

Atlantic States Marine Fisheries Commission

Atlantic Menhaden Management Board

October 28, 2025

1:15 – 5:15 p.m.

Draft Agenda

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

1. Welcome/Call to Order (*J. Clark*) 1:15 p.m.
2. Board Consent 1:15 p.m.
 - Approval of Agenda
 - Approval of Proceedings from August 2025
3. Public Comment 1:20 p.m.
4. Consider 2025 Single-Species Assessment Update and Ecological Reference Point Benchmark Stock Assessment and Peer Review Report **Action** 1:30 p.m.
 - Overview of Single-Species Assessment (*C. Craig*)
 - Overview of Ecological Reference Point Assessment (*M. Cieri*)
 - Presentation of Peer Review Report (*S. Gaichas*)
 - Consider Acceptance of 2025 Stock Assessments and Peer Review Report for Management Use
 - Consider Management Response, If Necessary
5. Set Specifications for the 2026-2028 Fishing Years (*C. Craig*) **Final Action** 2:30 p.m.
6. Consider Approval of Fishery Management Plan Review and State Compliance for the 2024 Fishing Year (*J. Boyle*) **Action** 3:20 p.m.
7. Consider Commercial Quota Reallocation (*J. Boyle*) **Possible Action** 3:30 p.m.
8. Consider Plan Development Team Direction on Chesapeake Bay **Possible Action** 3:50 p.m.
9. Consider Technical Committee Direction on Coastal Environmental Conditions (*J. Boyle*) **Possible Action** 4:50 p.m.
10. Other Business/Adjourn 5:15 p.m.

The meeting will be held at Hyatt Place Dewey Beach (1301 Coastal Highway, Dewey Beach, Delaware; 302.864.9100) and via webinar; click [here](#) for details.

Atlantic States Marine Fisheries Commission

MEETING OVERVIEW

Atlantic Menhaden Management Board

October 28, 2025

1:15 – 5:15 p.m.

Chair: John Clark (DE) Assumed Chairmanship: 5/24	Technical Committee Chair: Caitlin Craig (NY)	Law Enforcement Committee Representative: David Bailey (MD)
Vice Chair: Joe Cimino (NJ)	Advisory Panel Chair: Meghan Lapp (RI)	Previous Board Meeting: August 7, 2025
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 August 2025

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 should use the webinar raise your hand function and the Board Chair will let you know when to speak. For agenda items that have already gone out for public hearing and/or have had a public comment period that has closed, the Board Chair may determine that additional public comment will not provide additional information. In this circumstance, the Board Chair will not allow additional public comment 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. Consider 2025 Single-Species Assessment Update and Ecological Reference Point Benchmark Stock Assessment and Peer Review Report (1:30 –2:30 p.m.) Action

Background

- The 2025 ecological reference point (ERP) benchmark stock assessment for Atlantic menhaden was peer-reviewed by a panel of independent experts at SEDAR 102 the week of August 12, in Charleston, SC (**Briefing Materials**).
- The single-species assessment update was completed and reviewed by the TC in July 2025 (**Briefing Materials**).

Presentations

- Overview of single-species assessment update by C. Craig
- Overview of ERP benchmark assessment by M. Cieri
- Presentation of Peer Review reports by S. Gaichas

Board Actions for Consideration

- Accept the 2025 stock assessments and ERP peer review report for management use
- Consider management response, if necessary

Atlantic States Marine Fisheries Commission

5. Set Specifications for the 2026-2028 Fishing Years (2:30–3:20 p.m.) Final Action

Background

- The Board sets an annual or multi-year TAC using the best available science.
- The TC completed projection runs for the 2026-2028 years based on recommendations from the Board (**Briefing Materials**).

Presentations

- Review of 2026-2028 stock projections by C. Craig

Board Actions for Consideration

- Set specifications for the 2026 up to 2028 fishing years

6. Consider Fishery Management Plan Review and State Compliance for 2024 Fishing Year (3:20-3:30 p.m.) Action

Background

- State compliance reports were due August 1, 2025.
- The Plan Review Team reviewed each state reports and compiled the annual FMP Review (**Briefing Materials**).
- Pennsylvania, North Carolina, South Carolina, Georgia, and Florida have requested and meet the requirements for *de minimis*.

Presentations

- Overview of Atlantic menhaden FMP Review by J. Boyle

Board Actions for Consideration

- Accept 2024 FMP Review and State Compliance Reports
- Approve *de minimis* requests for Pennsylvania, North Carolina, South Carolina, Georgia, and Florida

7. Consider Commercial Quota Reallocation (3:30–3:50 p.m.) Possible Action

Background

- According to Amendment 3, quota allocations will be revisited every three years, and the current allocations were approved in October 2022. A change to the FMP would be needed for any changes to the allocation structure. Maintaining the current allocations would not require action.

Presentations

- Review of current commercial quota allocations by J. Boyle

Board Actions for Consideration

- Consider maintaining current allocations or initiating the management process

8. Consider Plan Development Team Direction on Chesapeake Bay (3:50–4:50 p.m.) Possible Action

Background

- In August 2025, the Board elected to form a PDT to develop options white paper for distributing the Chesapeake Bay reduction cap more evenly throughout the fishing season.

Atlantic States Marine Fisheries Commission

- The PDT members were approved in September. The PDT has not met to initiate the development of the requested white paper

Presentations

- PDT progress update by J. Boyle

Board Actions for Consideration

- Consider initiating the adaptive management process

9. Consider Technical Committee Direction on Coastal Environmental Conditions (4:50–5:15 p.m.) Possible Action

Background

- In August 2025, the Board discussed coastwide changes in menhaden availability and changing environmental conditions. In consideration of the priority for the TC and ERP Work Group to complete the single-species assessment update and ERP benchmark assessments, the Board decided to discuss potential TC tasks regarding coastwide changing environmental conditions at the Annual Meeting.

Presentations

- TC tasking update by J. Boyle

Board Actions for Consideration

- Consider tasking the TC to investigate the impacts of changing coastal environmental conditions

10. 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

- Evaluate FMP biological sampling requirement
- Annual compliance reports due August 1st

TC Members: Caitlin Craig (NY, Chair), Mike Mangold (USFWS), Robert Corbett (NC), Keilin Gamboa-Salazar (SC), Jason McNamee (RI), Eddie Leonard (GA), Jeff Brust (NJ), Matt Cieri (ME), Ingrid Braun-Ricks (PRFC), Micah Dean (MA), Kelli Mosca (CT), Shanna Madsen (VMRC), Chris Swanson (FL), Sydney Alhale (NMFS), Amy Schueller (NMFS), Alexei Sharov (MD), Garry Glanden (DE), Heather Walsh (USGS), Katie Drew (ASMFC), James Boyle (ASMFC)

SAS Members: Amy Schueller (NMFS, SAS Chair), Caitlin Craig (NY, TC Chair), Brooke Lowman (VA), Matt Cieri (ME), Chris Swanson (FL), Sydney Alhale (NMFS), Jason McNamee (RI), Alexei Sharov (MD), Jeff Brust (NJ), Keilin Gamboa-Salazar (SC), Katie Drew (ASMFC), James Boyle (ASMFC)

ERP WG Members: Matt Cieri (ME, ERP Chair), Andre Buchheister (HSU), Jason Boucher (NOAA), Michael Celestino (NJ), David Chagaris (FL), Micah Dean (MA), Jason McNamee (RI), Amy Schueller (NFMS), Alexei Sharov (MD), Genny Nessler (UMD), Howard Townsend (NFMS), Shanna Madsen (VMRC), Jainita Patel (ASMFC), Katie Drew (ASMFC), James Boyle (ASMFC)

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

**The Westin Crystal City
Arlington, Virginia
Hybrid Meeting**

August 7, 2025

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 May 7, 2025** by consent (Page 1).
3. **Move to task a Plan Development Team to develop options for distributing harvest of the Chesapeake Bay reduction cap more evenly throughout the Chesapeake Bay reduction season in order to mitigate potential effort bottlenecks that may be impacting other Bay small scale fisheries as well as the Bay ecosystem. The intent is for a draft document to come to the board at the 2026 Winter Meeting** (Page 12). Motion by Lynn Fegley; second by Mel Bell. Motion passes (Page 13).
4. **Move to adjourn** by consent (Page 15).

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ATTENDANCE

Board Members

Megan Ware, ME, proxy for Carl Wilson (ME)	Loren Lustig, PA (GA)
Rep. Allison Hepler, ME (LA)	John Clark, DE (AA)
Renee Zobel, NH, Administrative Proxy	Roy Miller, DE (GA)
Doug Grout, NH (GA)	Lynn Fegley, MD (AA)
Dennis Abbott, NH, proxy for Sen. Watters (LA)	Russel Dize, MD (GA)
Nichola Meserve, MA, proxy for D. McKiernan (AA)	Allison Colden, MD, proxy for Del. Stein (LA)
Raymond Kane, MA (GA)	Pat Geer, VA, proxy for J. Green (AA)
Nicole Lengyel Costa, RI, proxy for J. McNamee (AA)	Chris Batsavage, NC, proxy for K. Rawls (AA)
David Borden, RI (GA)	Ben Dyar, SC, proxy for B. Keppler (AA)
Eric Reid, RI, proxy for Sen. Sosnowski (LA)	Malcolm Rhodes, SC (GA)
Matthew Gates, CT, proxy for J. Davis (AA)	Mel Bell, SC, proxy for Sen. Cromer (LA)
Bill Hyatt, CT (GA)	Doug Haymans, GA (AA)
Robert LaFrance, CT proxy for Rep. Gresko, CT (LA)	Spud Woodward, GA (GA)
Marty Gary, NY (AA)	Erika Burgess, FL, proxy for J. McCawley (AA)
Emerson Hasbrouck, NY (GA)	Gary Jennings, FL (AA)
Joe Cimino, NJ (AA)	Ron Owens, PRFC
Jeff Kaelin, NJ (GA)	Rick Jacobson, US FWS
Adam Nowalsky, NJ, proxy for Sen. Gopal (LA)	Max Appelman, NMFS
Kris Kuhn, PA, proxy for T. Schaeffer (AA)	

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

Ex-Officio Members

Caitlin Craig, Technical Committee Chair

David Bailey, Law Enforcement Committee Rep.

Staff

Bob Beal	Caitlin Starks	Jeff Kipp
Toni Kerns	Emilie Franke	Samara Nehemiah
Tina Berger	Tracy Bauer	Jainita Patel
Madeline Musante	Chelsea Tuohy	
James Boyle	Katie Drew	

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, via hybrid meeting, in-person and webinar; Thursday, August 7, 2025, and was called to order at 8:30 a.m. by Chair John Clark.

CALL TO ORDER

CHAIR JOHN CLARK: Good morning, and welcome to this meeting of the Atlantic Menhaden Management Board. The meeting is now in session. Chairing is John Clark; Administrative Commissioner for Delaware, and I'm joined up here at the front table by, well remotely actually, by our Law Enforcement Committee representative David Bailey.

Then from ASMFC we have Plan Coordinator James Boyle and Stock Assessment Committee Chair Katie Drew here.

APPROVAL OF AGENDA

CHAIR CLARK: With that we'll go right to the consent agenda. Are there any revisions to the agenda? Seeing none; the agenda is approved as written.

APPROVAL OF PROCEEDINGS

CHAIR CLARK: Are there any revisions to the proceedings from the May 2025 meeting? Seeing none there; that is approved. Now we'll move on to public comments, and once again this is public comments for items not on the agenda. Do we have?

MS. TONI KERNS: Just really quick, John. As I've done the rest earlier in the week, I just wanted to note that Chris Batsavage and Renee Zobel are online, and I apologize if I've missed any other commissioners that are online.

CHAIR CLARK: Right, forgot that was a new thing we have to make part of the routine.

PUBLIC COMMENT

CHAIR CLARK: For public comment for items not on the agenda. We will try to take some public comments. I know people are very interested in our next agenda item. We'll try to take some comments on that. We only have an hour today, so we will see what we can do. Any public comments for items not on the agenda? Okay.

Anybody in the room want to raise their hand, if they have an item that is not on the agenda? I see, is it for an item not on the agenda, Tom? Because if it is on the agenda, we'll try to get you in at that point. Ma'am, is your item not on the agenda? About the osprey, go right ahead. Step up to the public microphone, state your name, and if you represent an organization. Then you'll have two minutes for your comment.

MS. ROBERTA KELLAM: My name is Roberta Kellam, and I live in Franktown, Virginia, which is in North Hampton County on the southern tip of the Delmarva. I drove four hours to get here from the east south shore of Virginia, so that I could give you my first-hand account of the devastation of the osprey population in the Chesapeake Bay on the eastern shore, 2025 has been the worst year ever. For the eastern shore reproductive rate it was only 0.42, which is far less than the 1.1 needed for a sustainable population. In my Creek, which is Nassawadox Creek, we have 22 pairs, and we only fledged six young.

What I really wanted to do is just ask that you see this for yourself, because I don't think that the data really adequately explains what is going on. In like the third week of April, we go out there and there are pairs at the nests. There are females on the eggs. It looks like a thriving ecosystem with, you know fishing.

In the third week of May it is like devastation, it's like a bomb hit and there are eggs abandoned in almost every nest that either or the chicks abandoned, dead chicks no adult osprey anywhere. No adult bald eagles anywhere either. If it were

bald eagles predating, obviously you would not see dead chicks in the nest.

What I really am asking is that you take some action. The ecosystem is extremely stressed. Something is going on with the Bay ecosystem that needs to be addressed. The menhaden are not coming into the Bay, but neither are any other fish that could be a substitute fish. I really ask that you take an action to relieve the stress on the Chesapeake Bay, and also that you send your scientists down to the eastern shores to see this for yourself. Thank you.

CHAIR CLARK: Thank you, Ms. Kellam. Next up, Tom, did you have an item that is not on the agenda? Okay, next up, I already said your name, but please, state your name again, Tom.

MR. TOM LILLY: My name is Tom Lilly. Ladies and Gentlemen of the Menhaden Board, I'm from Whitehaven, Maryland. You know I've been coming here, as many of you know, for about six years now. I probably attended, let's say 24 meetings. From our point of view, nothing has really happened to protect Chesapeake Bay menhaden during that period of time.

I hate to say that but it's the brutal truth, and so many of my colleagues, who you don't see here today, have been here for many of those years standing beside me. Anyway, the Work Group report on protective options gave you a very solid, fact-based report in May. Action as you know, oh every one of you know, was to take place before you at that meeting in May.

But somehow, you bowed to some influence, which I frankly can't understand, and at that meeting, actually not one single option was discussed, and now this today. I'm afraid history with this Board is about ready to repeat itself. Twenty-one years ago, from the period of 2004 through 2009, this Board studied the poor condition of Chesapeake Bay wildlife, and its connection to menhaden, and nothing was done.

At the conclusion of that, Dr. McGuire was hired as your consultant, as you know. He looked the situation over to advise you, and he recommended that you do time and area studies to control that intense factory fishing, and nothing was done. But in the meantime, most of you states that are affected by Maryland, you went ahead and took action to protect yourselves, didn't you? You kept that factory fishing out of your Bay's rivers and off your coast. Then we had the.

CHAIR CLARK: Thanks, Tom, please wrap it up. Thank you.

MR. LILLY: Okay, so the Chesapeake Bay is the largest estuary in the United States, and it is probably the most mistreated. When its food supply is exported to Canada, destroying our American jobs, our American businesses and our wildlife. The situation was bad.

CHAIR CLARK: Thanks Tom, please, wrap it up, we've got a lot to do and we don't have a lot of time. One more sentence.

MR. LILLY: Thank you, John. Just one other comment. The situation was very bad when I started here six years ago. It is probably 100% worse. Please, one of you stand up for Chesapeake Bay at this meeting, and ask that these protective options be acted on now. It's been one year.

CHAIR CLARK: Thank you, Mr. Lilly, that's enough, thank you. We have another commenter in the audience here, I believe. Yes, Sir, come on up to the microphone. Please, give your name and your affiliation.

MR. BEN LANDRY: Hi there, Mr. Chairman, my name is Ben Landry, I work for Ocean Harvesters, the menhaden industry operating out of Virginia. I wasn't planning on speaking today, but I did want to just let you all know that what you just heard from the previous commenter is false. You guys should know it. There is no overfishing occurring of Atlantic menhaden, that is according to the best available science.

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There are no foreign boats operating in either the Gulf or the Atlantic Coast. Every employee is an American, period. Please, understand that. I am sick and tired of hearing that everywhere we go, that it is a foreign company. People around this table have said that, it is demonstrably false. We get harassed constantly out at sea by recreational anglers.

I've had to report that to folks in New Jersey, Virginia, every state that we operate off of the coast of New Jersey, New York as well. It is unfair, this is a healthy fishery, according to your work, and this is a U.S. company. If you make any decisions based on the false information you've been provided, please understand that you should consult ASMFC leadership and the senior scientist here that it is a healthy stock.

I understand that a new assessment is underway, you're going to get results on that today. But I just can't let these misstatements and distortions constantly go on. I would appreciate it if the Commission itself made sure that false information wasn't provided during public comment. I've had that conversation before. But I think that would be helpful, because there are 45 of you guys around the table, and I don't want there to be any misinformation being shared, so thank you.

CHAIR CLARK: Thank you, Mr. Landry, thanks for your comments. Anybody else in the audience? I see another hand raised there. We'll take one more from the audience, then we have two online. Sir, if you could just state your name and if you have an affiliation, your affiliation.

MR. DAVID E. FRULLA: Good morning, thank you, David Frulla from Kelley Drye & Warren, representing Ocean Harvesters. Just one point, based on what you heard earlier. If there are problems with osprey in April and May, there is no menhaden fishing going on in the Bay in April and May. It's kind of hard to ascribe fault there.

I hope, and when I looked at the Working Group report back when it first came out, there is an assumption, an assumption that menhaden fishing is a problem for osprey. I hope the Board is not so incurious as to just accept that, contrary to the facts that are out there, and investigates if indeed there is an osprey problem, what is causing it and how to fix it. Thank you.

CHAIR CLARK: Thank you, Sir. Our next comment online is from James Fletcher. Go ahead, Mr. Fletcher.

MR. JAMES FLETCHER: James Fletcher, United National Fishermen's Association. Can ASMFC begin a process of mass spawning the fish that we say are in trouble, and releasing them in the Bays and the estuaries? We go over weakfish, what would happen if we mass spawned a billion? Don't hold them and grow them, just release the eggs where we think the eggs would be. On your topic for the day, menhaden.

Why not ask the companies that have the best aquaculture facilities in the world if they would be willing to spawn and release eggs in the trillions, which ASMFC does not have. But when you get into the lobsters and stuff. Why not try a facility to spawn and release? Why can we not look at just spawning, letting the eggs hatch, and then releasing them? Don't try to grow them into adults, but try something different. Thank you, on behalf of the United National Fishermen's Association.

CHAIR CLARK: Thank you, Mr. Fletcher. Next up we have Brian Collins, go ahead, Mr. Collins.

MR. BRIAN COLLINS: Thank you, good morning. Brian Collins, I'm just a citizen concerned about menhaden. I agree with Ben Landry. We want to avoid any misinformation. I don't know quite how we do that. When we hear about the fishery being healthy, that is only science in the ocean. There is no science in the Chesapeake Bay, it's a historical quota.

There is no science, nobody knows how many menhaden are in the Bay, and it's just as likely as

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anything that industry removes every menhaden that comes in the Bay, every school. Even though there is not technically science in the Bay, the users of the Bay know that the schools of menhaden are no longer in the Bay. It used to be you could see a school a mile around. The idea that we know how many menhaden are in the Bay is not true. The industry has no obligation to leave one menhaden for wildlife.

The ecosystem does not have any set aside whatsoever. The ERPs that are set aside are only for the ocean, there are no ERPs in the Chesapeake Bay to monitor the population when it collapsed, blue crabs are at an all-time low, osprey nests are failing. You'll hear people say, the osprey populations are fine. Yes, osprey populations in the Bay are fine, the adults. The chicks are failing. I appreciate all you're doing. I hope you do the right thing. Thank you.

CHAIR CLARK: Thank you, Mr. Collins. We have a few more hands online, but I'm sorry, we really don't have the time right now, so we are going to move on to our next agenda item. If we do have time after this agenda item, we'll see if we can take some more public comment. The next agenda item is Discuss Technical Committee Directions in Response to the Work Group Report on Precautionary Management in Chesapeake Bay. To start this off I am going to recognize Ms. Lynn Fegley of Maryland, she has a presentation and some direction.

**DISCUSS TECHNICAL COMMITTEE DIRECTION
IN RESPONSE TO WORK GROUP REPORT ON
PRECAUTIONARY MANAGEMENT IN
CHESAPEAKE BAY**

MS. LYNN FEGLEY: Thank you, Mr. Chair, I really appreciate that. I want to start this off by saying, you know we considered the Work Group report last spring. There was a lot of information in there, and it was something in the state of Maryland we really wanted to

spend some time with that report, and try to understand it.

I'm going to say that coming from the state of Maryland we're sitting in a little bit of a difficult spot. I want to walk you through some of the things that we found in the report that have really raised flags for us. I also want to say that I think that this Board has done incredible due diligence, to really reach out and explore issues around us in the Bay.

We have USGS in here to talk about ospreys. The Work Group Report was initiated due to the osprey problem. But I think there are other things here that I feel strongly, and having spent a summer listening to our commercial fishermen, one of whom is sitting to my right. There is a conversation that the state of Maryland is deeply interested in having about what is happening with our fisheries.

I'm going to show this to you, because a picture is always better than what I can explain. In the Work Group report there is this table, this is Table 2, it's a really interesting table, and what it is, it's the number of reductions set between 2015 and 2024 by biweekly time period. It's a heat map, so where you see green, that means that is a set intensity, or the number of sets is significantly above average.

The first thing that caught my eye was that the effort, and it's a little washed out on the screen, but it is intensifying through time to the mid-summer period, which would normally be where Maryland starts to see its peak menhaden harvest. I was curious about this in May, I asked the question here around the Board, what is causing this? Why is the effort changing, so that the reduction fleet is focusing in the middle part of the Bay?

The answer was fairly obvious, that the boats are there because the fish are there, which really got me thinking, because that is not what I was hearing from our commercial fishermen in the state of Maryland. This is the only data that is not coming from the Work Group Report. That orange line on the top left, we just added the number of reduction sets from Table 2 between June and August.

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That is just a time series of the total sets in the Bay in the midsummer. The green line, that is the Maryland menhaden harvest from pound nets during the same time period, which sort of speaks to my point that if the fish are there they are not where we are. For context, I put the total annual menhaden harvest from Maryland in that graph on the lower right. We catch somewhere between, on average, 30 to 40% of our pound net menhaden harvest in that time period between June and August. Then this is Figure 10 from the Work Group Report, and it is showing our pound net CPUEs in both Maryland and Virginia. What you see is during that same time period, our CPUEs in both Maryland and Virginia from pound nets are really starting to fall. The lower left-hand graph is the PRFC menhaden pound net index.

That seems to be holding its own. It does decrease in 2024, but what's really disturbing here is that we're hearing from commercial fishermen, they're not even setting their nets in the Potomac, because the fish aren't there. That index is likely to look a little bit different, and it is going to be based on fewer nets.

Then if we drill down further, this is Figure 11 from the Work Group Report, and as I said, in Maryland, our pound net harvest usually peaks in the summer, and also recognize this is our crab season. This shows the monthly harvest in both Maryland and Virginia. The lighter bars, again it's washed out on the screen in 2022, shows a fairly normal year, where we have a pretty good harvest is peaking in July and August.

Same thing in 2023, but in 2024 we see menhaden harvest nearly disappear from the Maryland pound nets in June, July and August. Interestingly, the same thing is happening for Virginia pound nets, and the harvest is disappearing in July and August. For us, this becomes a tremendous red flag.

We understand very well that there was a time period where there was a lot greater menhaden

harvest in the Bay and everybody was catching menhaden. The ospreys were covered. There was a time when things seemed to be ticking along in the Bay okay. But things have significantly changed in the Bay.

I can tell you, spending time on the water, I went through a litany of sort of red flags at one of these meetings. But now as a Maryland fisheries representative, what I hear from my commercial fishermen from the commercial fishermen in our state is, something is seriously wrong. I think what we have, is we have a situation where we have very intensive effort happening in a smaller window, when there is low availability of fish.

Fish are not as available in the Chesapeake Bay. This is nobody's fault, this is sort of the cycle that we're in. But we do have a period of low availability and this intensive effort that is potentially creating less escapement for these fish to get through to these small-scale gears, and could potentially be causing the collateral ecosystem damage. With all of that, what we would really like to see, and the task at hand here was to task the TC.

I think from Maryland's perspective, what we would really like to see, in thinking about this and how best to create some management that could solve this problem, or at least help us understand where the problem lies, is to look at a way to look at that reduction cap, and spread it out through the year.

It's in the Work Group Report, it is a tool that's recommended, and if we could put that cap into quota periods and spread it out, it would prevent concentrated effort. It would mitigate issues with concentrated effort that may be causing problems. We would very much like to task the PDT, we have some specific direction. But I'll just leave it there, Mr. Chair, for now, and if we can do a tasking we'll go from there.

