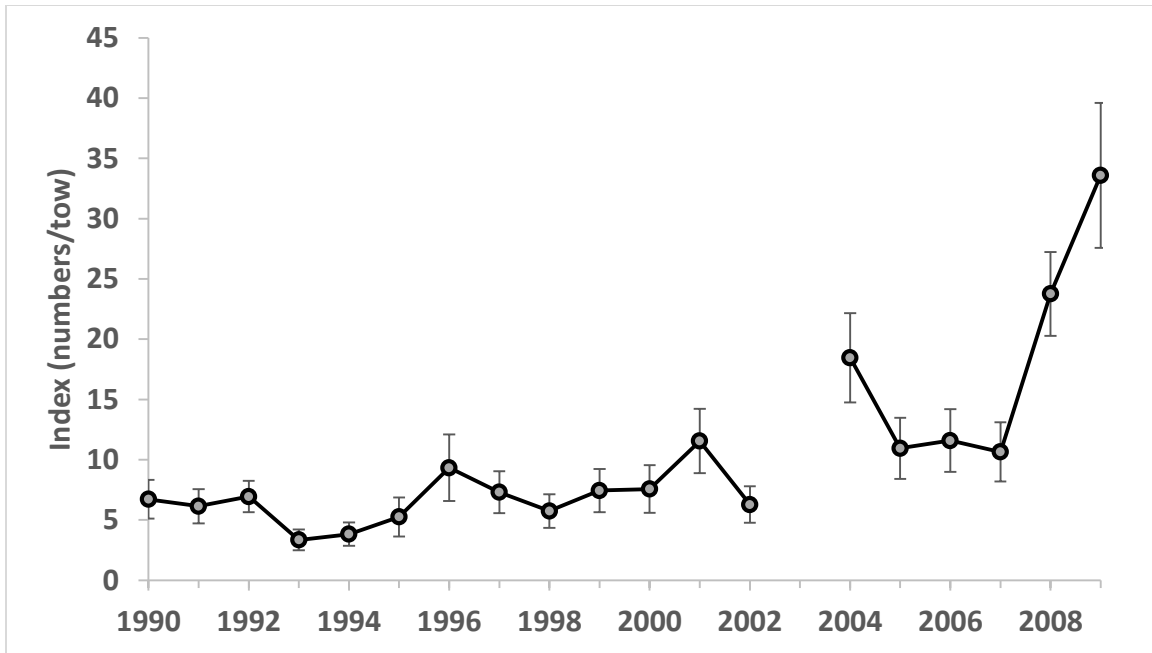
**Figure 46. GLM-standardized index of abundance for American eels caught by the MDDNR Striped Bass Seine Survey, 1966–2016. The error bars represent the standard errors about the estimates.**



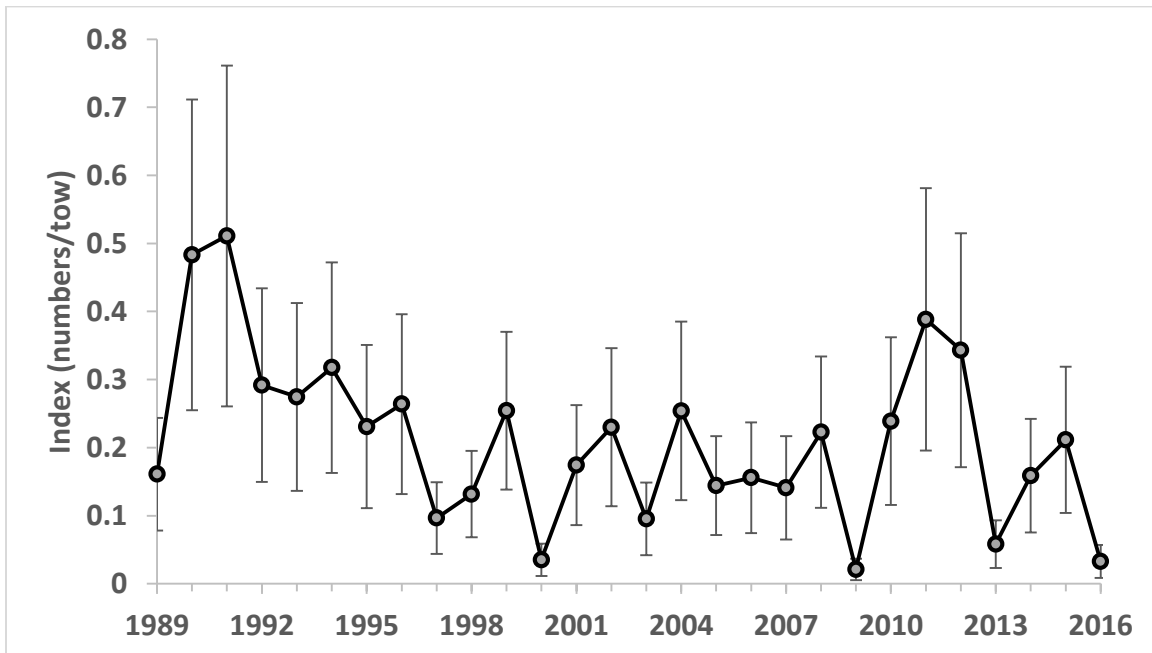
**Figure 47. GLM-standardized index of abundance for American eels caught by the VIMS Juvenile Striped Bass Seine Survey, 1967–2016. The error bars represent the standard errors about the estimates.**



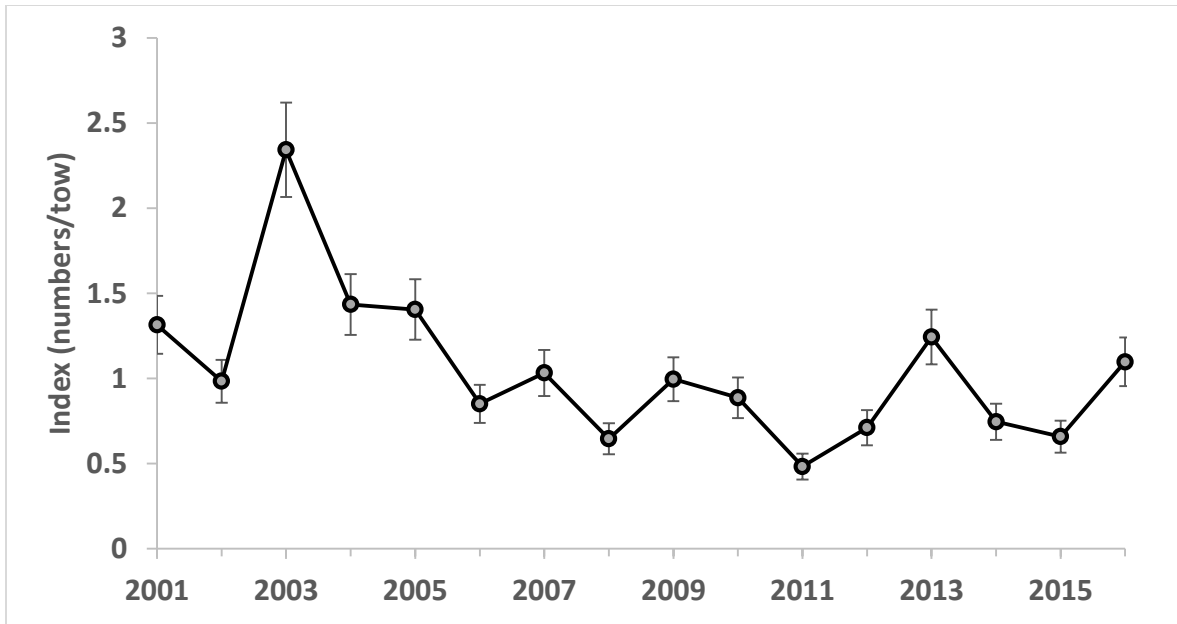
**Figure 48. GLM-standardized index of abundance for American eels caught by the VIMS Juvenile Striped Bass Seine Survey, 1989–2016. The error bars represent the standard errors about the estimates.**



