

Atlantic States Marine Fisheries Commission

Atlantic Menhaden Management Board

*August 6, 2019
3:45 – 5:15 p.m.
Arlington, 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.

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|--|-----------|
| 1. Welcome/Call to Order (<i>N. Meserve</i>) | 3:45 p.m. |
| 2. Board Consent | 3:45 p.m. |
| • Approval of Agenda | |
| • Approval of Proceedings from February 2019 | |
| 3. Public Comment | 3:50 p.m. |
| 4. Progress Update on 2019 Menhaden Single-Species and Ecological Reference Point Benchmark Stock Assessments (<i>K. Anstead, K. Drew</i>) | 4:00 p.m. |
| 5. Consider Approval of 2019 Fishery Management Plan Review and State Compliance (<i>M. Appelman</i>) Action | 4:15 p.m. |
| 6. Set 2020 Atlantic Menhaden Specifications (<i>N. Meserve</i>) Final Action | 4:45 p.m. |
| 7. Other Business/Adjourn | 5:15 p.m. |

The meeting will be held at the Westin Crystal City; 1800 S. Eads Street, Arlington, Virginia 22202; 703.486.1111

MEETING OVERVIEW

Atlantic Menhaden Management Board Meeting

August 6, 2019

3:45 – 5:15 p.m.

Arlington, Virginia

Chair: Nichola Meserve (MA) Assumed Chair: 05/18	Technical Committee Chair: Joey Ballenger (RI)	Law Enforcement Committee Representative: Maj. Robert Kersey (MD)
Vice Chair: Spud Woodward (GA)	Advisory Panel Chair: Jeff Kaelin (NJ)	Previous Board Meeting: February 7, 2019
Voting Members: ME, NH, MA, RI, CT, NY, NJ, PA, DE, MD, PRFC, VA, NC, SC, GA, FL, NMFS, USFWS (18 votes)		

2. Board Consent

- Approval of Agenda
- Approval of Proceedings from February 2019

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. Progress Update on 2019 Menhaden Single-Species and Ecological Reference Point Benchmark Stock Assessments (4:00-4:15 p.m.)

Background

- Two Atlantic menhaden-specific benchmark assessments are currently underway; a single-species assessment and an ecosystem-based assessment. The assessments will be used to evaluate the health of the stock and inform the management of the species in an ecological context.
- A tentative timeline for both benchmarks is included in **Briefing Materials**.

Presentations

- Benchmark stock assessment progress update by K. Anstead and K. Drew

5. Consider Approval of 2019 Fishery Management Plan and State Compliance (4:15-4:45 p.m.) Action

Background

- Annual state compliance reports for Atlantic menhaden are due April 1st
- The Plan Review Team (PRT) reviewed the reports and drafted the 2019 Fishery Management Plan (FMP) Review (**Briefing Materials**)

Presentations

- 2018 FMP Review report by M. Appelman

Board Actions for Consideration

- Consider the 2019 Fishery Management Plan Review and State Compliance

6. Set 2020 Atlantic Menhaden Specifications (4:45-5:15 p.m.) Final Action**Background**

- The Board sets an annual or multi-year TAC using the best available science.
- In 2017, the Board set the TAC at 216,000 metric tons for 2018 and 2019 with the expectation that setting of the TAC for subsequent years will be guided by menhaden-specific ecological reference points.
- However, the 2019 benchmark stock assessment and peer review reports will not be available for Board review until the Commission's February 2020 meeting.
- Memo 19-053 (**Briefing Material**) reviews the fishery specifications process and details the Boards options regarding the 2020 TAC.

Presentations

- Review of fishery specifications process by M. Appelman

Board actions for consideration at this meeting

- Approve fishery specifications for 2020

7. Other Business/Adjourn

Atlantic Menhaden

Activity level: High

Committee Overlap Score: High (SAS, ERP WG overlaps with American eel, striped bass, northern shrimp, Atlantic herring, horseshoe crab, weakfish)

Committee Task List

- TC, SAS, ERP WG – January-October – monthly conference calls/webinars for 2019 Benchmark stock assessment
- TC – April 1st: Annual compliance reports due
- SAS, ERP WG – April 1-5 – Assessment Workshop I
- SAS, ERP WG – June 24-28 – Assessment Workshop II
- Peer-Review Workshop – week of November 4

TC Members: Joey Ballenger (SC, TC Chair), Jason McNamee (RI), Lindsey Aubart (GA), Jeff Brust (NJ), Matt Cieri (ME), Ellen Cosby (PRFC), Micah Dean (MA), Corrin Flora (NC), Kurt Gottschall (CT), Jesse Hornstein (NY), Rob Latour (VIMS), Behzad Mahmoudi (FL), Ray Mroch (NMFS), Josh Newhard (USFWS), Derek Orner (NMFS), Amy Schueller (NMFS), Alexei Sharov (MD), Jeff Tinsman (DE), Kristen Anstead (ASMFC), Max Appelman (ASMFC)

SAS Members: Amy Schueller (NMFS, SAS Chair), Matt Cieri (ME), Micah Dean (MA), Robert Latour (VIMS), Chris Swanson (FL), Ray Mroch (NMFS), Jason McNamee (RI), Alexei Sharov (MD), Jeff Brust (NJ), Kristen Anstead (ASMFC), Max Appelman (ASMFC), Joey Ballenger (SC, TC chair)

ERP WG Members: Matt Cieri (ME, BERP Chair), Jeff Brust (NJ), Michael Celestino (NJ), David Chagaris (FL), Micah Dean (MA), Rob Latour (VIMS), Jason McNamee (RI), Amy Schueller (NMFS), Alexei Sharov (MD), Howard Townsend (NFMS), Jim Uphoff (MD), Kristen Anstead (ASMFC), Katie Drew (ASMFC), Sara Murray (ASMFC)

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

The Westin Crystal City
Arlington, Virginia
February 7, 2019

These minutes are draft and subject to approval by the Atlantic Menhaden 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 August 2018** by Consent (Page 1).

Postponed Motion from August, 2018

Move the Atlantic Menhaden Board recommend to the ISFMP Policy Board that the Commonwealth of Virginia be found out of compliance for not fully and effectively implementing and enforcing Amendment 3 to the Atlantic Menhaden Fishery Management Plan if the State does not implement the following measure from section 4.3.7 (Chesapeake Bay Reduction Fishery Cap) of Amendment 3; the annual total allowable harvest from the Chesapeake Bay by the reduction fishery is limited to no more than 51,000 mt. Motion made by Chris Batsavage and seconded by Jim Estes. Motion postponed indefinitely.

3. **Move to postpone indefinitely a recommendation to the ISFMP Policy Board to find the Commonwealth of Virginia out of compliance with Amendment 3 of the Atlantic Menhaden FMP for failure to implement a reduced cap on harvest from the Chesapeake Bay provided the annual catch from the Chesapeake Bay reduction fishery does not exceed that established by Amendment 3. The Board will consider action to modify the Bay Cap after it completes action on ecological-based reference points** (Page 12). Motion by Robert Boyles; second by Jim Gilmore. Motion carried (Page 18).
4. **Motion to adjourn** by Consent (Page 18).

ATTENDANCE

Board Members

Pat Keliher, ME (AA)	Andy Shiels, PA, proxy for T. Schaeffer (AA)
Steve Train, ME (GA)	Loren Lustig, PA (GA)
Doug Grout, NH (AA)	Roy Miller, DE (GA)
Cheri Patterson, NH, Administrative proxy	John Clark, DE, proxy for D. Saveikis (AA)
Ritchie White, NH	Craig Pugh, DE, proxy for Rep. Carson (LA)
Dennis Abbott, NH, proxy for Sen. Watters (LA)	Dave Blazer, MD (AA)
Nichola Meserve, MA, Administrative proxy (Chair)	Russell Dize, MD (GA)
Raymond Kane, MA (GA)	Allison Colden, MD, proxy for Del. Stein (LA)
Jason McNamee, RI (AA)	Steve Bowman, VA (AA)
Bob Ballou, RI, Administrative proxy	Bryan Plumlee, VA (GA)
David Borden, RI (GA)	Rob O'Reilly, VA, Administrative proxy
Eric Reid, RI, proxy for Rep. Sosnowski (LA)	Steve Murphey, NC (AA)
Justin Davis, CT (AA)	Chris Batsavage, NC, Administrative Proxy
Sen. Craig Miner, CT (LA)	Doug Brady, NC (GA)
Bill Hyatt, CT (GA)	Mike Blanton, NC, proxy for Rep. Steinburg (LA)
Jim Gilmore, NY (AA)	Robert Boyles, SC (AA)
Maureen Davidson, NY, Administrative proxy	Spud Woodward, GA (GA)
Emerson Hasbrouck, NY (GA)	Doug Haymans, GA (AA)
John McMurray, NY, proxy for Sen. Kaminsky (LA)	Jim Estes, FL, proxy for J. McCawley (AA)
Heather Corbett, NJ, proxy for L. Herrighty (AA)	Martin Gary, PRFC
Russ Allen, NJ, proxy for T. Fote (GA)	Derek Orner, NMFS
Adam Nowalsky, NJ, proxy for Sen. Andrzejczak (LA)	Mike Millard, USFWS

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

Ex-Officio Members

Jeff Kaelin, Advisory Panel Chair

Staff

Bob Beal	Jessica Kuesel
Toni Kerns	Katie Drew
Max Appelman	

Guests

Karl Blankenship, Bay Journal	Ken Hastings, Mason Springs Cons.	Nick Popoff, ME DMR
Jordan Brown, Saving Seafood	Sarah Heil, NMFS	Sam Rauch, NOAA
Josey Cline, ASA	Pete Himchak, Omega Protein	Alan Risenhoover, NMFS
Pat Geer, VMRC	Aaron Kornbluth, PEW Trusts	Bret Scholtes, Omega Protein
Matt Cieri, ME DMR	Ben Landry, Omega Protein	Dave Sikorski, CCA MD
Jeff Deem, VMRC	Arnold Leo, E. Hampton, NY	Stan Sutliff, VSSA
Monty Deihl, Omega Protein	Thomas Lilly, Salisbury, MD	Jack Travelstead, CCA
Michelle Duval, MAFMC Contr.	Chip Lynch, NOAA	Bob Vanasse, Saving Seafood
Lynn Fegley, MD DNR	Dan McKiernan, MA DMF	Mike Waine, ASA
David Frulla, KDW	Chris Moore, CBF	Kevin Wark, Orstal, GSSA
Shaun Gehan, Omega Protein	Mike Millard, USFWS	Kate Wilke, TNC
Joseph Gordon, PEW	Ed O'Brien, MD, Adm. Proxy	
Zach Greenberg, PEW	Patrick Paquette, MSBA	

The Atlantic Menhaden Management Board of the Atlantic States Marine Fisheries Commission convened in the Jefferson Ballroom of the Westin Crystal City Hotel, Arlington, Virginia; Thursday, February 7, 2018, and was called to order at 8:00 o'clock a.m. by Chairman Nichola Meserve.

CALL TO ORDER

CHAIRMAN NICHOLA MESERVE: Meeting in Session. Are there any modifications to the agenda this morning?

APPROVAL OF AGENDA

CHAIRMAN MESERVE: The only thing I would note is that I do not plan to give half an hour worth of introductory remarks before moving on to the next item. Small typo there; so seeing none, we'll consider the agenda approved.

APPROVAL OF PROCEEDINGS

CHAIRMAN MESERVE: Next are the proceedings from our August, 2018 meeting. Are there any modifications? One more note from me on that. On Page 15 it suggests that I offered Derek Orner one more trauma at the microphone. While it can feel that way sometimes; I think I meant turn at the microphone. If Max can make that correction, if there is anything else we'll consider those approved as well.

PUBLIC COMMENT

CHAIRMAN MESERVE: Moving on to public comment, is there anyone in the audience that would like to make a comment on an item that is not on the agenda this morning? Seeing none; the sign in sheet is also empty.

PROGRESS UPDATE ON THE MENHADEN STOCK ASSESSMENT TIMELINE

CHAIRMAN MESERVE: We will move on to a Progress Update on the Menhaden Stock Assessment timeline. This was added to the agenda; so we could get an update on primarily

whether or not the federal shutdown has had an impact on the timeline for the stock assessment. We'll turn to Katie Drew for that.

DR. KIRSTEN ANSTEAD: I'm actually going to update you on the single species assessment first. The government shutdown did happen during our main modeling time; and our lead modeler is Amy Schuler from NOAA; so that was unfortunate. But we hope to still come in on time. She's going to work really hard for I guess the next week; and then we'll cross our fingers.

If there is another shutdown that could delay our timeline, but for now we're still on track. We have a modeling workshop in April; and we will have, we hope, a full base run of BAM to review and talk about and start talking about some sensitivity runs. We're doing pretty well in staying on our timeline for the single-species benchmark.

DR. KATIE DREW: The story is the same with the Ecological Reference Point Group. We do rely on some federal data and federal partners as part of that assessment workgroup; but we remain on track. However, if the government is shut down again for any length of time that may end up pushing us back. The SEDAR schedule is still the same for us; so we will have the review the first week of November. But again, any kind of delays or shutdowns further may also impact the SEDARs ability to get us on the review schedule with that. So far so good; but we'll see.

CHAIRMAN MESERVE: Are there any questions from the Board about the timeline or the assessment? Seeing none; that's good news. Thank you both for that update.

REVIEW SYNTHESIS OF SCIENTIFIC FINDINGS OF ATLANTIC MENHADEN'S ROLE IN THE CHESAPEAKE BAY ECOSYSTEM

CHAIRMAN MESERVE: And we will move on to Agenda Item 5, to review a synthesis of

scientific findings of Atlantic menhaden's role in the Chesapeake Bay ecosystem.

Katie Drew prepared a document, which was in your briefing materials. That document clearly states that this is not a product of the ERP or the assessment. It was a result of our last couple meetings; and an ASMFC leadership request to summarize our current knowledge of menhaden's ecological role in the Bay that's going to help frame the next discussion on the agenda related to the Bay cap and potential of noncompliance with that.

I believe the request does reflect some comments from NOAA General Counsel at the last meeting; that put down the need for the ASMFC to develop the record of how failure to implement the cap would be a conservation risk for the species. Katie will give us a presentation and we'll move on from there.