CHAIR CLARK: Thanks very much, Lynn. That is very perceptive work that you've done there, and you've given us some ideas for the PDT tasking. Are there questions for Lynn, before we go to talking about tasks? Okay, there are no questions, would you

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actually like to make a more formal, oh, Russel, Mr. Dize, go right ahead.

MR. RUSSEL DIZE: I thank Lynn for the technical side of it. I'm going to give you the watermen's side of it. Houston, we have a problem! The Atlantic States Marine Fisheries Commission, we have a problem! My best friend Robbie Wilson, who operates out of Tilman, a big pound netter, has never caught enough fish to sell this year.

Down at Hoopers Island, that is 50 miles south of us, the Powley boys operate fixed net pound nets on the Hoopers Island side and on the western shore side towards Patuxent. They caught five fish. I didn't say 500 bushels, five fish, so we're hurting. I heard menhaden, business has completely dried up so our crabbers can't get bait. They are getting it out of, when they can get it, out of New Jersey, paying triple the amount they usually pay.

But I don't know the reason. But it's up to this group to come up with something, why the menhaden aren't coming in the Bay. But they aren't coming in the Bay. It's our problem, we need to fix it. How, I don't know. Now I could say, well, nothing is coming in the Bay. Well, that is not true.

We have an influx of red fish, red drum. We never had them years ago. We've got so many now that they're like the blue catfish. Everywhere we go we have the red drum. There is a reason why the menhaden aren't coming in the Bay, and we need to find out. Thank you, Mr. Chairman.

CHAIR CLARK: I see Pat Geer. Go right ahead, Pat.

MR. PATRICK GEER: The menhaden are coming in the Bay, but they are coming in later. If you look at the report, Lynn showed the Table 3 on Page 34. But Figures 4 and 5 on Page 40 and 41, show the variability over a 20-year period of harvest over time. What we've been seeing the

last three years is that the fish are not coming, there is no fishing effort from the purse seine fishery in May and June, it's very limited.

It's getting less and less. For the 10-year period between 2015 and '24, about 44% of the Bay effort occurred in May and June. In '22 it was 39%. This past year, in 2024 it was 18.23%. This year they didn't even start fishing in the Bay until July. Something is going on, if they are not fishing in the Bay the menhaden are probably not there yet. But typically, what has happened is, with them we're seeing what Lynn showed in the table.

When they do get in the Bay, the effort is increasing. But in general, they are coming in later, we don't know why. That is an issue right there. Something is going on, but is this going to be a trend? I mean this year it seems to be worse than it was the last two years, but they are coming in later, and then by about mid-August, they are about back up to normal, where they would normally be for an August. Those are things we have to look at too. They are coming into the Bay, they are just coming in later, is my point.

CHAIR CLARK: Thank you, Mr. Geer, and I believe, Lynn. One second, Russel. At this point we want to discuss having a PDT formed, and to task the PDT with looking into this situation, with the late arrival of menhaden, the lack of menhaden. Is that the direction we're heading there? Lynn and Russel, did you both want. Russel had his hand up first. You go ahead, Lynn.

MS. FEGLEY: Yes, I think it would be our intent to task a PDT to develop options. I can specify what those look like. I just want to say to Pat's point, we do understand that the timing is different. But the issue is that what you see in that Work Group Report is that the timing is changing so the effort is changing.

When the fish are there, they are not there for us. We're at the top of the Bay, right. I hesitate to call this an intercept, but I do think we're in a situation where there is lower availability, change in timing, so when those happen to come through, whenever

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it is, they just are meeting maybe an outsized gauntlet, and we would like to be able to explore ways to ease that pressure to let some of those fish go.

The proposal to the Board is to task a PDT to examine a range of quota periods for the reduction cap, 3 to 5 quota periods, no time block exceeding for the cap, and use the last five years of fishery data to show how those quota periods may impact the ability to achieve the reduction cap. I believe we need to be transparent in this, and we need to see the impacts on that fishery.

The quota periods may be evenly distributed to increase in later time blocks, if this offers some protection for menhaden ingress moving up the Bay. We would really like to see a draft document come before the Board in January, and from there the Board can review and determine what course of action it wants to take going forward. That's it, Mr. Chair, thank you.

CHAIR CLARK: Thank you, Lynn. What Lynn had just said is now up on the screen, so the Board can see that. As you see on the agenda, this was not put down as an action item, so we can do this by consent. But because it is not actually a management action, if we do need a motion, we can do it as a motion. Is that correct, Toni? Okay, so I guess we can ask the Board first of all if there are comments, questions about this task to the PDT. David Borden.

MR. DAVID V.D. BORDEN: Just a process question. Lynn has put up a good motion. I am happy to support it at the appropriate time. But does this mean that we're only going to limit the tasking to this one item, or will there be opportunities to discuss other ideas?

CHAIR CLARK: I believe that it's up to the Board. We can task further items to the PDT. This is just a start, a first ask. I saw Emerson's hand and Joe's hand.

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MR. EMERSON C. HASBROUCK: I'll try not to disconnect us here today, as I reach for the microphone. I think there is a much bigger issue going on along the coast with menhaden. I know the Work Group was relative to Chesapeake Bay. I know that this discussion is relative to Chesapeake Bay. But I'll give what is going on in New York as another example, and I'm not sure what is occurring in other states.

But in New York, in the past we've had a robust inshore menhaden fishery, and the primary gears for that menhaden fishery in New York are pound nets and beach seines. It is all inshore in the Bays. For several years there the fishermen were doing great, more and more menhaden landed every year.

We were able to take advantage of increasing quota for New York, a very good fishery. Again, it's all inshore, in the Bays, eastern Long Island. The past three years, we've caught far less than a million pounds of menhaden, last year probably even less than a half a million pounds. We all know that the resource is in really good shape.

But sitting here listening to what is going on in the Chesapeake, just reminds me of what is going on in my own backyard in New York, where those fish just aren't coming inshore. They are not available to the gear that typically catches menhaden in New York, again, pound nets and beach seines. We've got no landings.

Something else is going on along the coast. I think we need to keep that in mind going forward here, in terms of perhaps tasking the Technical Committee to do something. I don't think this is an issue particular to the Chesapeake. You know maybe the purse seine issue is particular to the Chesapeake, but put that aside for a minute. Something is going on with menhaden coming to inshore Bay.

CHAIR CLARK: Next up is Joe Cimino.

MR. JOE CIMINO: I raised my hand, because I didn't see in this motion, and maybe it's my rose-colored glasses. I didn't see an amendment or addendum,

so I'm assuming this is more of a white paper that first comes before us? That was my question, but after Emerson's comments, I just have to say that we see the same in New Jersey.

We are having issues with osprey; we are seeing timing issues. I think it's been a similar experience on land as what these fish are experiencing on the water, and on the Mid-Atlantic we're going from 60 degrees to 90 degrees. We went from not seeing any menhaden inshore to, they are suffocating in the lagoons again, and we're seeing large fish kills of menhaden in our lagoons.

My understanding is we had a report about the Senate's budget during Executive Committee that they are looking at doing a study in the Chesapeake Bay, and I appreciate that. But this is a coastwide issue, and I do hope that we can look at this outside of just the Chesapeake Bay. Back to my question, are we talking about a white paper, and if so is that a PDT assignment? Because I don't know that we form PDTs just for white papers.

CHAIR CLARK: Going back to Lynn Fegley on this.

MS. FEGLEY: First, I with respect to my colleague across the table, I understand this is a coastwide issue. We understand that things along the coast are changing. But I want to remind everybody what we see in Table 2 of the Work Group Report, that there is significant effort by a large-scale fishery happening in such a peak area.

The fish were there, but they were not where we are. It's not that the fish weren't coming in the Bay. They came in the Bay and somebody caught them, but they weren't available to us, so it's a little bit of a different issue. I really want to flag that. As for the question about the addendum vs. tasking the PDT. To be perfectly transparent.

In our mind in January, we would absolutely hope that there would be a management document ready for a review. We understand that there was not action on the agenda, so we would really like to tee this up and form a PDT and look at these options, and get it moving, because you know it's a tough spot.

There are fishermen in Maryland, somethings up, but there are menhaden being caught in Chesapeake Bay. That is the disconnect. We have a situation where things are changing along the coast, things are changing in the Bay, but right now, all that aside, we have a fishery that is failing in Maryland, and we would very much like to figure out a way to sort through that.

CHAIR CLARK: To clarify, this would be tasking a PDT to create management options in an addendum, correct? Okay, so we're clear on that. Then we go to Pat Geer. James has reminded me, not technically an addendum, to come up with options. An options paper.

MS. KERNS: For clarity purposes, first of all we don't have a motion on the table. This is a tasking of a group. The agenda did say that we were going to task the Technical Committee. It would be helpful, Lynn, if you could provide some rationale of why you want to use as Plan Development Team versus the Technical Committee. We did have notification that we would be discussing TC taskings.

If the TC isn't the right group to task, then I think it's fair to say you could task another group to do some work. Then whatever that group is doing, is pulling together a white paper to bring back to the Board at the winter meeting. If this Board decides to turn that white paper into something else at a future meeting, between now and the winter meeting, that is your prerogative to do so. But at this time, it's a white paper for winter 2026.

CHAIR CLARK: Just to clarify, what we're talking about here is then rather than a PDT, Toni, you're saying that this should be tasked to the Technical, no they can go to the PDT. But the non-addendum.

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MS. KERNS: Now we need Lynn to provide rationale of why she wanted to use the PDT.

CHAIR CLARK: Okay, Lynn. Clarify everything now.

MS. FEGLEY: Yes, and I should have begun by saying that we left the meeting in the spring with the homework to go home and look at the report and think through how we might want to task the TC, and so that is what we did in Maryland. I walked you through the presentation, and what became abundantly clear is that that is not a technical issue. There is not really anything there that the TC can tell us. This really is a policy decision. It's a policy decision how you manage effort within the Bay.

It's not a scientific one. The data are there; they are available. They were supposed to task somebody. It really isn't something for the TC, so in our minds it would be something for a PDT to do. I hope that provides clarification, and I apologize for not doing that earlier.

CHAIR CLARK: Is everybody clear on that where we're going right now? I had Eric Reid, then I go to Pat.

MR. ERIC REID: Thanks, I'm clear. But I have a little bit of an issue here. I don't have any problem with figuring out harvest, but when there is no fish there is no harvest, that is pretty clear. But we've heard a lot about the quality of the water in the Bay, and we don't know what's going on. Well, in my mind we need to figure out what is going on.

It may not be all that difficult, because there has been a band of cold water that is inshore of the shelf for a couple of years now. I mean not too far offshore surface temperature is 84 degrees, and the bottom temperature is 57 degrees. That cold water blocks a lot of things from coming across the bank.

I would prefer to analyze or look at the environmental conditions that exist now, as opposed to what they used to be, when everything was normal, because there is certainly no normal in the fish business. Before we went down the road of trying to figure out distributing harvest. You have to figure out where those fish are, and where they are not moving to where they would normally be.

They come in the Chesapeake Bay at some time in some quantity, but they are not coming into the Delaware Bay, they are not coming into the Peconic Bay, they are not coming into Narragansett Bay either. Instead of just looking at the Chesapeake Bay, I would like to look at more states on the ASMFC as a group, and figure out what the environmental factors are that are blocking these fish from coming, before we start figuring out harvest.

CHAIR CLARK: I know that those are points that Jeff Kaelin submitted to the supplemental, but I just want to remind everybody that the specific agenda item is directed towards the Chesapeake Bay. These are great points that I think the Board certainly wants to look into, but for right now can we focus on what has been suggested, and on the Chesapeake. I'm going to Pat, and then I've got Nichola.

MR. GEER: I'm going to agree with what was just said and what Emerson said earlier, something is going on. Before we start splitting up a quota and doing different things with it and coming up with another plan, it would be nice to know why these things occur. We don't know. We don't know why the fish are coming later into the Bay or into the other estuaries. The other question I have is, I'm a little uncertain about this whole process, because we didn't have any potential action items on the agenda today. Now we're saying this is not a management action, so we can task a group to look at something. I'm looking at procedurally. We can do this. We can do this without it being an action? I'm trying to make that clear.

CHAIR CLARK: The interpretation that I presented that was correct, Pat, because this is not directly a

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management action, this is actually looking to a group to develop what could possibly be a management action. It's not a fast process, as you know. But because of that it is not the same as a motion that leads directly to a management action. Let Toni explain it better.

MS. KERNS: I think, Pat, it is very clear on the record from what you all discussed at the last meeting that we paused on taking any action, and we were going to come back to this meeting and provide any tasking to the Technical Committee on where to go in the next steps from the Work Group Report.

I would consider this an extension of that Work Group Report, and that Lynn has provided her justification of why she does not want to use the TC and use the PDT. Management Boards on the regular task committees to do things. Sometimes they do it with a motion, and sometimes they don't. But it's not always on the agenda. It is just a white paper that would come back to this Board, and then you would take management actions to turn that white paper into something else.

CHAIR CLARK: It's the magical white paper. We're going to Nichola Meserve and then to Alison Coldon, and then I saw Jeff and then Joe.

MS. NICHOLA MESERVE: I think my process question was answered and satisfactory, a little different than our usual course. But I do support the underlying concept here to consider how menhaden distribution issue is having a particular effect on Maryland, given the geographic location of its fisheries, which is unique to what the rest of the coast may be experiencing in menhaden distribution.

I just want to say that I don't think that idea to task the Technical Committee, it has to be a one or the other here. I do appreciate kind of the timeline here, which would allow for us to also receive the stock assessment at the annual meeting, and see how that plays into this

question, whether it does or not. But I appreciate the extended timeline on this.

CHAIR CLARK: Next up we have Allison Colden.

DR. ALLISON COLDEN: You know I appreciate some of the comments around the table about trying to get to the bottom of what is going on in the Chesapeake Bay and along the coastal shelf. I think it's really important for the long term, but listening to my fellow delegate from Maryland talk about the crisis that our watermen are seeing, I think warrants continuing to explore these options, even as we can task the TC to look into some of these things.

In the long term, yes, it will be important to know why things are changing. It will be important to know if and how we can mitigate any of those stressors on the ecosystem. But we have a crisis here in the Chesapeake Bay, and there is a lot of information in the Work Group Report about the data that we have. But we also had extensive discussions in the Work Group about the data we don't have. I would just encourage folks to look at that report, because we had grand dreams of things that we would like to see and like to explore, with respect to impacts on menhaden availability. But for some of those questions the information is not there. I just want to avoid this Board in those taskings going down a rabbit hole of things that we have already explored through the Work Group, and know that those answers are not currently there.

Then delay action even further for our watermen and our fisheries who are struggling now. As of this meeting, it has been an entire year since we originally brought this concept to the Board, and now we have a process that would take us to the winter of 2026, before we would see a draft document, if this Board were to choose to turn that into an addendum and take action, we're looking at, at least another year. That's another two years that our fishermen are going to have to suffer if we do not continue to go down this road.

CHAIR CLARK: Next, we have Jeff Kaelin.

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MR. JEFF KAELIN: I spoke with you before the meeting started. I just wanted the Board to know that in the queue I have three tasking of tasks also myself, focused on some of the environmental issues we touched on. I would have them in the form of a motion, I'm not ready to make it now, but I just wanted to give everybody a heads up. If it's not a motion, once we're finished with this, I can put those motions up, or just simply task them verbally.

But I do have three motions prepared for consideration whenever we wrap this one up. Personally, I'm okay with the approach being taken here. I understand what's being said there, but I think there are some other mitigating factors that really aren't kind of coast wide is what's touched on. Just when you're ready, Mr. Chairman, I've got those queued up. James has those.

CHAIR CLARK: As the discussion we're having here shows, we have the immediate concern with the Chesapeake, which is what this agenda item is about. But as we've heard from several commissioners already, the problems in the Chesapeake are being replicated up and down the coast. We'll have to as a Board, have a discussion as to whether we want the PDT to look at the bigger picture, or right now just stay focused on the Chesapeake. I had Joe and then Rob LaFrance.

MR. CIMINO: I don't disagree that there is a policy element to this, but I still am worried that we're not getting to the root of this problem. We had our Sciaenids Board and looked at croaker landings. We had our Striped Bass meeting and we saw that if you looked at the harvest reductions for, say Wave 6.

Another species that was supposedly offshore of North Carolina in November and December, you would see that for quite a few years there has been no harvest south of New Jersey. I'm very uncomfortable that we're not approaching this more holistically, and I apologize. I know that there is an issue in the Bay as well, but I

don't understand why we wouldn't still tackle this for everyone.

Yet, at the same time, as Lynn pointed out. The CPUE in the Potomac River has been pretty consistent, so there are still fish moving through. We know that the juvenile abundance for menhaden in the Chesapeake Bay has been good for a couple of years. As Eric pointed out, there is cold water moving, as we saw, some of us saw in the State of the Ecosystem Report that we're seeing colder waters right now. I hope there is a lot to look at. It's not necessarily that I am opposed to this motion, I just wish it was more encompassing.

CHAIR CLARK: Perhaps there should be a dual track we're looking at here, maybe this would go to the PDT and we ask the Technical Committee to look at some of these bigger issues. Go to Rob LaFrance.

MR. ROBERT LaFRANCE: Chairman Clark, that was sort of exactly what I was going to say. Some of the issues are in fact technical, and some of them are in fact policy. My sense of this, what we're looking at in this particular motion is a logical expansion of what our Work Group Report was about.

We were exploring the options available for management, and for management maybe in a precautionary way. I think because of the urgency that we're seeing in the Bay, it is important to have those options available to us, so we can take action. That's not to take away from what Jeff Kaelin and others are talking about, in terms of science.

I heard about the science. I think there are some significant issues we need to understand. But we should also be prepared, and I think that's the purpose of this. We should be prepared for actions that are precautionary if needed, and I think that is the real reason to try and push this forward. Thank you.

CHAIR CLARK: Thanks, Rob, I'll try not to read your mind again. Why don't we do this, if the Board is willing. Why don't we see if we can get the consensus about this, and then we'll move on and talk about tasks for the TC that look at the bigger

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picture, if the Board is willing to consider that. Does that sound like a path we can take right now? I see one objection there from Pat.

MR. GEER: Well, my concern with developing a Plan Development Team would be that obviously we would need representation from Virginia, and you all know I am retiring, and Shanna Madsen, who is much better and a much more informed person on menhaden, is leaving the Agency as well. We may not have somebody who could sit on this, who has history and expertise. Thanks, Pat, and Toni, did you have something?

MS. KERNS: I guess, Pat, I would ask you, how long would it take Virginia to find a person to sit on a group that would be looking at this? Obviously, we may start some work between now and the annual meeting, but it would probably be very little. Most of the work would get done after the annual meeting moving forward for this, Pat. Would you be able to get somebody?

MR. GEER: I couldn't even begin to guess, I mean it's the state, you don't fill positions over night, it takes time.

CHAIR CLARK: Pat brings up a practical problem for Virginia, with PDT, but at the same time, hopefully that is not an insurmountable problem. For this Board to consider this non motion for a non-addendum, can we by consent ask the PDT to move forward with this, or if there are objections, I guess we will have to do it in the form of a motion. Are there objections to this tasking? Eric Reid, and I see a couple of objections there. Lynn, would you want to make this as a motion?

MS. FEGLEY: Yes, Mr. Chair, I would like to turn this into a motion. I just want to repeat that while I really appreciate the comments, and I understand and I hope that we do get to some tasking around the environmental conditions. This is a very distinct fishery problem that fish are in the Bay, as is noted in Table 2, because the effort is in the Bay, and that effort, by the

way, is occurring if you look at Figure 7 in the Work Group Report.

A lot of that effort is pretty much setting on the Maryland state line. Again, I am not saying this is an intercept fishery, but I'm saying that the conditions are changing in such a way that we are having a real fishery problem in Maryland, and it's not just about Maryland. This is about estuarine ecosystem that supports the coast.

With that; I move to task a Plan Development Team to develop options for distributing harvest of the Chesapeake Bay reduction cap more evenly throughout the Chesapeake Bay reduction season in order to mitigate potential effort bottlenecks that may be impacting other Bay small scale fisheries as well as the Bay ecosystem. The intent is for a draft document to come before the Board at the Winter 2026 Meeting.

CHAIR CLARK: Thank you, Lynn, for reading that into the record, and we have a second from Mel Bell. We have a motion and a second, and Toni has informed me that we need to take a five-minute break to work a few things out here, so it would be a good time to caucus also. Let's get back at 9:33.

Okay, we want to get started again here, we're already running late, so will everybody that will be possibly voting please return to the table. We've had a lengthy break here, does anybody need more time to caucus? Not seeing any, let's call the question. **Can we have all those who are in favor of this motion, please raise their hands.**

MS. KERNS: I just accidentally put a commissioner's hand down on the webinar, so if that Commissioner could put their hand back up. Thank you, **Chris. North Carolina, Rhode Island, Massachusetts, Connecticut, New York, Pennsylvania, Florida, Georgia, South Carolina, Potomac River Fisheries Commission, Maryland, Delaware, Maine, New Hampshire.**

CHAIR CLARK: All right, and all those opposed.

MS. KERNS: New Jersey and Virginia.

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CHAIR CLARK: Any abstentions?

MS. KERNS: Fish and Wildlife Service and NOAA Fisheries.

CHAIR CLARK: Any null votes, not seeing any. What is the tally? We have 14 yeas, 2 no, and 2 abstentions. The motion carries. As we said next, we have more ideas for the TC, but before we go to that, David Borden asked me if he could bring up some process questions here.

MR. BORDEN: This is just a process concern. I'm concerned about the amount of time that we have to deal with this, and I wouldn't want to see us rush into making decisions on alternatives with a lack of time to discuss it. A number of people around the table have already said that they want to offer motions.

I guess to you, Mr. Chairman, the question is, do we do it now and run way over the timeline, or do we set some time aside, adequate time at the next meeting and say, anyone that has any other ideas can bring those forward at that time, and there will be time for everyone to weigh in on the pros and cons of the strategy. I myself would like to see some kind of time area discussion, and I'm sure there are others that have different strategies.

CHAIR CLARK: That's a great point, David, especially as the Board was asked to look into options or ideas specific to the Work Group's Report, and we are, as has been brought up here, talking about other items too. Let me ask the Board if we would want to pursue right now, as we are already running beyond the time limit of this meeting, to start getting into tasks for the Technical Committee, or as David suggested, wait for the next meeting or possibly some process where we could send ideas to James for this. What does everybody think? I see Spud Woodward.

MR. SPUD WOODWARD: I think we should postpone it. I think we need a little time to sort

of react to the decision we made today, because I think that next conversation might consume more time than we've already spent on this one. I think to be respectful of our schedule, because I know folks have to fly out today and we still have a pretty good agenda for a Policy Board, so I would support that.

CHAIR CLARK: Jeff.

MR. KAELIN: I did my homework and I have three motions. I'll listen to the Board and set it aside. I've been sending information around for the last month, getting ready for this today. It's based on science, it is not based on policy, which I didn't think we were going to get into today. Obviously, that motion just was approved.

But I'll set it aside. For the people around the table look at Page 284 of the supplemental materials. You will see my July 25th letter to Katie and others, and also letters, e-mails from Woods Hole and NOAA on some of this environmental stuff. I also have two other motions on birds and other environmental effects in the Chesapeake Bay. But I will hold them, and I'll be ready to come in the next time and put them up on the Board, and we take time for it.

CHAIR CLARK: I tell you what, Jeff, since you have done your homework, maybe you can e-mail those to James, and James can send them to the Board in advance, so people can see what you're getting at there, and so we could go from there.

MR. KAELIN: That's already been done, Mr. Chairman.

CHAIR CLARK: Okay, thank you, and then I see Matt Gates.

MR. MATTHEW GATES: I was just going to offer an alternative, is if we could put the motions up now so the Board could see them, and then postpone them until next meeting. Just an option, because I haven't seen what he's talking about.

CHAIR CLARK: Go ahead, Jeff.

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MR. KAELIN: In the interest of time, I appreciate that, Matt, but in the interest of time, I think if they get sent around that would satisfy me today, given the timeframe. We all need to get out of here at some point this morning, in the interest of that I will set those aside.

CHAIR CLARK: Thanks Jeff, thanks, Matt, and Bob.

EXECUTIVE DIRECTOR ROBER E. BEAL: Just a couple quick comments, and of course it's obviously up to the Board. But just controlling expectations, which is very important. You know the timeline that was in the motion that was just passed by the Board, contemplates bringing something back, a product back at the annual meeting, I'm sorry, at the winter meeting next year, January/February of 2026.

If an addendum was started hypothetically at that meeting, it could not be wrapped up in time to affect the 2026 fishery. It takes a few meeting cycles to do that. Regardless of if you hash out more things today or you hash them out at the annual meeting. I think the first year that the fishery could be affected under the normal addendum process would be 2027.

Doing it today or doing it at the annual meeting, I think the ultimate implementation of changes would be the same, which would be the 2027 fishery. Then another thought. Without seeing Jeff's motions, I think as the complexity of these requests' increases, the Plan Development Team that has not yet been formed, may not be the right group to do this.