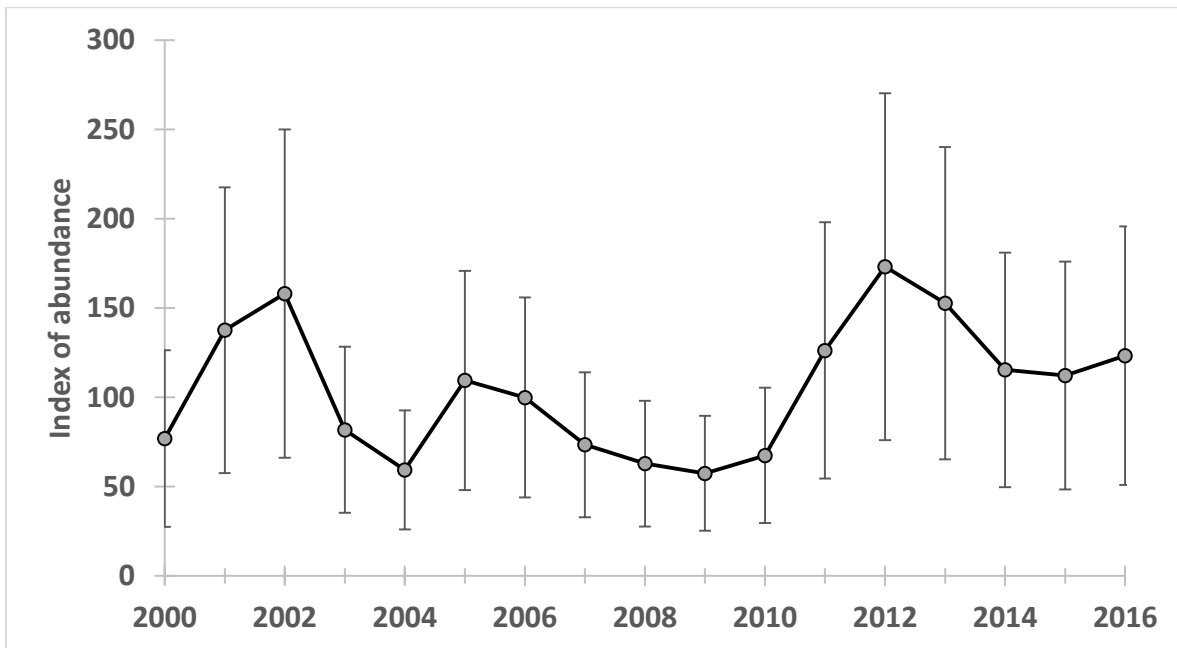
**Figure 49.** GLM-standardized index of abundance for American eels caught by the North Anna Electrofishing Survey, 1990–2009. The error bars represent the standard errors about the estimates.



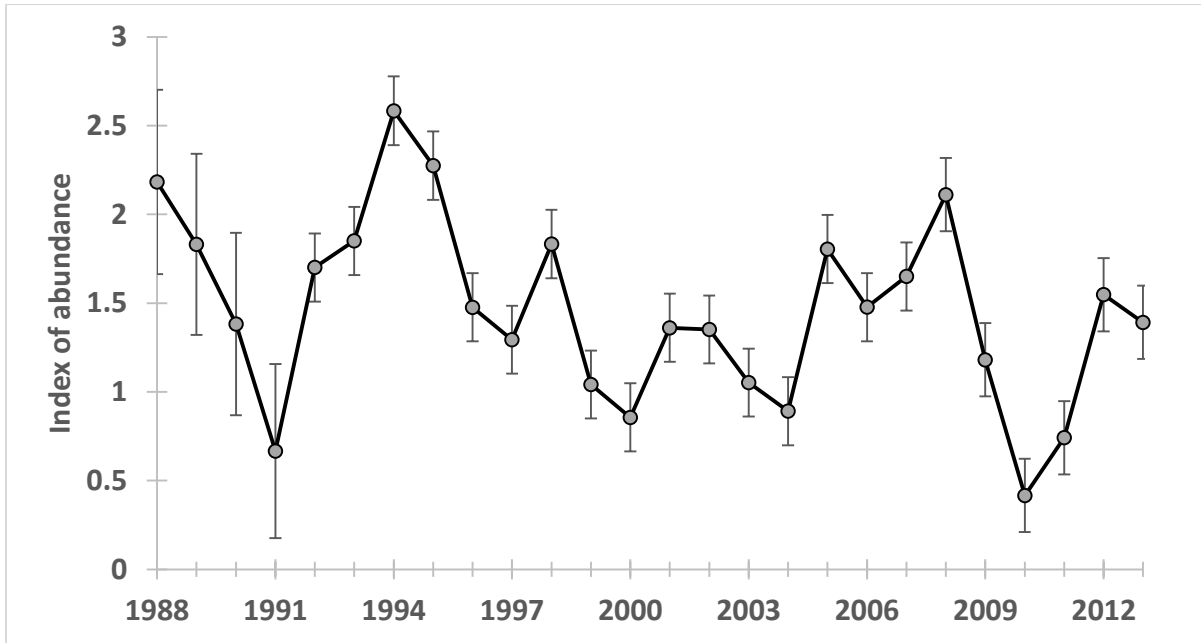
**Figure 50.** GLM-standardized index of abundance for American eels caught by the NCDMF Estuarine Trawl Survey, 1989–2016. The error bars represent the standard errors about the estimates.



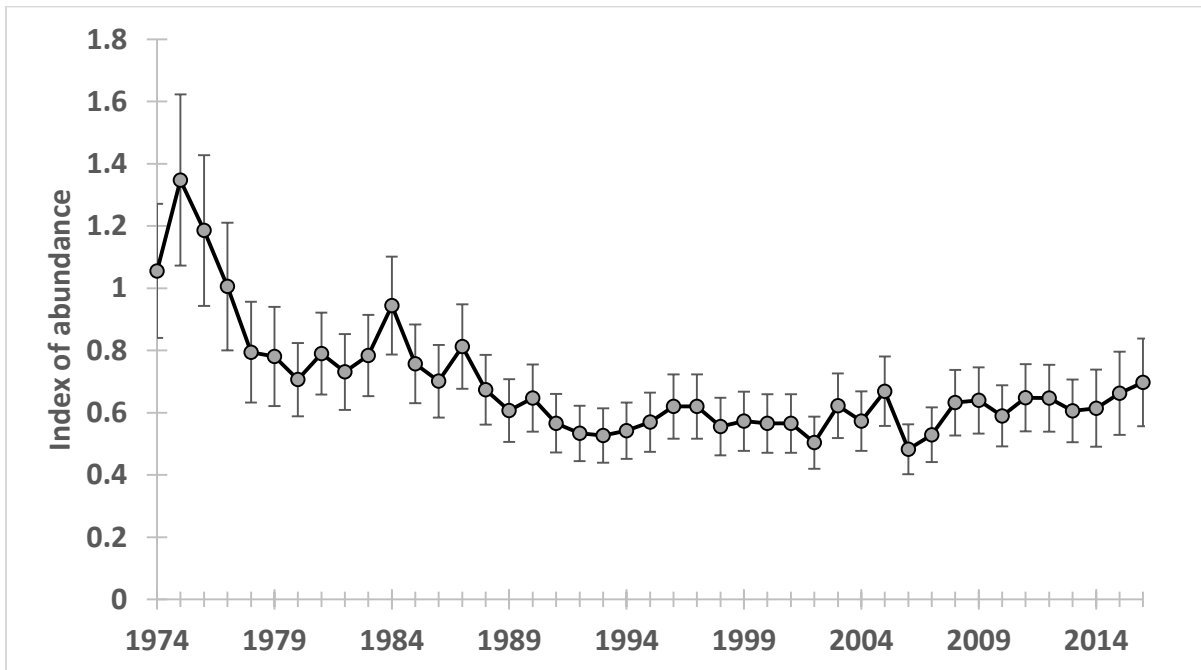
**Figure 51. GLM-standardized index of abundance for American eels caught by the SC Electrofishing Survey, 2001–2016. The error bars represent the standard errors about the estimates.**