DR. DREW: Our Chair did give us the background; so I'm just going to skip quickly over this slide. Just to point out again, we want to emphasize that this was conducted by ASMFC staff; and it's not a product of the TC, the SAS, or the ERP Workgroup, because they are in the middle of this assessment right now, and we didn't want to burden them with what is essentially a review of the existing literature.

We looked at things that went into the background of the last benchmark assessment and Amendment 3; as things that the Board has seen before, but obviously in a much larger format. Rather than making you guys read several thousand pages of assessment and management documents; we tried to boil some of this existing literature down into something more comprehensive.

Again, it doesn't reflect the current ongoing work of the ERP group, which is still on track for that 2019 Benchmark Assessment. Kind of to frame the issue, I just wanted to give you guys a quick overview of the Bay cap; and point out that sort of the impetus for this cap

development was really the fact that through the late 1990s, in fact even up to today, we've seen the reduction plants closing along the Atlantic coast, and the number of vessels in the reduction fleet declining.

What that resulted in is kind of a concentration of effort in the Chesapeake Bay area. You got overall landings declined both in the Bay and in the coast. But the overall proportion of landings coming from the Bay was increasing. That led to concerns about this concept of localized depletion within that Bay that even if we're taking a sustainable amount on the coast, are we taking too much from one specific area?

In 2005 through Addendum II, we implemented this Bay cap; a cap on the removals of Atlantic menhaden from the Bay, specifically for reduction. That cap site has varied over time. As it was originally implemented in 2006 that first year of actual implementation, it was about 109,000 metric tons based on landings from 2001 to 2005. In 2013, when the coast took a cut in response to the assessment that Bay cap was also reduced to 87,000 metric tons, and in 2018 with Amendment 3, it went down to 51,000 metric tons; which was about the average of landings from 2012 to 2016. Reduction landings from the Bay have not really exceeded 51,000 metric tons since 2012; even under that higher cap from 2013 to 2018.

The question is in a sense of what the Board wanted to get some information on is what is menhaden's role in the ecosystem; and what does that say about an appropriate level of removals from the Bay? What I'm going to review today are some items that the Board in Amendment 2 identified as potential research areas that could help you figure out if localized depletion is occurring.

In order to do that some of the things we need to understand are menhaden recruitment dynamics, how are they getting into the Bay? What is Menhaden's role sort of as a consumer of production; and what is menhaden's role as

forage within the Bay? I'm going to briefly go over all of these topics.

Obviously again, this is something you could do multiple dissertations on; so we're trying to boil it down to some quick key talking points here, rather than really get into the depth of what this all means. To start out with recruitment, as you all know Atlantic menhaden based on genetic studies are a single stock.

Unlike a lot of our species, which spawn in the bays and estuaries that act as nursery areas; Atlantic menhaden spawn in the ocean all along the coast as they migrate. As they're moving up and down the coast in the ocean they're spawning; and then those larvae are carried into bays and estuaries, where they settle as new recruits.

What this means is that recruitment to the Bay is driven by a number of different factors; and that includes both large scale climactic factors like the Atlantic Multidecadal Oscillation, where it seems like we get higher recruitment during some phases of this oscillation within Chesapeake Bay, and then during other phases you get higher recruitment in other areas along the coast, and lower recruitment within the Bay.

But you also get annual variability in the ocean currents that bring those larvae into the Bay; as well as water conditions within the Bay, the abundance of plankton for them to feed on within the Bay, and so forth. Obviously coastwide SSB also is a factor here. You need some kind of SSB out there to produce recruitment.

However, the relationship overall between SSB and recruitment is weak; so that these environmental factors are playing a significant role in getting recruitment into the Bay, as long as you have some kind of recruitment fecundity along the coast. As larvae, menhaden are really feeding on zooplankton; but then transition

over to be filter feeders, feeding on phytoplankton in the Bay.

As consumers, some of the modeling work that's been done suggests that they can reduce the extent of algal blooms by feeding on those algal blooms; but they're not really removing nitrogen from the Bay, sort of in the net, in overall. That is they excrete a lot of that nitrogen back into the Bay; and they also themselves are consumed by predators within the Bay who return that nitrogen to the Bay. They're not really a way to get nitrogen out of the Bay; if that's a concern. Obviously a lot of our concern for menhaden is focused on their role as prey, as forage.

There have been extensive studies on fish diets within the Chesapeake Bay; both short term studies and long term monitoring programs like NEMAP and CHESMAP. When you go through this literature, it is difficult to directly compare across studies; because they occur in different years, in different seasons.

They cover different age ranges and focus on different predators; and they even use different metrics to estimate diet composition, and how much is actually being consumed. To just take one study and say well this is the percentage of menhaden in the diet here; and you compare it to another study and it looks completely different.

The menhaden TC actually did a tremendous amount of work synthesizing all of those existing diet data for Atlantic menhaden; by season and region for several key predators for the last benchmark assessment. I'm pulling on their work and showing you their work here; rather than going through an exhaustive literature review, because that has essentially already been done.

I'm showing you right now the percent by weight of menhaden and striped bass diet that the menhaden TC developed by season and age class; from data pooled over multiple different

studies, as well as ongoing monitoring programs like the Northeast Fisheries Science Center database, CHESMAP and NEMAP.

What I want you to kind of take away from this graph, even if you can't read the actual numbers is that the proportion of menhaden in the diet is extremely variable over time, and also over age classes. You can see it ranges from almost no contributions to the youngest ages across seasons, to making up a large proportion of the diet in certain seasons for the oldest age classes.

There is a tremendous amount of variability within a predator's diet; and this is pooled over time. It's not even getting into some of the variability you get as menhaden abundance changes over time. There is a lot of variability in the prevalence of menhaden within diets. This is for striped bass. We have a couple of other species within your briefing materials.

Obviously I just focused on kind of the key predators; in terms of fin fish species. But you see similar patterns for different fin fish species; and you see to a certain extent similar patterns for other non-fish predators. But unfortunately the diet studies of non-fish predators within Chesapeake Bay are much less extensive.

It's a lot harder to justify capturing a bald eagle and cutting its stomach open; then it is to capture a striped bass and take a look. There has been some work on predator species within the Bay; for example, there was a thesis on bald eagle diets within the Bay, and a lot of the fish diets are based on sitting there and watching what's being brought back to the nest or looking at droppings, and things like that in the nest itself. The bald eagles for example; they found that you had high prevalence in the summer, so they were eating predominantly fish in the summer, and most of that fish was menhaden and gizzard shad. Whereas in the winter you had a very low occurrence of fish; mostly it was carrion that they were eating. The menhaden is important in the summer; but

not in the winter. For osprey, the menhaden was important when you are in the high salinity sites; whereas for menhaden that are nesting in the lower salinity regions of the Chesapeake Bay, you had a lot more gizzard shad and almost no menhaden in the diets.

There is a question of availability and access as well; in terms of trying to assess how important the menhaden are in various diets. Overall what we can kind of take away from some of this is that Atlantic menhaden can make up a significant proportion of many predators diets for specific seasons, for specific size and age classes, and even for specific locations within the Bay.

There is a tremendous amount of variability; and even if you probably averaged it, it may be lower or higher across everything. But in certain seasons, certain age classes, they are very important. The other thing to note is that the prevalence of Atlantic menhaden in the diet does change depending on how abundant menhaden are.

Studies that occurred during periods of high menhaden abundance show a much higher prevalence of menhaden in the diet than studies that occurred during periods of lower menhaden abundance. When menhaden are there the predators are capable of consuming them. When they're not there, they switch over to other prey items.

We know they are an important part of the diet; but what does that say about the impact of reduced menhaden abundance on predator populations? I think that is unfortunately the big question that we're still struggling to deal with. This is the question that the ERP Workgroup is right now trying to deal with on a larger, coastwide scale.

Modeling work does provide estimates of predatory demand. You can do that for one or more predators within the Bay; to say striped bass need this amount of menhaden within the

Bay, based on the population size that we're estimating. But there are no estimates of menhaden abundance specifically within the Bay.

Our assessment model is a coastwide model. We can't say how much are in the Bay in any given year; compared to how much are on the coast. As a result, we don't have a way to measure whether those estimates of single species or multispecies predatory demand can be met by what's available in the Bay.

We can look and say, so we've seen some negative population metrics that you can correlate with low menhaden abundance for some species. For example, things like a current outbreak of mycobacteriosis in striped bass within the Bay has been linked to lower menhaden abundance and higher striped bass abundance.

There is some hypothesis that the increasing natural mortality we're seeing in weakfish may be linked to declining levels of menhaden abundance in the Bay; that if you look at population growth rates for osprey over time, you see slightly lower growth rates during periods of lower menhaden abundance than you see when you have periods of higher menhaden abundance. But the flip side of this is this is an incredibly complicated system. There are other factors that are linked to these negative population metrics. This increased mycobacteriosis prevalence has also been associated with warmer water temperatures and poorer water condition within the Chesapeake Bay. We know environmental factors and shrimp trawl bycatch may also be contributing to weakfish population declines.

The osprey population growth rates are actually higher in low salinity areas; where you don't see as much menhaden in the diet as in the higher salinity areas, as well as being driven by again, environmental factors and even the availability of nesting sites are going to impact the ability of that population to grow.

Overall, what we can say about this is that the Chesapeake Bay is an incredibly complex ecosystem; both in terms of the food web, and then how that is interacting with a changing environment, and the population dynamics of all of these species. We can't prove, at this point we can't say lower levels of menhaden are directly causing these negative population consequences that we're seeing in some of our predators.

But the flip side of that is we also can't say they're unrelated. It probably is a combination of all of these factors that are driving the dynamics of this system. We can say that recruitment to Chesapeake Bay does not appear to be correlated with the abundance of Age 2 and Age 3 menhaden within the Bay.

As long as we have favorable environmental conditions, and favorable coastwide fecundity, we can get recruitment to the Bay. Depletion within the Bay is not going to keep the Bay depleted; but we need that coastwide fecundity and coastwide environmental conditions to remain favorable to continue to supply the Bay.

From a single species perspective, which is a little jarring, but just to point out that when we're deciding how much fecundity is favorable coastwide, and how that catch is impacting that level of abundance or fecundity. The projections we used in the single species model are done with the assumption that the proportion of removals from the Bay is going to stay at their current levels, because the selectivity between the Bay and between the more northern reductions fleets is different.

The Bay has a higher proportion of smaller fish; compared to the more northern regions, which have a higher proportion of larger fish in the catch. Even if the total population removals, the total coastwide quota is not exceeded, the having more or less removals from the Bay can impact the effect of those removals on the overall population, because the overall selectivity pattern will be different from the

assumptions that we used when we did these projections.

Overall there is no current estimate of menhaden abundance within the Bay; and there is no quantitative determination of what an appropriate depletion threshold is, either within the Bay or along the coast. Again, this is what the ERP Workgroup is trying to do on a coastwide level is come up with this hard number.

We don't have a quantitative determination of whether or not localized depletion is occurring. The Board's decision on this is going to have to come from a more qualitative assessment of what we know about the ecosystem and the complexity, and the role of menhaden within that larger overall ecosystem. I'm going to pause here and take specific questions about anything I've presented today. But I think there are also the larger questions, maybe more Board of management decision questions, in terms of how you interpret the extreme body of evidence that we have here.

CHAIRMAN MESERVE: That's very helpful to have that all put together in a more easily digestible format for the Board. I'll turn to questions; and I see Ritchie White's hand first.

MR. G. RITCHIE WHITE: Katie, seemingly the spawning stock biomass of menhaden seems to be moving north. I'm wondering whether that could affect recruitment in Chesapeake Bay. If they're spawning farther to the north in the ocean, then might that settle in to the north of Chesapeake Bay?

DR. DREW: Well we know that is the thing. The adults always move further north. The fact that we're seeing more of them to the north may just mean we're seeing more of a population expansion; rather than that the population is itself moving further north. I think it's probably less likely of a function.

Well it is where they're spawning; but also then is the current environmental climate favorable for bringing those larvae into the Bay, versus are they spawning down here and they're just not making it into the Bay at the same rate as they're making it into the bays and estuaries further north, which may be more of a function of those larger, climactic events rather than where they're spawning?

CHAIRMAN MESERVE: Andy Shiels.

MR. ANDREW SHIELS: Katie, could you speak to the energetic of menhaden; if you're able to do that. For instance, not all forage is created equal. If you deplete the highest quality forage, they will eat whatever is left; which I think is what was clear in one of your statements. Can you give us any sort of sense on the quality of menhaden as forage; compared to other forage that might be available in the Bay?

DR. DREW: Sure, I think menhaden are definitely high on the favorability list; both for their own internal energetic components, but also because they're more of a soft rayed fish, rather than some of the bonier fish that are harder to consume. Some studies do suggest that even if the, I think it was done with striped bass, comparing sort of the energetic content of diets across different time periods, even if you still are getting full stomachs, depending on the makeup of those, you may get better quality nutrition; depending on if you have more menhaden in the diet, compared to some of the other species. That is certainly something to keep in mind; I think as well as sort of the age range or the size range of what's available to the fish, and what the fish can actually eat. Whereas the birds and the largest of the fin fish predators can eat those very large menhaden; but a lot of the focus is also on those small Age 0 and Age 1 menhaden, so if those are abundant that is better for the population as well.

CHAIRMAN MESERVE: John Clark.

MR. JOHN CLARK: Thanks for the presentation, Katie. Kind of a follow up on the same thing, I was wondering if any of the studies you looked at had the condition factor of striped bass under different diets. I know that we've been looking at the stomach contents of striped bass caught in the recreational fishery in lower Delaware Bay for about the past ten years.

When they can get bunker they've always got a higher condition factor. I remember one year in particular the top prey item was lady crabs. The condition factor was around 0.9, whereas when they get the bunker like your chart showed there, much higher condition factor. It makes sense that they are loading up before the spawning season too.

DR. DREW: Yes there is not as much. I think that is one of the things we would definitely want to implement in terms of a monitoring program is trying to associate body condition with what is being consumed. Definitely some of the studies seem to be you get better body condition when you have more abundant menhaden. But there can be a lot of other factors that are also contributing to the ability to put on or retain weight, in prey as well. But it is certainly something that looks like one of the correlations there.