You know some of these large-scale ecosystem questions on "what is going on along the east coast", and all these changes we're seeing in the Bay, and through New Jersey and New York and other areas we've heard about. The PDT may not be the right group to do that, so we're going to think about that.

CHAIR CLARK: Bob, I think we had already discussed having the TC look at the, that's why I separate the two things out and have the TC look at the next set of ideas for the coastwide technical situation.

EXECUTIVE DIRECTOR BEAL: Yes, and a TC won't be really available until after the annual meeting. They are wrapping up the stock assessment and ecological reference points. Just again, controlling expectations and letting folks know the timing of some of these issues.

CHAIR CLARK: Just taking on that Bob, the timing wise, so the TC will be freed up, I guess, after the annual meeting. If this Board then brought forward these tasks for the TC at the annual meeting, that would work for them to then start considering these.

EXECUTIVE COMMITTEE: Yes, that seems fair.

CHAIR CLARK: Okay, sounds good. Is the Board all satisfied with that path forward? Okay, not seeing any objections to that, we will consider that item wrapped up for now then, and we will move on to Item 5, which is a progress update on the 2025 Ecological Reference Point Benchmark Stock Assessment, and I'll turn that over to Katie Drew.

PROGRESS UPDATE ON 2025 ECOLOGICAL REFERENCE POINT BENCHMARK STOCK ASSESSMENT

DR. KATIE DREW: Thank you, Chair, I'll keep this very brief. We have completed the assessment and submitted all of the materials to SEDAR. The peer review is next week, Tuesday through Friday. There will be a webinar option if people would like to listen in, and the link for that is on the ASMFC calendar, as well as on the SEDAR website.

You can find that information there. The natural mortality issue that we discussed at our last meeting that I presented on, will be peer reviewed on that first day, so I know that has been a topic of a lot of interest. That will be covered on the first day, if people would like to listen in to that. I'm

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happy to take any questions, but I think we'll have a lot more to tell you in October.

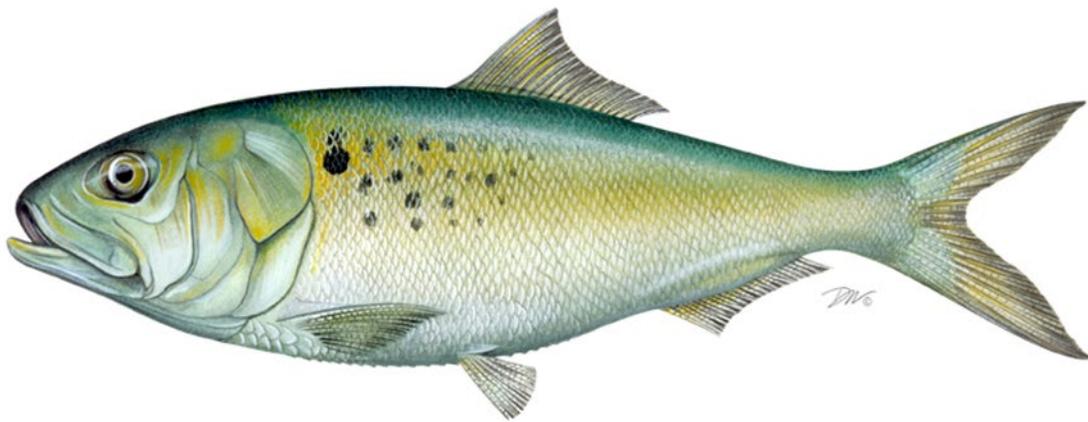
ADJOURNMENT

CHAIR CLARK: Any questions for Dr. Drew?
Okay, not seeing any, then we move on to Other Business. Is there any other business to come before this Board? Not seeing any, then I believe we can adjourn, and thank you, everybody.

(Whereupon the meeting adjourned at 9:43 a.m. on Thursday, August 7, 2025)

Atlantic States Marine Fisheries Commission

2025 Atlantic Menhaden Stock Assessment Update



Sustainable and Cooperative Management of Atlantic Coastal Fisheries

Atlantic States Marine Fisheries Commission

Atlantic Menhaden Stock Assessment Update

Prepared by the

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EXECUTIVE SUMMARY

The purpose of this assessment was to update the 2020 Atlantic Menhaden Single-Species Benchmark Stock Assessment (SEDAR 2020a) and recent stock assessment update (ASMFC 2022) with data from 2022-2023. The stock assessment update reran the peer-reviewed Beaufort Assessment Model (BAM) with a terminal year of 2023.

As part of the assessment process, the Atlantic Menhaden Stock Assessment Subcommittee (SAS) identified an error in the publication used to estimate the natural mortality rate used in the assessment. The SAS developed a revised estimate of M to use in the base run of the assessment, which was lower than the estimate used in the 2020 benchmark. This resulted in a lower estimate of biomass and fecundity and a higher estimate of fishing mortality over the time-series compared to the previous assessment update.

The ecological reference points (ERPs) for Atlantic menhaden were updated and refined through the 2025 ERP Benchmark Assessment (SEDAR 2025), and the new estimates of ERPs were used to evaluate stock status in this update.

Landings

The Atlantic menhaden commercial fishery has two major components, a purse-seine reduction sector that harvests fish for fish meal and oil and a bait sector that supplies bait to other commercial and recreational fisheries. The first coastwide total allowable catch (TAC) for commercial landings of Atlantic menhaden was implemented in 2013 and has changed in value depending on the most recent stock assessment and management document. Incidental catch and recreational harvest are not counted toward the TAC. The current TAC for the 2023 – 2025 fishing seasons is 233,550 mt. Reduction landings have been steady since the implementation of the TAC, while bait landings have increased, particularly in the northern states. For 2022-2023, reduction landings comprised about 70% of the coastwide landings. In 2023, bait and recreational landings were approximately 50,000 mt and reduction landings were approximately 131,800 mt.

Indices of Relative Abundance

The juvenile Atlantic menhaden index developed from 16 fishery-independent surveys showed the highest young-of-year abundance occurred during the 1970s and 1980s. Abundance has been lower since the 1990s with some moderate increases in the mid-2000s, 2016, and 2021-2023.

Three coastwide indices of adult abundance were developed from eight fishery independent survey data sets: northern (NAD; age-2+), Mid-Atlantic (MAD; age-1+), and southern (SAD; age-1) adult indices. The NAD indicated that age-2+ relative abundance has been variable, but abundance was high in 2012 and 2019-2022 before declining again in 2023. The MAD showed high relative abundance in the late 1980s and then variable abundance with peaks in recent years, including 2022 before declining again in 2023. The SAD indicated that age-1 abundance was high in 1990 and then declined through the 1990s. Abundance peaked again in 2006 and then remained variable with low abundance in the terminal years.

Fishing Mortality

Highly variable fishing mortalities were noted throughout the entire time series and are dependent upon fishing and management policies, as well as stock biomass. The fishing mortality rate was highest in the 1970s and 1980s and has been relatively stable since the early 2000s.

Biomass

Age-1+ biomass has fluctuated over time with a time-series high in 1959 and a time-series low in 1973. During the 1990s, age-1+ biomass increased and has remained relatively stable over the past decades.

Fecundity

Population fecundity (i.e., number of maturing ova), used as a measure of spawning potential, was highest in the early 1960s, low in the 1970s and 1980s, and high again from the 1990s to the present. The largest values of population fecundity were in 1955, 1961, and 2012. Fecundity estimates have been declining since the high in 2012.

Stock Status

Based on the current definition of the ERPs used in management, as updated by the 2025 ERP benchmark assessment, the Atlantic menhaden population is not overfished and overfishing is not occurring. Fecundity was below the target but above the threshold, while the fishing mortality rate was above the target but below the threshold value.

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INTRODUCTION

This Terms of Reference (TOR) report describes the update to the single-species benchmark stock assessment for Atlantic menhaden (SEDAR 2020a). The benchmark was updated in 2022 (ASMFC 2022) to extend the fishery-independent and -dependent data for Atlantic menhaden through 2021, rerun the peer-reviewed Beaufort Assessment Model (BAM), and determine stock status of Atlantic menhaden using the ecological reference points (ERPs) defined in SEDAR (2020b) and accepted for management use in 2020. This update further extends the data, model, and assessment through 2023. This update includes a revised estimate of M , which was peer-reviewed through the concurrent 2025 ERP Benchmark Assessment, and uses ERPs based on the Board's definition of the ERP target and threshold, as updated and refined through the 2024 ERP Benchmark Assessment, to determine stock status.

TOR 1. Fishery-Dependent Data

Update fishery-dependent data (landings, discards, catch-at-age, etc.) that were used in the previous peer-reviewed and accepted benchmark stock assessment.

The commercial reduction, commercial bait, and recreational landings time series were extended from the previous assessment (SEDAR 2020a; ASMFC 2022) through 2023, along with the associated age compositions from the reduction and bait fisheries. For use in the BAM, landings were split into northern and southern regions as defined by waters north and south of Machipongo Inlet, Virginia, where the Chesapeake Bay is in the southern region.

Reduction landings were provided by the NOAA Fisheries Beaufort Lab. Reduction landings in the southern region have been increasing since the last assessment update while the northern reduction landings were decreasing. Southern landings are consistently larger than those in the north (Figure 1). Total reduction landings in 2023 were 131,800 mt.

Bait landings from 1955-1984 were compiled from historic records and considered incomplete, whereas bait landings for 1985-2023 were validated with the states by the Atlantic Coastal Cooperative Statistics Program (ACCSP). Bait landings in the north increased in recent years and were over twice as much as bait landings in the south for the last four years (Figure 2). Total bait landings were relatively constant for 2019-2022, averaging 57,140 mt, but decreased in 2023, in both the north and south, to 48,550 mt.

The Marine Recreational Fisheries Statistics Survey (MRFSS, 1981-2003) and the Marine Recreational Information Program (MRIP, 2004-2023) data sets were used to derive a time series of recreational landings of Atlantic menhaden. The uncertainty associated with recreational estimates for Atlantic menhaden is high and the landings are variable but have increased approximately 2-3 times in the last decade compared to earlier years. (Figure 3). For use in the BAM, recreational harvest, which comprises less than 1% of coastwide harvest, was added to the bait landings.

Coastwide reduction landings have remained relatively steady since 2000 with bait landings increasing over time, comprising 27% of coastwide landings in 2023 (Figure 4).

Commercial reduction and bait catch-at-age matrices were developed from the available biological data collected in each fishery by region. Age proportions of the bait catch were applied to the MRIP estimates of recreational catch and pooled with the bait catch-at-age.

See Appendix for supplemental tables (Table A1 – Table A5) for TOR 1.

TOR 2. Fishery-Independent Data

Update fishery-independent data (abundance indices, age-length data, etc.) that were used in the previous peer-reviewed and accepted benchmark stock assessment.

Sixteen fishery-independent surveys from Rhode Island to South Carolina were used to develop young-of-year (YOY) abundance indices, which were then combined into a coastwide index of relative YOY abundance using the Conn method (Conn 2010; Table 1). Eight fishery-independent surveys from Connecticut to Georgia were developed into age 1+ abundance indices and were combined into three regional adult surveys: a northern adult index (NAD), a Mid-Atlantic adult index (MAD), and a southern adult index (SAD). Several surveys were affected by the COVID-19 pandemic and had no or limited sampling in 2020 and 2021 (Table 1).

The coastwide YOY index of relative abundance for Atlantic menhaden indicated high abundance in the 1970s and 1980s, with declines through the 1990s before stabilizing at pre-1970s levels (Figure 5). YOY abundance remained low but there was a slight increase in the terminal years of 2021-2023. The NAD index predicted variable abundance throughout the time series with high abundance occurring in the recent years of 2019-2022 before declining again in the terminal year of 2023 (Figure 6). The MAD index predicted higher than average abundance in the beginning of the time series followed by a lower but variable abundance through the late 1990s-early 2010s (Figure 7). Abundance in the Mid-Atlantic region began to increase in the mid-2010s but then decreased and was variable through the terminal years with 2020 representing a time series low. Abundance increased in 2021-2022 but declined in 2023. The SAD index predicted high abundance in 1990 followed by low abundance through the mid-2000s (Figure 8). The index peaked again in 2006 but then decreased and was variable through the terminal year. The terminal years of 2022-2023 both indicated relatively low abundance in the region.

For the adult indices, length compositions were developed by combining data from each of the surveys and weighting the data by the inverse of the squared sigma values outputted from the Conn method.

An index of Atlantic menhaden spawning biomass was developed using larval abundance data collected from two regional ichthyoplankton surveys (MARMAP and EcoMon; Figure 9). The index increased in the last few years to an EcoMon time series peak in 2019, after which it started to decline again. The index was updated through 2022, although data from 2021 were not available due to COVID. This index was included in the base run of the assessment model in SEDAR 2020a but was excluded from the 2022 update and this update's base run due to issues with model fitting (ASMFC 2022).

See Appendix for supplemental tables (Table A6 – Table A7) and figures (Figure A1- Figure A4) for TOR 2.

TOR 3. Life History Information and Model Parameterization

Tabulate or list the life history information used in the assessment and/or model parameterization (M, age plus group, start year, maturity, sex ratio, etc.) and note any differences (e.g., new selectivity block, revised M value) from benchmark.

Tabulated life history information and model inputs can be found in Table 2. The benchmark assessment was updated with all available data through the terminal year of 2023. The same time blocks for catch selectivity estimations used in SEDAR 2020a were used in this update. Since the last assessment (SEDAR 2020a), the fecundity information was updated by the Virginia Institute of Marine Science (R. Latour and J. Gartland, VIMS, unpublished data; Latour et al 2023) using the same methods as was used for the benchmark.

Three changes were made to the updated run from the benchmark assessment during the 2022 assessment update which were carried through to this update:

1. Censoring of the MARMAP/EcoMon (MARECO) ichthyoplankton index;
2. Censoring of the commercial bait south age compositions for 2020;
3. The inclusion of penalties on some of the selectivity parameters that were hitting bounds during the estimation process.

These changes to the assessment update were considered thoroughly during the last assessment update and were discussed thoroughly in that documentation (ASMFC 2022). Briefly, the quality and quantity of data during the COVID-19 pandemic years caused some problems with estimation of parameters and the determination of year-class strength (recruitment). This update assessment retained the same method of recruitment estimation as used during the benchmark assessment. There is no formal stock-recruitment structure, rather median recruitment is estimated along with annual recruitment deviations from that median for the duration of the time series.

The only new change for this update assessment is the inclusion of a new vector of natural mortality based on a revised analysis of the historical tagging data that was completed by the M Working Group. The 2020 benchmark assessment used the estimate of M from Liljestrand et al.'s (2019) analysis of the tagging data to scale the Lorenzen (1996) curve of M-at-age, assuming that the M estimated from the tagging data represented the M for age-1.5 menhaden, based on the size of the tagged fish. During the 2025 benchmark assessment process, Ault et al. (2023) submitted a working paper to the Atlantic menhaden SAS and the Ecological Reference Points Work Group (ERP WG) that re-analyzed the historical tagging data and produced an estimate of $M = 0.56$, significantly lower than the $M = 1.17$ reported by Liljestrand et al. (2019).

However, Ault et al. (2023) had used a different subset of the data and a different approach to handling key parameters, which made direct comparisons with Liljestrand et al. (2019) difficult. The SAS formed a working group to review the datasets and methods in consultation with the primary authors to determine the best estimate of M for use in the Atlantic menhaden stock assessment. The M WG and SAS determined that the main cause of the difference in the M estimates was the handling of the magnet efficiency parameter, which was equivalent to the

tag reporting rate in conventional tagging models. The M WG and SAS found that Liljestrand et al. (2019) had overestimated the magnet efficiency rate in their analysis, but did not agree with the stepwise estimation approach proposed by Ault et al. (2023) to estimate this parameter. In the end, the M WG and SAS recommended a revised estimate of $M = 0.92$ from the tagging study, based on the corrected magnet efficiency rate and updated effort and landings datasets, which was lower than the value used in the 2020 benchmark, but higher than the value estimated from Ault et al.'s (2023) method. This revised estimate of M was used to scale the Lorenzen (1996) curve to develop M -at-age estimates so that the estimate of M -at-age for age-1.5 was equal to the estimate from the tagging model, based on the size of the tagged fish, as was done for the benchmark (Table 2). The estimate developed using the Ault et al. (2023) stepwise approach was used as a sensitivity run (Table 2). See the working paper SEDAR 102 WP-01 for a full description of the data, methods, and M WG findings. The revised estimate of M was peer reviewed through SEDAR 102, as part of the ERP Benchmark Assessment.

TOR 4. Updated Beaufort Assessment Model

Update accepted model(s) or trend analyses and estimate uncertainty. Include sensitivity runs and retrospective analysis if possible and compare with the benchmark assessment results. Include bridge runs to sequentially document each change from the previously accepted model to the updated model.

In order to bridge from the benchmark assessment to the current updated assessment with the new M vector, we provided bridging runs including the benchmark assessment, the 2022 update assessment, and this update assessment both with the old natural mortality vector and the new vector.

In general, the updated base run assessment is similar to the 2020 benchmark assessment, the 2022 update assessment, and the continuity run for this assessment with main differences being in the scale of this assessment given the difference in the scale of natural mortality. Generally, the trends over time are similar across metrics, and the largest change is in the estimation of mean recruitment from the time series, which is an expected change. The model fit well to the landings for all four fleets. In general, the patterns in the age compositions were random and did not exhibit any patterning. The fits to the indices were similar to the fits during the benchmark assessment and did not have runs in residuals. The fits to the NAD and MAD length compositions were also similar to the fits during the benchmark assessment. Selectivity for the fisheries and the indices were similar to the last assessment.

The fishing mortality rate (F) increased slightly in 2022 and then decreased again in 2023 and has been relatively stable since 2000 (Figure 10). The recruitment classes for 2022 and 2023 appear to be slightly larger than average over the last two decades (Figure 11). However, the model does have difficulty estimating year-classes in the terminal year of the model, as evidenced by the 2022 update to the benchmark assessment. Age-1+ biomass increased slightly during the last two years but is still below average for the last few decades (Figure 12). Finally, fecundity has been stable during the most recent years (Figure 13).

A sensitivity run was completed to show how an alternative natural mortality estimate impacted assessment outcomes. In general, natural mortality is one of the components in stock

assessments that is the most uncertain. However, in the case of Atlantic menhaden the SAS has an extensive tagging study that addressed many assumptions for use in estimating the scale of natural mortality.

The sensitivity run with the lower values of M estimated by Ault et al. (2023) resulted in very similar fits to all of the indices of abundance. The largest differences between the base run and the sensitivity run with the lower M values were the estimates of the recruitment time series and the full fishing mortality rate time series, both of which scaled with assumptions about natural mortality. In general, natural mortality scales an assessment, along with landings, to give an indication of the overall mortality, Z , and thus the fishing mortality. In addition, the recruitment estimates will also scale to the appropriate level associated with the anticipated mortality rates and the catch levels. One interesting response for this sensitivity run compared to the base run was that the geometric mean fishing mortality rate was the same for both runs from the 1990s to the present. This occurred because the geometric mean fishing mortality rate is focused on age-2 to -4, and the proportion of older aged individuals was increasing in the population causing reduced fishing mortality for older ages, which was in line with the base run values.

A retrospective analysis was also completed for the update assessment. A series of runs were done removing the terminal year data in sequence. The update assessment had a terminal year of 2023, and the retrospective analysis was run back through a terminal year of 2018. Overall, the retrospective runs fall within the uncertainty bounds from the uncertainty analysis. The fits to the indices for the retrospective runs are very similar to the base run. All of the retrospective plots have good overlap in the estimated historical values across fishing mortality, fecundity, and recruitment. In general, the recruitment retrospectives did a good job estimating terminal year recruitment values, especially 2022 and 2021, which were the values estimated in the base run with the terminal year of 2023. The geometric mean fishing mortality rate and the fecundity values were generally estimated close to the base run, but the terminal geometric mean fishing mortality was generally lower in all years of the retrospective than the base run while fecundity was generally higher.

A Monte Carlo bootstrap (MCB) uncertainty analysis was completed as was done for the last benchmark assessment. The configuration was kept exactly the same with uncertainty in natural mortality and fecundity. The range of uncertainty surrounding natural mortality was updated to reflect the tagging reanalysis. Specifically, the range of natural mortality estimates for age-1.5 was [0.83, 0.97]; the Lorenzen curve for the age-varying M for each run was rescaled to the estimate of age-1.5 M drawn for that run. A total of 5,000 runs were completed. Some runs were excluded due to large gradients, leaving 4,734 MCB runs for analysis. Overall, the uncertainty was much narrower for all the metrics of interest when compared to the last update assessment and the benchmark assessment. During the benchmark and update assessments, the MCB analyses provided outcomes that were bimodal in nature. With this update, that bimodality was reduced substantially.

See Appendix for supplemental tables and figures for TOR 4: model fits to landings (Figure A5 - Figure A8) and associated age comps (Figure A9 - Figure A16), model fits to indices (Figure A17 - Figure A20) and associated length comps (Figure A21 - Figure A24), estimated selectivities

(Figure A25 - Figure A30), model estimated F , recruitment, biomass, and fecundity (Figure A31 - Figure A38), bridge runs (Figure A39 - Figure A46), sensitivity runs (Figure A47), and the retrospective analysis (Figure A55 - Figure A62).

TOR 5. Stock Status

*Update the biological reference points or trend-based indicators/metrics for the stock.
Determine stock status.*

The Atlantic Menhaden Management Board (Board) adopted ERPs in Amendment 3 to account for menhaden's ecological role as a forage species. Thus, stock status is determined using ERPs. The 2025 ERP Benchmark Assessment incorporated the revised estimate of M into the ERP models and re-estimated the ERP F target and F threshold using the new ERP model and the definitions adopted by the Management Board in 2020. The ERPs from the 2025 Benchmark Assessment are lower than the ERPs developed through the 2020 benchmark assessment and used in the 2022 menhaden single-species update (Table 3), due to both the change in M for the single-species model and the refinements made during the 2025 benchmark process (SEDAR 2025). The 2025 ERP Benchmark Assessment provides a tool for the Board to use to evaluate tradeoffs in their goals and objectives for Atlantic menhaden. Thus, stock status may change if the Board chooses a different definition of the ERPs going forward.

Using the current definition of the ERP benchmarks, as re-estimated by the 2025 ERP Benchmark Assessment, the Atlantic menhaden population is not overfished and overfishing is not occurring (Table 4). The fishing mortality rate for the terminal year of 2023 is below the ERP threshold and above the ERP target ($F_{2023}/F_{ERPThreshold} = 0.56$; $F_{2023}/F_{ERPTarget} = 1.69$; Figure 14), and the fecundity for the terminal year of 2023 is above the ERP threshold and but below the ERP target ($FEC_{2023}/FEC_{ERPThreshold} = 1.05$; $FEC_{2023}/FEC_{ERPTarget} = 0.71$; Figure 15). Therefore, overfishing is not occurring and the stock is not overfished (Table 3).

The uncertainty in the stock status was evaluated through the MCB analysis. The terminal year F was below the ERP threshold for all of the MCB runs (Figure 16) and the terminal year fecundity was above the ERP threshold for 77% of the runs (Figure 17). The SAS does note that each MCB run was not run through the ERP's Northwest Atlantic Coastal Shelf Model of Intermediate Complexity for Ecosystems (NWACS-MICE) model, thus the benchmark comparisons were to those from the base run. The MCB plots are not internally consistent for each run, but do give an idea of the uncertainty related to the ERP benchmarks, which agrees with the base run stock status determinations.

TOR 6. Projections

Conduct short term projections when appropriate. Discuss assumptions if different from the benchmark and describe alternate runs.

Short-term projections at the current Total Allowable Catch (TAC) of 233,550 mt were provided (Figure 18). Under a constant TAC of 233,550 mt, F will be between the F target and the F threshold, with a 4% probability that F will be above the ERP F threshold and a 100% probability

that it will be above the F target in 2028 (Table 4). Further projections based on the Board's requests were conducted after the Peer Review and provided in Appendix 1.

The projections have the same methods and assumptions as those run for the benchmark assessment. It is important to note that uncertainty is accounted for in the projections. Additionally, during the benchmark (SEDAR 2020a), the SAS used a new procedure for recruitment in the projections. Instead of assuming a static median value for recruitment, as is done for many assessment projection methodologies, recruitment was projected using nonlinear time series analysis methods (Deyle et al 2018). Specifically, projections were based on the MCB runs, which allows recruitment to change from year to year in the projections based on how recruitment has changed in the past under similar conditions. Thus, uncertainty is recognized in the recruitment time series, and the methods used for projections adequately accounted for that uncertainty using the best scientific methods available. However, the Board should still consider these uncertainties in the context of risk when using the projection information for management.

TOR 7. Research Recommendations

Comment on research recommendations from the benchmark stock assessment and note which have been addressed or initiated. Indicate which improvements should be made before the stock undergoes a benchmark assessment.