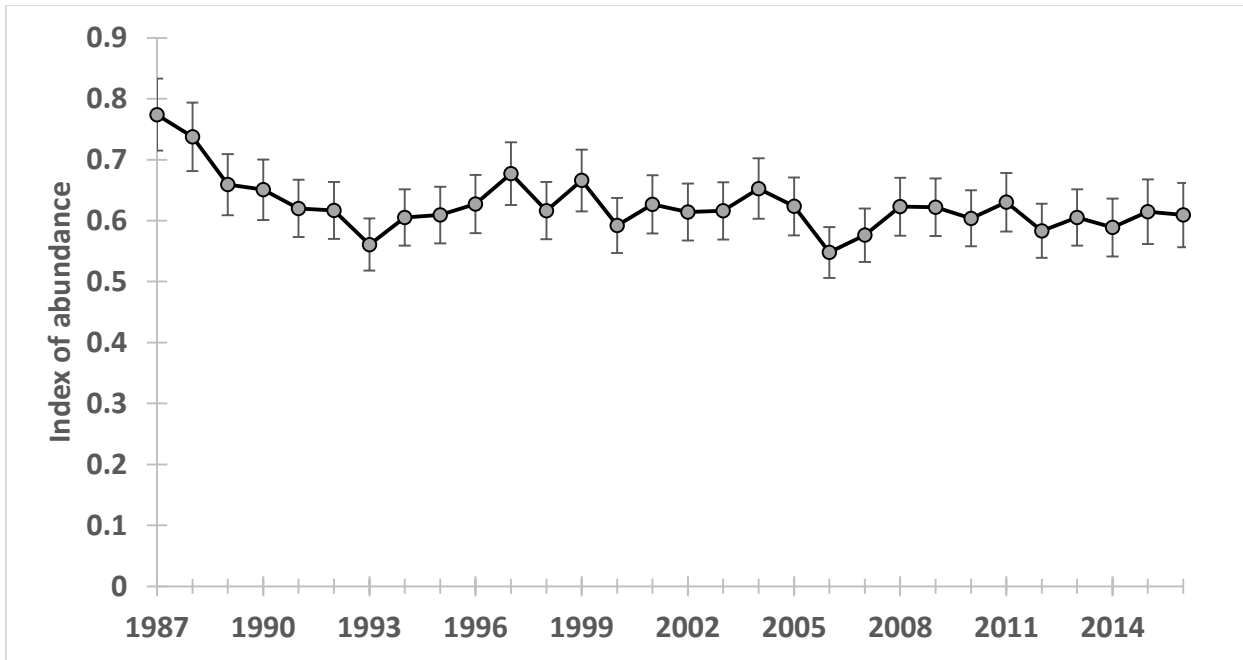
**Figure 52. GLM-standardized, short-term index of abundance for YOY American eels along the Atlantic Coast, 2000–2016. The error bars represent the standard errors about the estimates.**



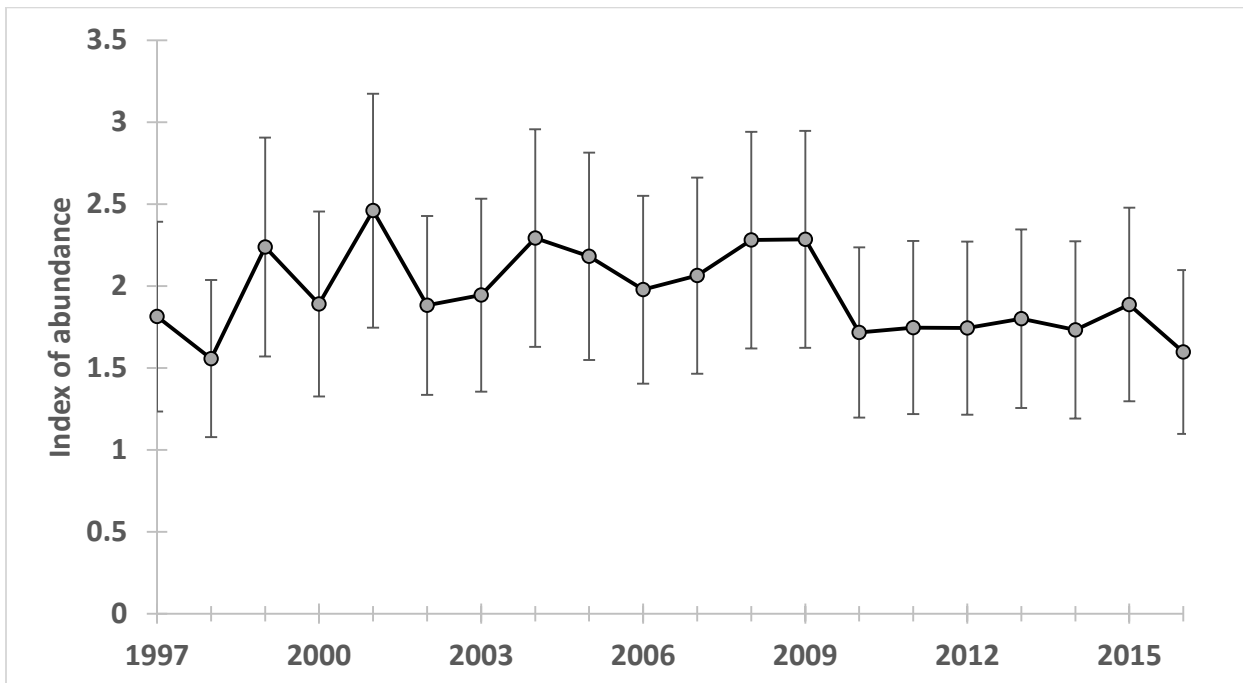
**Figure 53. GLM-standardized, long-term index of abundance for YOY American eels along the Atlantic Coast, 1988–2013. The error bars represent the standard errors about the estimates.**



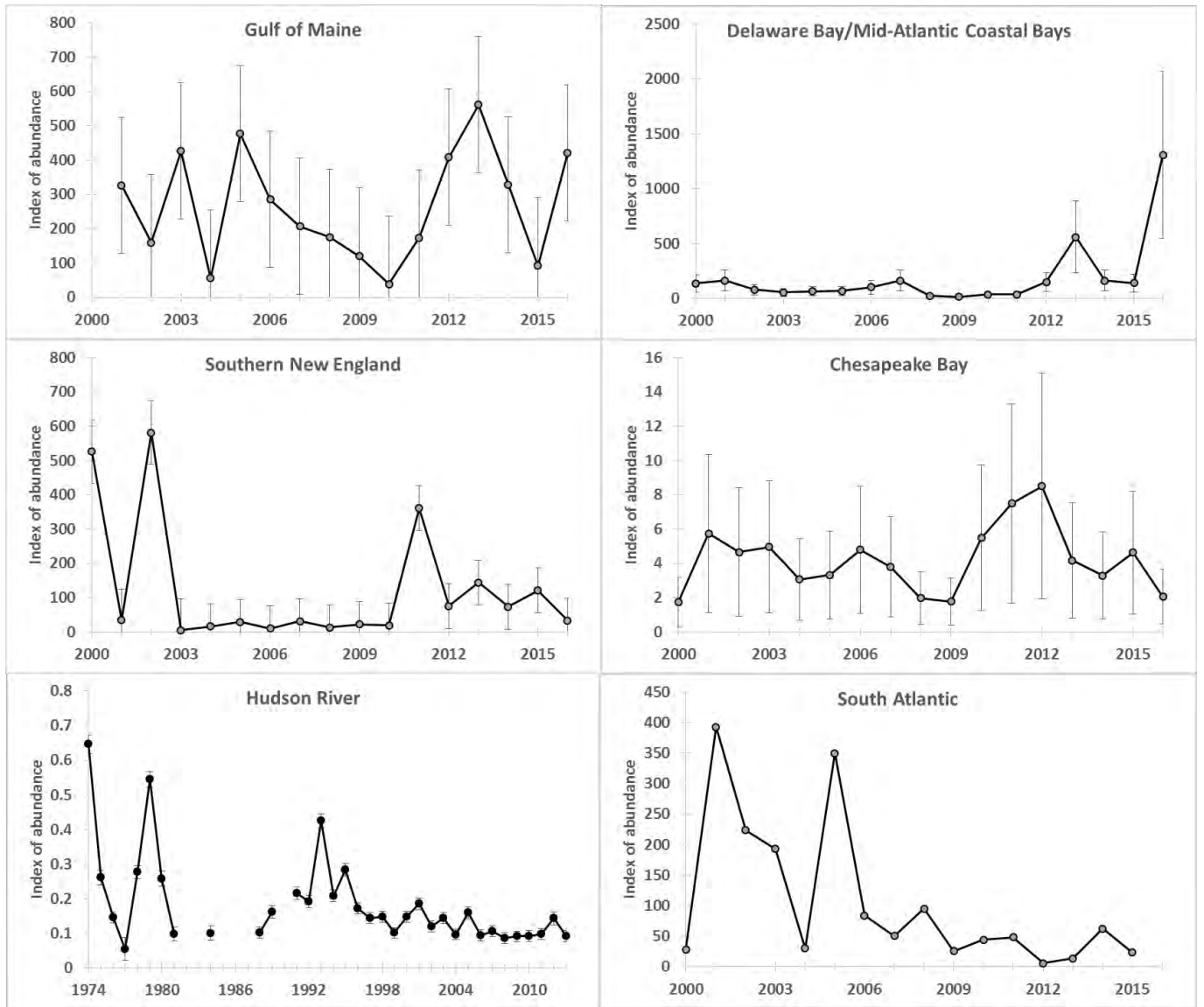
**Figure 54. GLM-standardized index of abundance for yellow-phase American eels along the Atlantic Coast, 1974–2016 (40-plus-year index). The error bars represent the standard errors about the estimates.**