CHAIRMAN MESERVE: Allison Colden.

DR. ALLISON COLDEN: Katie, could you remind me what was the estimate of the contribution to the coastwide stock that comes from the Bay?

DR. DREW: It's hard to tell exactly. We do have some otolith microchemistry data that suggested it was about 30 to 40 percent of the exploitable menhaden on the coast were coming from the Chesapeake Bay when those studies were conducted. Likely that was something that would provide change over time; depending on the strength of recruitment in those various regions. But it was about 30 to 40 percent when we did the study.

DR. COLDEN: You mention that there wasn't a strong correlation between the Age 2s and the Age 3s within the Bay in recruitment; which kind of makes sense. But obviously those are going to go on to contribute to that total coastwide fecundity that you were saying is driving that.

DR. DREW: Right. You would not want to. I guess the question is does it matter from the population perspective of if you harvest them all in the Bay versus if you harvest them when they're all out on the coast; if you're taking sort of the same amount overall for the population out. I think that is where trying to balance is localized depletion happening, or is it happening on the coastwide scale?

For sure you wouldn't want to deplete the fecundity overall to such a point that the population is going to struggle to produce enough eggs. Does it matter if that removal is coming from the Chesapeake Bay; as long as you preserve say the New Jersey fish in the ocean to spawn? You could still get recruitment back into the Bay; it seems based on the dynamics, as far as we understand the dynamics of recruitment. But you wouldn't want to overall deplete that coastwide spawning stock by removing too much of the whole population.

CHAIRMAN MESERVE: Rob O'Reilly.

MR. ROB O'REILLY: Thank you for the report, Katie. Close to the end of your presentation, maybe three or four slides before the end. There was sort of a cautionary slide about removals, and when the TAC changes if the removals from the Bay can have a greater impact than when you look overall.

I think we'll have to wait for the landings; but we built a conservation plan with Amendment 3. You know the main idea of Amendment 3 for many of us was to look forward to the biological and ecological reference points. Allocation was part of Amendment 3. But when allocation was finished, we're probably going to find that of

the 216,000 metric tons, many of those tons aren't going to be in the landings.

Virginia is frozen at 2017 quota. In the Bay itself Maryland and Potomac River Fisheries Commission were recipients of quite a bit of quota that will be unused; because they are pound net fisheries, they are not going to change. There is quota that is being held for whatever reasons, and there is relinquished quota which couldn't be used as well. When you talk about equal to current levels, are you referring to 2017, or are you referring to the end of Amendment 3?

DR. DREW: Ah, 2016 would be the values that were used in the projections. Again, this is also the cap is specifically for a reduction harvest; you can still have bait harvest that would exceed that cap within the Bay, as well. But it was based on 2016 levels that we did all these calculations.

CHAIRMAN MESERVE: Go ahead, Rob.

MR. O'REILLY: I understand that; but I mean I want everyone to understand that forage is also what we're really looking at as well at the same time, and it should be clear that there is forage that is available that many expected not to be available once we finished Amendment 3. That is by virtue of the way the allocation went.

But again, I think we have to wait for the landings; get a report back, and although the Bay is important, I think overall the forage aspect is something that is very important and moves right into our biological and ecological reference point scenarios that will be developed later.

CHAIRMAN MESERVE: Bob Ballou.

MR. ROBERT BALLOU: Katie, as I'm sure you know Rhode Island has had a menhaden management plan in effect for many years for Narragansett Bay; and it includes both a floor and ceiling biomass levels of menhaden are

monitored and the Bay is opened and closed depending on those levels.

The upper level is essentially a cap. Are you familiar with the modeling work that was undertaken; I believe Mark Gibson was the lead, and he may have been assisted by a young whippersnapper named Jason McNamee. I'm not sure. Again, this dates back to the 2000s. Are you familiar with that modeling work; and if so does it have any applicability to your analysis of the Chesapeake Bay situation?

DR. DREW: I'm not familiar with that work enough to say whether or not it would be applicable here. I think we're probably still struggling with the same issue of turning sort of qualitative information into quantitative information; in that sense of what an actual hard cap would be. But I would have to talk to the authors to get more detail on that.

CHAIRMAN MESERVE: Katie, one question. You mentioned of course that we don't have estimates of menhaden in the Bay right now. Could you give the Board a quick update on the RFP for the aerial survey design?

DR. DREW: We did receive, if the Board remembers we've dedicated some funds to doing an aerial survey of the Chesapeake Bay to try to, well dedicated some funds to develop a design for an aerial survey of the Chesapeake Bay, in order to help provide some of this information. We've received two proposals; and they're in the process of being evaluated right now to determine which, if any, we would like to actually fund.

However, I would just like to sort of temper expectations to say the money that we've dedicated is really for just coming up with the design, and potentially a little bit of pilot testing. It wouldn't be for a full aerial survey. Even if we had a full aerial surveys, we would still need several years of data in order to be able to turn that sort of relative abundance concept into an understanding of trends within

the Bay, and how that relates to the larger coastwide assessment.

CHAIRMAN MESERVE: Are there any further questions? Justin Davis.

DR. JUSTIN DAVIS: I'm curious; based on the review of the different diet studies in the Chesapeake Bay, whether you can comment on some of the other species that are important prey items for fish predators, like striped bass and weakfish, which as alluded to earlier they are kind of classic generalist predators when their preferred prey item menhaden isn't there they will go find something else to eat.

I'm thinking about this in the context of the potential problem that localized depletion could cause. I understand we can't prove it is happening. But it doesn't mean that it shouldn't be a concern. Are any of the other prey species that striped bass or weakfish or some of these other fish that they're likely to prey on?

Do those species either support important fisheries or are they of conservation concern? I know up in New England at times there have been concerns about striped bass impacts on winter flounder, lobster, river herring; that kind of thing. I'm wondering if there are some of those same concerns down in the Bay.

DR. DREW: Some of the alternate prey items that they would consume; bay anchovy is a big one. I think certainly the concern with that is that is not something that we monitor or assess at the moment. It is an important forage species as an alternate; but we don't have a good sense of how that population is doing either at the Bay or at the coastwide level as much. We do have some indices for it; but it's not something we monitor or assess. They also consume a lot of invertebrates; including blue crabs at small sizes, as well as shad and river herring, which we have concerns about for their low population levels and things like that and of course juveniles of other species.

Weakfish do show some signs of cannibalism as well on those small, young individuals. For sure the lack of menhaden is going to change how much they are consuming of some of these other things that either we don't monitor; or that do have some relevance for ASMFC or the states, in terms of being important consumption items for humans.

CHAIRMAN MESERVE: John McMurray.

MR. JOHN G. McMURRAY: Given what we've heard about the quality and favorability of menhaden over other baits; and I could speak to that personally, being out on the water. Predators aggregate around menhaden in a way they do not around bay anchovies and other small baits.

My question is; has there been any analysis of what an increase over the 51,000 metric tons cap would mean for striped bass in the context of what we heard yesterday that the stock is overfished and overfishing is occurring, and the Chesapeake Bay is the primary spawning area. Has there been any analysis or just discussion about that?

DR. DREW: No, because essentially that is the work that the ERP group is trying to do right now. I think in terms of the whole ERP assessment is really focused on taking all of this information and turning it into a number; at least at the coastwide level. In terms of saying more than 51,000 are going to have this percent effect on striped bass. We certainly can't say that right now.

CHAIRMAN MESERVE: Follow up.

MR. McMURRAY: Will the ERP group look specifically at the Chesapeake Bay; or are they just doing coastwide, because I would think it would be intuitive that you would look at the biggest producer area on the coast. That's it.

DR. DREW: Right now the model is coastwide. I think there is the ability to have a little bit of

spatial scale in terms of again, the selectivity of these fisheries to say the Bay has this kind of a selectivity and is focused on this size range. But right now we don't have the data to support a fully spatially explicit model; in terms of understanding how menhaden in the Bay are related to menhaden on the coast, and likewise how striped bass in the bay and their predatory demands compare to the coast are falling out.

We may be able to do some follow up work; in the sense of looking at things like that otolith micro chemistry, to say how much of the stock is in the Bay versus on the coast, based on some stuff. But for right now the ERP Workgroup is really a coastwide project.

CHAIRMAN MESERVE: Dave Blazer.

MR. DAVID BLAZER: Katie, thank you and excellent job on the report; a lot of good stuff, and this is a great dialogue this morning. I greatly appreciate it. I want to build I guess a little bit off of John's question related to kind of where do we go from here? The ERP group as you've mentioned is looking at some of the aspects of this more on a coastwide basis. I don't see us resolving some of the questions or issues here.

My question is twofold, I guess. What do we need to do to try and answer this question a little bit more diligently than maybe we have at this point? Is the ERP group going to look at that and make some recommendations specifically; or can we task the TC to do that? I'm just trying to figure out, you know where we're going to resolve this in a year, two years, five years, ten years, and what do we need to be doing now to try and get to that point?

DR. DREW: That is an excellent question; and we will have a number of research recommendations I am sure coming out of this assessment for the long term, in terms of I think for sure this is what the ERP Workgroup is working on now is a coastwide project. But we see this as the first step towards ecosystem

management for this species; and for all the species involved, in that as we go forward we would like to build more spatial complexity into this model, because it probably is important for the dynamics on a larger scale.

I think developing then research programs to get at some of this; how are menhaden moving in and out of the Bay and along the coast, and contributing to those things? How does that interact with striped bass and other migratory species; are things we need to collect more data on in the long term. That I think is definitely a five year, a ten year project.

In the short term I think we can look at like I said, some of these things about the proportion of menhaden from the Chesapeake Bay in the exploitable classes. What does that say about and where were they relative to the assessment at that point? When both the single species and the multispecies are done, we can look at kind of changing some of the selectivity assumptions about the fishery.

If the fishery is focused on the smaller ones, more in the Bay, what does that do to the larger overall population? But I think some of this decisions about what is the correct amount of harvest for the Bay, should we be managing the Bay differently than the rest of the coast is going to come down to more of a qualitative assessment of risk on the Board's part. The Board has chosen to be more conservative on a coastwide scale; then the single species model would have suggested.

We set a lower quota than what the single species model would have suggested; in order to preserve on a qualitative level, some of that forage importance. I think that is the kind of conversation the Board has to have about the Bay; as well is are you comfortable making qualitative assessments of risk and levels of harvest from the Bay specifically, versus the coast, in the absence of more concrete, quantitative numbers about what the appropriate level is.

CHAIRMAN MESERVE: I'm not seeing any more hands for questions. We could begin a discussion about this or move to our next agenda item; which I think the two are going to be closely tied together.

CONSIDER POSTPONED MOTION FROM THE AUGUST, 2018 MEETING

CHAIRMAN MESERVE: If the Board is okay, I think we'll do that and move to Item 6, which is to consider a postponed motion From the August, 2018 meeting. This was a motion that was initially introduced at the May, 2018 meeting, postponed then. It was also postponed in August. I'll read it to get us going. Move the Atlantic Menhaden Board recommend to the ISFMP Policy Board that the Commonwealth of Virginia be found out of compliance for not fully and effectively implementing and enforcing Amendment 3 to the Atlantic Menhaden Fishery Management Plan.

If the State does not implement the following measure from Section 4.3.7 (Chesapeake Bay Reduction Fishery Cap) of Amendment 3: The annual total allowable harvest from the Chesapeake Bay by the reduction fishery is limited to no more than 51,000 metric tons; the motion by Mr. Batsavage and seconded by Mr. Estes.

That motion is brought back to the table; it's a little bit of Groundhog Day here for me. I do see your hand, Robert Boyles, but I was hoping if we could maybe turn to Virginia to get any update on legislative action or landings in the Bay to start our discussion.

MR. STEVEN G. BOWMAN: The Commonwealth of Virginia once again through legislation, attempted to have the Virginia Marine Resources Commission manage the menhaden issue in the Commonwealth of Virginia. Measures were sponsored by both the delegate

and Senator. Both were heard by Committee, and both failed unanimously in Committee.

Therefore, to come here today and indicate that that is a viable alternative as we thought previously would not be appropriate at this time; nor do I anticipate it based on the history that I've seen throughout, it occurring any time in the near future. I may be wrong; but that is just based on my experience.

As far as the landings; I'm not going to give the specific poundage; because that's not appropriate. But I will tell you this that we very closely, and that motion deals with enforcement, which is somewhat a broad term when you're dealing with this. We monitored the catch from the Bay; data provided by the National Marine Fisheries Service, at every opportunity that that data became available, very closely.

I had Rob do that and provided a report. I will tell you that based on our observations, surveillance by aerial law enforcement that there was not, again the cap was not exceeded, and as a matter of fact it did not come close to being exceeded based on the data that we were provided. Omega was cooperative with us; as well as providing any other data that we requested.

At this juncture, I can just tell you that again now since 2012 through 2018, the cap was not exceeded. We do have also evidence based on dialogue with Omega that they spent a significant time out in the ocean instead of in the Bay; which of course as we all know is beneficial to both their business management plan as well as ecological situation within the Bay. That is pretty much the overall scenario from the Commonwealth; and I'll be glad to answer any questions.

CHAIRMAN MESERVE: Thank you for that update, Steve. Sorry to put you in the hot seat.

MR. BOWMAN: I'm used to it, believe me. I've been down the road, so yes.

CHAIRMAN MESERVE: Robert Boyles.

MR. ROBERT H. BOYLES, JR.: It may not be Groundhog Day, but I would like to take us to the Magic Kingdom, if you could. Roy Disney, Walt's lesser known brother said; "It's not hard to make a decision when you know what your values are." I repeat that for the record. "It's not hard to make a decision when you know what your values are." Later today after this meeting, should we conclude this meeting today; we are going to talk about a strategic plan, and developing a strategic plan for the next five years.

But we are operating under a current Strategic Plan that has words that I would like to remind the Board of; words like cooperative, words like stewardship, phrases like sound science, and important words like honesty, and integrity. I think that I would suggest that those last two really reflect that we are a nation of laws and not a nation of men. With the late Mr. Disney's admonition to us, I would like to make a motion if it pleases the Board and pleases you, Madam Chair.