All research recommendations from SEDAR 2020a and 2020b remain important to the continued assessment of Atlantic menhaden, including those updated in this section. Please refer to the appendices at the end of this report for the complete list.

A long-standing research recommendation for Atlantic menhaden is to develop and implement a multi-year coastwide fishery-independent survey. It was noted in SEDAR 2020a that even area-specific surveys could provide substantial improvements over the indices currently used in the assessment. Pilot studies combining hydroacoustics and aerial or trawl surveys have been conducted successfully in Chesapeake Bay and mid-Atlantic ocean waters (e.g., Wilberg et al. 2020; Nesslage et al. 2024). However, no funding has been secured for long-term implementation of these projects.

Despite the research recommendation to continue the current level of sampling from the fisheries, some sampling was reduced or temporarily discontinued due to the COVID-19 pandemic. However, sample sizes have returned to pre-pandemic levels in the years since the 2022 assessment update. The TC is planning to meet this summer to evaluate the adequacy of the current bait sampling requirements for the states.

In preparation for shifting ageing responsibilities to the states, ASMFC coordinated an age exchange in 2023 – 2024, with the final report due in 2025. During the exchange, 65 paired scale and otolith samples and 11 scale-only samples were read by staff from 12 states and the NOAA Beaufort lab. True age was not known for any of the samples, so comparisons only provide information on variability among users. Preliminary results indicate that precision was generally low across labs and structures, and bias was commonly detected, likely due to the fact that many of the participating labs do not regularly age menhaden. ASMFC is scheduling a

follow-up meeting to review results and discuss ways to improve precision among partners before fully transitioning bait ageing to the states.

Although a seasonal and spatially-explicit model has not been developed, the SAS has recently completed a thorough review of data from an extensive mark-recapture study conducted by the NOAA Beaufort lab during the late 1960s that could provide insight into age-specific movement patterns needed for such a model (see SEDAR 102 WP-01 for more details on the dataset and estimated movement patterns).

During the next benchmark stock assessment process (scheduled for 2031), the SAS recommends that the MARECO index still be considered for inclusion in the model, but further investigation is necessary. One option the SAS could consider is using nonlinear relationships between q and the MARECO index. Additionally, the SAS recommends that ACCSP continues to work with the states to validate bait landings and resolve the transition in the time series from pre-1985 bait landings in the northern region.

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TABLES

Table 1. Fishery-independent surveys included in the coastwide young-of-year (YOY) and regional adult Atlantic menhaden abundance indices (Northern Adult Index, NAD; Mid-Atlantic Index, MAD; Southern Adult Index, SAD).

Conn Index	Fishery-Independent Survey (years of data)	Months	Length
NAD	CT LISTS (1996-2009, 2011-2019, 2021-2023)	Sept-lagged Jan	1990-2023
	DB Adult Trawl (1990-2023)		
	NJ Ocean Trawl (1990-1997, 1999-2019)		
MAD	MD Gill Net (1985-1995, 1998-2002, 2005-2023)	March-May	1985-2023
	VIMS Shad Gill Net (1998-2023)		
SAD	NC p915 (2008-2019, 2021-2023)	April-July	1990-2023
	SEAMAP (1990-2019, 2022-2023)		
	GA EMTS (2003-2023)		
YOY	RI Trawl (1990-2023)	Varies by survey	1959-2023
	CT LISTS (1996-2009, 2011-2019, 2021-2023)		
	CT River Alosine (1987-2023)		
	CT Thames River Alosine (1998-2016)		
	NY Juvenile Striped Bass Seine (2000-2023)		
	NY Peconic Bay Trawl (1987-1988, 1990-1992, 1994-2007, 2009-2023)		
	NY WLIS Seine (1986-2023)		
	NJ Ocean Trawl (1990-2019)		
	NJ Striped Bass YOY Seine (1986-2019, 2021-2023)		
	DB Inner Bays (1986-2023)		
	MD Coastal Trawl (1972-1992, 1994, 1998-2023)		
	MD Juvenile Striped Bass (1959-2023)		
	VIMS Juvenile Trawl (1990-2023)		
	VIMS Striped Bass Seine (1968-1972, 1980, 1982, 1985-2023)		
	NC p120 (1989-2023)		
SC Electrofishing (2001-2023)			

Table 2. Model structure and life history information used in the stock assessment.

	Value(s)
Years in Model	1955-2023
Age Plus Group	6+
Fleets	4 (north and south regions for bait and reduction fisheries)
Fecundity	Time-varying fecundity-at-age
Natural Mortality	Age-varying natural mortality scaled to tagging based estimate, revised for 2025
Maturity	Time-varying maturity-at-age based on length-at-age
Sex Ratio	Fixed at 1:1 for males:females

Natural Mortality	Age Group						
	0	1	2	3	4	5	6+
2020 Benchmark	1.76	1.31	1.03	0.9	0.81	0.76	0.72
2025 Update Base Run	1.39	1.03	0.82	0.71	0.64	0.60	0.57
2025 Update Sensitivity	0.71	0.52	0.42	0.36	0.33	0.30	0.29

Table 3. Ecological Reference Points for F and fecundity used in the 2022 and 2025 single-species updates. Fecundity is in billions of eggs.

	F		Fecundity	
	Target	Threshold	Target	Threshold
2022 Update	0.19	0.57	2,003,986	1,492,854
2025 Update	0.15	0.46	1,758,288	1,184,339

Table 4. Stock status based on fishing mortality (F) and fecundity (FEC) ecological reference points (ERP targets and thresholds) from the 2025 ERP assessment and terminal year values from the base run of the BAM for the stock assessment update. Fishing mortality is the full fishing mortality. Fecundity is in billions of eggs.

Reference Point	ERP Value	2023 Value	Stock Status
$F_{THRESHOLD}$	0.458	0.26	Not Overfishing
F_{TARGET}	0.151		
$FEC_{THRESHOLD}$	1,758,288	1,240,272	Not Overfished
FEC_{TARGET}	1,184,339		

Table 5. Probability of ERP *F* threshold and target for 2026-2028 under a constant status quo TAC.

	2026	2027	2028
ERP <i>F</i> threshold	1%	4%	4%
ERP <i>F</i> target	100%	100%	100%

FIGURES

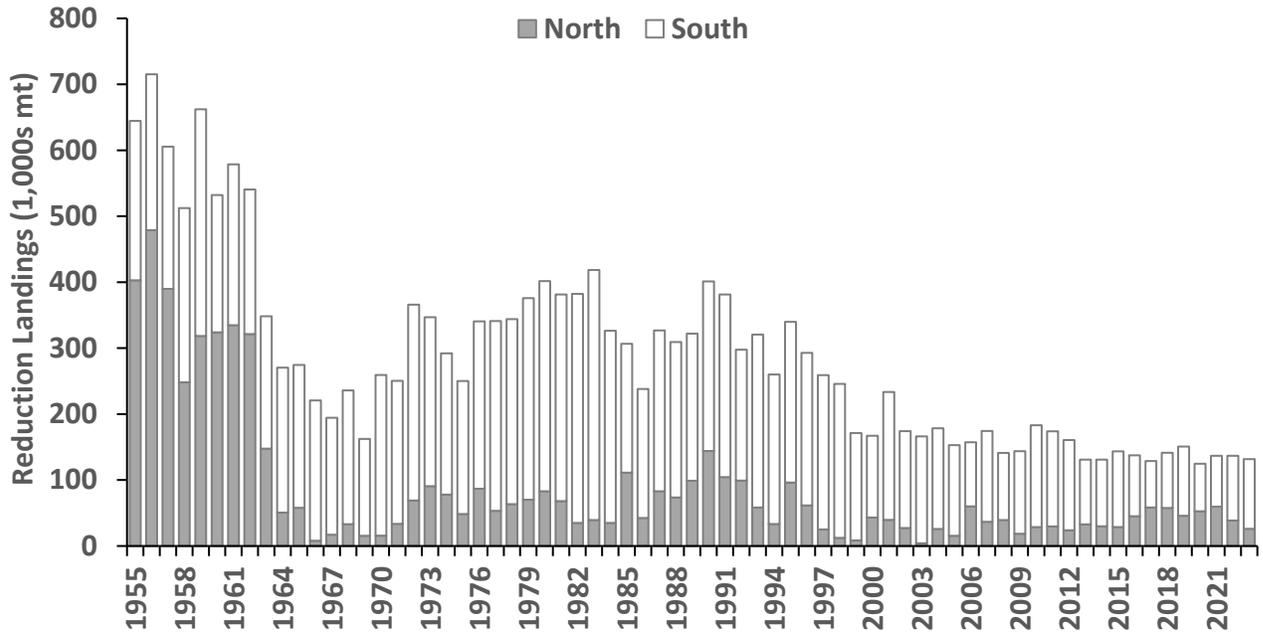


Figure 1. Atlantic menhaden reduction landings (1000s mt) from 1955-2023. The northern region is comprised of landings from Maine to Maryland’s Eastern Shore, excluding the Chesapeake Bay, and the southern region is comprised of landings from Virginia Eastern Shore and Chesapeake Bay through Florida (Source: NOAA Fisheries Beaufort).

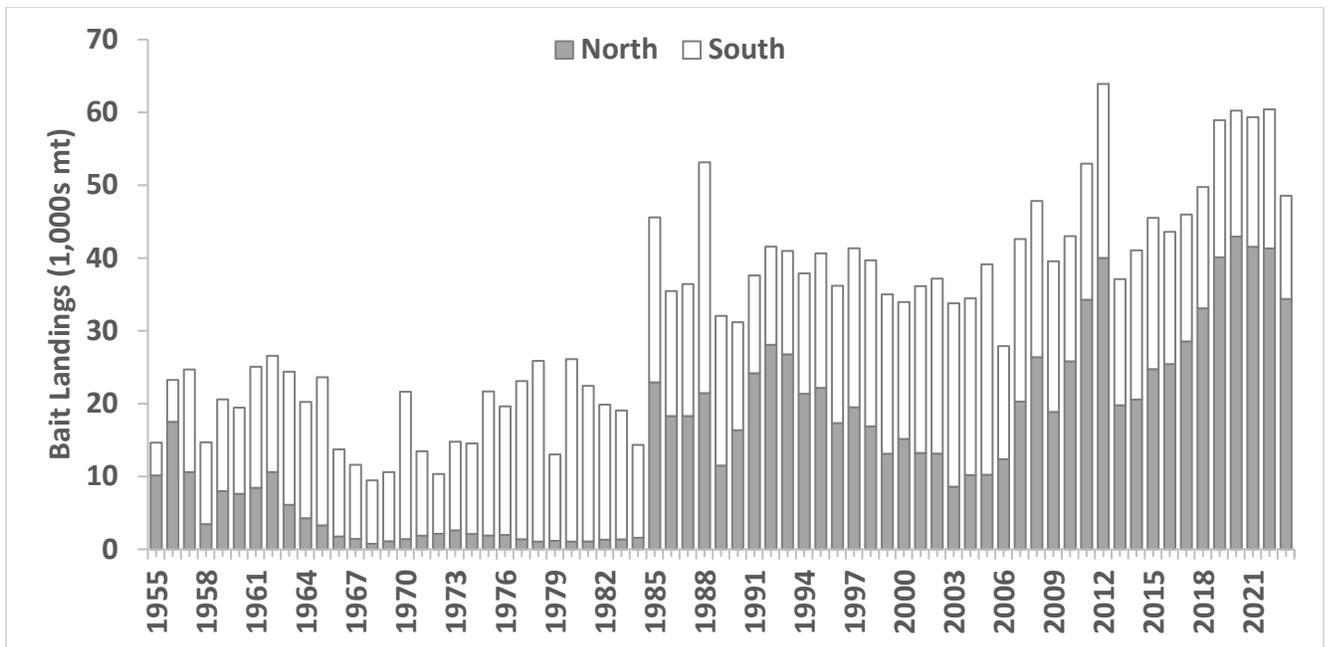


Figure 2. Atlantic menhaden bait landings (1000s mt) from 1955-2023. The northern region includes landings from Maine to Maryland’s Eastern Shore, excluding the Chesapeake Bay, and the southern region is comprised of landings from Virginia Eastern Shore and Chesapeake Bay through Florida Only landings from 1985 on can be validated (Source: ACCSP).

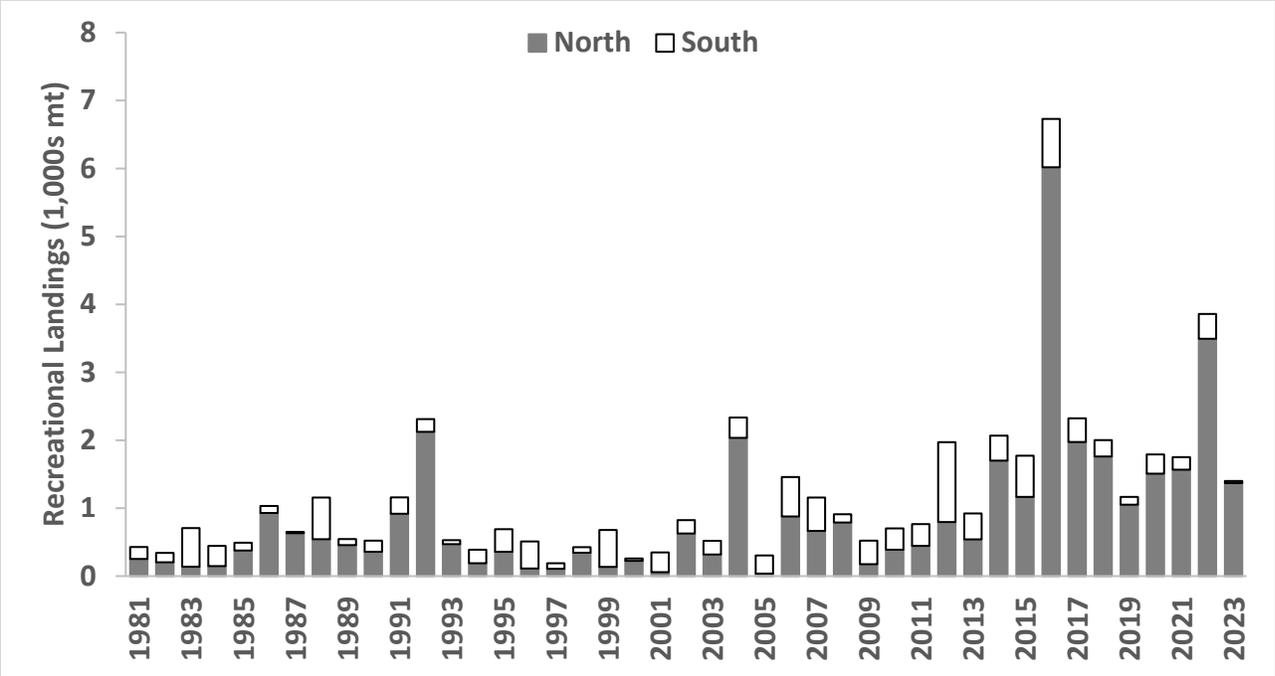


Figure 3. Atlantic menhaden recreational landings (1000s mt) from 1981-2023. The northern region includes landings from Maine to Maryland’s Eastern Shore, excluding the Chesapeake Bay, and the southern region is comprised of landings from Virginia Eastern Shore and Chesapeake Bay through Florida (Source: MRIP).

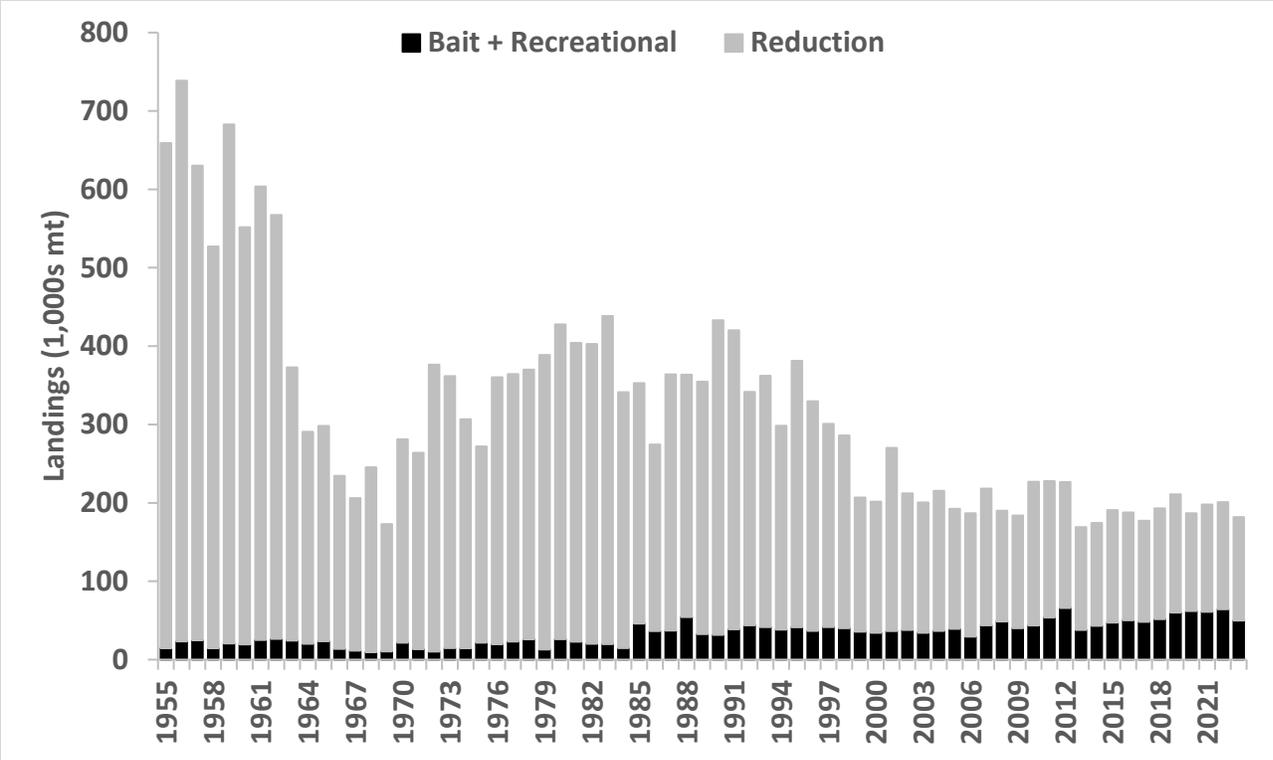


Figure 4. Coastwide Atlantic menhaden landings for the reduction and bait fisheries (1955-2023).

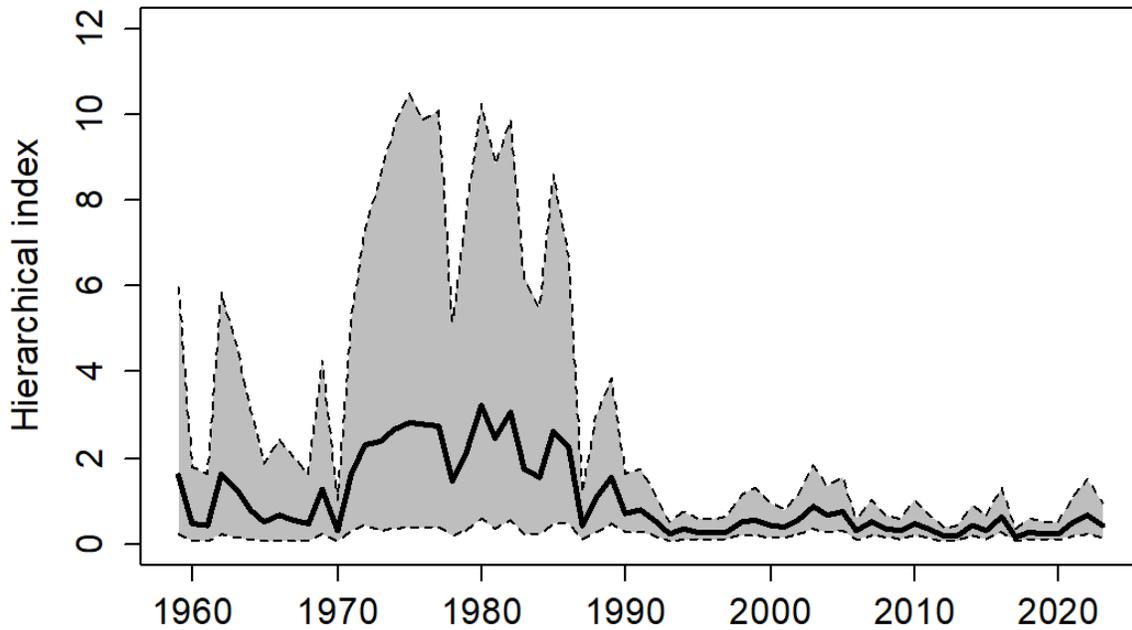


Figure 5. Time series of the young-of-year (YOY) Atlantic menhaden relative abundance index as estimated from hierarchical analysis (Conn 2010). The black line gives the posterior mean and the grey, dashed lines represent a 95% credible interval about the time series.

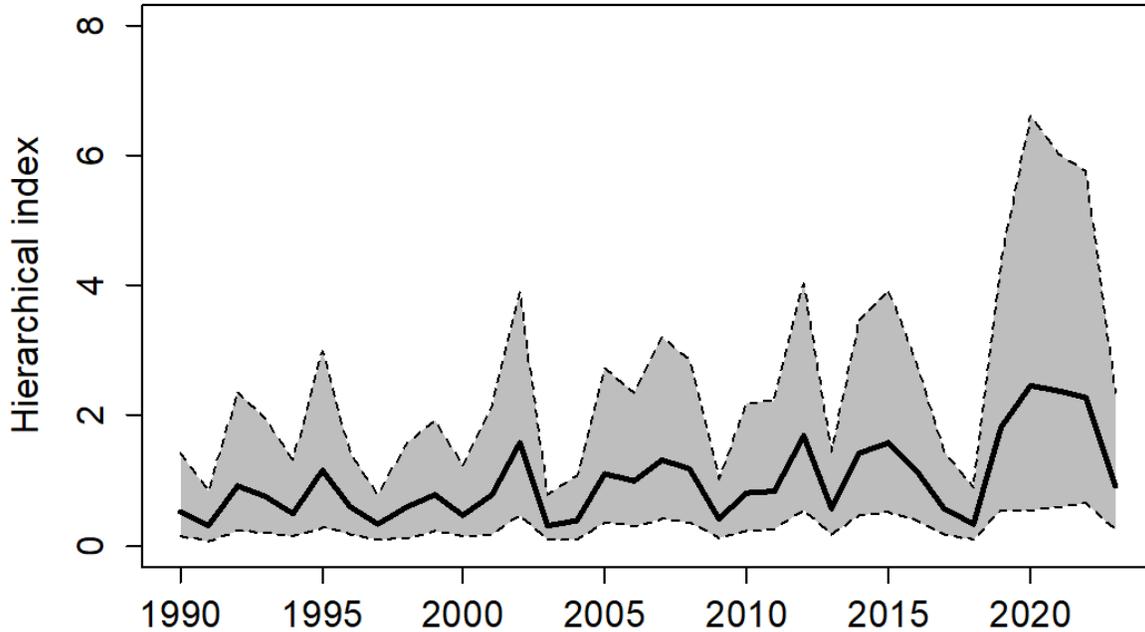


Figure 6. Time series of the northern adult Atlantic menhaden relative abundance index (NAD) as estimated from hierarchical analysis (Conn 2010). The black line gives the posterior mean and the grey, dashed lines represent a 95% credible interval about the time series.

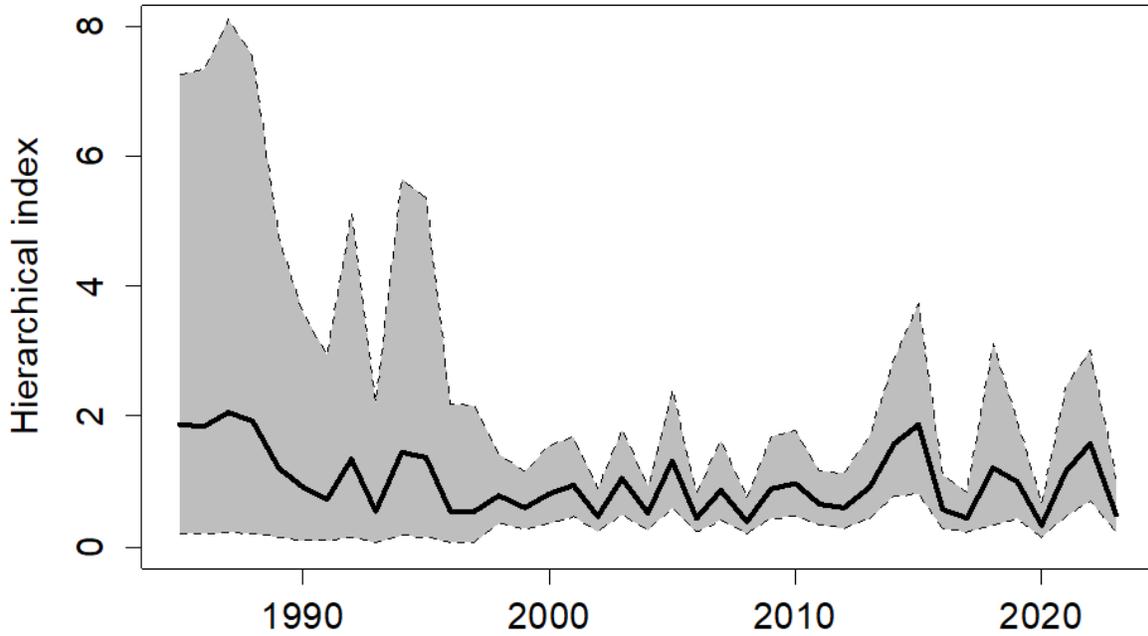


Figure 7. Time series of the Mid-Atlantic adult menhaden relative abundance index (MAD) as estimated from hierarchical analysis (Conn 2010). The black line gives the posterior mean and the grey, dashed lines represent a 95% credible interval about the time series.