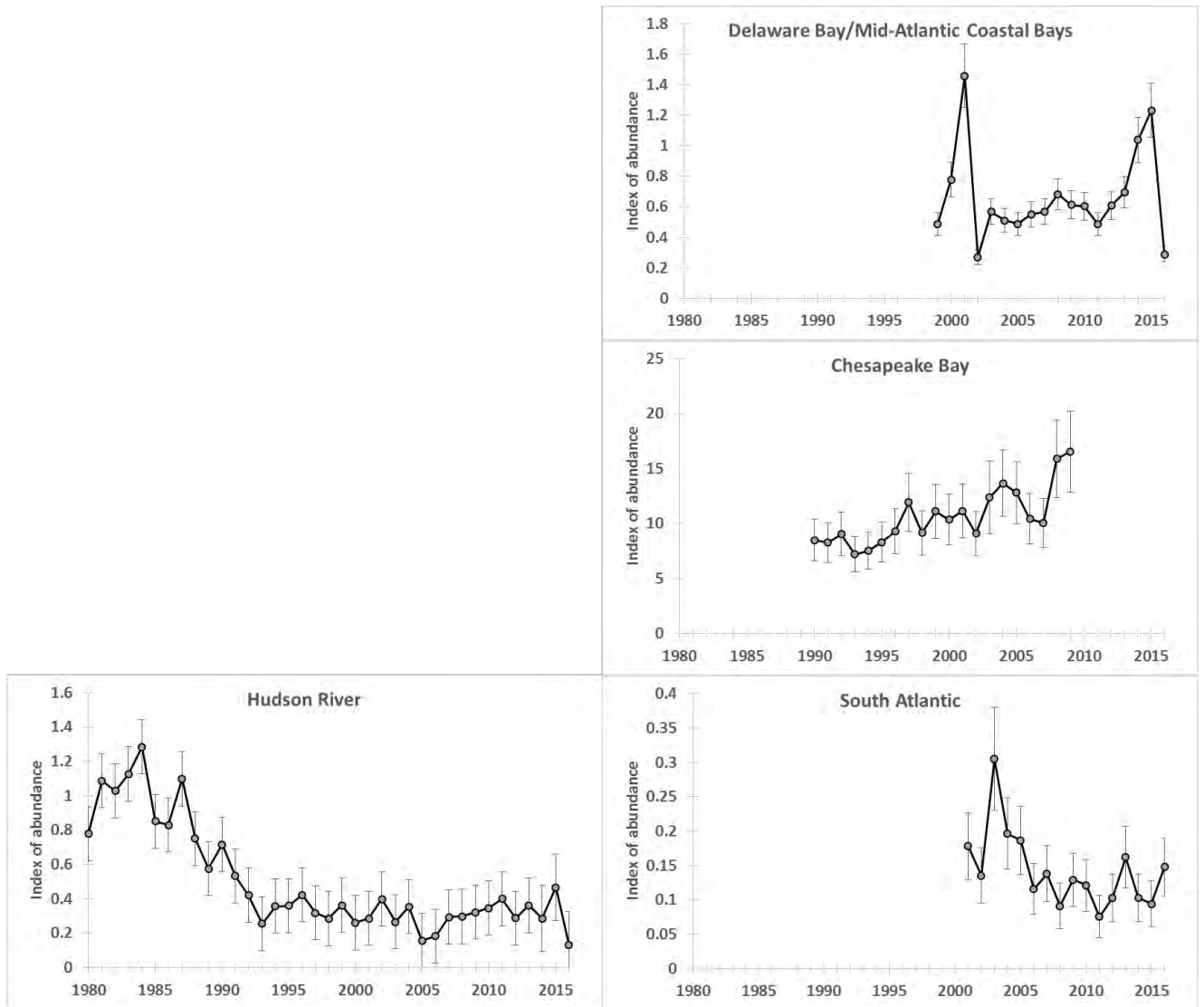
**Figure 55. GLM-standardized index of abundance for yellow-phase American eels along the Atlantic Coast, 1987–2016 (30-year index). The error bars represent the standard errors about the estimates.**



**Figure 56. GLM-standardized index of abundance for yellow-phase American eels along the Atlantic Coast, 1997–2016 (20-year index). The error bars represent the standard errors about the estimates.**

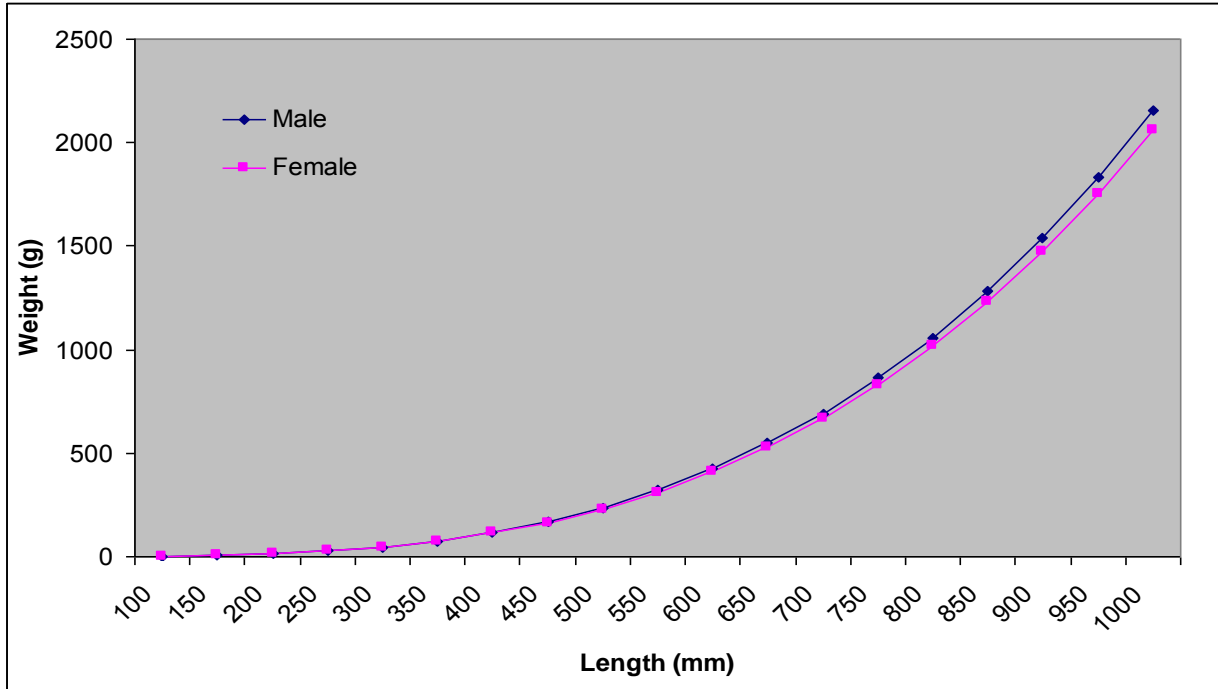


**Figure 57. Regional indices of YOY abundance for American eels. The error bars represent the standard errors about the estimates. For the South Atlantic, the standard errors were small and do not show up on the graph.**