That motion is; move to postpone indefinitely a recommendation to the ISFMP Policy Board to find the Commonwealth of Virginia out of compliance with Amendment 3 of the Atlantic menhaden fishery management plan, for failure to implement a reduced cap on harvest from the Chesapeake Bay provided the annual catch from the Chesapeake Bay reduction fishery does not exceed that established by Amendment 3. The Board will consider action to modify the Bay Cap after it completes action on ecological-based reference points.

CHAIRMAN MESERVE: Is that a second? Jim Gilmore seconds the motion; further discussion, Robert?

MR. BOYLES: Just one more quote; and this one I can't attribute, but it's not mine. "When one bases his life on principle, 99 percent of his decisions are already made." Thank you.

CHAIRMAN MESERVE: A clarifying question about the motion. If the Bay Cap were exceeded that would be triggering the Board to reconvene and have a discussion about it; not triggering a noncompliance finding, correct?

MR. BOYLES: That's correct, yes Ma'am.

CHAIRMAN MESERVE: Thank you for that clarification; discussion on the motion, Jim Gilmore.

MR. JAMES J. GILMORE: It's always tough following Robert; he just speaks so eloquently. But I just wanted to add to his comments that on this motion and the situation we're in, I think is rather unique. I think that is what maybe Robert was getting at that actually if we just had a simple rule book, and we had black and white decisions on everything, we wouldn't need to sit around the table, everything would be automatic.

But because of the complexity of what we do it gets us into these situations now; the fact that we are going into new territory. We're going to have ecosystem-based management coming up. We're in that crossroads between the old standard of single species going into ecosystem, it makes this very unique. We have a new frontier with old sets of rules. That is what has complicated this quite a bit. I think the best way I can put it is that we've got to get into old fashioned management; maybe it's seat of the pants, maybe it's not following the rules exactly. But I think it's the smart thing to do at this point. I'll just quote Porky Pig; I hope "that's all folks."

CHAIRMAN MESERVE: The quote of the day, thank you. David Borden.

MR. DAVID V. BORDEN: I'll be brief. I support the motion. I would offer the view that I think the Commission representatives from Virginia basically have done due diligence; and made a valid attempt to try to bring the state into compliance. They should be complemented for that. Although I personally feel that because they haven't adopted the rules they are technically out of compliance.

Where I end up on this is that I basically don't think it's worth fighting over this. We're going to move to ecological reference points in a fairly short period of time. I have no question in my mind that our understanding of the menhaden resources is going to significantly change when we do that. In fact, I could anticipate that the numbers, in terms of regional numbers, gear specific numbers and so forth are all going to change in the future.

Where I end up on this is that I don't think it's worth fighting over; and burdening the Commission and the staff with this. If we're going to change the numbers in a couple of years, let's just get on. Keep the objective of getting the ecological reference points as soon as we can in mind; and not burden anyone with fighting with a noncompliance finding.

CHAIRMAN MESERVE: Steve Bowman.

MR. BOWMAN: Very briefly, Madam Chair. I would just like to take the opportunity to thank everyone that has been, although the vote has not been taken, everyone for the understanding. It has been a difficult situation. We believe that we have done our best; as far as doing what is the intent of the Commission.

We very much respect in the Commonwealth this established body. We look forward to working diligently with this organization; to come to a time where we all have reference points and science that can be used in making good, informed decision as we address this species, so thank you very much for your time.

CHAIRMAN MESERVE: Pat Keliher.

MR. PATRICK C. KELIHER: I too want to comment the Commonwealth of Virginia; they have as the Executive Branch has done its work in due diligence to try to rectify this with the Legislative Branch. They have not been able to do so. I don't think we should be holding them hostage on this. I have been kept up to date from Commissioner Bowman; along with Commission leadership. It's clear that they've worked hard to try to resolve it; and have not been able to do so. I think it is time to move on, and I think this motion will allow us to do that.

CHAIRMAN MESERVE: Steve Murphey.

MR. STEVE MURPHEY: I would like to also congratulate the MRC; I think they've done yeoman's work on this. I think they were in a tight spot on this. I think they have done about everything you could do to try to address this. I support the motion; and I think my mind was really changed on this after listening to, I believe it was National Marine Fisheries talk about really the science behind this or the lack thereof.

I think it is a reminder to us as we move with not only this plan; but other plans that we need to remain vigilant that our management recommendations are science based and not pushed one way or the other by something that appeals to one group or the other. I support this motion.

CHAIRMAN MESERVE: Andy Shiels.

MR. SHIELS: I'm not opposed to this motion. But what concerns me is the final sentence; and I would like to at least open up for further discussion what that means. It says the Board will consider action to modify the Bay Cap after it completes action on ecological-based reference points. In the previous presentation we heard that at least at this time there is no plan to address the Bay separately in developing ecological reference points. We

heard it was a coastwide, population-wide development of ecological reference points.

I believe that is what I heard. Whether it's in this motion or whether it is reserved for further discussion, what would make me comfortable is specifically calling out that that study on ecological reference points will include the Bay proper. That way when we get to this point where a decision needs to be made, the Board will have all the information it needs to determine whether there is an impact coastwide, or within the Bay, or combined.

CHAIRMAN MESERVE: My take on the motion is that following the conclusion of the assessments, the next document be it an amendment or addendum, would deal with considering adoption of ecological-based reference points. Following that a subsequent action would deal with the Bay Cap. That is the intent of the maker of the motion, I believe. Did you want to clarify further that? No, okay. I'm going to stick with my list, unless Andy, you wanted to see further changes.

MR. SHIELDS: I didn't feel that what I said was captured there. I want to make sure that based on the previous presentation, where it seemed clear to me that we were looking at the population coastwide as a whole. That we, because this motion and what's brought us here today is what's going on in the Bay; that may be more important than the coastwide analysis as a whole is the component of the Bay, and what it does to striped bass and nursery water for the entire population of menhaden, and for striped bass. Either here or some sort of assurance before we leave this item that we're going to address the Bay as its own part of the ecological reference points.

CHAIRMAN MESERVE: Robert Boyles.

MR. BOYLES: Andy, I certainly understand your concern. The intent when making the motion, you know recognizes in my mind at least that the golden ring for the Commission is this

development of these ecological reference points. That is a heavy, heavy, heavy lift. Brave new world, a lot of new ground, and I think that for me at least, from my perspective that is my interest with respect to South Carolina is making sure we can focus on that golden ring.

The reason that I put this in the motion is; I think it is important that we remind ourselves that we have talked about the concept of localized depletion for the past decade plus. The reason here was an attempt to build consensus that yes we are not dismissing this issue. The Amendment in place is still a 51,000 metric ton cap.

We've heard from the Commonwealth that that cap during fishing year 2018 was not exceeded. I think what I would suggest to you, Andy, is I'm very interested in revisiting this issue of the Bay Cap, not necessarily as part of Amendment 4. Let me be clear about that; not as part of the ecological reference points.

CHAIRMAN MESERVE: Bob Ballou.

MR. BALLOU: I do support the motion; but I do want to note that my support is wholly dependent on the report out from Virginia that the cap as set forth in Amendment 3 has not been exceeded. In fact I think it was represented that it didn't even come close to being exceeded; and that this motion is conditioned on continuing to ensure that that cap is not exceeded.

With those two data points, I feel that we do have a good basis, a good sound policy basis, if you will, to support this particular motion. But I do want to note those two points for the record; because I really think they're hugely important. If the cap had been exceeded, I would have a much different take on the status of this issue.

CHAIRMAN MESERVE: That is on the record. We're going to continue to get regular updates on the reduction fishery landings in the Bay; and the Board would have another, based on

this motion we would have another discussion about it were the cap to be exceeded. Next is Ritchie White.

MR. WHITE: I also support this motion. I believe it provides an opportunity for Omega Protein to partner with the Commission; with the management of menhaden in Chesapeake Bay. I think it's a great opportunity for them and for us. I clearly hope that it goes as it has in the past.

CHAIRMAN MESERVE: John McMurray.

MR. McMURRAY: I want to go back to Andy's question; because I don't think it was properly addressed. How are we going to deal with the Bay Cap after we have the reference points? My question earlier and the response given was that we're not going to look at the Bay specific. We don't have the resources to do that right now.

What's the plan? I mean this is the burning question. I still don't understand why this Commission can't make precautionary policy decisions based on something that is to me intuitive. I think Andy was asking how we're going to address that. I mean it's nice that we put it in the motion. But it doesn't really mean much to me anyway.

CHAIRMAN MESERVE: I think there are some uncertainties; and part of it will be contingent upon what comes out of the assessment. It's hard to say with clarity where we're going to be; although Katie has indicated that there may be some information within the latest assessments that would lead us to look at, to consider the appropriateness of the cap level. But we are in a bit of a wait and see, but it is clearly expressed in the motion that we plan to revisit it.

DR. DREW: Yes, I would say that for sure the final results of the formal models will be on the coastwide level. We may be able to provide some sort of follow up post hoc analyses; to

help provide some additional information on the Bay, relative to the rest of the coast. But it will not be the same. It will not be a fully spatially explicit model.

Then it becomes up to the Board to, as you say, determine how precautionary you want to be on this specific regional management questions, when we don't have a fully regional model. That I think is something that you will have to address; based on what we can provide you through the ERP assessment, and whether that satisfies your need to make decisions.

CHAIRMAN MESERVE: John, go ahead.

MR. McMURRAY: Sorry, I don't want to extend this any more than it has to be. I mean the bigger question in my mind, and maybe you could answer this, but I'm guessing that you can't is can this Commission without rock solid science, which we'll probably never have, make a policy decision based on what we know and what our constituents want us to do with the public resource? I guess that's it.

CHAIRMAN MESERVE: Robert.

MR. BOYLES: Yes John, I think that's a great question. We heard from NOAA Fisheries in August; who reminded us of the requirements of the law for enforcing compliance, to create the conditions by which the Secretary could enforce compliance. You all bluntly, we've outkicked our coverage with this particular action. There is by my read of the law, there is one requirement for this Commission to find a jurisdiction out of compliance; and that is they are not fully and faithfully executing the provisions of the plan.

There you all, I think we've been briefed, but just to refresh our memory should this Board and the Commission find the jurisdiction out of compliance. There is the provision by which we notify the Secretary of Commerce; that sets in a very prescribed review of what is required for the Secretary to enforce that noncompliance.

Chip Lynch did a great job of reminding us of those requirements back in August.

I think it's important to recognize that there are two conditions that the Secretary must find; in order to enforce that compliance. There is a disconnect between what this Commission is required to do, and the standards by which the Commissioner must act. That is the reality of the situation. I'm not happy about it, don't like it. But I go back to those values. We must conduct ourselves according to the law. I think at the end of the day, I go back to one of the first values listed in our Strategic Plan; and I think it's an important one, and that is cooperative. This is a very difficult amendment. We all struggle with it. But I think it's important to note that the law doesn't support a noncompliance finding here. That is the hard and fast fact.

I think it's really, really important that we keep these decisions about these resources around this table. Quite honestly, perhaps some days I would feel better about myself, about for a day, if we just said let's kick this up to the Secretary of Commerce. But I think we know enough. We've heard enough from our attorneys; we've heard enough from NOAA, with respect to what the law requires, and this is the situation we find ourselves in.

I'll note for the record to remind you. Virginia did prepare, did prepare an appeal to this action, and that appeal was withdrawn. We've found ourselves a little bit in a corner; and I think this is the most prudent course of action. I think it is important that we recognize the concept, and keep alive the concept of localized depletion.

Let's try to learn more about this. My folks back home are concerned about weakfish. Some of your folks are concerned about striped bass. Some of your folks are concerned about bluefish or sharks. Let's do what we can to keep focused on the matter at hand; in developing ecological reference points.

Bay Cap, I mean the Chesapeake Bay is a wonderful, wonderful system. Those of you who were charged with its stewardship; I'm somewhat envious of, beautiful place to live, and to work, and to play. We'll get there, but we've outkicked our coverage right now. Thanks.

CHAIRMAN MESERVE: John Clark and then Eric Reid.

MR. CLARK: The Board is clearly in a tough spot today. This is putting lipstick on a pig here, but I would just like to say as to actions the Board can take. As long as we look at this as a compliance action we are very limited; we're between the rock of the corporation and its friends in Richmond, and on the other hand the Secretary of Commerce, whom the less said about the better. But we could also look at this as an allocation issue. Under Amendment 3 we have adaptive management.

Whether there is a scientific basis for the 51,000 metric ton cap for the Bay is beside the point. It's in the Amendment. It was taken out to the public; the public overwhelmingly supports the cap. We as a Board, I think do have power through the adaptive management, to take actions that could make Virginia see that it's in their interest to put the cap into place. I'll just leave it at that.

CHAIRMAN MESERVE: Eric.

MR. ERIC REID: As far as the original motion goes. To me it's a dead end, it's a no win, you call it whatever you want. It's going nowhere. I would prefer to support this motion. We could find the Virginia Legislature out of compliance, because they're out of compliance. As far as our fellow Commissioners, which one of them may be governor here in the next couple of days. I prefer to support the future governors of the state of Virginia in their efforts; and also you know support industry as well. Industry is in compliance. Our Commissioners have done everything they possibly can to do what is right.

My preference is to support this motion, support the industry, and support our fellow Commissioners in the spirit of cooperation.

CHAIRMAN MESERVE: Ray Kane, last comment.

MR. RAYMOND W. KANE: I would like to thank Katie, first of all, for a very comprehensive presentation to the lay people sitting around this table. Let's have some solace in the fact that we are going to do a biomass survey in the Chesapeake Bay by way of an aerial survey, which have proven to be very effective in other fisheries.

I know we don't have a timeframe when Katie and her staff can come back and say this is what we learned from the aerial surveys. I'm sure it's five or six years down the road, because vessels have to be integrated with aerial survey and what not. But I would speak in favor of this motion; knowing that once we have an aerial survey completed, and we have our ERPs in place, we can move forward.

CHAIRMAN MESERVE: I just want to clarify that the survey is not a given yet. It's very contingent upon funding a successful survey design long term plan. Yes, Marty Gary.