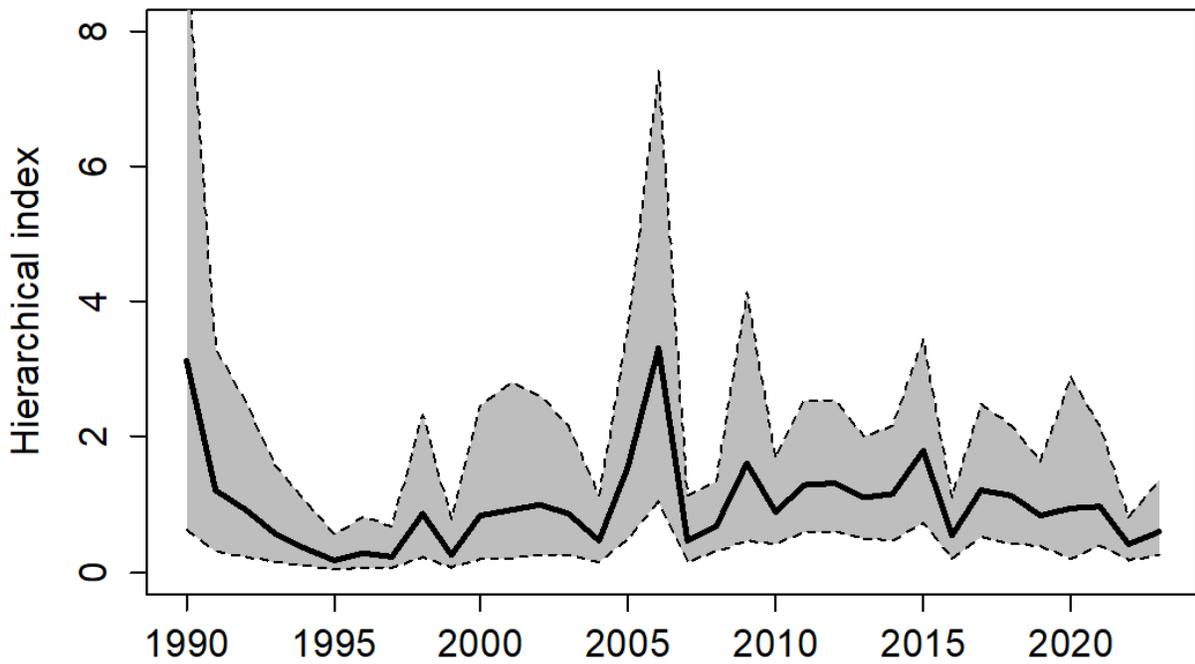


Figure 8. Time series of the southern adult Atlantic menhaden relative abundance index (SAD) as estimated from hierarchical analysis (Conn 2010). The black line gives the posterior mean and the grey, dashed lines represent a 95% credible interval about the time series.

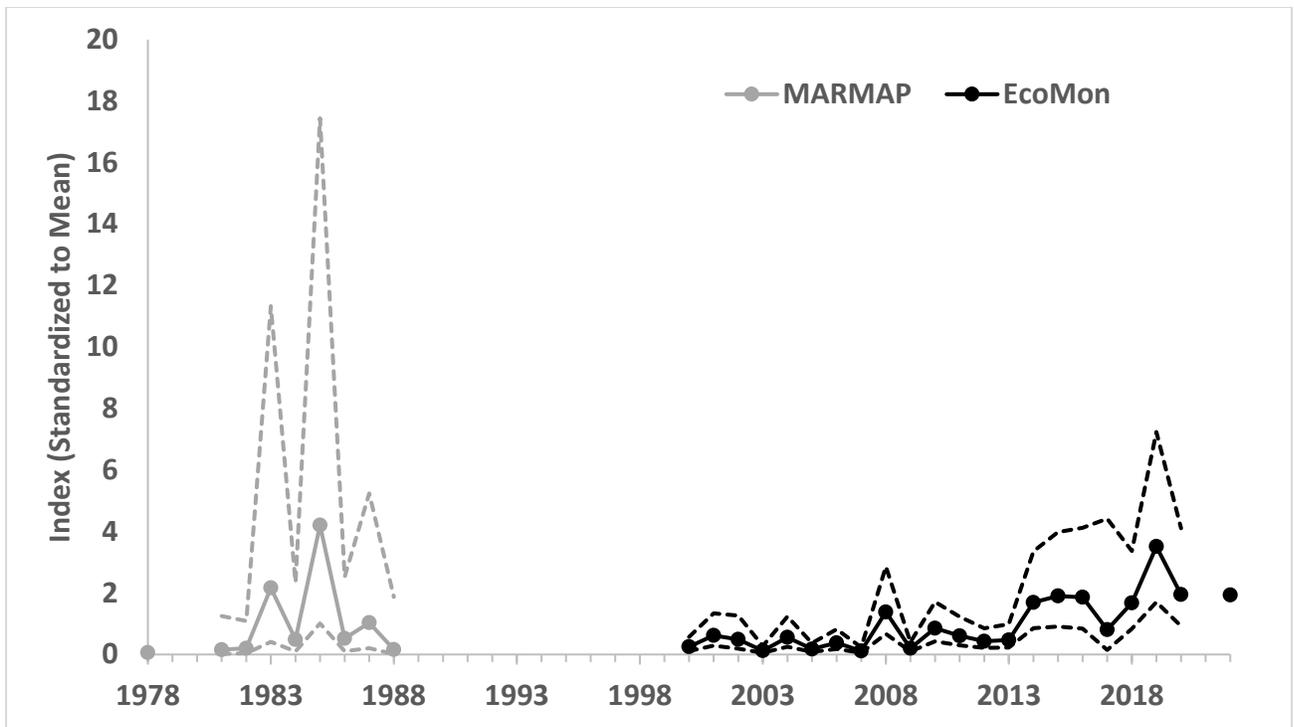


Figure 9. Standardized index of relative spawning stock biomass of Atlantic menhaden developed from the MARMAP and EcoMon ichthyoplankton surveys. Dashed lines represent 95% confidence intervals. The 1978 upper confidence interval has not been included on the graph because of its large value (94).

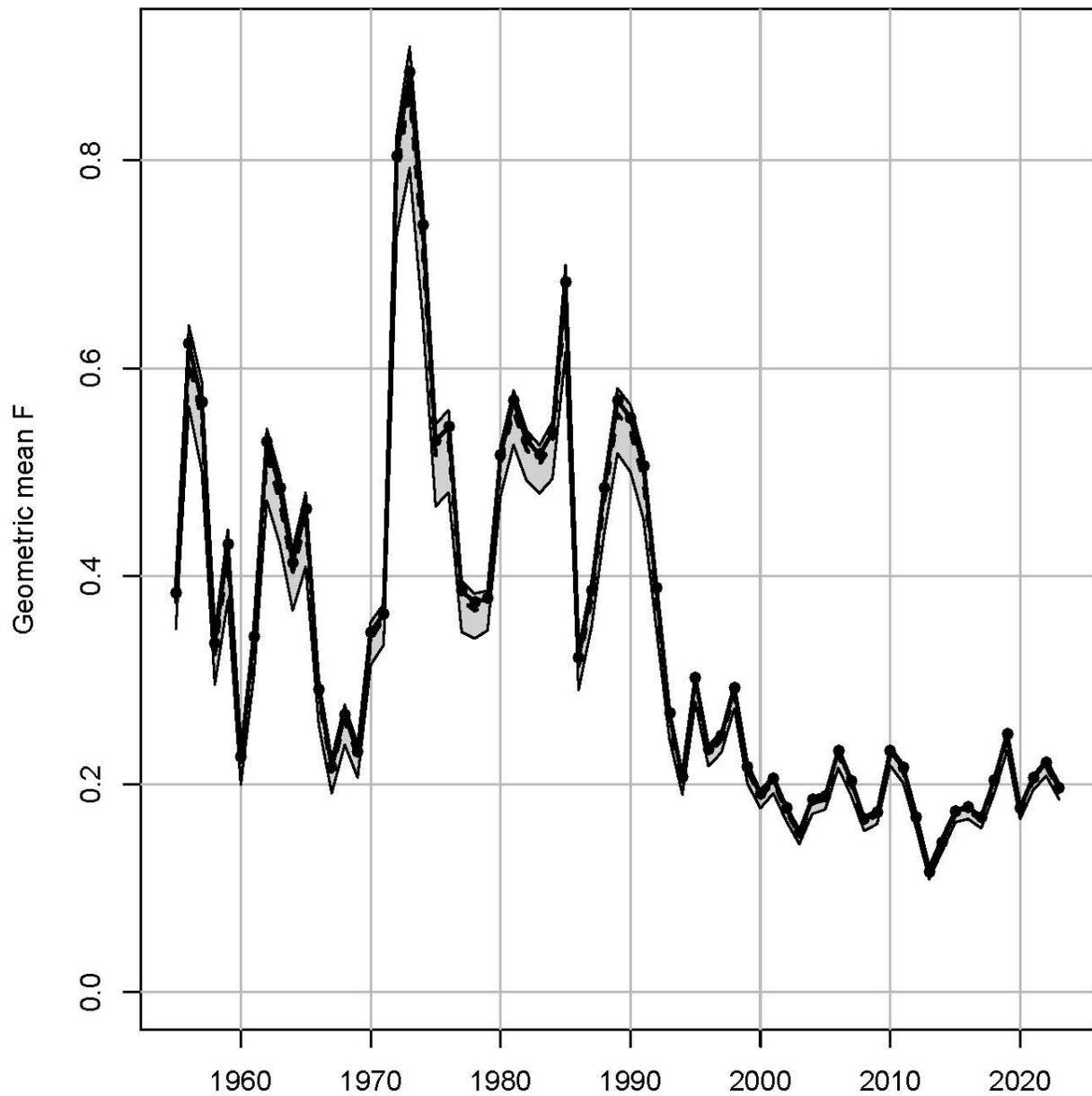


Figure 10. Time series of the geometric mean fishing mortality rate for ages-2 to 4 from 1955-2023 for the Monte Carlo bootstrap runs. The grey represents the 5th and 95th percentiles across the runs, while the black line with closed black circles represents the base run. The dashed line represents the median of the MCB runs.

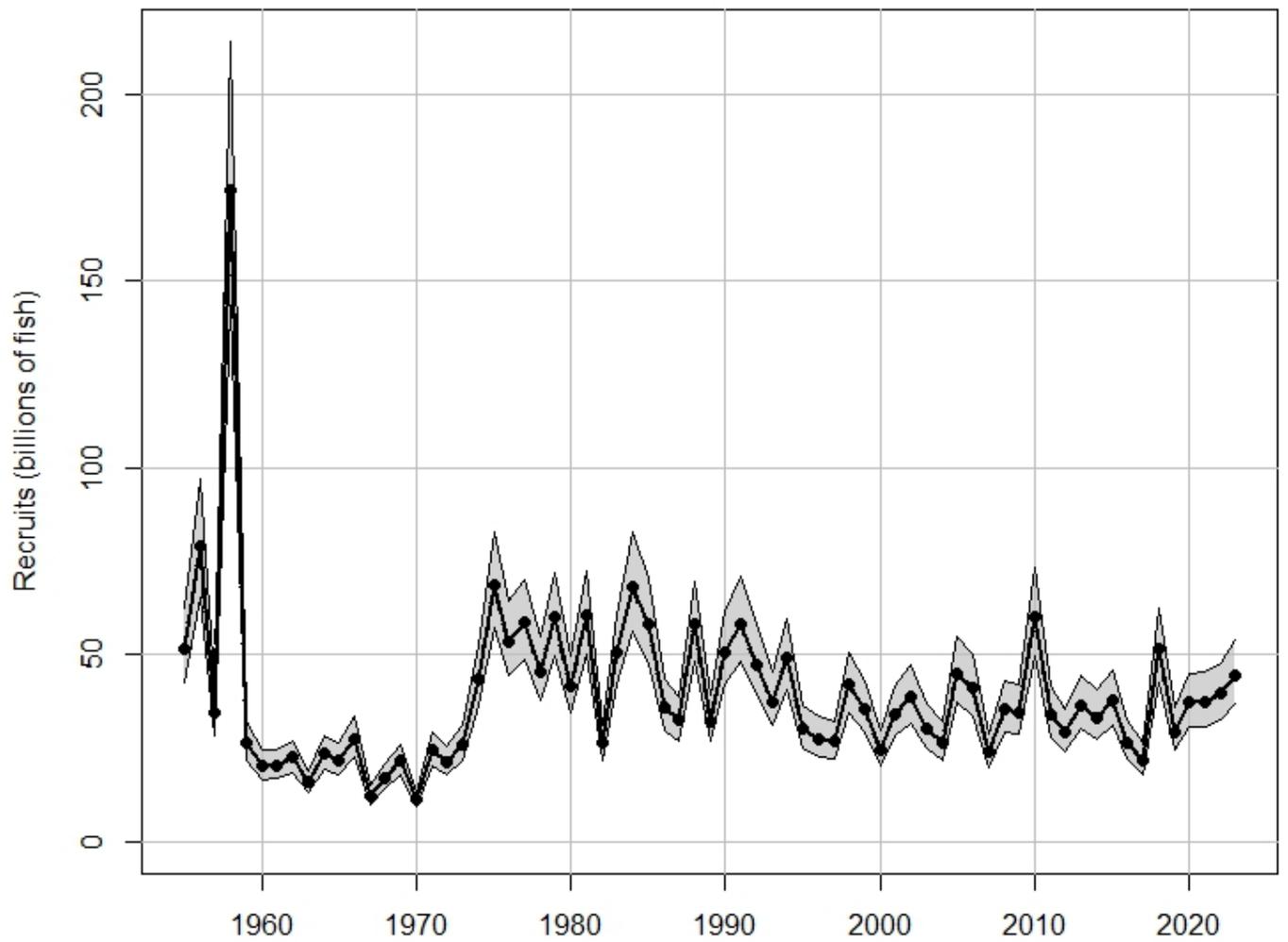


Figure 11. Estimated recruitment (billion fish) over time from 1955-2023 for the Monte Carlo bootstrap runs. The grey represents the 5th and 95th percentiles across the runs, while the black line with closed black circles represents the base run.

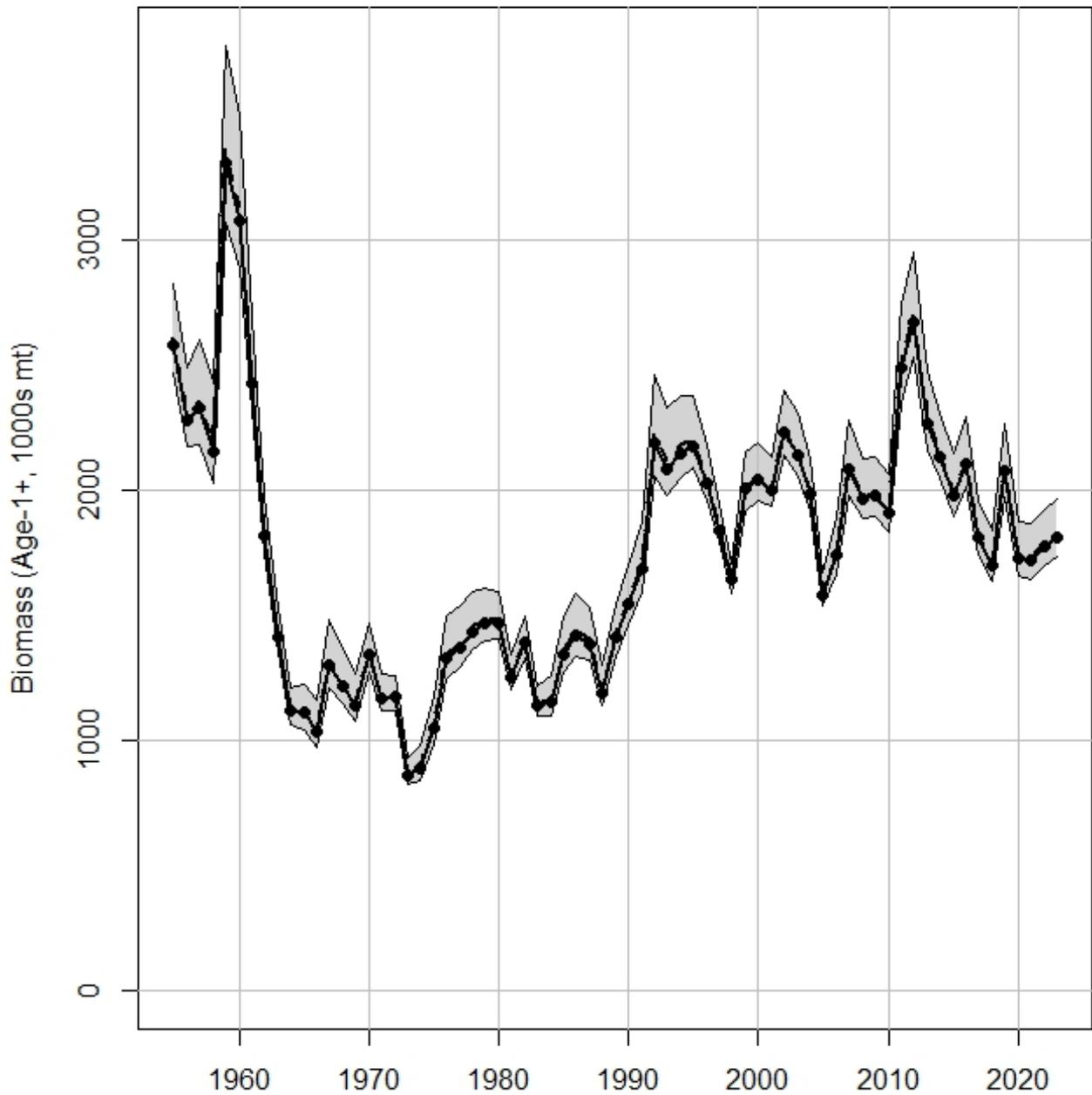


Figure 12. Time series of age-1+ biomass (1,000s metric tons) from 1955-2023 for the Monte Carlo bootstrap runs. The grey represents the 5th and 95th percentiles across the runs, while the black line with closed black circles represents the base run. The dashed line represents the median of the MCB runs.

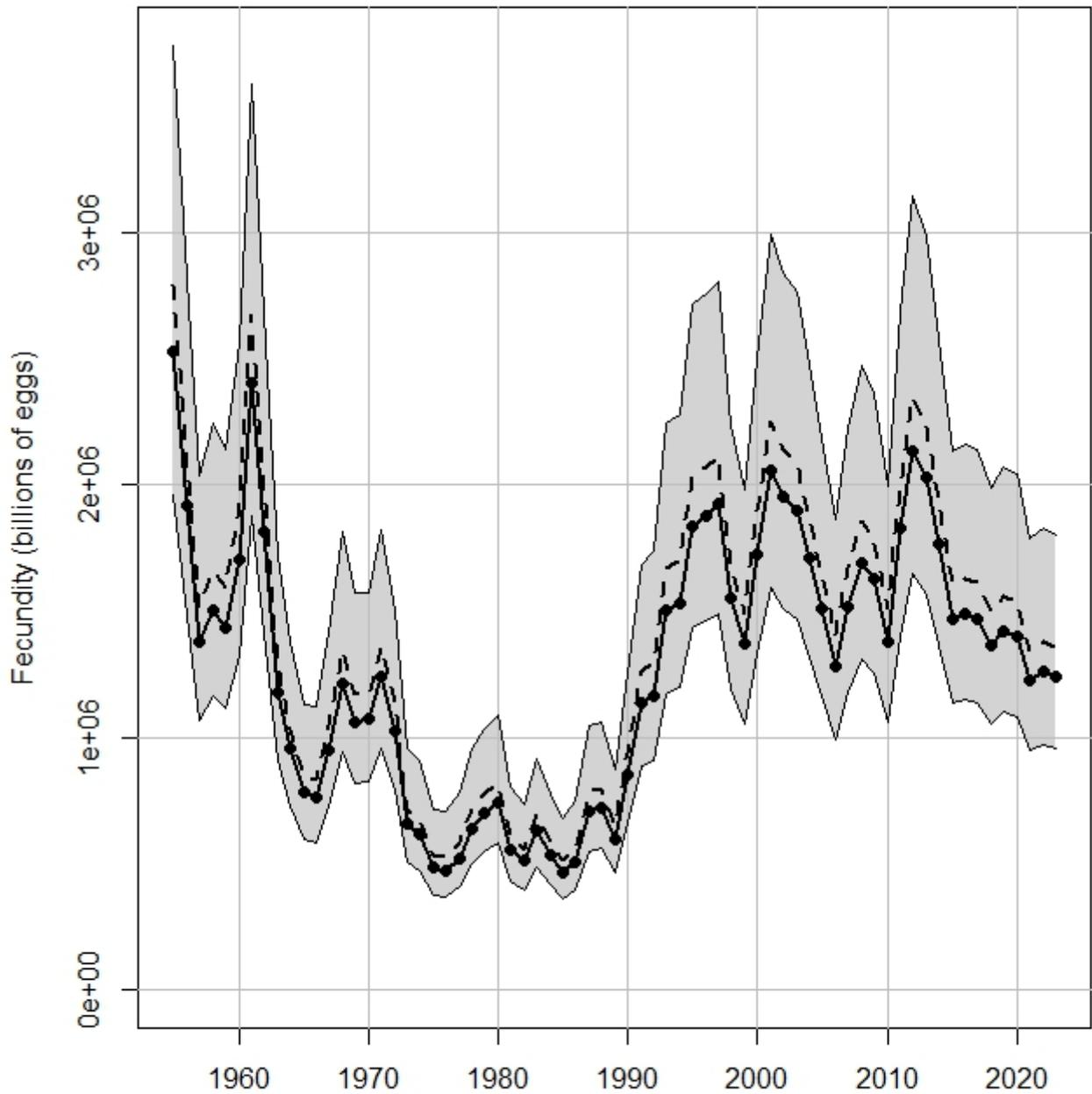


Figure 13. Time series of fecundity (billions of eggs) from 1955-2023 for the Monte Carlo bootstrap runs. The grey represents the 5th and 95th percentiles across the runs, while the black line with closed black circles represents the base run. The dashed line represents the median of the MCB runs.