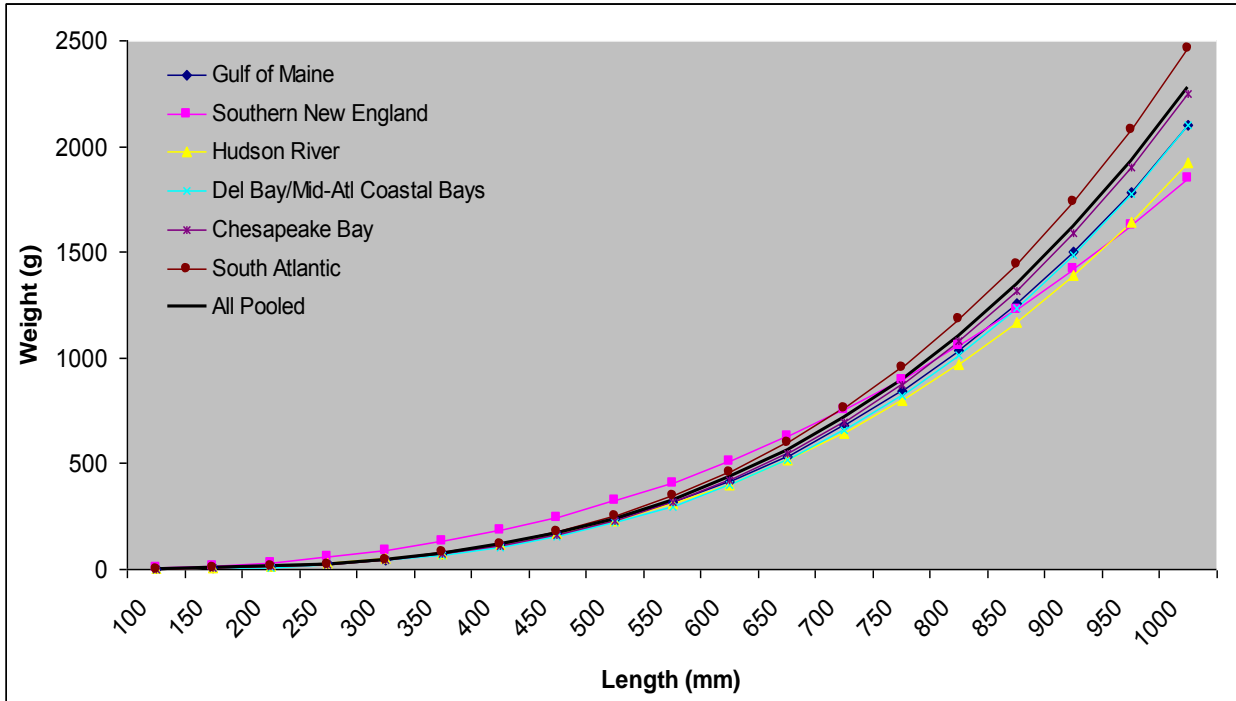


**Figure 58. Regional indices of yellow-stage abundance for American eels. The error bars represent the standard errors about the estimates.**





**Figure 59. Predicted total length-weight relation for American eel based on available data, by sex.**



**Figure 60. Predicted total length-weight relation for American eel based on available data, by region and all pooled.**

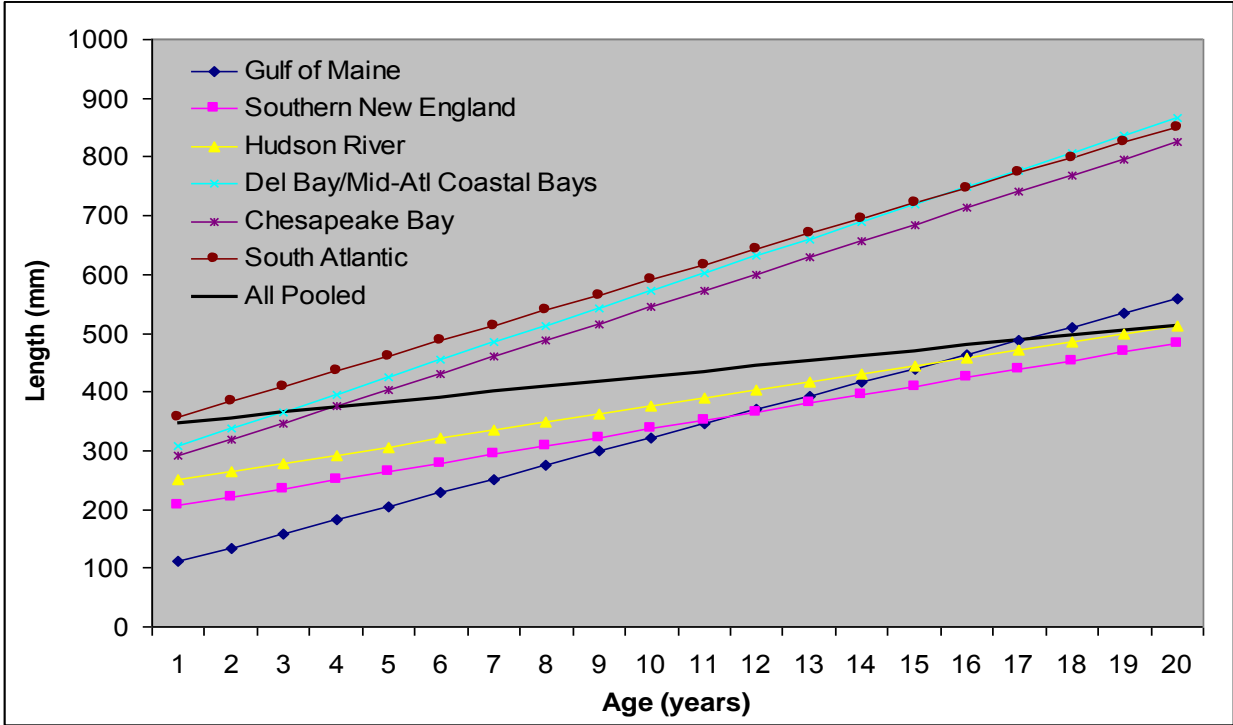


Figure 61. Predicted linear age-length relation for American eel based on available data, by region and all pooled.