MR. MARTIN GARY: I purposefully held off to listen to other folks around the table; everybody is vested in this issue. Not that PRFC is more vested than anybody else, but we are geographically, demographically, politically as close to this issue as any jurisdiction sitting around the table.

Our jurisdiction, our community wants an abundance of menhaden in the river for our pound netters, for our charterboat operators that rely on menhaden for bait, for our crabbers, for our sport fishermen that want an abundant pretty species in the river for predatory species like striped bass. That is why we supported the Cap. But we've also seen since 2012 the Cap hasn't been raised. We know the uncertainty around the science. We

know the political landscape and the trajectory through an appeal process.

It's all been stated well. I think Robert hit the key word; and I just really appreciate it, cooperation. I get to experience that with my sister jurisdictions, the Commonwealth and Maryland day in and day out, and I could tell you first hand this is exemplary what they've done with menhaden, and their cooperation. I support the motion. I just wanted you all to hear it. We're right at the epicenter of this; it's as meaningful to us as anybody at the table, and we support the motion.

CHAIRMAN MESERVE: I think we're at a place. Does the Board need a moment to caucus? Let's just take one minute to caucus. Is the Board ready; question, Roy Miller?

MR. ROY W. MILLER: Madam Chair, could you or perhaps someone on staff review for us exactly what is meant by postpone indefinitely? Does that mean the item could come up again for discussion if the cap were exceeded; or does it mean it can never come up again for discussion?

CHAIRMAN MESERVE: I did ask staff for some clarification on this in advance. Postpone indefinitely means that this could come back up; but it would take a new noncompliance motion to bring it back. It's different from tabling or postponing in that way; but it could be reintroduced with a new motion.

With that clarification let's give this a try. Is there any opposition to the motion? Seeing one; we will start from the top then. **All those in favor of the motion please raise your right hand. All those opposed like sign. Are there any null votes or abstentions?**

MR. BOWMAN: Madam Chair, a question. This is a final action; should a roll call vote be taken or not?

CHAIRMAN MESERVE: Staff is indicating it's not considered a final action; but a roll call could be requested if desired.

MR. BOWMAN: No, thank you.

CHAIRMAN MESERVE: **With no nulls and no abstentions, the motion passes 17 to 1; and that is our final agenda item, and I appreciate the Board's brevity today.**

ADJOURNMENT

CHAIRMAN MESERVE: If there is no other business to come before the Board, we are adjourned. Thank you very much.

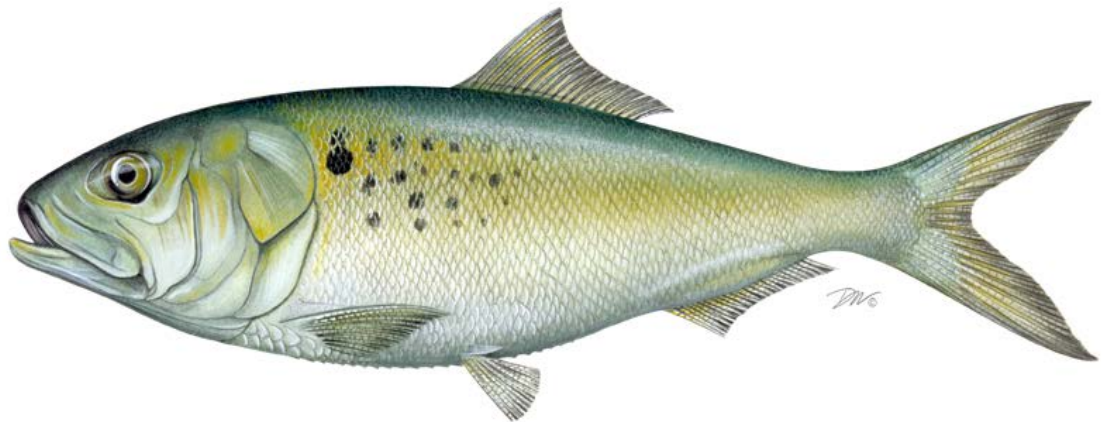
(Whereupon the meeting adjourned at 9:15 o'clock a.m. on February 7, 2019)

Tentative Timeline:
2019 ASMFC Atlantic Menhaden Single-Species and ERP Benchmark Stock Assessments

Meeting Description	*Committee	Meeting Dates/ Deadlines
2018		
Pre-Assessment Webinar	TC, SAS, ERP	✓ Feb 2
Data Template Submission Deadline	TC	✓ March 23
Pre-Data Workshop Webinar	TC, SAS, ERP	✓ April 2
Data Workshop I	TC, SAS, ERP	✓ April 23-25 (ATM) ✓ April 25-27 (ERP)
Board Approval of TOR's	Board	✓ May
Submission Deadline for Alternate Multi-Species Model(s)	PUBLIC	✓ June 1
Data Workshop Follow-up Tasks Webinar – progress update	SAS ERP	✓ July 24, ✓ August 31 ✓ August 30
Data Workshop II	SAS ERP	✓ October 9-10 ✓ October 11-12
Board Meeting – progress update (canceled)	Board	October
Submission Deadline for Alternate Single-Species Model(s)	PUBLIC	✓ Nov 1
Check-In Call – progress update on DWII follow-up tasks	SAS, ERP	✓ December 13
2019		
Pre-Modeling Workshop Check-In Call – progress update on follow-up tasks	ERP SAS	✓ January 23 ✓ January 24
Production model review call	ERP	✓ March 28
Assessment/Modeling Workshop I	ERP SAS	✓ April 1-3 ✓ April 3-5
Modeling Workshop Follow-up Tasks Webinar – progress update	SAS, ERP	✓ May/June
Assessment/Modeling Workshop II	SAS, ERP	✓ June 24-28
Modeling Workshop Follow-up webinar(s)	SAS, ERP	✓ July
Final webinar to approve stock status determination	SAS, ERP	August 19
TC to discuss assessment findings & approve single-species assessment for peer review	TC	September 17-19
Submit report to external peer-review panel	ASMFC	October 21
Board Meeting – progress update on benchmarks	Board	Annual Meeting (October 28-31)
Peer Review	SEDAR	November 4

* TC – Atlantic Menhaden Technical Committee; SAS – Atlantic Menhaden Stock Assessment Subcommittee; ERP – Ecological Reference Point Workgroup

**DRAFT 2019 REVIEW OF THE
ATLANTIC STATES MARINE FISHERIES COMMISSION
FISHERY MANAGEMENT PLAN AND STATE COMPLIANCE
FOR
ATLANTIC MENHADEN (*Brevoortia tyrannus*)
2018 Fishery**



Prepared by:

The Atlantic Menhaden Plan Review Team
Max Appelman, Chair, Atlantic States Marine Fisheries Commission
Alex Aspinwall, Virginia Marine Resources Commission
Joey Ballenger, South Carolina Department of Natural Resources
Matt Cieri, Maine Department of Marine Resources
Ellen Cosby, Potomac River Fisheries Commission
Nicole Lengyel, Rhode Island Department of Environmental Management
Harry Rickabaugh, Maryland Department of Natural Resources
Andrew Scheld, Virginia Institute of Marine Science

Drafted May 2019

DRAFT REVIEW OF THE ASMFC FISHERY MANAGEMENT PLAN AND STATE COMPLIANCE FOR ATLANTIC MENHADEN (*Brevoortia tyrannus*) FOR THE 2018 FISHERY

Management Summary

<u>Date of FMP:</u>	Original FMP: August 1981
<u>Amendments:</u>	Plan Revision: September 1992 Amendment 1: July 2001 Amendment 2: December 2012 Amendment 3: November 2017
<u>Management Unit:</u>	The range of Atlantic menhaden within U.S. waters of the Northwest Atlantic Ocean, from the estuaries eastward to the offshore boundary of the Exclusive Economic Zone (EEZ).
<u>States With Declared Interest:</u>	Maine – Florida, including Pennsylvania
<u>Additional Jurisdictions:</u>	Potomac River Fisheries Commission, National Marine Fisheries Service, United States Fish and Wildlife Service
<u>Active Boards/Committees:</u>	Atlantic Menhaden Management Board, Advisory Panel, Technical Committee, Stock Assessment Subcommittee, Plan Review Team, Plan Development Team, Ecological Reference Point Work Group
<u>Stock Status:</u>	Not overfished, and overfishing is not occurring (2017 stock assessment update)

I. Status of the Fishery Management Plan

Atlantic menhaden management authority is vested in the states because the vast majority of landings come from state waters. All Atlantic coast states and jurisdictions, with the exception of the District of Columbia, have declared an interest in the Atlantic menhaden management program.

The first coastwide fishery management plan (FMP) for Atlantic menhaden was passed in 1981 (ASMFC 1981). The 1981 FMP did not recommend or require specific management actions, but provided a suite of options should they be needed. In 1992, the plan was revised to include a suite of objectives intended to improve data collection and promote awareness of the fishery and its research needs (ASMFC 1992).

Amendment 1 was implemented in 2001 and provided specific biological, ecological and socioeconomic management objectives for Atlantic menhaden (ASMFC 2001). No recreational or commercial management measures were implemented as a result of Amendment 1; however, subsequent addenda instituted a harvest cap¹ on the reduction fishery in the Chesapeake Bay, based on average landings from 2001-2005. Addendum I and V revised the biological reference points for menhaden and specified that stock assessments are to occur every three years (ASMFC 2004; ASMFC 2011).

Amendment 2, approved in 2012, established a 170,800 metric ton (mt) total allowable catch (TAC) for the commercial fishery beginning in 2013 (ASMFC 2012). This TAC represented a 20% reduction from average landings between 2009 and 2011. The 2009-2011 time period was also used to allocate the TAC among the jurisdictions. Additionally, the Amendment established timely reporting requirements for commercial landings and required states to be accountable for their respective quotas by paying back any overages the following year. Amendment 2 also included provisions that allowed for the transfer of quota between jurisdictions and a bycatch allowance of 6,000 pounds per day² for non-directed fisheries that operate after a jurisdiction's quota has been landed. The Amendment also reduced the Chesapeake Bay reduction fishery harvest cap by 20% to 87,216 mt.

Amendment 2 also established an episodic events set aside program. This program set aside 1% of the coastwide TAC for the New England states (Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut) to harvest Atlantic menhaden when they occur in higher abundance than normal. Technical Addendum I to Amendment 2 established a mechanism for New England states to use the set aside (ASMFC 2013). In order to participate in the program, a state must reach its individual quota prior to September 1, implement daily trip level harvester reporting, restrict harvest to state waters, and implement a daily trip limit no greater than 120,000 pounds/vessel. At its October 2013 meeting, the Board extended the episodic event set aside program through 2015, adding a provision that re-allocated unused set aside to the coastwide states based on the same allocation percentages included in Amendment 2. At its May 2016 meeting, the Board again extended the episodic events program until final action on Amendment 3 and added New York as an eligible state to harvest under the program.

At its May 2015 meeting, the Board established a TAC of 187,880 mt for the 2015 and 2016 fishing years. This represented a 10% increase from the 2013 and 2014 TAC. In October 2016, the Board approved a TAC of 200,000 mt for the 2017 fishing year, representing a 6.45% increase from the 2015 and 2016 TAC.

¹ Addendum II to Amendment 1 initially implemented a harvest cap for 2006-2010 seasons; Addendum III revised the harvest cap amount before the 2006 season commenced; Addendum IV extended the harvest cap through 2013 at the same level established in Addendum III (ASMFC 2005; ASMFC 2006; ASMFC 2009; ASMFC 2009).

² Addendum 1 to Amendment 2 allows two licensed individuals to harvest up to 12,000 pounds of menhaden bycatch when working from the same vessel using stationary multi-species gear (ASMFC 2016). The intent of this Addendum was to accommodate cooperative fishing practices that traditionally take place in Chesapeake Bay.

At its February 2014 meeting, the Board passed a motion to manage cast net fisheries for Atlantic menhaden under the bycatch allowance for 2014 and 2015, with the states bearing responsibility for reporting. In November 2015, the Board approved a motion to continue the management of cast net fisheries under the bycatch allowance for 2016, and in February 2017, the Board extended management of the cast net fishery under the bycatch provision until implementation of Amendment 3.

Atlantic menhaden are currently managed under the provisions of Amendment 3. Approved in November 2017, the Amendment continues to manage menhaden via single-species biological reference points until the review and adoption of menhaden-specific ecological reference points (ERPs) as part of the 2019 ecosystem-based benchmark stock assessment process (see *Section II*). In doing so, the Board placed the development of menhaden-specific ERPs as its highest priority and supports the efforts of the Ecological Reference Point Work Group to reach that goal. Amendment 3 also changes commercial quota allocations in order to strike an improved balance between gear types and jurisdictions, and to facilitate future growth opportunities. The Amendment allocates a baseline quota of 0.5% to each jurisdiction, and then allocates the rest of the TAC based on historic landings between 2009 and 2011. This measure provides fishing opportunities to states which had little quota under Amendment 2, while still recognizing historic landings in the fishery. States also have the option to relinquish all or part of its quota which is then redistributed to the other jurisdictions based on the historic landings period (2009-2011). The Amendment prohibits the rollover of unused quota; maintains the quota transfer process; maintains the incidental catch provision³ and the episodic events program for the states of Maine – New York. Finally, the Amendment reduces the Chesapeake Bay cap to 51,000 mt, recognizing the importance of the Chesapeake Bay as nursery grounds for many species by capping recent reduction landings from the Bay at current levels.

In addition to its Amendment 3 deliberations, the Board set the TAC for the 2018 and 2019 fishing seasons at 216,000 mt (an 8% increase from 2017) with the expectation that setting of the TAC for subsequent years would be guided by menhaden-specific ERPs.

In 2018, the Board approved state implementation plans for Amendment 3 and postponed action indefinitely to find the Commonwealth of Virginia out of compliance for not implementing the Chesapeake Bay reduction fishery cap of 51,000 mt. In making its decision, the Board took into account the fact that reduction fishery harvest within the Chesapeake Bay has been below the cap level since 2012, including 2018 harvest (see *Section VII*). This action is contingent upon the Chesapeake Bay reduction fishery not exceeding the cap. If the cap is exceeded, the Board can reconsider the issue of compliance.