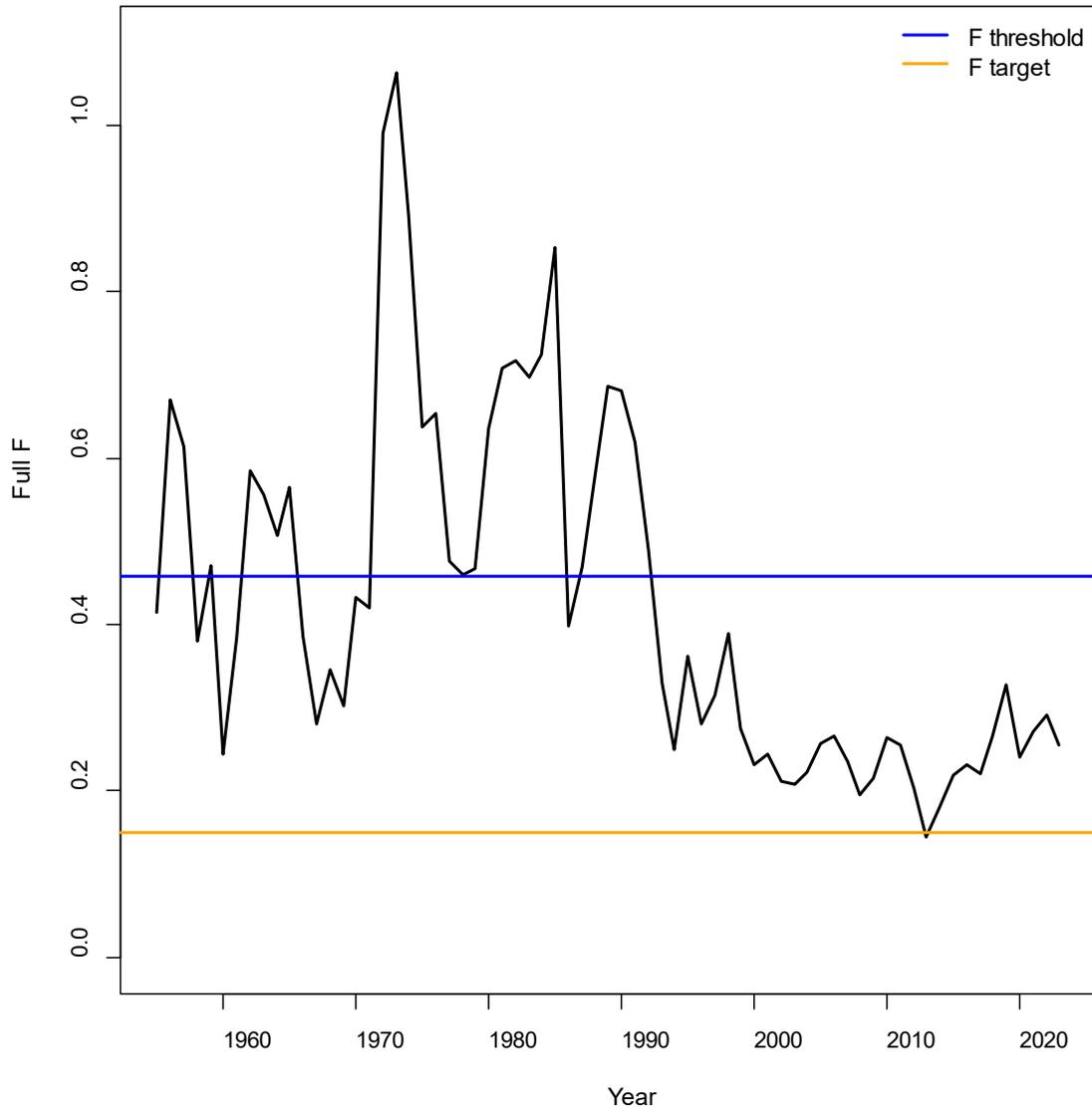


Figure 14. The full fishing mortality rate for 1955-2023 compared to the current ERP threshold and target for fishing mortality rate. The full fishing mortality is dependent upon selectivity for the fisheries, and thus can represent ages-2 to 4, depending upon the year.

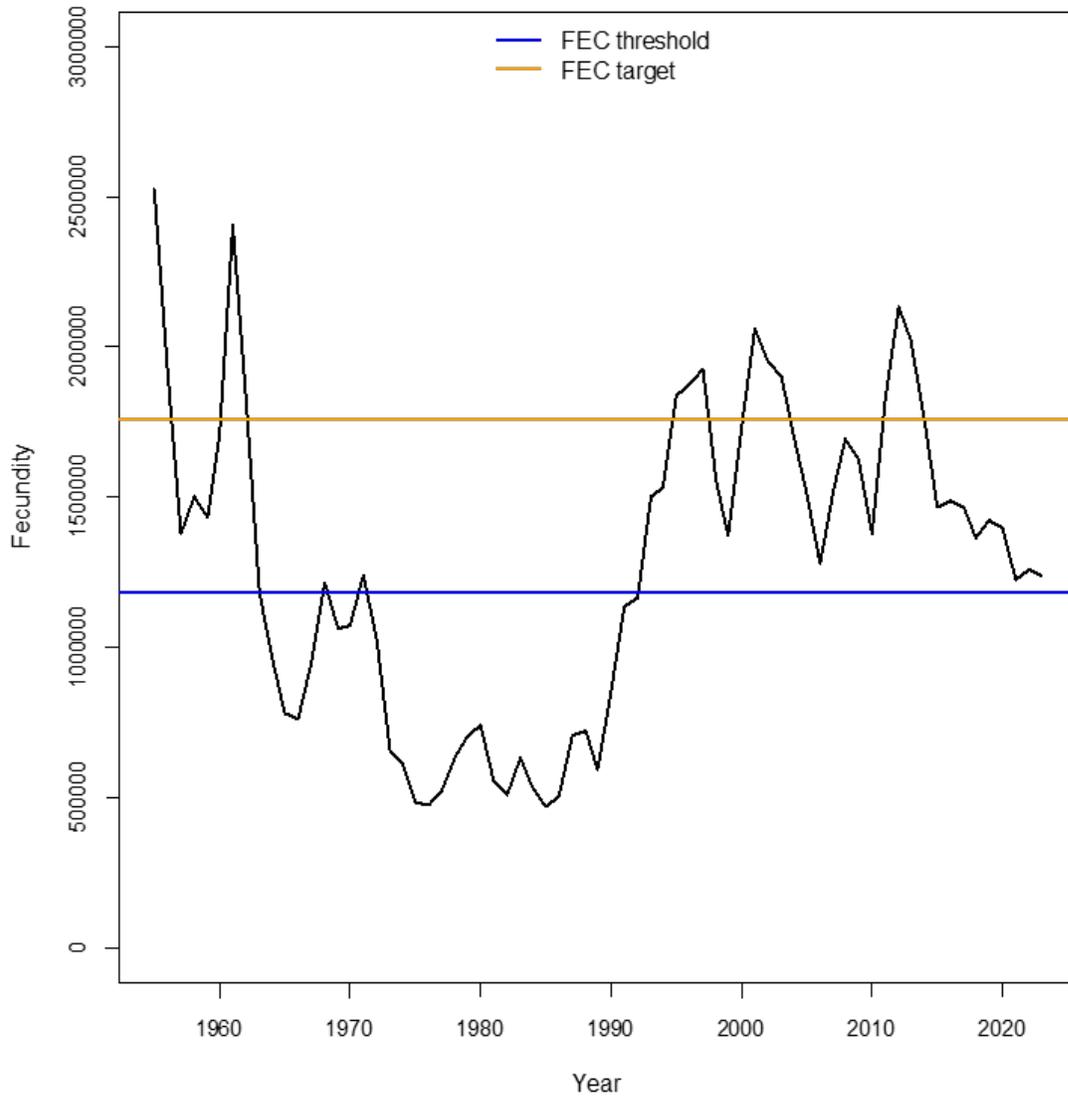


Figure 15. The fecundity for 1955-2023 compared to the current ERP threshold and target for fecundity.

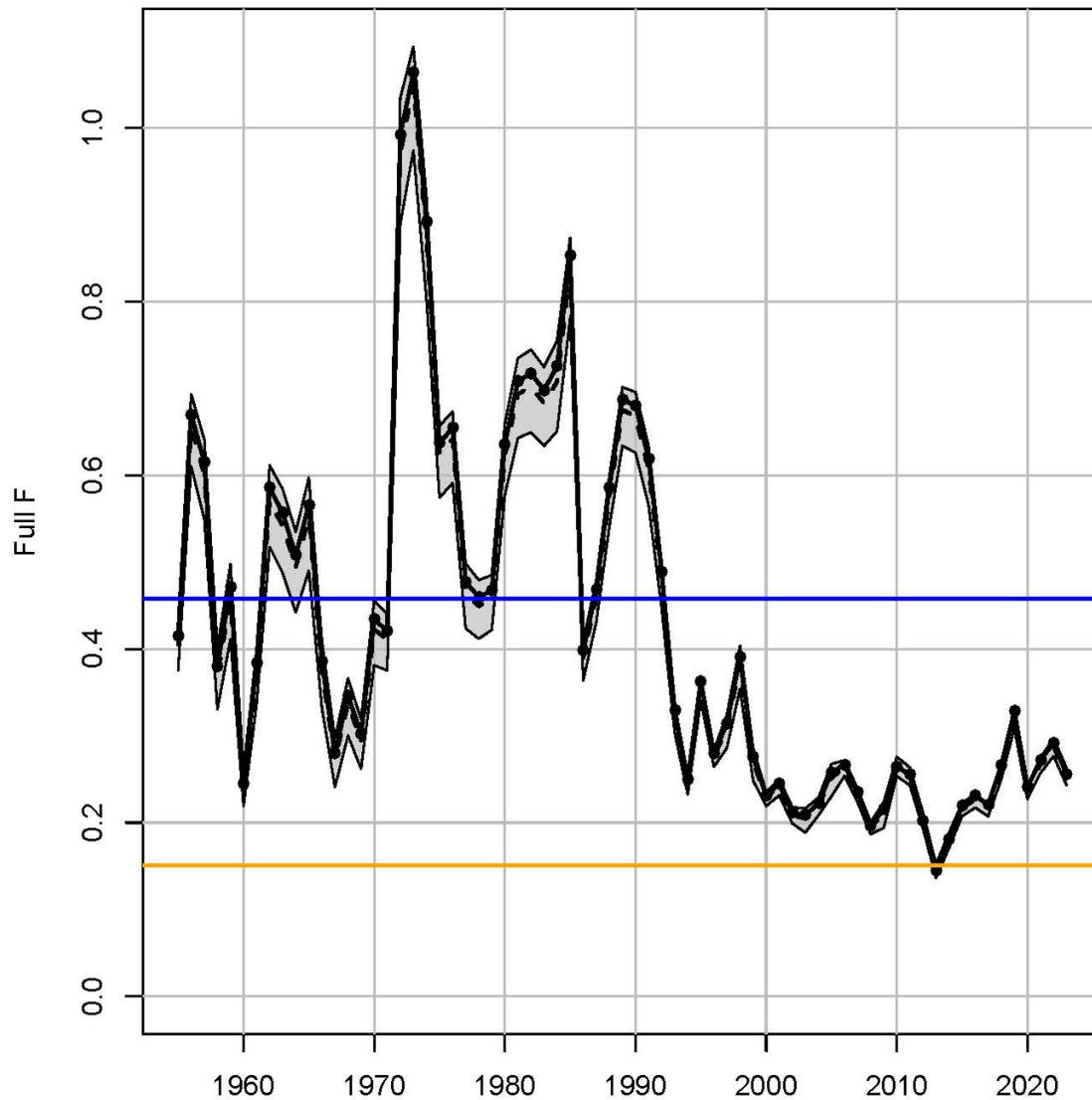


Figure 16. Fishing mortality rate from the MCB analysis plotted with the current ERP F threshold and target. The grey represents the 5th and 95th percentiles across the runs, while the black line with closed black circles represents the base run. The dashed line represents the median of the MCB run.

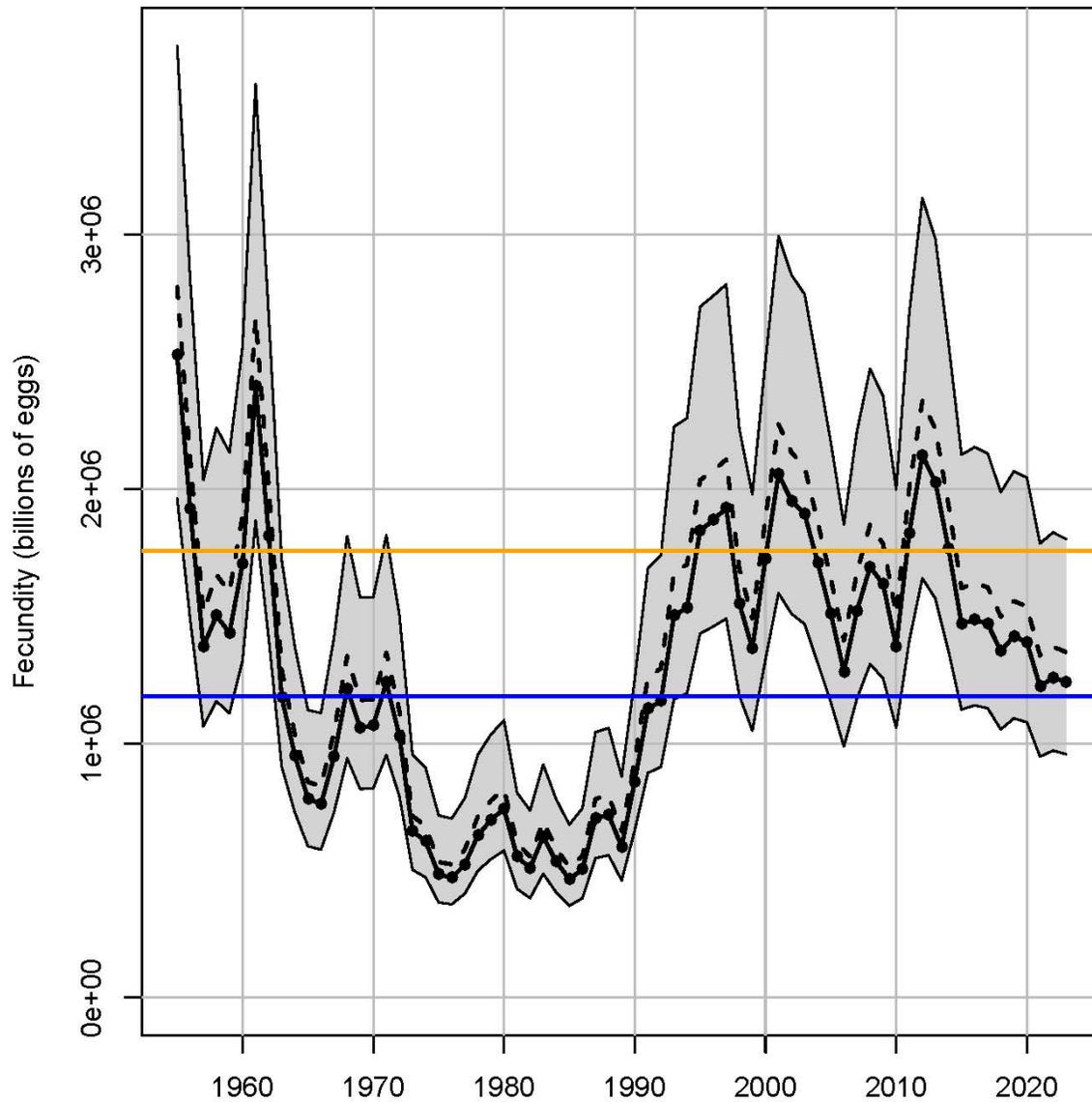


Figure 17. Fecundity from the MCB analysis plotted with the current ERP fecundity threshold and target. The grey represents the 5th and 95th percentiles across the runs, while the black line with closed black circles represents the base run. The dashed line represents the median of the MCB runs.

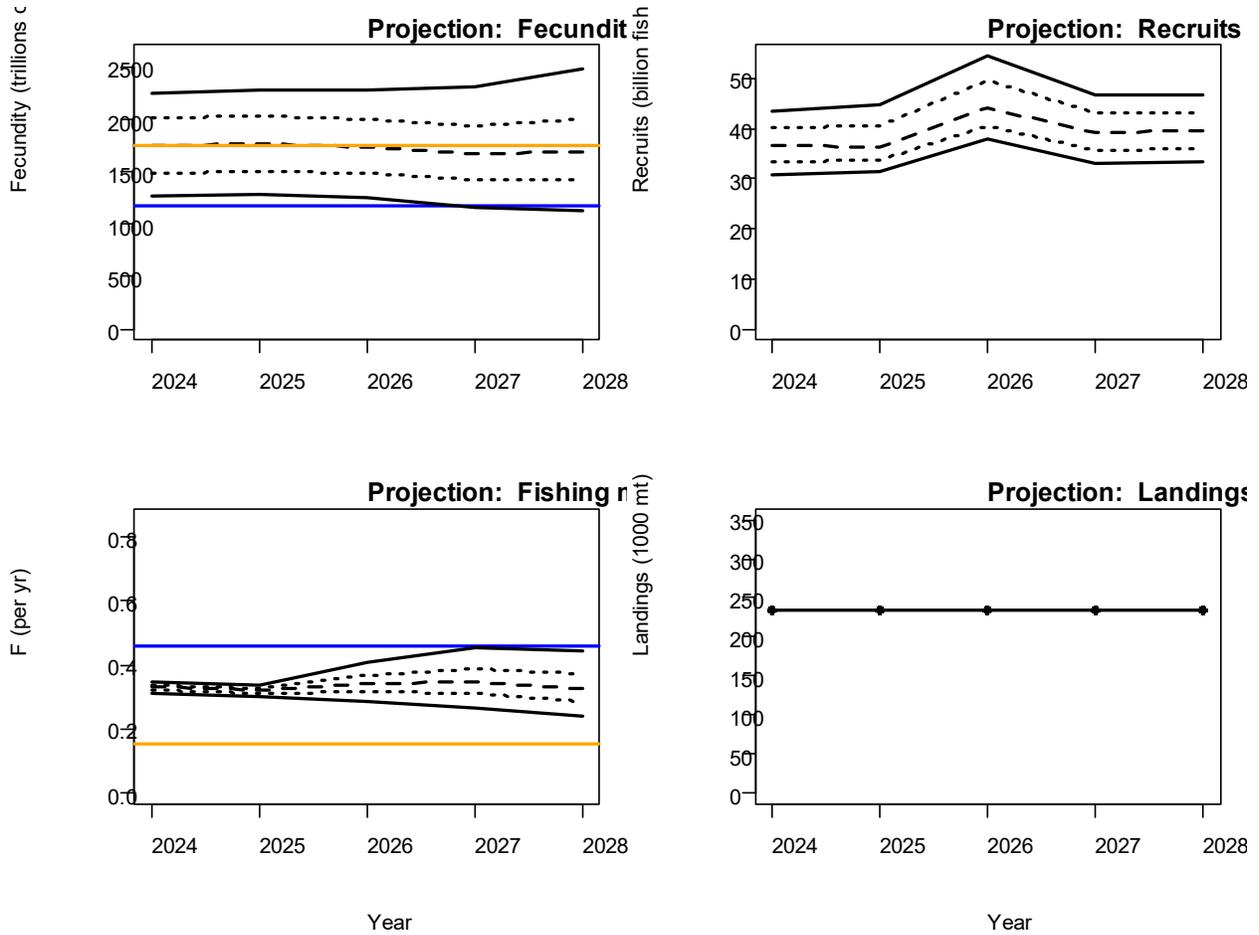


Figure 18. Fecundity, full fishing mortality rate, and recruits projected from 2024 to 2028 for a coastwide total allowable catch of 233,550 mt. The orange lines represent the current ERP target fishing mortality rate and fecundity, while the blue lines represent the current threshold fishing mortality rate and fecundity for the ecological reference points. The dashed black line is the 50th percentile (median), the dotted black lines are the 25th and 75th percentiles, and the solid black lines are the 5th and 95th percentiles.

APPENDIX 1: STOCK PROJECTIONS MEMO



Atlantic States Marine Fisheries Commission

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MEMORANDUM

TO: Atlantic Menhaden Management Board

FROM: Atlantic Menhaden Technical Committee and Ecological Reference Point Workgroup

DATE: October 9, 2025

SUBJECT: Stock Projections to Inform 2026-2028 Total Allowable Catch Levels

The Atlantic Menhaden Management Board (Board) will discuss the 2026-2028 total allowable catch (TAC) for Atlantic menhaden at its October 2025 meeting. 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. If the Board does not set a TAC for 2026 by December 31, 2025, next year's TAC will automatically be set at the level of the 2025 TAC (233,550 mt).

Since the implementation of coastwide quota management the TAC has varied but has overall increased from 170,800 metric tons for 2013–2014 to 233,550 mt for 2023-2025 (Table 1). Table 2 provides each jurisdiction's Addendum I allocations.

At the May meeting, the Board tasked the Atlantic Menhaden Technical Committee (TC) with developing projections using the ecological reference points (ERPs) and the single-species assessment model (Beaufort Assessment Model, or BAM). Specifically, the Board requested the following projections:

- The TACs that have a 40%-60% probability of exceeding the ERP target, in 5% increments, using 2026-2028 combined and as separate years.
- The percent risk of exceeding the ERP target and threshold if the current TAC was changed by -20% to +20% in 5% increments, including 0% (the current TAC).

This memo outlines the methods for the projections and the results of the analysis that the Board requested to support the specifications process.

TAC Setting Process

As in recent years, the TAC has been informed by the results of projection analysis, which explores a range of TAC alternatives to determine the percent risk of exceeding the ERP reference points adopted in 2020:

- **ERP target:** the maximum fishing mortality rate (F) on Atlantic menhaden that sustains Atlantic striped bass at their biomass target when striped bass are fished at their F

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target and the other ERP species in the model (bluefish, spiny dogfish, weakfish, and Atlantic herring) are fished at their current levels

- **ERP threshold:** the maximum F on Atlantic menhaden that keeps Atlantic striped bass at their biomass threshold when striped bass are fished at their F target and the other ERP species in the model (bluefish, spiny dogfish, weakfish, and Atlantic herring) are fished at their current levels

Monte Carlo Bootstrap (MCB) runs of the base model run from the BAM are used as the basis for the projection analysis (see main stock assessment update report for details on BAM base run and MCB runs).

Sources of Uncertainty

Single-Species Model

The projections have the same methods and assumptions as those run for the benchmark assessment. It is important to note that key uncertainties about natural mortality and fecundity are accounted for in the projections. Additionally, during the benchmark assessment (SEDAR 2020), the SAS used a new procedure for projecting recruitment. Instead of assuming a static median value for recruitment, as is done for many assessment projection methodologies and as was done in the past, recruitment was projected using nonlinear time series analysis methods (Deyle et al 2018). Nonlinear time series analysis methods project recruitment based on how recruitment has changed in the past under similar conditions. This is done for each MCB run to account for uncertainty. Thus, uncertainty is recognized in the recruitment time series and the methods used for projections adequately accounted for that uncertainty using the best scientific methods available. As usual, projections are highly uncertain and subject to model assumptions (i.e., no changes in fishing effort, seasonality of the fishery is not modeled, there is no structural model uncertainty in projections).

The assumption that the full 2023-2025 TAC would be utilized in 2024 and 2025 is also a source of uncertainty, as compliance report data indicated that only 80% of the TAC was landed in 2024. After the initial presentation of results to the TC and SAS, sensitivity runs were conducted using the 2024 bait and reduction landings from the compliance reports and assuming either (1) full utilization of the TAC in 2025, or (2) 80% utilization of the TAC in 2025.

The TC used the Commission's Retrospective Pattern Advice flowchart (ASMFC 2024) to determine whether a retrospective adjustment was warranted. The estimates of Mohn's rho for F ($\rho=-0.09$) and fecundity ($\rho=0.12$) were within the acceptable limits for a short-lived species. The rho values for both values were closer to zero than in the 2022 assessment update, indicating a smaller retrospective pattern in the 2025 update. The retrospectively adjusted value of fecundity was within the 90% confidence intervals of the unadjusted estimate, and all of the retrospective peels for fecundity were inside the confidence intervals of the base run. However, the adjusted value of F and 2 of the 3 most recent peels were outside the confidence intervals. Because F is not used in the projections, and because adjusting F would not change stock status, the TC elected not to apply a retrospective adjustment for the projections. The TC noted that the confidence intervals on F were extremely narrow in the 2025 update, which

likely affected the outcome of the flowchart for that metric. The TC also recommended that the Assessment Science Committee review the flowchart performance in this case and consider revising the guidance document to provide explicit guidance on situations where the recommendations for F and spawning stock biomass or fecundity are different.

Ecological Reference Point Model

The projections do not incorporate any uncertainty around the ERP target and threshold values, because there is not a comprehensive, quantitative way to estimate that uncertainty in the current model framework. Better quantification of uncertainty around the reference points themselves was a recommendation from the 2025 peer review panel (SEDAR 2025), but some of the uncertainty can be captured through sensitivity runs. Uncertainty in the ecological reference points includes both model uncertainty and ecosystem uncertainty. The ecosystem model was sensitive to the relationship between spiny dogfish and striped bass, and small changes in the parameters of that relationship affected striped bass's ability to rebuild to their biomass target under different combinations of striped bass and menhaden F rates. A sensitivity run where spiny dogfish diet composition data was adjusted to reflect the assumption that not all of the biomass estimated by the new spiny dogfish assessment was present within the ERP model domain resulted in a lower F target for Atlantic menhaden compared to the base run.

Uncertainty about future ecosystem conditions also contributes to uncertainty in the ERP target and threshold. For example, in the base run, it was assumed that the current low recruitment regime that Atlantic herring were experiencing at the end of the time-series would persist into the future. A sensitivity run was done where it was assumed that Atlantic herring recruitment would return to the long-term average, which resulted in a slightly higher ERP target, indicating Atlantic menhaden could experience a higher F rate and striped bass would remain at their biomass target when Atlantic herring were more abundant.

Results

The TACs with a 40%-60% probability of exceeding the F target are presented in Table 3. The probabilities of exceeding the F target and threshold for a range of TACs representing a 20% decrease to a 20% increase from the current TAC are presented in Table 4, and the probability of falling below the ERP fecundity target and threshold for those TACs is shown in Table 5.

Instead of providing figures for all the scenarios the Board requested, the TC provided figures of the fecundity, recruits, F , and landings for the current TAC (233,550 mt), a TAC of 106,100 mt (associated with a 40% probability of exceeding the F target in 2026), and a TAC of 280,260 mt (an increase of 20% from the status quo TAC). These three plots provide the bounds of the highest and lowest risk scenarios requested by the Board, in comparison to the status quo scenario (Figure 1 - Figure 3).