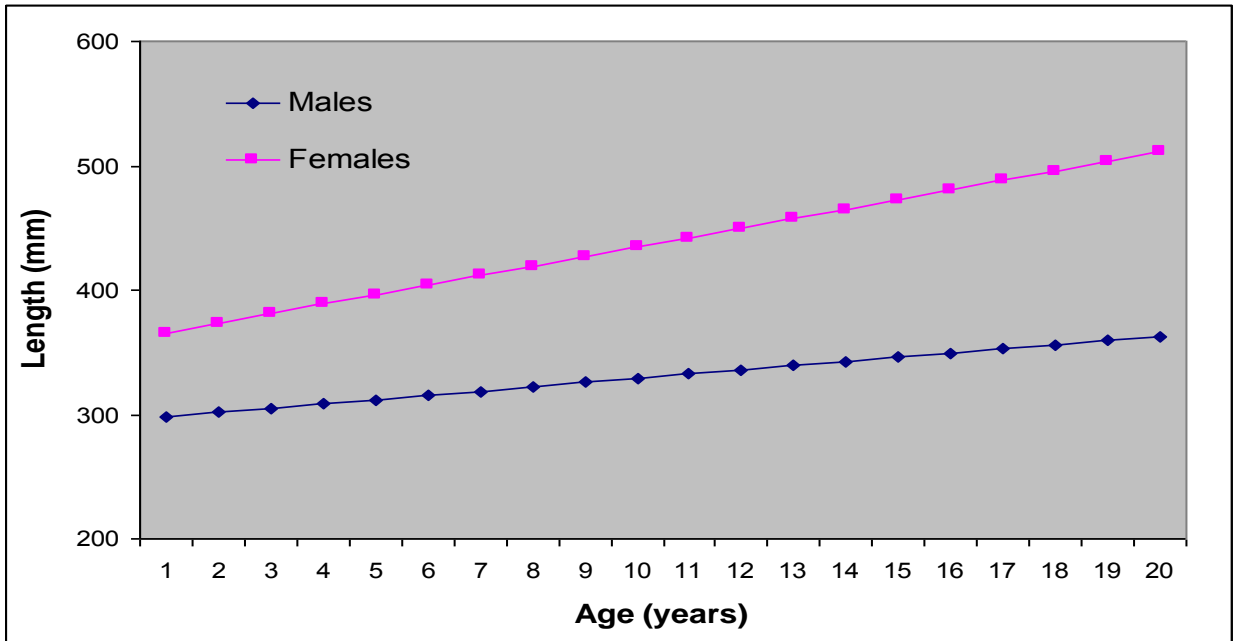
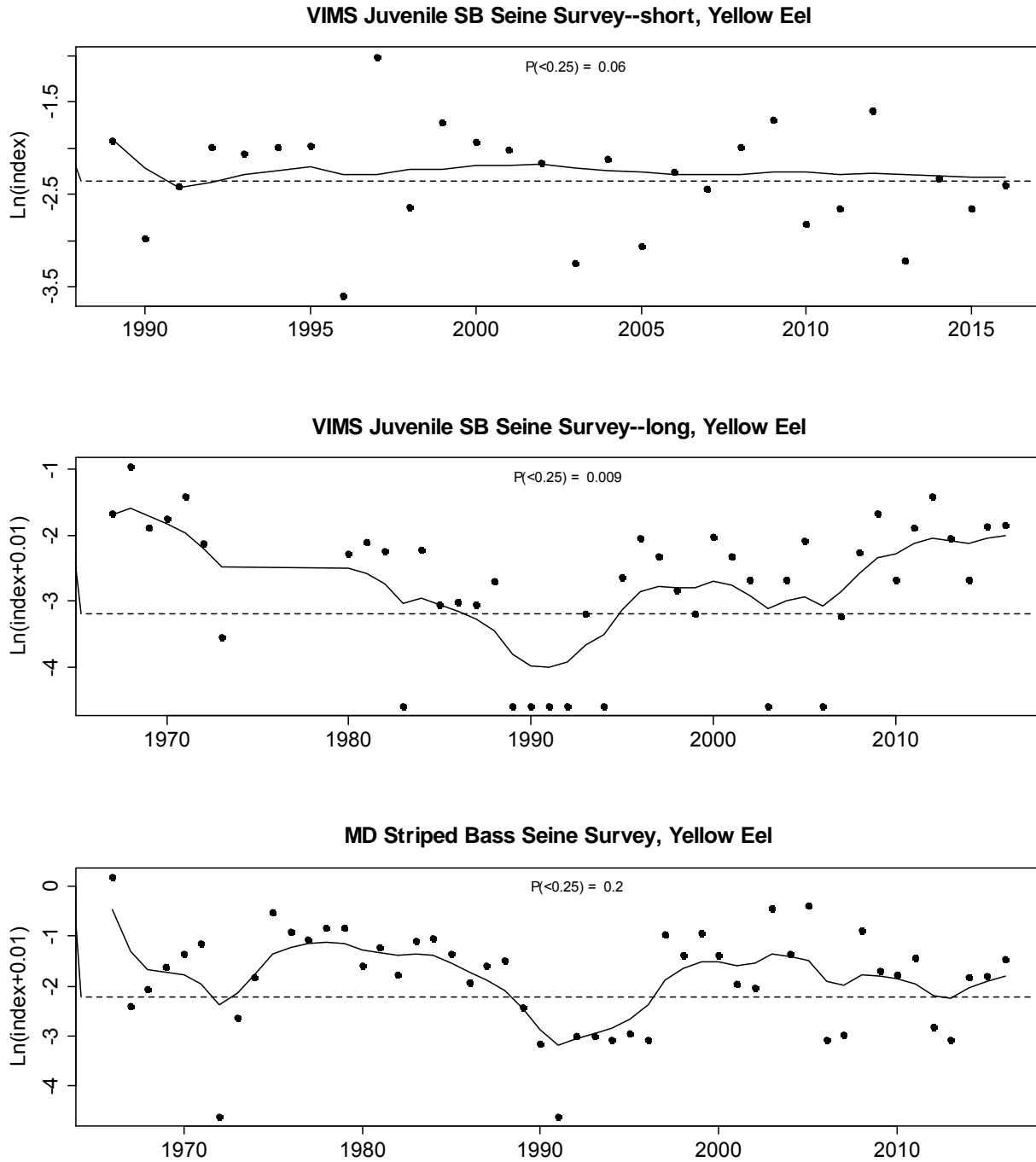
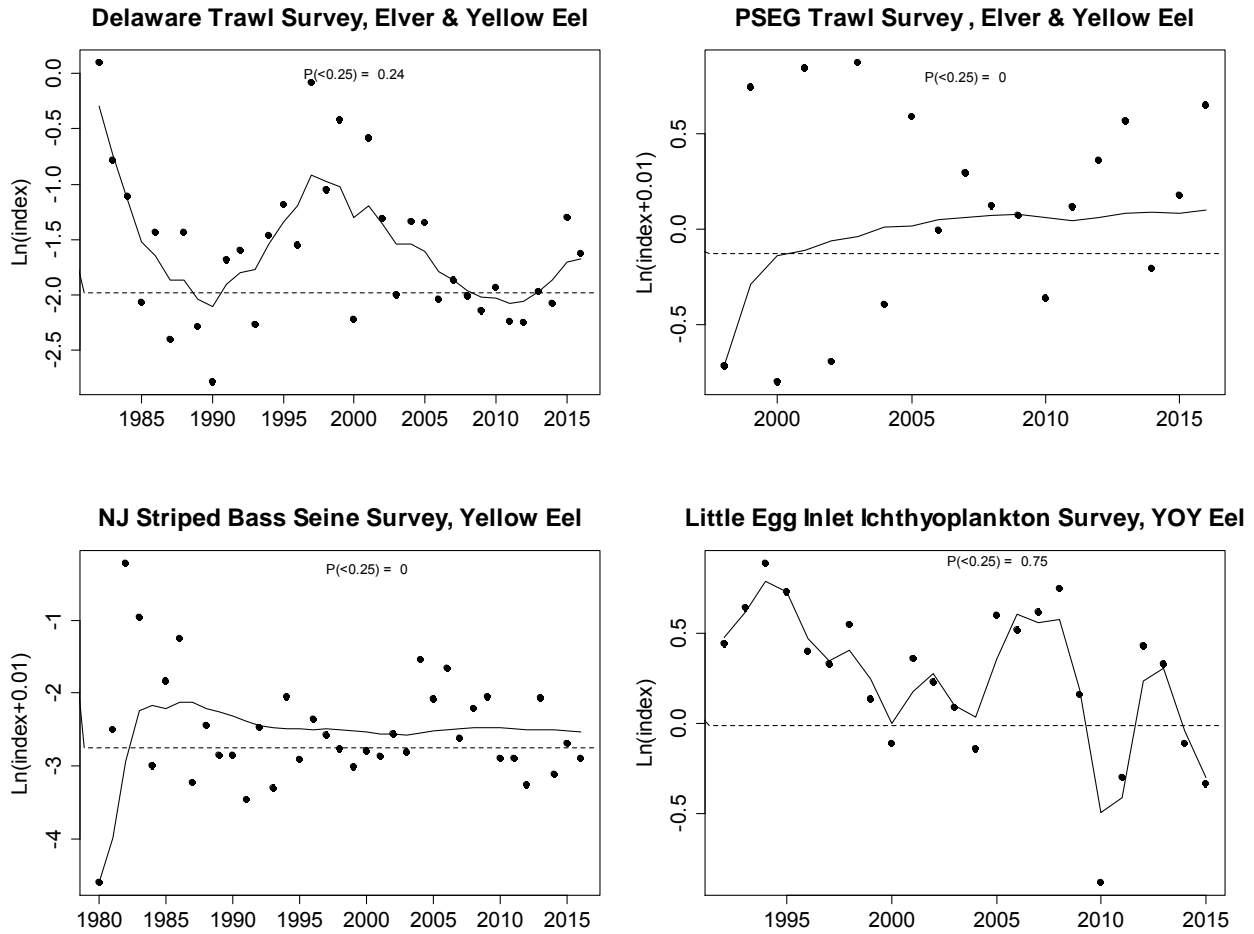