³ The bycatch provision under Amendment 2 was rebranded under Amendment 3 as the incidental catch and small scale fisheries provision. Under the provision, small-scale and non-directed gears, as defined in the amendment, may land up to 6,000 pounds of menhaden per trip per day after the quota in a given jurisdiction is met.

II. Status of the Stock

Threshold reference points are the basis for determining stock status. When the fishing mortality rate (F) exceeds the F -threshold, overfishing is occurring. When the reproductive output measure, in this case population fecundity (FEC), falls below its threshold, then the stock is overfished, meaning there is insufficient egg production to replenish the stock.

Amendment 2 implemented maximum spawning potential (MSP) based reference points that relate current stock conditions as a percent of unfished conditions. Considering the modeling and data input changes that occurred in the 2015 Benchmark Stock Assessment, the Technical Committee (TC) and Peer Review Panel recommended new MSP-based reference points that are applicable to the results of the assessment (SEDAR 2015). These new reference points were accepted by the Board in 2015 and continue to be used under Amendment 3.

As recommended by the Peer Review Panel, and accepted by the TC, the values of the threshold and target fishing mortality reference points are calculated as the maximum and median geometric mean fishing mortality rate for ages-2 to -4 during the reference period of 1960-2012. These ages represent the fully selected fishing mortality rates depending upon the year and fishery (i.e., bait and reduction). The fecundity (FEC) reference points match the F reference points meaning they are equal to the fecundity estimated when F reaches equilibrium at its target and threshold MSP levels, respectively.

According to the 2017 stock assessment update (ASMFC 2017), the fishing mortality reference points are $F_{\text{target}} = F_{36\% \text{ MSP}} = 0.80$ and $F_{\text{threshold}} = F_{21\% \text{ MSP}} = 1.85$. Associated reference points for population fecundity are $FEC_{\text{target}} = FEC_{36\% \text{ MSP}} = 99,467$ (billions of eggs), and $FEC_{\text{threshold}} = FEC_{21\% \text{ MSP}} = 57,295$ (billions of eggs). Based on the 2017 stock assessment, overfishing is not occurring because fishing mortality for the terminal year (2016) is estimated to be $F = 0.51$ ($F_{48\% \text{ MSP}}$), below both the target and the threshold (Figure 1). Additionally, the stock is not overfished because fecundity for 2016 is estimated to be $FEC = 83,486$ billion eggs, above the threshold but below the target (Figure 2). A benchmark assessment is expected to be completed and peer-reviewed in November 2019 at SEDAR-69.

Progress of the Ecological Reference Point Work Group

The Ecological Reference Point Work Group (ERP WG; formerly known as the BERP WG) has been tasked with developing menhaden-specific ERPs. The intent of menhaden-specific ERPs is to provide a method to assess the status of menhaden not only in regard to their own sustainability, but also in regard to their interactions with predators and the status of other prey species. The benefit of this approach is that it allows fishery managers to consider the harvest of menhaden within a broad ecosystem context, which includes other fish, birds, mammals, and humans who utilize and depend on marine resources.

In 2017, the ERP WG held three workshops to review candidate ERP models. The candidate models include a Bayesian surplus production model with a time-varying population growth rate, a Steele-Henderson model which permits non-fisheries effects (predation and environment) to be quantified and incorporated into the single-species stock assessments, and

a multispecies statistical catch-at-age model in which single-species models are linked to provide a predator-prey feedback between the population models. An Ecopath with Ecosim model is also being evaluated for strategic planning purposes and exploring tradeoffs.

In 2018, the ERP WG held two data workshops to review all available data for menhaden, and other candidate predator and prey species for the ERP models. An Assessment Workshop was recently held in April 2019 to identify base runs for each of the models as well. Peer-review of the menhaden-specific ERP model(s) will coincide with the peer-review of the single-species benchmark assessment at SEDAR-69 in November 2019.

V. Status of the Fishery

Commercial

Total commercial Atlantic menhaden landings in 2018, including directed, incidental catch, and episodic event set aside (EESA) landings, are estimated at 421.5 million pounds (191,202 mt), approximately an 11% increase relative to 2017 (Table 1). The non-incidental catch fishery landings (directed landings plus landings under the EESA) total for 2018 is estimated at 418.3 million pounds (189,744 mt) and represents an 12% underage of the coastwide commercial TAC of 476.2 million pounds (216,000 mt). Landings from the incidental catch fishery are estimated at 3.21 million pounds (1,458 mt) and do not count towards the coastwide TAC.

Reduction Fishery

The 2018 harvest for reduction purposes is estimated at 311.6 million pounds (141,317 mt), a 10% increase from 2017 and 5% above the previous 5-year average of 296.2 million pounds (134,373 mt) (Table 2; Figure 3). Omega Protein's plant in Reedville, Virginia, is the only active Atlantic menhaden reduction factory on the Atlantic coast.

Bait Fishery

The coastwide bait harvest estimate for 2018, including directed, incidental catch, and EESA landings, is 110.0 million pounds (49,885 mt). This represents a 14% increase relative to 2017 and an 18% increase compared to the previous 5-year average (Table 2; Figure 3). New Jersey (46%), Virginia (27%), Maine (13%), and Massachusetts (5%) landed the four largest shares in 2018.

Incidental Catch and Small Scale Fisheries Landings

Incidental catch landings in 2018 are estimated at 3.21 million pounds (1,458 mt), which is an 18% increase relative to 2017 but well below the time series average (Table 3). Three states reported incidental catch landings in 2018; Maine, New Jersey, and Virginia (Table 4). Maine accounted for 90% of total incidental fishery landings in 2018 (73% from purse seines and 17% from gill nets). 2018 also marked the lowest number of trips occurring under the provision since its inception (Table 4).

Episodic Events Set Aside Program (EESA)

One percent of the TAC is set aside for episodic events. Episodic events are defined as any instance when a qualified state has reached its individual state quota prior to September 1, and

has information indicating the presence of unusually large amounts of menhaden in its state waters. The 2018 EESA quota was 4.48 million pounds (2,031 mt) and accounts for the 285,398 pound overage from the 2017 season. Maine declared participation in the EESA on July 23, 2018, and closed the fishery on August 11. The preliminary EESA landings estimate for 2018 is 4.64 million pounds (2,103 mt) which is 3.6% above the quota. Maine transferred 159,433 pounds of 2018 quota to reconcile the overage. The resulting EESA quota for 2019 is 4.76 million pounds. Table 5 details the EESA fishery by year.

Recreational

Menhaden are important bait in many recreational fisheries; some recreational fishermen employ cast nets to capture menhaden or snag them with hook and line for use as bait, both dead and live. Recreational harvest is not well captured by the Marine Recreational Information Program (MRIP) because there is not a known identified direct harvest for menhaden, other than for bait. MRIP intercepts typically capture the landed fish from recreational trips as fishermen come to the dock or on the beach. However, since menhaden caught by recreational fishermen are used as bait during their trip, they are typically not a part of the catch that is seen by the surveyor completing the intercept.

The MRIP estimate of Atlantic menhaden harvest (A + B1) in 2018 is 3,457,987 pounds. This is an 8% decrease from 2017 (3,756,722 pounds), but a 9% increase when compared to the previous 5-year average (3,174,751 pounds).

VI. Status of Research and Monitoring

Commercial fisheries monitoring

Reduction fishery - The NMFS Southeast Fisheries Science Center Beaufort Laboratory in Beaufort, North Carolina, continues to monitor landings from the Atlantic menhaden purse-seine reduction fishery and collect biological samples. The Beaufort Laboratory processes and ages all reduction samples collected on the East Coast. In addition, the purse-seine reduction fishery continues to provide Captains Daily Fishing Reports (CDFRs) to the Beaufort Laboratory where NMFS personnel enter data into a database for storage and analysis.

Bait fishery - Per Amendment 3, states are required to implement a timely quota monitoring system in order to maintain menhaden harvest within the TAC and minimize the potential for overages. The SAFIS daily electronic dealer reporting system allows near real time data acquisition for federally permitted bait dealers in the Mid-Atlantic and Northeast. Landings by Virginia's purse-seine for-bait vessels (snapper rigs) in Chesapeake Bay are tabulated at season's end using CDFRs maintained on each vessel during the fishing season. A bait-fishery sampling program for size and age composition has also been conducted since 1994. The Beaufort Laboratory, and some states, age the bait samples collected. See *Section VII* for more information on quota monitoring and biological sampling requirements.

Atlantic menhaden research

The following studies relevant to menhaden assessment and management have been published within the last year:

- Harrison, J.L., Naumenko, A. and Whitehead, J.C., 2018. Citizen Preferences for Ecosystem-based Fisheries Management: The Case of Atlantic Menhaden (No. 18-10). Department of Economics, Appalachian State University

Theses and Dissertations of Potential Interest:

- Liljestrand, Emily Morgan. 2017. Mortality and Movement of Adult Atlantic Menhaden during 1966-1969. Order No. 10618597 University of Maryland, College Park
- Siple, Margaret Clark. 2017. Implications of Demographic Diversity for Forage Fish, their Fisheries, and Ecosystems. Order No. 10680836 University of Washington

VII. Implementation of FMP Compliance Requirements for 2018

All states are required to submit annual compliance reports by April 1.

Quota Monitoring and Results

Menhaden purse seine and bait seine vessels (or snapper rigs) are required to submit CDFRs. Maine, New York and Virginia fulfilled this requirement in 2018. New Jersey did not require purse seine vessels to fill out the specific CDFR but did require monthly trip level reporting on state forms that include complementary data elements to the CDFR. Rhode Island purse seine vessels must call in daily reports to RI DFW and fill out daily trip level logbooks. Massachusetts and Connecticut require trip level reporting for all commercial fishermen. Menhaden purse seine fisheries do not currently operate in all other jurisdictions in the management unit.

The Board approved timely quota monitoring programs for each state through implementation of Amendment 3. Monitoring programs are intended to minimize the potential for quota overages. Table 6 contains a summary of each state's approved quota monitoring system.

Table 7 contains state-specific quotas and directed harvest that occurred in 2018. The final quotas for 2018 account for 6.70 million pounds of quota relinquished by Delaware, South Carolina, and Georgia, and include an adjustment of eight in-season quota transfers; seven inter-state transfers and one state-to-EESA transfer. The quota transfers occurred as follows:

1. Connecticut transferred 1,000,000 pounds to Maine
2. New York transferred 1,000,000 pounds to Maine
3. Delaware transferred 150,000 pounds to Maine
4. Florida transferred 1,250,000 pounds to Maine
5. Maryland transferred 1,500,000 pounds to Maine
6. Virginia transferred 1,000,000 pounds to Maine
7. Maine transferred 500,000 pounds to Connecticut
8. Maine transferred 159,433 pounds to the EESA quota

These quota transfers were pursued to ameliorate overages, and therefore, no quota overages occurred in 2018. States may also relinquish all or part of its annual quota by December 1st of the previous year. Delaware and Georgia relinquished 4.36 million pounds of quota which was redistributed to the states according to the procedures outlined in Amendment 3 and is

reflected in the 2019 Base Quota (Table 7). At their November 2017 meeting, the Board set the 2019 TAC at 216,000 mt (476.2 million pounds).

Biological Monitoring Requirements

Amendment 2 implemented monitoring requirements for non *de minimis* states as follows:

- One 10-fish sample (age and length) per 300 mt landed for bait purposes for ME, NH, MA, RI, CT, NY, NJ, and DE; and
- One 10-fish sample (age and length) per 200 mt landed for bait purposes for MD, PRFC, VA, and NC.

Table 8 provides the number of 10-fish samples required for 2018. These are based on the best available 2018 total bait landings data (including directed, incidental, and EESA landings) provided to the Commission by the states. In 2018, Massachusetts fell short of the eight required samples primarily due to the very short fishing season (the purse seine fishery was only open three weeks). The state was also unable to collect samples from bycatch in the Atlantic herring fishery or other fishery independent sources as was done in previous years. The state indicated plans to more intensely sample the primary purse seine fishery to ensure the sampling requirement is met in the future. All other jurisdictions met the biological monitoring requirements in 2018.

The PRT continued to discuss whether a sufficient number of samples are being collected from different gear types and regions, and whether additional sampling should be conducted from incidental catch fisheries. The 2019 benchmark provides an opportunity for the Technical Committee to evaluate age and length data from commercial bait fishery catches and respond to the PRT's comments.

Adult CPUE Index Requirement

Amendment 3 requires that, at a minimum, each state with a pound net fishery must collect catch and effort data elements for Atlantic menhaden as follows; total pounds landed per day, number of pound nets fished per day. These are harvester trip level ACCSP data requirements. In May of 2013, the Board approved North Carolina's request to omit this information on the basis that it does not have the current reporting structure to require a quantity of gear field by harvesters or dealers⁴. All other states with a pound net fishery met this requirement. New Jersey did note, however, that there appeared to be some confusion in the reporting of effort and that New Jersey personnel are working with industry to clarify the reporting requirement.

Chesapeake Bay Reduction Fishery Cap

Amendment 3 implemented a 51,000 mt harvest cap for the reduction fishery in the Chesapeake Bay, which is roughly the average harvest from the Chesapeake Bay reduction

⁴ North Carolina continues to explore developing a proxy for this from existing information collected on permits. The current method estimates a maximum number of pound nets fished per day. A more specific pound net permit data set is being explored to further narrow data.

fishery over the 5-year time period from 2012-2016. Reported reduction landings from the Chesapeake Bay for 2018 was about 32,000 mt which is below the Cap.

De Minimis Status

To be eligible for *de minimis* status, a state's bait landings must be less than 1% of the total coastwide bait landings for the most recent two years. State(s) with a reduction fishery are not eligible for *de minimis* consideration. If granted *de minimis* status by the Board, states are exempt from implementing biological sampling as well as pound net catch and effort data reporting. The Board also approved a *de minimis* exemption for New Hampshire, South Carolina and Georgia from implementation of timely reporting. The states of Pennsylvania, South Carolina, Georgia, and Florida requested and qualify for *de minimis* status for the 2019 fishing season.