The assumption about levels of removals in 2024 and 2025 had a minimal effect on the results. The estimates of the combined year TACs that would have a 40%-60% probability of achieving the ERP F target for 2026-2028 were approximately 1,000-4,000 mt greater under the lower

2024-2025 removals assumptions (Table 6 - Table 7). The risk of exceeding the ERP F target and threshold under the status quo TAC showed at most a 1% difference in risk (Table 8).

The TACs with the 40%-60% probability of achieving the F target are significantly lower than the current TAC and the TACs with the same risk levels presented in 2022. This is driven largely by the change in natural mortality (M) in the single-species model: the lower M used in 2025 resulted in a lower biomass compared to the 2022 update (Figure 4)(ASMFC 2025). The time-series average of age-1+ biomass for the 2025 update with the lower M was 37% lower than the time-series average of the 2022 update. In addition, the 2022 update showed a large increase in biomass at the end of the time-series that was not present at the end of the 2025 update. As a result, the 2021 biomass that was projected forward to inform the 2023-2025 TAC options was approximately 60% higher than the 2023 biomass, which is informing the 2026-2028 TAC.

In addition, the ERP F target changed as a result of the benchmark assessment (SEDAR 2025): the ERP target from the 2020 benchmark was 0.19 and the ERP target from the 2025 benchmark is 0.15. Although the change in the ERP F target appears relatively small, it did have an impact on the scale of the projections. The probability of exceeding the ERP target for a specific TAC in Table 4 were higher for the new, lower ERP target, and the TACs required to have a 40%-60% probability of exceeding the ERP target were lower for the new ERP target. This change in the ERP target was due to both the lower estimate of menhaden biomass going into the ERP models as a result of the lower M in the single-species model, and also to other factors including an increase in spiny dogfish biomass estimates, refinements to other inputs like diet data, and changes to the model structure (SEDAR 2025).

In addition, it is important to note that the values for the ERP target and threshold were based on the definitions currently used in management. The Board can use the ecosystem model developed through the ERP benchmark assessment (SEDAR 2020, SEDAR 2025) to evaluate the trade-offs between predator biomass and menhaden fishing mortality under different ecosystem assumptions and consider choosing a different ERP target and threshold definition to best meet their management objectives for Atlantic menhaden. If the Board redefined the ERP target and threshold – for example, using different assumptions about the biomass levels of other species in the ecosystem in the future or about striped bass fishing mortality – the values of the reference points and the associated TACs would change.

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Tables

Table 1. History of Atlantic menhaden TAC levels.

TAC Period	TAC (mt)
2013-2014	170,800
2015-2016	187,880
2017	200,000
2018-2020	216,000
2021-2022	194,400
2023-2025	233,550

Table 2. Allocation of the coastwide Atlantic menhaden TAC by state, as set by Addendum I to Amendment 3.

State	Allocation (%)
ME	4.80%
NH	1.19%
MA	2.12%
RI	0.81%
CT	0.33%
NY	0.84%
NJ	11.00%
PA	0.01%
DE	0.27%
MD	1.17%
PRFC	1.09%
VA	75.21%
NC	0.37%
SC	0.25%
GA	0.25%
FL	0.29%

Table 3. The TACs associated with a 40-60% probability of exceeding the ERP F target for 2026-2028 combined and as separate years. For the combined years, the TAC is chosen such that the probability of exceeding the F target for 2026-2028 is no greater than the specified percent in any one year.

Probability of exceeding the ERP F Target	TAC for 2026-2028	2026 TAC	2027 TAC	2028 TAC
40%	106,100	106,100	111,800	120,900
45%	107,400	107,400	113,500	123,000
50%	108,450	108,450	115,300	124,800
55%	109,700	109,700	117,000	127,200
60%	111,000	111,000	119,200	129,700

Table 4. Percent risk of exceeding the ERP F target and ERP F threshold for different TAC projections.

TAC (Status quo -/+)	Probability of Exceeding the ERP F Target			Probability of Exceeding the ERP F Threshold		
	2026	2027	2028	2026	2027	2028
186,840 (-20%)	100%	100%	100%	0%	0%	0%
198,518 (-15%)	100%	100%	100%	0%	0%	0%
210,195 (-10%)	100%	100%	100%	0%	1%	1%
221,872 (-5%)	100%	100%	100%	0%	1%	1%
233,550 (0%)	100%	100%	100%	1%	4%	4%
245,228 (+5%)	100%	100%	100%	1%	10%	8%
256,905 (+10%)	100%	100%	100%	4%	18%	14%
268,583 (+15%)	100%	100%	100%	11%	29%	23%
280,260 (+20%)	100%	100%	100%	22%	41%	32%

Table 5. Percent risk of falling below the ERP fecundity target and ERP fecundity threshold for different TAC projections.

TAC (Status quo -/+)	Probability of Falling Below the ERP Fecundity Target			Probability of Falling Below the ERP Fecundity Threshold		
	2026	2027	2028	2026	2027	2028
186,840 (-20%)	52%	52%	46%	2%	4%	4%
198,518 (-15%)	52%	54%	49%	2%	4%	5%
210,195 (-10%)	52%	56%	51%	2%	5%	5%
221,872 (-5%)	52%	58%	54%	2%	6%	7%
233,550 (0%)	52%	59%	57%	2%	6%	8%
245,228 (+5%)	52%	61%	59%	2%	7%	9%
256,905 (+10%)	52%	62%	61%	2%	8%	10%
268,583 (+15%)	52%	64%	64%	2%	8%	12%
280,260 (+20%)	52%	66%	66%	2%	9%	13%

Table 6. Sensitivity run results showing the TACs associated with a 40-60% probability of exceeding the ERP *F* target for 2026-2028 for the scenario using 2024 landings from compliance reports and assuming full utilization of the TAC in 2025.

Probability of exceeding the ERP <i>F</i> Target	TAC for 2026-2028	2026 TAC	2027 TAC	2028 TAC
40%	107,100	107,100	111,900	120,900
50%	109,500	109,500	115,500	124,800
60%	112,200	112,200	119,600	129,700

Table 7. Sensitivity run results showing the TACs associated with a 40%-60% probability of exceeding the ERP *F* target for 2026-2028 for the scenario using 2024 landings from compliance reports and assuming 80% utilization of the TAC in 2025.

Probability of exceeding the ERP <i>F</i> Target	TAC for 2026-2028	2026 TAC	2027 TAC	2028 TAC
40%	110,200	110,200	112,900	120,900
50%	112,600	112,600	116,600	124,900
60%	115,100	115,100	120,300	129,700

Table 8. Sensitivity run results showing the percent risk of exceeding the ERP *F* target and ERP *F* threshold for status quo TAC projections under different assumptions about 2024 and 2025 removals.

Assumption for 2024 and 2025 Removals	Probability of Exceeding the ERP Target			Probability of Exceeding the ERP Threshold		
	2026	2027	2028	2026	2027	2028
2024 & 2025 = full TAC utilization	100%	100%	100%	1%	4%	4%
2024 = compliance report data 2025 = full TAC utilization TAC	100%	100%	100%	1%	4%	4%
2024 = compliance report data 2025 = 80% TAC utilization	100%	100%	100%	0%	3%	3%

Figures

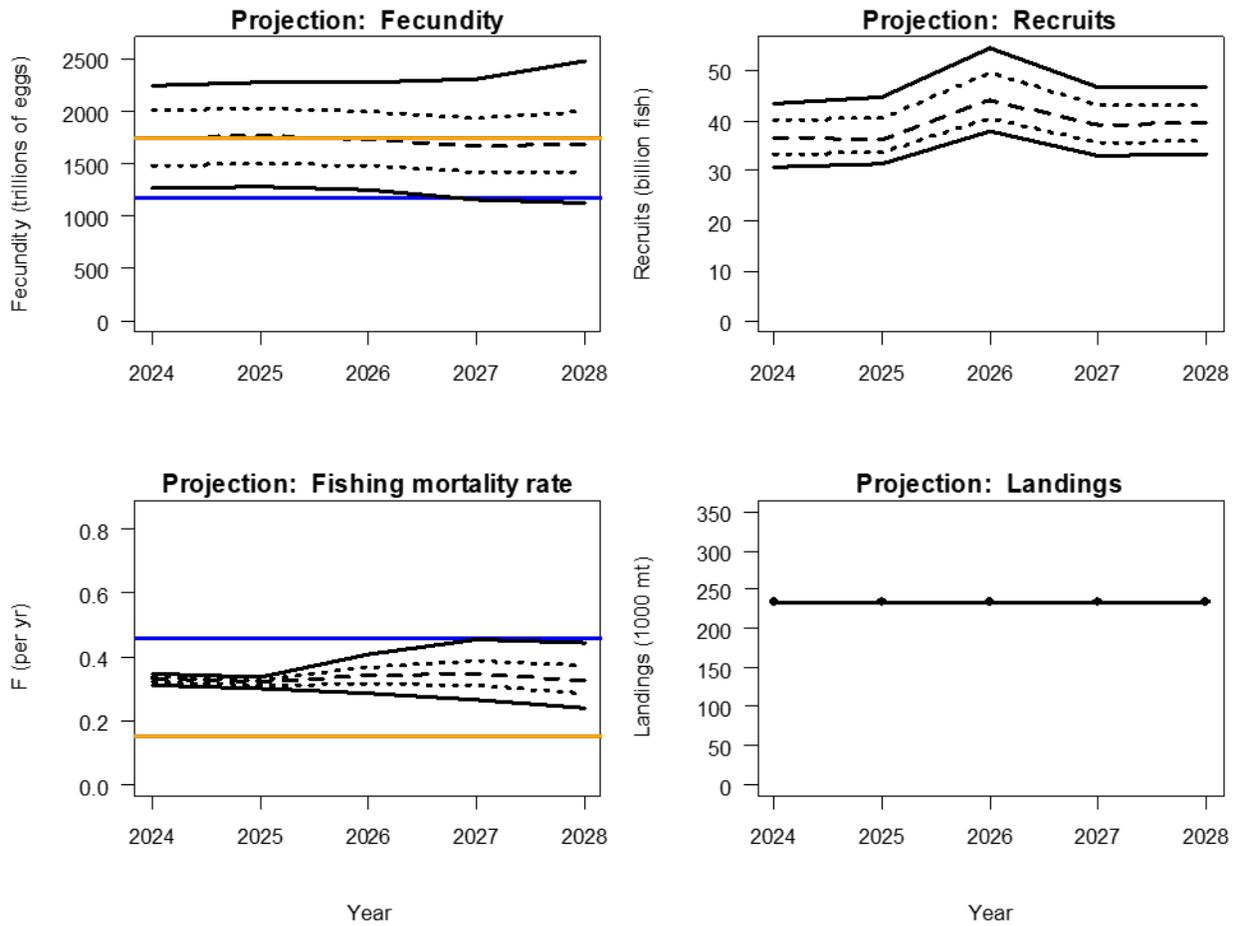


Figure 1. Fecundity, full fishing mortality rate, and recruits projected from 2024 to 2028 for a coastwide total allowable catch of 233,550 mt. The orange lines represent ERP target fishing mortality rate and fecundity, while the blue lines represent the ERP threshold fishing mortality rate and fecundity. The dashed black line is the 50th percentile (median), the dotted black lines are the 25th and 75th percentiles, and the solid black lines are the 5th and 95th percentiles.

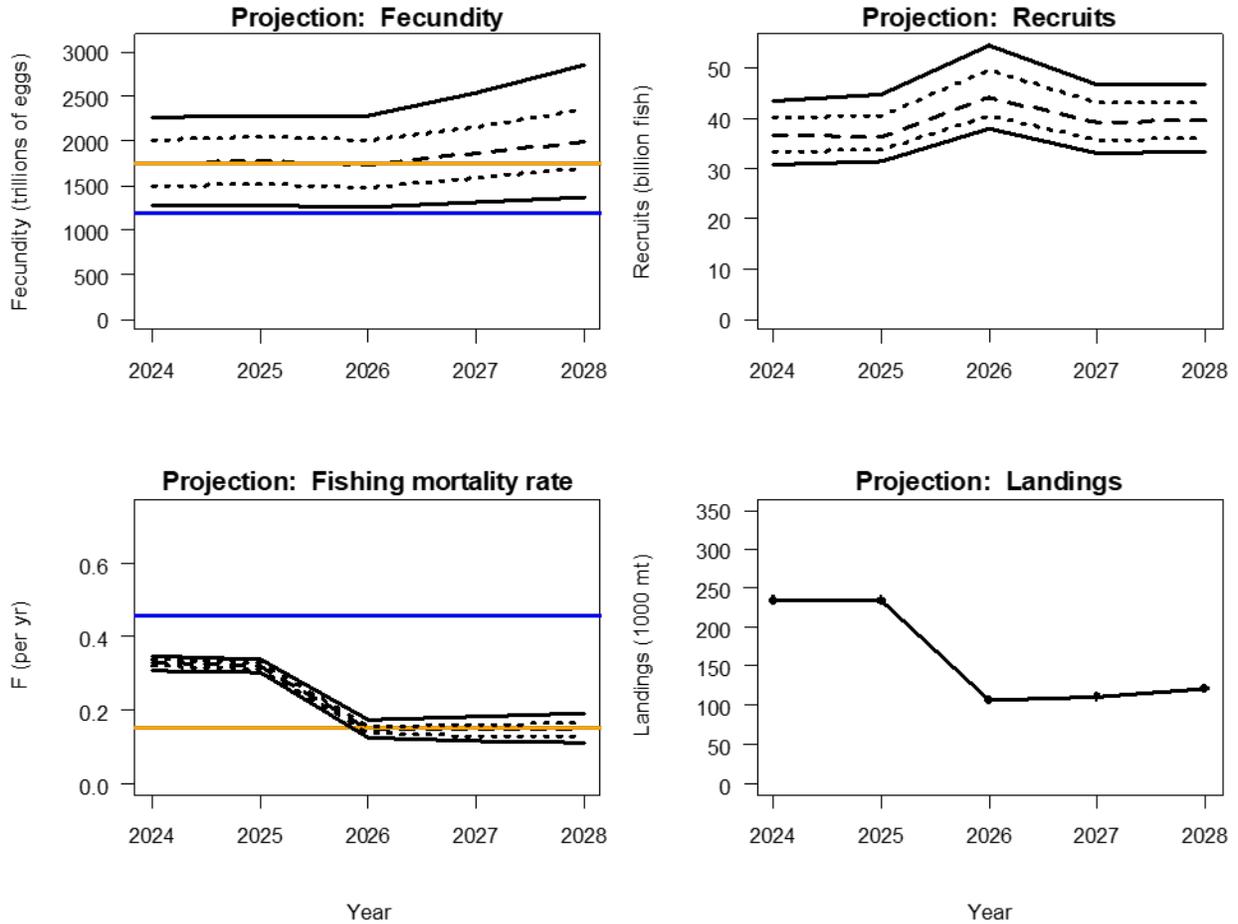


Figure 2. Fecundity, full fishing mortality rate, and recruits projected from 2024 to 2028 for a coastwide total allowable catch with a 40% probability of exceeding the ERP F target (106,100 mt). The orange lines represent ERP target fishing mortality rate and fecundity, while the blue lines represent the ERP threshold fishing mortality rate and fecundity. The dashed black line is the 50th percentile (median), the dotted black lines are the 25th and 75th percentiles, and the solid black lines are the 5th and 95th percentiles.

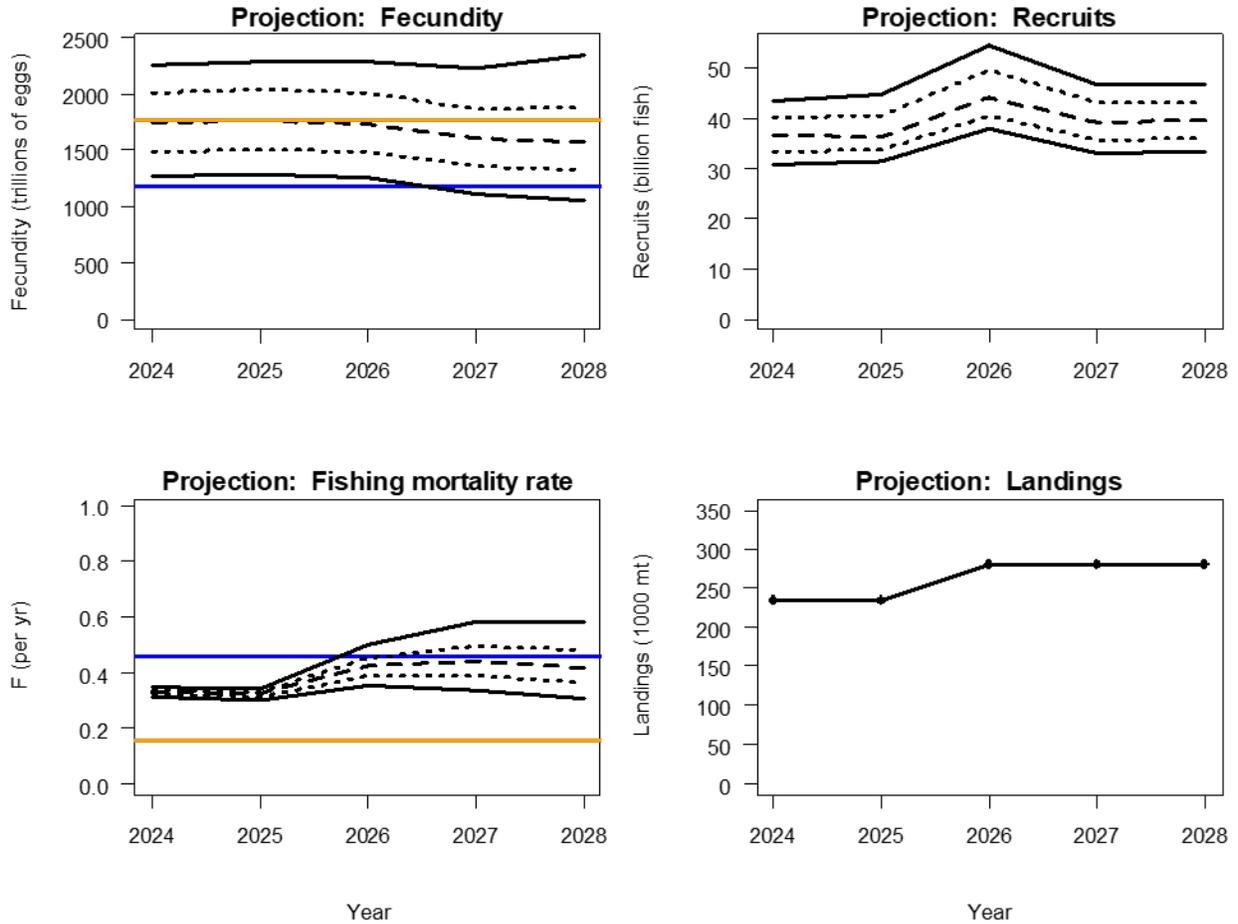


Figure 3. Fecundity, full fishing mortality rate, and recruits projected from 2024 to 2028 for a 20% increase to the coastwide total allowable catch (280,260 mt). The orange lines represent ERP target fishing mortality rate and fecundity, while the blue lines represent the ERP threshold fishing mortality rate and fecundity. The dashed black line is the 50th percentile (median), the dotted black lines are the 25th and 75th percentiles, and the solid black lines are the 5th and 95th percentiles.

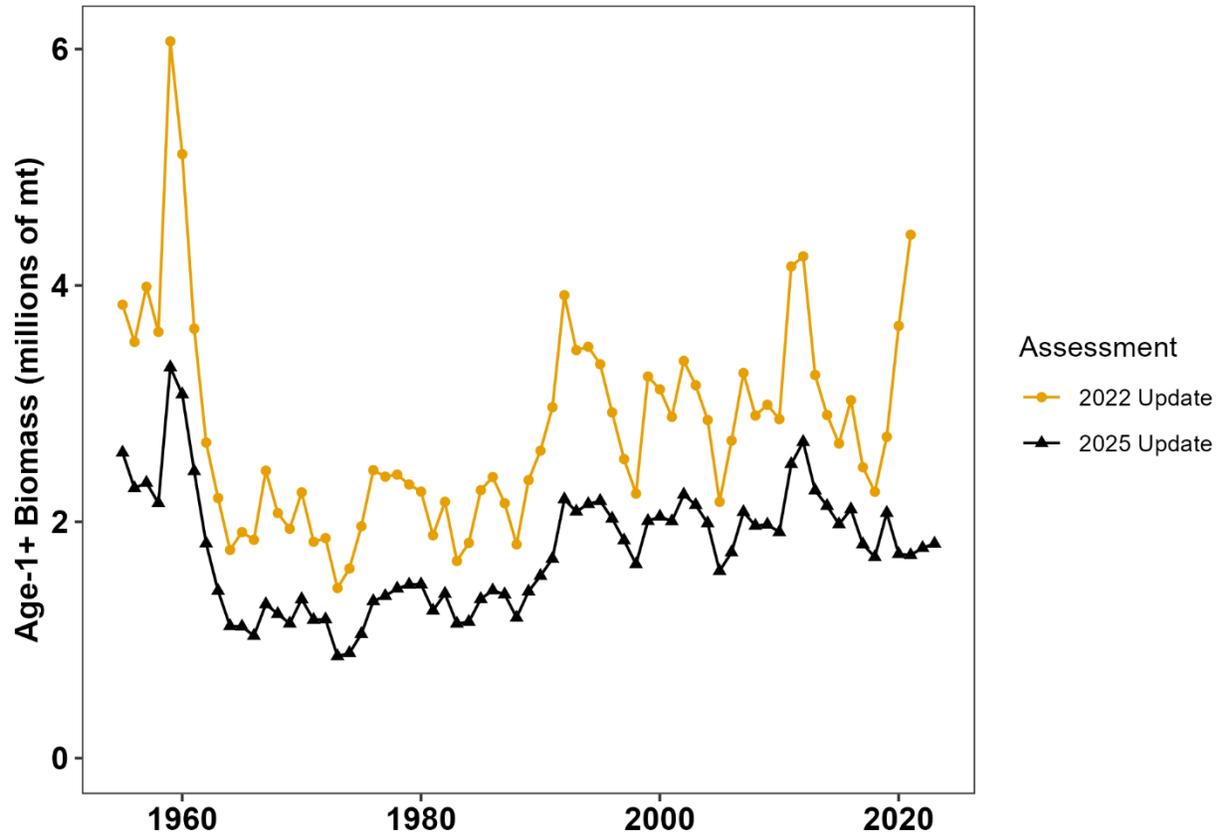


Figure 4. Age-1+ biomass estimates from the 2022 update and the 2025 update of the Atlantic menhaden single-species assessment model.

APPENDIX 2: SUPPLEMENTAL ASSESSMENT INFORMATION

Appendix Tables

Table A1. Atlantic menhaden landings (in 1,000s of metric tons) by fishery and region, 1955-2023. Bait landings are considered incomplete until 1985.