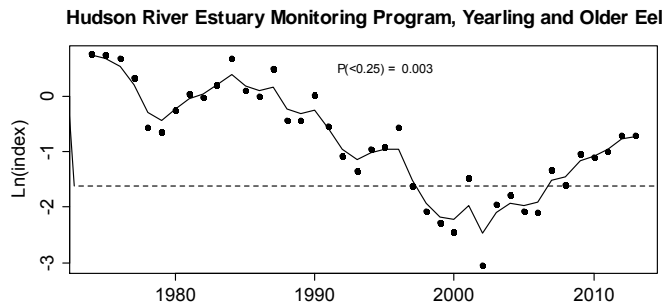
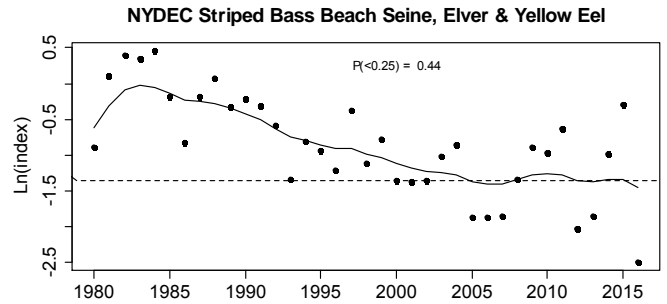
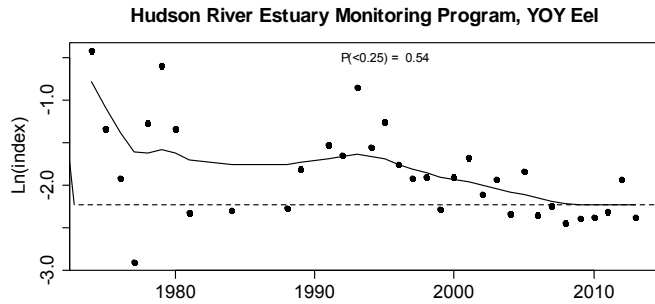
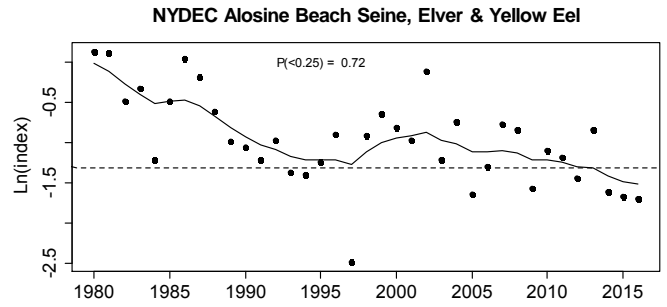
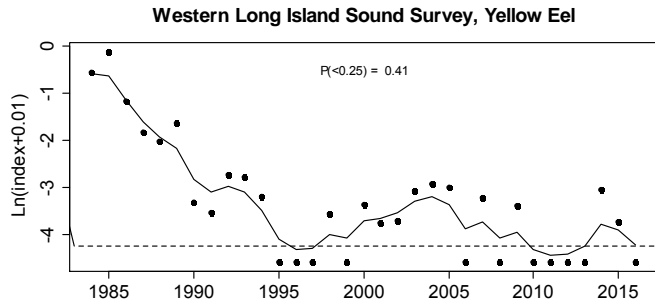
Figure 62. Predicted linear age-length relation for American eel based on available data, by sex.



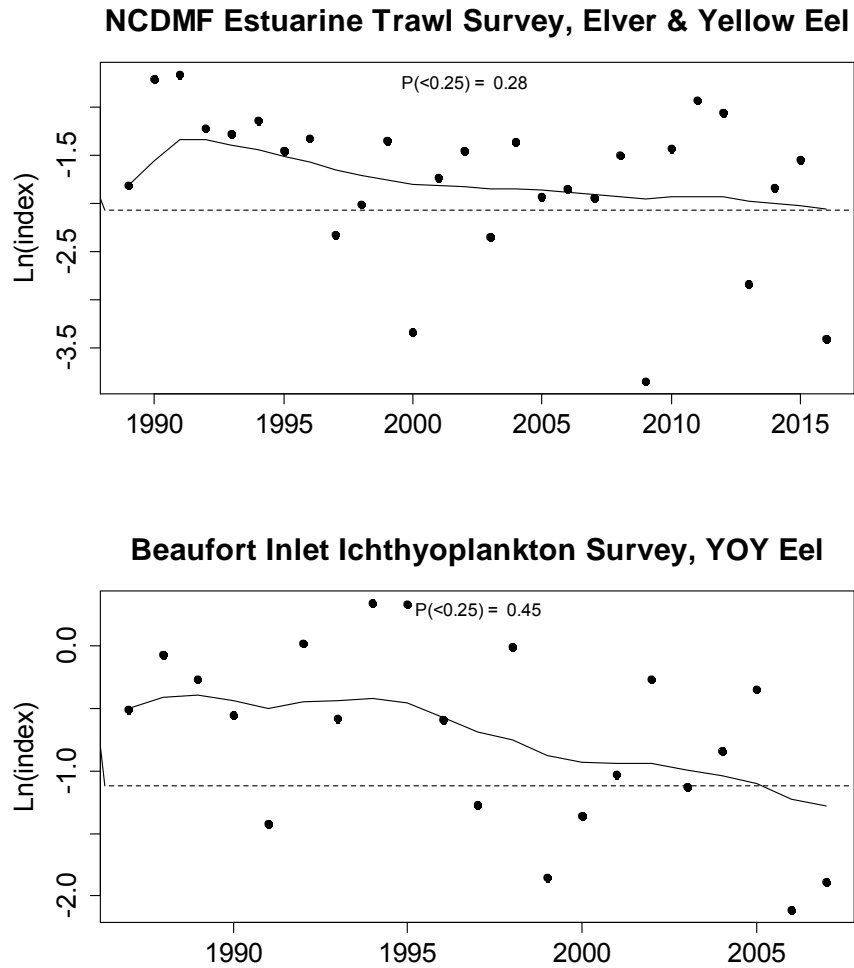
**Figure 63. ARIMA model fits to American eel surveys from the Chesapeake Bay region. The dotted line represents the 25<sup>th</sup> percentile of the fitted values and  $P(<0.25)$  is the probability of the terminal year of the survey being less than the 25<sup>th</sup> percentile of the values.**



**Figure 64. ARIMA model fits to American eel surveys from the Delaware Bay/Mid-Atlantic Coastal Bays region. The dotted line represents the 25<sup>th</sup> percentile of the fitted values and  $P(<0.25)$  is the probability of the terminal year of the survey being less than the 25<sup>th</sup> percentile of the fitted values.**



**Figure 65. ARIMA model fits to American eel surveys from the Hudson River region. The dotted line represents the 25<sup>th</sup> percentile of the fitted values and  $P(<0.25)$  is the probability of the terminal year of the survey being less than the 25<sup>th</sup> percentile of the fitted values.**