IX. Plan Review Team Comments and Recommendations

Plan Review Team Comments

Landings data suggest that Atlantic menhaden have become increasingly available to the Gulf of Maine fishery in recent years (2016-2018). In 2018, the state of Maine reported landings in excess of 14 million pounds, marking a 350% increase relative to the state's 2017 landings. Maine has requested additional quota through in-season transfers each year since 2016. In 2018, Maine tripled its base quota by securing 5.4 million pounds of additional quota to extend the directed fishery. Maine has also opted into the EESA fishery for three consecutive years and fully utilized the EESA quota in 2018. After closing the directed fishery and EESA the fishery, Maine landed an additional 2.9 million pounds in 2018 under the incidental catch provision. The recent increase in landings may also be attributed to the status and availability of other bait fish populations in the region (e.g., Atlantic herring), or social and economic factors.

The 2018 incidental catch fishery cannot be directly compared to previous years due to the implementation of Amendment 3 and the reallocation of the coastwide TAC. With the exception of Maine, however, it appears that the new allocations provided states sufficient quota to keep the directed fisheries open throughout the season. While total incidental catch landings increased in 2018 relative to 2017 (see comments regarding Maine's landings above), the number of trips occurring in 2018 were the lowest on record and the fewest number of states participated in the fishery since 2013 (the first year the provision was implemented).

The incidental catch provision in Amendment 3 states "after a quota allocation is met for a given jurisdiction, the fishery moves to an incidental catch fishery in which small-scale gears and non-directed gear types may land up to 6,000 pounds of menhaden per trip per day" (12,000 pounds per trip per day for two authorized individuals, working from the same vessel fishing stationary multi-species gear). The amendment does not give guidance for the incidental catch provision if a state subdivides its quota to different gear types or sectors. New Jersey and the Commonwealth of Virginia subdivide its quotas and has done so since the Commission implemented state quotas in 2013. Virginia allocates its annual quota to three sectors: the reduction sector, the purse seine bait sector, and the non-purse seine bait sector. New Jersey allocates majority of its annual quota to the purse-seine fishery, and the remaining quota is

allocated to all other gear types. Once the non-purse seine bait sector or “other gears” fishery has harvested its portion of the state’s allocation, the fishery moves into an incidental catch fishery regardless of whether the entire state’s quota has been harvested. This has resulted in Virginia and New Jersey reporting incidental catch landings when they have not met their overall quota allocation for a given year. Since the inception of the incidental catch provision, the PRT has reported landings following the closure of Virginia’s non-purse seine bait fishery and New Jersey’s “other gears” fishery as incidental catch. The PRT requests guidance from the Board if they would like to see this reported differently. The PRT recommends this issue be addressed in a future management document.

Management Recommendations

- The PRT recommends that the *de minimis* requests from Pennsylvania, South Carolina, Georgia, and Florida, be approved.
- The PRT recommends that the incidental catch fishery provision issue be readdressed in a future management document.

IX. Literature Cited

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ASMFC. 2017b. Atlantic Menhaden Stock Assessment Update. Prepared by the ASMFC Atlantic Menhaden Stock Assessment Subcommittee. 180 pp.

Southeast Data, Assessment, and Review (SEDAR). 2015. SEDAR 40 – Atlantic Menhaden Stock Assessment Report. SEDAR, North Charleston SC. 643 pp.

Table 1. Directed, bycatch, and episodic events set aside landings in pounds for 2018 by jurisdiction. NA = not applicable; C = confidential

State	Directed	Incidental Catch	EESA
ME	6,537,294	2,900,169	4,636,020
NH	C	-	-
MA	5,715,608	-	-
RI	722,388	-	-
CT	821,360	-	-
NY*	909,908	-	-
NJ	50,250,542	204,240	NA
DE	162,838	-	NA
MD	3,112,159	-	NA
PFRC	3,323,014	-	NA
VA	340,965,634	110,281	NA
NC	712,599	-	NA
SC	C	-	NA
GA	-	-	NA
FL	247,260	-	NA

Table 2. Atlantic menhaden reduction and bait landings in thousand metric tons, 1985-2018

	Reduction Landings (1000 mt)	Bait Landings (1000 mt)
1985	307	26.6
1986	238	21.6
1987	310	25.5
1988	278	43.8
1989	284	31.5
1990	343	28.1
1991	330	29.7
1992	270	33.8
1993	310	23.4
1994	260	25.6
1995	340	28.4
1996	293	21.7
1997	259	24.2
1998	246	38.4
1999	171	34.8
2000	167	33.5
2001	234	35.3
2002	174	36.2
2003	166	33.2
2004	183	34.0
2005	147	38.4
2006	157	27.2
2007	174	42.1
2008	141	47.6
2009	144	39.2
2010	183	42.7
2011	174	52.6
2012	161	63.7
2013	131	37.0
2014	131	41.6
2015	143	45.8
2016	137	43.1
2017	129	43.8
2018	141	49.9
Avg 2013-2017	134	42.3

Table 3. Incidental fishery landings by state in pounds, 2013-2018. Only states that have reported incidental catch landings are listed. Average total incidental catch landings for the time series is 4.29 million pounds.

State	2013	2014	2015	2016	2017	2018
ME	-	-	-	506,145	699,874	2,900,169
RI	16,100	98,533	69,947	39,540	135,748	-
CT	-	-	10,469	-	123,666	-
NY	-	324,857	769,312	281,017	807,392	-
NJ	-	625,643	240,922	195,523	-	204,240
DE	75,928	111,944	91,543	20,823	29,285	-
MD	2,864,298	2,200,662	1,949,577	995,698	-	-
PRFC	1,087,410	1,112,343	455,350	105,669	670,447	-
VA	268,215	2,231,708	2,102,529	325,692	-	110,281
FL	64,790	125,772	301,963	111,165	263,643	-
Total	4,376,741	6,831,462	5,991,612	2,581,272	2,730,055	3,214,690

Table 4. Total incidental landings (pounds), number of trips, and number of states reporting landings in the incidental catch fishery, 2013-2018.

Year	Landings (pounds)	Number of Trips	Number of states landing
2013	4,376,741	2,783	6
2014	6,831,462	5,275	8
2015	5,991,612	4,498	9
2016	2,581,272	2,222	9
2017	2,730,055	2,093	7
2018	3,214,690	1,224	3
Total	25,725,832	18,095	

Table 5. Episodic Events Set-Aside (EESA) fishery quota, landings, and participating states by year. *the 2018 EESA is reduced due to an overage in 2017. The 2018 EESA overage was paid back in full by the state of Maine.

Year	States Declared Participation	EESA Quota	Landed (MT)	% EESA Quota Used
2013		1,708	-	-
2014	RI	1,708	134	7.8%
2015	RI	1,879	854	45.5%
2016	ME, RI, NY	1,879	1,728	92.0%
2017	ME, RI, NY	2,000	2,129	106.5%
2018*	ME	2,031	2,103	103.6%

Table 6: State quota reporting timeframes in 2018. The **bold** text indicates which reporting program (dealer or harvesters) the states use to monitor its quotas.

State	Dealer Reporting	Harvester Reporting	Notes
ME	monthly	monthly/daily	Harvesters landing greater than 6,000 lbs must report daily during episodic event
NH	weekly	monthly	Exempt from timely reporting. Implemented weekly, trip level reporting for state dealers.
MA	weekly	monthly/daily	Harvesters landing greater than 6,000 lbs must report daily
RI	twice weekly	quarterly/daily	Harvesters using purse seines must report daily
CT	weekly/monthly	monthly	CT operates as directed fisheries until 90% of the quota is harvested. Then operates at the 6,000 pound bycatch trip limit.
NY	Weekly	monthly	Capability to require weekly harvester reporting if needed
NJ	weekly	monthly	All menhaden sold or bartered must be done through a licensed dealer
DE	—	monthly/daily	Harvesters landing menhaden report daily using IVR
MD	monthly	monthly/daily	PN harvest is reported daily, while other harvest is reported monthly.
PRFC	—	weekly	Trip level harvester reports submitted weekly. When 70% of quota is estimated to be reached, then pound netters must call in weekly report of daily catch.
VA	—	monthly/weekly/daily	Purse seines submit weekly reports until 97% of quota, then daily reports. Monthly for all other gears until 90% of quota, then reporting every 10 days.
NC	monthly (combined reports)		Single trip ticket with dealer and harvester information submitted monthly. Larger dealers (>50,000 lbs of landings annually) can report electronically, updated daily.
SC	monthly (combined reports)		Exempt from timely reporting. Single trip ticket with dealer and harvester information.
GA	monthly (combined reports)		Exempt from timely reporting. Single trip ticket with dealer and harvester information.
FL	monthly/weekly (combined reports)		Monthly until 75% fill of quota triggers implementation of weekly.

Table 7. Results of 2018 quota accounting in pounds. The 2018 landings do not include landings from the incidental catch fishery because they do not count towards the TAC. The 2018 episodic events set aside (EESA) quota was exceeded by 159,433 pounds, and was paid back by Maine (the pay back was deducted from Maine’s final 2018 quota). The 2019 quotas account for overages which occurred in the 2018 fishery and the redistribution of relinquished by Delaware (2.0 million pounds) and Georgia (2.4 million pounds). * includes redistributed relinquished quota for that year and any overages from the previous season. ^includes inter-state transfers and transfers to the EESA quota.

State	2018 Base Quota*	Returned Set Aside	Transfers^	Final 2018 Quota	Overages	2019 Base Quota*	
ME	2,439,114	Set Aside Exceeded by 159,433 pounds (paid back by ME)	5,240,567	7,679,681	-	2,438,677	
NH	2,357,315				2,357,315	-	2,357,314
MA	6,027,724				6,027,724	-	6,045,252
RI	2,366,618				2,366,618	-	2,441,380
CT	2,432,640			(500,000)	1,932,640	-	2,432,238
NY	3,270,675			(1,000,000)	2,270,675	-	3,265,806
NJ	52,013,736				52,013,736	-	51,749,064
PA	2,357,183				2,357,183	-	2,357,183
DE	415,940			(150,000)	265,940	-	416,467
MD	9,002,733			(1,500,000)	7,502,733	-	8,967,312
PRFC	5,102,086				5,102,086	-	5,087,456
VA	376,543,328			(1,000,000)	375,543,328	-	374,548,891
NC	4,540,560				4,540,560	-	4,528,923
SC	10,000				10,000	-	2,357,183
GA	0				0	-	-
FL	2,443,819			(1,250,000)	1,193,819	-	2,443,357
TOTAL	471,323,470				471,164,037	-	471,436,502

Table 8. Biological monitoring results for the 2018 Atlantic menhaden bait fishery.

State	#10-fish samples required	#10-fish samples collected	Age samples collected	Length samples collected	Gear/Comments
ME	21	21	210	210	purse seine
MA	8	3	30	51	30 purse seine, plus 21 midwater trawl lengths
RI	1	4	43	43	floating fish traps
CT	1	1	13	13	
NY	2	4	41	41	cast net
NJ	76	127	1270	1270	118 purse seine, 9 "other gears"
DE	1	1	10	10	gill net
MD	7	16	188	688	pound net ^
PRFC	7	9	90	90	pound net
VA	67	87	870	870	pound net (18), gill net (64), haul seine (5)
NC	2	2	20	20	gill net
Total	193	275	2785	3306	

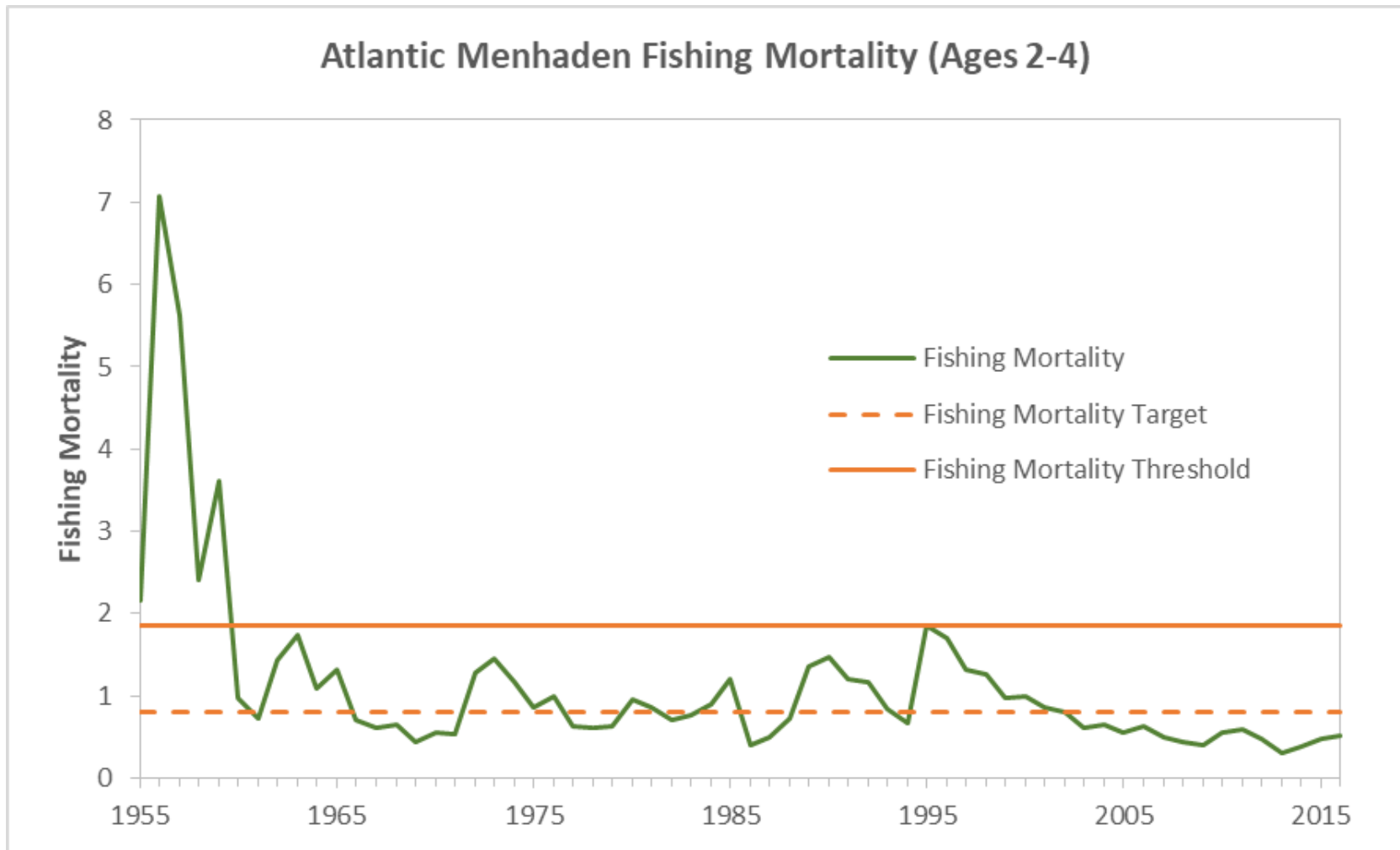


Figure 1. Fishing mortality, 1955-2016. The fishing mortality reference points are $F_{\text{target}} = F_{36\% \text{ MSP}} = 0.80$ and $F_{\text{threshold}} = F_{21\% \text{ MSP}} = 1.85$. $F_{2016} = 0.51$. Source: ASMFC 2017b.