**Figure 66. ARIMA model fits to American eel surveys from the South Atlantic region. The dotted line represents the 25<sup>th</sup> percentile of the fitted values and  $P(<0.25)$  is the probability of the terminal year of the survey being less than the 25<sup>th</sup> percentile of the fitted values.**



# Atlantic States Marine Fisheries Commission

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## American Eel Allocation Working Group Calls Summary

*September 5 & 25 2017*

**Allocation WG members:** John Clark (DE; Board Chair), Lynn Fegley (MD), Ross Self (SC), Michelle Duval (NC)\*, Pat Keliher (ME), Rob O'Reilly (VA), Cheri Patterson (NH)

*\*Dr. Duval chaired the South Atlantic Council Meeting and was unable to participate in the second call.*

**Staff:** Kirby Rootes-Murdy (ASMFC), Kristen Anstead (ASMFC)

The American eel Allocation Working Group met via conference call on September 5<sup>th</sup> and 25<sup>th</sup>, 2017 to receive a preliminary report on the Stock Assessment Update and discuss three issue items 1) Implementation of state by state quotas for the yellow eel fishery 2) Maine's 2018 glass eel quota 3) State by state yellow eel commercial quotas as outlined in Addendum IV. The following is a draft summary of the call.

Staff updated the WG on the progress of the stock assessment update which is scheduled to be presented to the Board in October. Landings and fishery-independent data sets that were previously used in the trend or growth analyses will all be updated. The trend analyses and tests will include ARIMA, Mann-Kendall, Manly, and power. Progress has been made on the analyses and report writing and thus far the stock assessment subcommittee is on target to meet their deadline. Though analysis has not been reviewed by the full TC yet, overall most of the trend analyses indicate there has been no improvement since the 2012 benchmark stock assessment. The TC should anticipate reviewing and discussing this document within the next few weeks.

### 1) **Implementation of state by state quotas**

Staff presented background on Addendum IV provisions and a review of the current information regarding 2016 commercial yellow eel landings. As presented at the August 2017 Board meeting, '1A' of the management trigger was tripped based on preliminary 2016 commercial yellow eel landings (928,358 pounds) exceeding the coastwide cap (907,669 pounds). If that overage holds AND 2017 landings exceed the coastwide cap, per provisions of Addendum IV, state by state quotas would be implemented. Staff highlighted that as part of Addendum IV implementation plans, states and jurisdictions needed to show that if state-by-state quotas were implemented, that they would be able to effectively monitor landings in a timely enough manner to manage their state quota. As of now, most states are still operating on monthly reporting, not weekly reporting, limiting the states' ability to monitor their landings well under quotas. Additionally, many states' rule making process would required a longer timeframe than immediately (the

Addendum IV language specifies ‘automatic implementation’) being able to implement a quota mid-season.

In considering these background issues, the WG also noted the challenges associated with the current Addendum IV provisions, specifically the automatic triggering of state by state quotas in relation to when commercial landings data is finalized. While previous TC recommendations focused on harvester reporting to monitor landings throughout the season and the request to have prior year landings finalized by March of the current year, ACCSP does not release final landings from the prior year until the fall of the current year; implementing a quota 2/3 -3/4 through the fishing year would present challenges. Additionally, the WG was in agreement with not trying to assess whether a management trigger was tripped based on preliminary landings given staff’s indication that landings information may change from preliminary to final.

Based on the information presented and discussion, **the WG recommends the Board move to implement state by state quotas- as specified in Addendum IV- beginning January 1, 2019 the management trigger has been exceeded based on final 2017 landings information (if either two consecutive years-2016 & 2017-exceed the coastwide cap annually or 2017 landings exceeding the coastwide cap by 10%).** The WG also discussed the possibility of states taking voluntary measures to reduce harvest in the current year; for example, for Fall 2017 Maryland has implemented closures for the yellow eel fishery for Saturday and Sunday from September 1-November 30, with a full commercial season closing at 11:59pm November 30. Staff did point out that for voluntary measures to reduce harvest for the current year to preventatively limit the potential of a coastwide cap overage in 2017, states would need to implement those voluntary measures this fall (i.e. now), and not next year.

Additionally, the **WG recommends that a new addendum be initiated at the Annual Meeting to consider alternative allocations, management triggers, and coastwide caps to the current management program in Addendum IV.** For each of the subsequent issue items, additional management alternatives are recommended to be included in this potential new addendum. One potential alternative would be to adjust one of the current management triggers. For example, the trigger would not be tripped if the coastwide cap is exceeded by 10% for consecutive years, rather just one year.

## **2) Maine’s 2018 glass eel quota**

Similar to the previous issue item, Staff presented the WG with background information and recent fishery performance. Prior to the approval of Addendum IV, the previous Allocation Working Group recommended setting Maine’s glass eel quota based on the 2014 landings level (9,688 pounds). Reasons cited included: 1) uncertainty in the added conservation benefits with a lower quota; 2) socio-economic impacts to local communities; 3) expected increased level poaching and enforcement problems; 4) expected inability for Maine to complete important life history study.

Since the implementation of new quota in 2015, landings have tracked close to the quota in 2016-2017 (>94% of the quota based on preliminary landings information) after being much lower in 2015 (5,243 pounds) (see below).



**Table 1. Maine Glass Eel Landings 2007-2017**

Year	Landings	Value	Addendum IV	Value
2007	3,713	\$1,287,479	3,713	\$1,287,485
2008	6,951	\$1,486,353	6,951	\$1,486,355
2009	5,119	\$514,629	5,119	\$519,559
*2010	5,676	\$592,405	3,158	\$584,850
*2011	9,388	\$7,656,345	8,584	\$7,653,331
*2012	31,589	\$38,791,627	20,764	\$38,760,490
2013	18,076	\$32,926,991	18,076	\$32,926,991
2014	9,607	\$8,440,333		
2015	5,243	\$11,389,891		
**2016	9,330	\$13,388,040		
**2017	9,282	>\$12,000,000		

\*Discrepancy in landings information

\*\* Preliminary landings

Note: 'Landings' are reported from annual compliance reports and ACCSP. 2017 landings are based on information provided on Maine DMR website: <http://www.maine.gov/dmr/news-details.html?id=738442>

'Landings' do not include those seized by Law Enforcement (2014-2016)

Based on recent performance, one WG member suggested that the quota be increased back to previous 2014 quota of 11,479 pounds. **The WG on a whole recommended that Maine's glass eel quota should be maintained for 2018 at status quo level from 2015-2017 (9,688 pounds) and that the previously mentioned new addendum should address the quota for 2019 and beyond.**

### 3) Commercial yellow eel state by state quotas

Staff presented background information on how current state-by-state quotas in addendum IV were derived based on information from the prior benchmark stock assessment and as well as the 'filtering' method applied. WG members, going off of the staff presentation on the stock assessment update, indicated an interest in updating the baseline years to include information on state by state and coastwide landings through 2016 (1998-2016) rather than continue using 1998-2010 (currently specified in Addendum IV). Staff reminded the WG that the prior TC recommendation on the coastwide cap and state-by-state quotas indicated that an approximate 12% reduction from the baseline period should be implemented for the coastwide cap (approximately 798,751 pounds) given the benchmark stock assessment results and need to reduce fishing mortality; ultimately that was not implemented.

Based on the discussion, the WG recommends that the new addendum should address the current state by state quotas and coastwide cap. Specifically, the first recommendation for addressing the two connected items would be change the baseline years from 1998-2010 to 1998-2016. Two additional proposals were offered seeking to address the management triggers and change the formula of historical years and recent years data to reflect other recent FMPs

(i.e. current options being explored in the Cobia draft FMP). Both of these proposals will be developed further prior to the Board meeting.

Lastly, the WG noted that a new coastwide cap should be implemented through the proposed addendum, but that determining the exact number will be decided after the Board has considered the Stock Assessment Update Report at the 2017 ASMFC Annual Meeting. Some of the reasoning for revising the coastwide cap was the regulatory changes that have happened since 2014 and an interest incorporating new landings information through 2016.

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