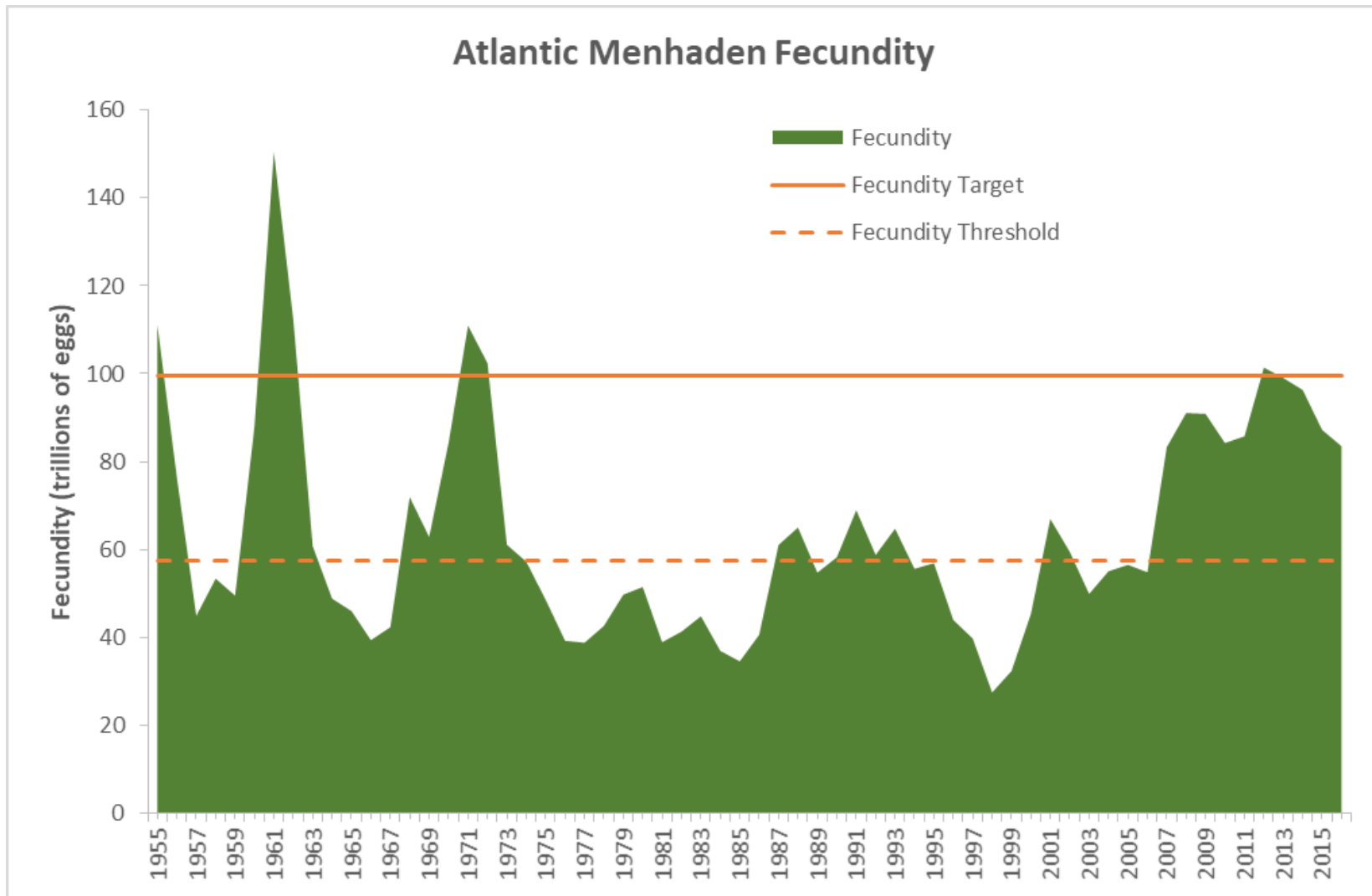


Figure 2. Atlantic menhaden fecundity, 1955-2016. The reference points for population fecundity are $FEC_{target} = FEC_{36\%MSP} = 99,467$ (billions of eggs), and $FEC_{threshold} = FEC_{21\%MSP} = 57,295$ (billions of eggs). $FEC_{2016} = 83,486$ billion eggs.

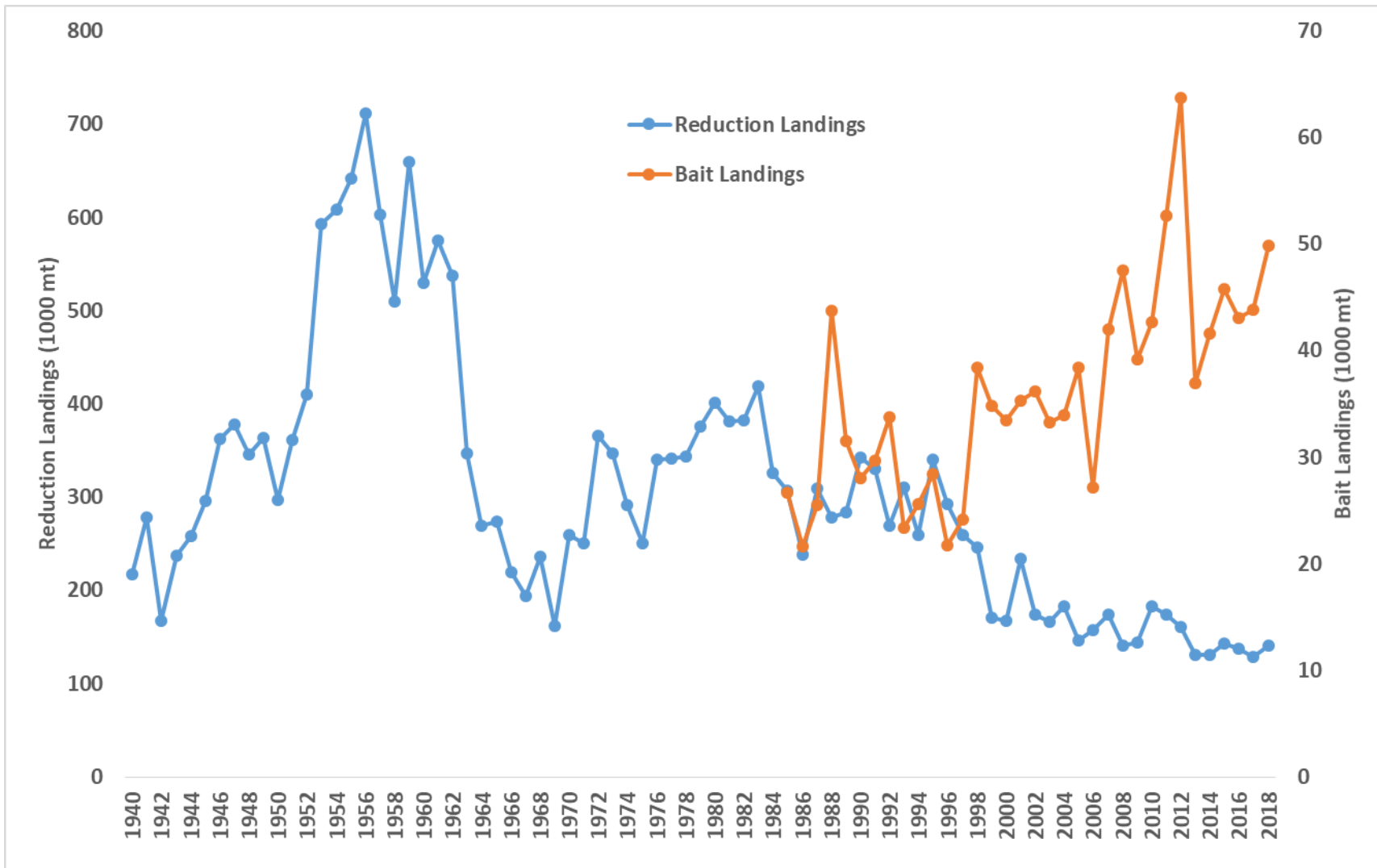


Figure 3. Landings from the reduction purse seine fishery (1940–2018) and bait fishery (1985–2018) for Atlantic menhaden. Note: there are two different scales on the y-axes.



Atlantic States Marine Fisheries Commission

1050 N. Highland Street • Suite 200A-N • Arlington, VA 22201
703.842.0740 • 703.842.0741 (fax) • www.asmfmc.org

MEMORANDUM

TO: Atlantic Menhaden Management Board
FROM: Max Appelman, Fishery Management Plan Coordinator
DATE: July 19, 2019
SUBJECT: Atlantic Menhaden Fishery Specifications Process

The Atlantic Menhaden Management Board (Board) will discuss the 2020 total allowable catch (TAC) for menhaden at its August 2019 meeting. In November 2017, the Board set the TAC for the 2018 and 2019 fishing seasons with the expectation that setting of the TAC for subsequent years would be guided by menhaden-specific ecological reference points. However, the Atlantic menhaden single-species and ecological-based benchmark stock assessments will not be ready for Board review until February of next year and a TAC for 2020 has not yet been set. Per Amendment 3, if the Board does not set a TAC for 2020 by December 31, 2019, next year's TAC will automatically be set at the level of the 2019 TAC.

TAC Setting Process

Per Amendment 3, the TAC is set through Board action, either on an annual basis or for multiple years, based on the best available science; primarily the results of projection analysis which explores a range of TAC alternatives to determine the percent risk of exceeding the F_{target} or the $F_{\text{threshold}}$. Monte Carlo Bootstrap runs of the base model run from the Beaufort Assessment Model (BAM) are used as the basis for the projection analysis. Amendment 3 also established the "Indecision Clause" that rolls over the current year's TAC if the Board is unable to approve a TAC by year's end.

Projections were last prepared by the Atlantic Menhaden Technical Committee (TC) in 2017 which guided the Board's setting of the TAC for 2018 and 2019. These explored the effect of a range of TAC alternatives for three years ending in 2020; specifically a 0%, 5%, 10%, 20%, 30%, and 40% increase to the 2017 TAC of 200,000 metric tons, plus identifying the TACs that would result in a 50%, 55%, and 60% probability of being below the F_{target} in 2018 (Table 1). Landings were assumed to be constant at 200,000 metric tons for 2017–2020.

Since the implementation of coastwide quota management the TAC has been set at the following levels: 170,800 metric tons (2013–2014); 187,880 metric tons (2015–2016); 200,000 metric tons (2017); and 216,000 metric tons (2018–2019).

Options for Setting the 2020 TAC

1. The Board can use the existing projections prepared by the TC in 2017 as the basis for setting the 2020 TAC. Under this option, the Board could take action at the August 2019 meeting to set the 2020 TAC.

2. The Board can request updated projections be prepared by the TC to serve as the basis for setting the 2020 TAC. Under this option, the Board would provide the TC with the range of alternatives to be analyzed in the projection analysis, and action to set the TAC for 2020 could occur at the 2019 Annual Meeting. These updated projections would still be based on the 2017 stock assessment update, but incorporate actual landings estimates for 2017 and 2018.
3. The Board could defer action on the 2020 TAC until the 2019 benchmark stock assessments and peer review reports are presented and new projections based on the best available science at that time are developed. This would cause the 2020 TAC to be set at the 2019 level of 216,000 metric tons in the interim. (The Board could similarly revisit the 2020 TAC if set under Options 1 or 2 above).

While the existing projections could be updated (Option 2 above), it is unlikely that the results would differ significantly from the TC’s last projections. Actual landings estimates for 2017 (final) and 2018 (preliminary) are below the 200,000 metric tons assumed level, and the proportions of total landings by sector have not changed significantly. Importantly, the work to update the projections would detract from the ongoing assessments which are at a critical stage of the assessment process. Staff also notes that based on the 2017 projections analysis, there is a 0% chance of exceeding the F_{target} or the $F_{threshold}$ in 2020 at the current TAC (Table 1).

Table 1. Percent risk of exceeding the F_{target} and $F_{threshold}$ for a six different total allowable catch (TAC) projections. Source: Menhaden TC memo to the Board dated June 30, 2017 (subject: projection runs for 2018 fishery specifications). Three additional projections were explored to determine the TAC level that results in a 50% (314,500 mt), 55% (288,500 mt), and 60% (286,000 mt) probability of being below the F_{target} in 2018.

	TAC (mt)	2018	2019	2020
Percent Risk of exceeding F_{target}	200,000	9.5%	0.5%	0%
	210,000	12%	1.5%	0%
	220,000	15.5%	3.5%	0%
	240,000	22.5%	9.5%	2.5%
	260,000	29.5%	20.5%	10.5%
	280,000	37.5%	33%	29%

	TAC (mt)	2018	2019	2020
Percent Risk of exceeding $F_{threshold}$ (Overfishing)	200,000	0%	0%	0%
	210,000	0%	0%	0%
	220,000	0%	0%	0%
	240,000	0.5%	0%	0%
	260,000	1.5%	0%	0%
	280,000	2.5%	0%	0%