Year	Reduction Landings			Bait Landings			Recreational Landings			Total Landings
	Total	North	South	Total	North	South	Total	North	South	
1955	644.48	402.74	241.74	14.64	10.14	4.50				659.12
1956	715.25	478.89	236.36	23.25	17.51	5.74				738.50
1957	605.58	389.80	215.78	24.71	10.60	14.11				630.29
1958	512.39	248.34	264.05	14.69	3.46	11.23				527.07
1959	662.17	318.44	343.73	20.58	7.98	12.61				682.76
1960	532.24	323.86	208.37	19.44	7.61	11.83				551.68
1961	578.61	334.76	243.85	25.07	8.44	16.63				603.68
1962	540.66	321.36	219.31	26.58	10.60	15.98				567.24
1963	348.44	147.55	200.89	24.39	6.11	18.28				372.83
1964	270.40	50.61	219.80	20.23	4.27	15.97				290.64
1965	274.60	57.96	216.64	23.62	3.30	20.32				298.22
1966	220.69	7.89	212.80	13.72	1.76	11.96				234.41
1967	194.39	17.21	177.18	11.61	1.44	10.17				206.00
1968	235.86	33.07	202.80	9.46	0.75	8.71				245.32
1969	162.33	15.41	146.92	10.61	1.11	9.50				172.94
1970	259.39	15.80	243.59	21.64	1.41	20.23				281.03
1971	250.32	33.44	216.87	13.47	1.87	11.60				263.79
1972	365.87	69.09	296.78	10.35	2.14	8.21				376.22
1973	346.92	90.69	256.23	14.77	2.61	12.16				361.69
1974	292.20	77.90	214.31	14.54	2.11	12.43				306.74
1975	250.21	48.40	201.81	21.69	1.89	19.80				271.90
1976	340.54	86.84	253.70	19.63	1.98	17.65				360.17
1977	341.16	53.31	287.85	23.09	1.39	21.70				364.25
1978	344.08	63.53	280.55	25.87	1.07	24.80				369.95
1979	375.74	70.19	305.55	13.02	1.17	11.85				388.76
1980	401.53	83.02	318.51	26.11	1.07	25.05				427.64
1981	381.31	68.06	313.25	22.44	1.08	21.36	0.42	0.25	0.17	404.17
1982	382.46	35.08	347.38	19.86	1.32	18.54	0.34	0.20	0.14	402.66
1983	418.63	39.37	379.26	19.06	1.36	17.71	0.68	0.14	0.54	438.38
1984	326.30	34.97	291.33	14.33	1.59	12.75	0.42	0.15	0.27	341.05
1985	306.67	111.25	195.42	45.59	22.92	22.66	0.52	0.38	0.14	352.78

Table A1. Continued

Year	Reduction Landings			Bait Landings			Recreational Landings			Total Landings
	Total	North	South	Total	North	South	Total	North	South	
1986	237.99	42.57	195.42	35.46	18.30	17.17	1.03	0.93	0.10	274.49
1987	326.90	82.99	243.91	36.43	18.30	18.13	0.65	0.63	0.02	363.98
1988	309.29	73.64	235.65	53.14	21.44	31.70	1.16	0.54	0.61	363.58
1989	322.00	98.82	223.18	32.06	11.49	20.57	0.54	0.46	0.09	354.61
1990	401.15	144.10	257.05	31.19	16.35	14.84	0.52	0.36	0.16	432.86
1991	381.43	104.55	276.87	37.62	24.17	13.45	1.16	0.92	0.24	420.20
1992	297.64	99.14	198.50	41.56	28.08	13.48	2.31	2.12	0.19	341.51
1993	320.60	58.37	262.23	40.98	26.76	14.22	0.53	0.47	0.06	362.11
1994	259.99	33.39	226.60	37.89	21.35	16.54	0.39	0.19	0.20	298.27
1995	339.92	96.30	243.62	40.64	22.17	18.47	0.69	0.36	0.33	381.25
1996	292.93	61.55	231.38	36.19	17.34	18.85	0.51	0.11	0.40	329.63
1997	259.14	25.17	233.98	41.35	19.49	21.86	0.19	0.11	0.08	300.68
1998	245.91	12.33	233.58	39.70	16.88	22.81	0.43	0.34	0.08	286.03
1999	171.19	8.42	162.77	35.00	13.11	21.89	0.68	0.13	0.54	206.87
2000	167.26	43.19	124.08	33.95	15.15	18.80	0.26	0.22	0.03	201.47
2001	233.56	39.62	193.94	36.14	13.24	22.91	0.35	0.06	0.29	270.05
2002	174.07	27.17	146.89	37.18	13.13	24.05	0.82	0.63	0.19	212.07
2003	166.11	4.15	161.96	33.79	8.60	25.19	0.52	0.32	0.20	200.42
2004	178.47	25.91	152.55	34.46	10.19	24.27	2.33	2.03	0.30	215.26
2005	152.85	15.37	137.48	39.15	10.23	28.91	0.30	0.04	0.27	192.30
2006	157.36	60.15	97.21	27.91	12.38	15.53	1.46	0.88	0.58	186.73
2007	174.48	36.63	137.84	42.62	20.28	22.34	1.16	0.66	0.49	218.25
2008	141.14	39.30	101.84	47.84	26.37	21.47	0.91	0.79	0.12	189.90
2009	143.75	18.66	125.09	39.55	18.87	20.68	0.52	0.18	0.35	183.82
2010	183.10	28.67	154.43	43.00	25.81	17.19	0.70	0.39	0.32	226.80
2011	174.02	29.57	144.45	52.98	34.27	18.70	0.77	0.44	0.32	227.76
2012	160.62	23.91	136.71	63.91	40.01	23.90	1.97	0.80	1.18	226.50
2013	131.02	32.70	98.32	37.10	19.77	17.32	0.92	0.54	0.38	169.04
2014	131.10	29.90	101.20	41.06	20.57	20.49	2.07	1.70	0.37	174.23
2015	143.50	28.80	114.70	45.52	24.73	20.79	1.77	1.17	0.61	190.79
2016	137.40	45.00	92.40	43.60	25.44	18.16	6.73	6.02	0.71	187.73
2017	128.92	58.45	70.47	45.97	28.54	17.42	2.32	1.97	0.35	177.21
2018	141.31	57.72	83.59	49.76	33.09	16.68	2.00	1.76	0.24	193.08
2019	150.82	45.78	105.05	58.94	40.10	18.83	1.17	1.05	0.11	210.92
2020	124.60	52.55	72.05	60.24	42.93	17.31	1.79	1.51	0.28	186.63
2021	136.69	59.62	77.07	59.36	41.54	17.82	1.75	1.57	0.19	197.80
2022	136.70	38.70	98.00	60.42	41.33	19.09	3.86	3.49	0.37	200.98
2023	131.80	26.00	105.80	48.55	34.38	14.17	1.40	1.37	0.03	181.75

Table A2. Catch-at-age for the northern commercial reduction fishery from 1955-2023.

Year	0	1	2	3	4	5	6+	# of fish sampled
1955	0	0.015	0.471	0.217	0.253	0.032	0.012	8408
1956	0	0.133	0.555	0.195	0.025	0.072	0.020	11050
1957	0	0.270	0.610	0.051	0.033	0.017	0.020	11247
1958	0	0.025	0.908	0.042	0.010	0.008	0.009	8777
1959	0	0.531	0.291	0.159	0.009	0.004	0.007	10470
1960	0	0.009	0.892	0.037	0.049	0.009	0.004	9346
1961	0	0.003	0.160	0.803	0.012	0.018	0.003	8059
1962	0	0.015	0.245	0.218	0.457	0.033	0.032	9598
1963	0	0.296	0.438	0.095	0.068	0.080	0.023	6058
1964	0	0.034	0.357	0.345	0.128	0.065	0.072	4619
1965	0	0.160	0.370	0.373	0.071	0.013	0.014	6564
1966	0	0.201	0.467	0.212	0.100	0.009	0.012	1859
1967	0	0.055	0.296	0.567	0.072	0.009	0.000	1840
1968	0	0.007	0.479	0.388	0.116	0.009	0.001	5701
1969	0	0.001	0.251	0.594	0.149	0.005	0	3621
1970	0	0.150	0.793	0.050	0.007	0	0	700
1971	0	0.126	0.288	0.433	0.137	0.017	0	760
1972	0	0.169	0.286	0.452	0.085	0.008	0	759
1973	0	0.021	0.821	0.133	0.024	0.001	0	729
1974	0	0.028	0.844	0.117	0.006	0.004	0	1280
1975	0	0	0.798	0.175	0.025	0.001	0	1850
1976	0	0.092	0.823	0.071	0.013	0	0	2010
1977	0	0.022	0.567	0.326	0.079	0.006	0.001	2200
1978	0	0	0.298	0.567	0.120	0.015	0	1861
1979	0	0.007	0.579	0.332	0.076	0.006	0	1688
1980	0	0.002	0.237	0.462	0.243	0.051	0.004	1744
1981	0	0.001	0.357	0.357	0.210	0.070	0.006	2220
1982	0	0.042	0.393	0.473	0.063	0.025	0.004	840
1983	0	0.012	0.826	0.120	0.037	0.005	0	840
1984	0	0.024	0.343	0.506	0.097	0.029	0.001	3110
1985	0	0.020	0.760	0.089	0.111	0.017	0.003	1490
1986	0	0.010	0.795	0.107	0.050	0.031	0.006	530
1987	0	0.005	0.652	0.277	0.058	0.006	0.002	940
1988	0	0	0.225	0.486	0.260	0.026	0.003	1650
1989	0	0.081	0.623	0.173	0.097	0.025	0	1360

Table A2. Continued

Year	0	1	2	3	4	5	6+	# of fish sampled
1990	0	0.011	0.788	0.134	0.049	0.018	0.001	1660
1991	0	0.085	0.430	0.385	0.072	0.023	0.005	1460
1992	0	0.058	0.687	0.107	0.118	0.026	0.004	1180
1993	0	0.045	0.675	0.226	0.036	0.017	0.002	640
1994	0	0.017	0.420	0.333	0.183	0.047	0	300
1995	0	0.020	0.567	0.329	0.079	0.006	0	710
1996	0	0	0.579	0.320	0.092	0.008	0	500
1997	0	0	0.495	0.293	0.158	0.055	0	130
1998	0	0	0.657	0.281	0.062	0	0	100
1999	0	0	0.389	0.428	0.168	0.015	0	120
2000	0	0.005	0.559	0.406	0.019	0.011	0	490
2001	0	0	0.150	0.796	0.055	0	0	380
2002	0	0.040	0.347	0.491	0.120	0.002	0	290
2003	0	0	0.474	0.378	0.139	0.010	0	90
2004	0	0.004	0.615	0.320	0.061	0	0	290
2005	0	0	0.219	0.605	0.174	0.002	0	240
2006	0	0.022	0.456	0.422	0.099	0.001	0	1040
2007	0	0.022	0.761	0.174	0.041	0.002	0	520
2008	0	0.002	0.216	0.668	0.106	0.008	0	550
2009	0	0.123	0.299	0.463	0.102	0.013	0	240
2010	0	0	0.456	0.348	0.193	0.003	0	380
2011	0	0.058	0.726	0.190	0.023	0.003	0	410
2012	0	0.001	0.778	0.192	0.029	0	0	330
2013	0	0.028	0.724	0.233	0.015	0	0	370
2014	0	0.085	0.518	0.274	0.119	0.004	0	290
2015	0	0.006	0.593	0.362	0.038	0	0	390
2016	0	0.075	0.413	0.481	0.031	0	0	700
2017	0	0.017	0.572	0.393	0.015	0.003	0	1070
2018	0	0.088	0.680	0.211	0.021	0	0	590
2019	0.002	0.464	0.437	0.089	0.009	0	0	640
2020								0
2021	0	0.106	0.849	0.045	0	0	0	80
2022	0	0.155	0.752	0.086	0.007	0	0	140
2023	0.009	0.167	0.674	0.130	0.020	0	0	130

Table A3. Catch-at-age for the southern commercial reduction fishery from 1955-2023.

Year	0	1	2	3	4	5	6+	# of fish sampled
1955	0.374	0.323	0.269	0.016	0.016	0.002	0	7742
1956	0.017	0.885	0.049	0.018	0.004	0.022	0.004	8831
1957	0.151	0.598	0.217	0.010	0.011	0.007	0.006	8467
1958	0.059	0.466	0.443	0.018	0.005	0.005	0.004	7008
1959	0.003	0.855	0.099	0.034	0.005	0.002	0.002	7490
1960	0.052	0.192	0.701	0.018	0.025	0.008	0.004	4167
1961	0	0.538	0.217	0.234	0.004	0.007	0	5158
1962	0.040	0.387	0.491	0.033	0.044	0.003	0.002	6197
1963	0.079	0.460	0.386	0.059	0.007	0.008	0.002	6977
1964	0.187	0.433	0.349	0.028	0.002	0	0	5824
1965	0.184	0.528	0.269	0.018	0.001	0	0	13017
1966	0.265	0.414	0.299	0.020	0.001	0	0	13848
1967	0.007	0.663	0.269	0.057	0.003	0	0	13648
1968	0.143	0.349	0.468	0.037	0.003	0	0	21168
1969	0.188	0.442	0.330	0.038	0.002	0	0	11511
1970	0.016	0.650	0.309	0.022	0.003	0	0	7761
1971	0.083	0.288	0.569	0.054	0.005	0.001	0	7510
1972	0.033	0.618	0.285	0.061	0.003	0	0	5800
1973	0.036	0.372	0.591	0.001	0	0	0	5640
1974	0.196	0.388	0.413	0.003	0	0	0	4330
1975	0.154	0.371	0.469	0.006	0.001	0	0	5450
1976	0.101	0.572	0.324	0.003	0	0	0	4720
1977	0.140	0.289	0.567	0.003	0	0	0	5080
1978	0.158	0.230	0.558	0.050	0.003	0	0	5250
1979	0.413	0.172	0.403	0.012	0.001	0	0	4680
1980	0.028	0.476	0.452	0.038	0.004	0.001	0	5548
1981	0.316	0.186	0.460	0.038	0	0	0	7000
1982	0.038	0.306	0.558	0.096	0.001	0	0	8230
1983	0.279	0.148	0.547	0.016	0.008	0.001	0	4340
1984	0.396	0.311	0.244	0.040	0.007	0.002	0	8580
1985	0.235	0.394	0.364	0.006	0	0	0	6230
1986	0.056	0.126	0.797	0.019	0.002	0.001	0	4880
1987	0.022	0.253	0.691	0.031	0.003	0	0	6460
1988	0.175	0.146	0.573	0.099	0.006	0.001	0	5708
1989	0.069	0.514	0.402	0.014	0.001	0	0	5530

Table A3. Continued

Year	0	1	2	3	4	5	6+	# of fish sampled
1990	0.190	0.078	0.697	0.023	0.010	0.002	0	5180
1991	0.317	0.360	0.281	0.038	0.004	0.001	0	6230
1992	0.243	0.428	0.313	0.014	0.002	0	0	4430
1993	0.049	0.266	0.608	0.074	0.003	0	0	4680
1994	0.064	0.197	0.609	0.094	0.035	0.002	0	4410
1995	0.044	0.408	0.366	0.150	0.031	0.002	0	3900
1996	0.036	0.226	0.630	0.092	0.015	0.001	0	3720
1997	0.027	0.260	0.423	0.236	0.047	0.007	0.001	3970
1998	0.073	0.187	0.535	0.123	0.073	0.009	0.001	3740
1999	0.188	0.292	0.428	0.069	0.020	0.003	0	3500
2000	0.140	0.205	0.510	0.127	0.016	0.002	0	2550
2001	0.039	0.073	0.604	0.265	0.018	0.001	0	3540
2002	0.242	0.284	0.321	0.140	0.012	0	0	3310
2003	0.088	0.185	0.643	0.073	0.010	0.001	0	3400
2004	0.020	0.234	0.670	0.060	0.015	0.001	0	3880
2005	0.020	0.131	0.618	0.210	0.018	0.003	0	3290
2006	0.016	0.525	0.378	0.072	0.008	0	0	2530
2007	0.001	0.306	0.631	0.054	0.008	0	0	3270
2008	0.017	0.115	0.812	0.053	0.003	0	0	2220
2009	0.007	0.515	0.311	0.147	0.019	0.001	0	2590
2010	0.017	0.447	0.494	0.034	0.008	0	0	2890
2011	0	0.477	0.467	0.048	0.007	0.002	0	2820
2012	0.007	0.183	0.789	0.020	0.001	0	0	2300
2013	0.043	0.457	0.388	0.095	0.016	0	0	1760
2014	0.007	0.482	0.377	0.106	0.026	0.002	0	1790
2015	0	0.141	0.759	0.092	0.009	0	0	2170
2016	0.022	0.303	0.509	0.160	0.006	0	0	1800
2017	0	0.249	0.581	0.144	0.026	0	0	1280
2018	0.036	0.334	0.479	0.136	0.015	0	0	1520
2019	0.002	0.755	0.202	0.037	0.004	0.001	0	1620
2020	0.0	0.177	0.819	0.003	0	0	0	450
2021	0.0	0.831	0.167	0.002	0.001	0	0	660
2022	0	0.530	0.412	0.047	0.010	0	0	1320
2023	0.010	0.322	0.608	0.056	0.004	0	0	915

Table A4. Catch-at-age for the northern commercial bait fishery (includes MRIP estimates of recreational catch).

Year	0	1	2	3	4	5	6+	# of fish sampled
1985	0.000	0.010	0.754	0.116	0.093	0.022	0.006	0
1986	0.000	0.001	0.207	0.563	0.116	0.091	0.023	0
1987	0.000	0.002	0.215	0.531	0.226	0.016	0.010	0
1988	0.000	0.000	0.070	0.521	0.363	0.041	0.004	0
1989	0.000	0.010	0.216	0.374	0.310	0.089	0.001	30
1990	0.000	0.003	0.534	0.262	0.144	0.053	0.005	0
1991	0.000	0.012	0.228	0.553	0.143	0.051	0.012	0
1992	0.000	0.025	0.335	0.212	0.330	0.079	0.019	0
1993	0.000	0.008	0.327	0.494	0.099	0.065	0.008	29
1994	0.000	0.000	0.098	0.505	0.347	0.045	0.004	401
1995	0.000	0.000	0.088	0.475	0.435	0.001	0.000	190
1996	0.000	0.000	0.413	0.442	0.137	0.008	0.000	203
1997	0.000	0.000	0.144	0.324	0.396	0.118	0.018	111
1998	0.000	0.000	0.103	0.379	0.420	0.084	0.013	225
1999	0.000	0.000	0.149	0.479	0.318	0.043	0.011	201
2000	0.000	0.004	0.415	0.315	0.229	0.030	0.007	266
2001	0.000	0.000	0.112	0.735	0.135	0.014	0.004	678
2002	0.000	0.000	0.053	0.552	0.336	0.058	0.000	524
2003	0.000	0.000	0.127	0.661	0.201	0.011	0.000	101
2004	0.000	0.007	0.438	0.381	0.161	0.013	0.000	29
2005	0.000	0.002	0.188	0.626	0.162	0.022	0.000	0
2006	0.000	0.004	0.278	0.566	0.147	0.001	0.004	259
2007	0.000	0.000	0.382	0.482	0.126	0.008	0.002	729
2008	0.000	0.000	0.262	0.585	0.139	0.013	0.000	973
2009	0.000	0.000	0.204	0.608	0.175	0.013	0.000	435
2010	0.000	0.000	0.365	0.380	0.228	0.025	0.002	466
2011	0.000	0.000	0.142	0.486	0.327	0.045	0.000	449
2012	0.000	0.000	0.392	0.468	0.130	0.008	0.002	547
2013	0.000	0.000	0.257	0.555	0.159	0.029	0.000	236
2014	0.000	0.000	0.066	0.525	0.387	0.020	0.002	806
2015	0.000	0.002	0.377	0.522	0.099	0.000	0.000	1291
2016	0.000	0.021	0.392	0.528	0.053	0.007	0.000	1018
2017	0.000	0.017	0.566	0.380	0.036	0.001	0.000	1487
2018	0.000	0.000	0.274	0.595	0.121	0.010	0.000	331
2019	0.000	0.037	0.356	0.446	0.142	0.015	0.004	837
2020	0.000	0.007	0.684	0.255	0.046	0.007	0.002	754
2021	0.000	0.018	0.546	0.283	0.134	0.019	0.000	471
2022	0.000	0.064	0.578	0.264	0.085	0.009	0.000	467
2023	0.000	0.132	0.435	0.352	0.077	0.005	0.000	428

Table A5. Catch-at-age for the southern commercial bait fishery (includes MRIP estimates of recreational catch).

Year	0	1	2	3	4	5	6+	# of fish sampled
1985	0.004	0.310	0.661	0.016	0.007	0.002	0.000	800
1986	0.001	0.064	0.860	0.066	0.006	0.003	0.001	420
1987	0.001	0.089	0.836	0.068	0.006	0.000	0.000	220
1988	0.004	0.060	0.663	0.232	0.038	0.003	0.000	10
1989	0.004	0.341	0.577	0.063	0.013	0.003	0.000	0
1990	0.005	0.061	0.903	0.026	0.003	0.001	0.000	10
1991	0.012	0.301	0.595	0.084	0.005	0.001	0.000	78
1992	0.000	0.554	0.446	0.000	0.000	0.000	0.000	70
1993	0.008	0.357	0.530	0.097	0.006	0.003	0.000	121
1994	0.001	0.142	0.650	0.150	0.052	0.005	0.000	139
1995	0.000	0.392	0.374	0.217	0.017	0.000	0.000	174
1996	0.000	0.006	0.757	0.199	0.037	0.000	0.000	156
1997	0.000	0.055	0.531	0.346	0.056	0.008	0.004	293
1998	0.036	0.065	0.539	0.237	0.108	0.012	0.003	411
1999	0.000	0.105	0.663	0.174	0.052	0.006	0.000	338
2000	0.008	0.222	0.659	0.112	0.000	0.000	0.000	270
2001	0.004	0.043	0.658	0.275	0.017	0.004	0.000	286
2002	0.000	0.047	0.265	0.494	0.173	0.020	0.002	180
2003	0.007	0.095	0.740	0.142	0.015	0.000	0.000	328
2004	0.000	0.066	0.733	0.167	0.031	0.003	0.000	327
2005	0.000	0.008	0.515	0.447	0.027	0.003	0.000	316
2006	0.000	0.327	0.451	0.197	0.024	0.000	0.000	220
2007	0.000	0.243	0.671	0.067	0.019	0.000	0.000	434
2008	0.005	0.044	0.809	0.112	0.017	0.013	0.000	366
2009	0.004	0.241	0.367	0.341	0.047	0.000	0.000	573
2010	0.003	0.306	0.527	0.102	0.059	0.002	0.000	435
2011	0.000	0.338	0.470	0.121	0.051	0.020	0.000	508
2012	0.000	0.068	0.825	0.085	0.017	0.002	0.002	408
2013	0.007	0.449	0.289	0.173	0.054	0.027	0.000	434
2014	0.000	0.437	0.365	0.138	0.055	0.005	0.000	559
2015	0.010	0.309	0.589	0.089	0.002	0.000	0.000	251
2016	0.000	0.225	0.423	0.324	0.021	0.007	0.000	205
2017	0.000	0.267	0.496	0.229	0.008	0.000	0.000	137
2018	0.000	0.328	0.446	0.166	0.060	0.001	0.000	280
2019	0.000	0.580	0.250	0.125	0.039	0.003	0.003	684
2020	0.000	0.004	0.023	0.972	0.000	0.000	0.000	65
2021	0.000	0.271	0.256	0.424	0.043	0.005	0.000	266
2022	0.005	0.334	0.492	0.124	0.040	0.006	0.000	233
2023	0.049	0.146	0.523	0.199	0.062	0.013	0.009	262

Table A6. Young-of-year abundance index (YOY), northern adult index (NAD), Mid-Atlantic adult index (MAD), and southern adult index (SAD) of abundance for Atlantic menhaden developed from the Conn method with associated coefficients of variation (CV).

Year	YOY		NAD		MAD		SAD	
	Index	CV	Index	CV	Index	CV	Index	CV
1959	1.60	1.03						
1960	0.47	1.07						
1961	0.42	1.10						
1962	1.60	1.03						
1963	1.24	1.08						
1964	0.80	1.15						
1965	0.49	1.06						
1966	0.64	1.09						
1967	0.53	1.10						
1968	0.48	0.90						
1969	1.28	0.90						
1970	0.30	0.90						
1971	1.62	0.86						
1972	2.29	0.84						
1973	2.39	1.00						
1974	2.68	0.99						
1975	2.83	1.00						
1976	2.77	0.98						
1977	2.76	1.01						
1978	1.45	0.99						
1979	2.11	1.00						
1980	3.20	0.83						
1981	2.45	1.01						
1982	3.05	0.84						
1983	1.74	0.99						
1984	1.53	0.98						
1985	2.64	0.86			1.88	1.09		
1986	2.27	0.76			1.87	1.13		
1987	0.41	0.72			2.06	1.13		
1988	1.06	0.69			1.94	1.11		
1989	1.54	0.59			1.21	1.12		

Table A6. Continued

Year	YOY		NAD		MAD		SAD	
	Index	CV	Index	CV	Index	CV	Index	CV
1990	0.71	0.51	0.53	0.67	0.93	1.12	3.12	0.75
1991	0.76	0.50	0.31	0.67	0.74	1.15	1.23	0.67
1992	0.52	0.51	0.92	0.63	1.34	1.11	0.92	0.66
1993	0.20	0.55	0.77	0.62	0.55	1.18	0.57	0.70
1994	0.32	0.52	0.50	0.63	1.46	1.12	0.36	0.79
1995	0.26	0.51	1.15	0.64	1.38	1.11	0.18	0.81
1996	0.25	0.51	0.59	0.56	0.54	1.16	0.28	0.77
1997	0.28	0.50	0.32	0.58	0.54	1.17	0.24	0.75
1998	0.50	0.50	0.60	0.65	0.78	0.36	0.85	0.68
1999	0.56	0.53	0.78	0.58	0.60	0.39	0.27	0.77
2000	0.43	0.48	0.48	0.63	0.83	0.39	0.84	0.74
2001	0.37	0.46	0.80	0.67	0.95	0.34	0.93	0.77
2002	0.53	0.44	1.59	0.58	0.46	0.39	1.00	0.66
2003	0.86	0.45	0.30	0.63	1.05	0.32	0.86	0.59
2004	0.65	0.44	0.39	0.66	0.52	0.34	0.47	0.57
2005	0.74	0.44	1.12	0.55	1.31	0.36	1.56	0.53
2006	0.28	0.44	1.00	0.54	0.45	0.37	3.31	0.50
2007	0.49	0.44	1.33	0.55	0.87	0.37	0.46	0.58
2008	0.32	0.44	1.20	0.55	0.39	0.39	0.68	0.39
2009	0.29	0.42	0.41	0.57	0.90	0.36	1.60	0.61
2010	0.47	0.45	0.81	0.68	0.97	0.36	0.90	0.37
2011	0.33	0.45	0.83	0.65	0.65	0.33	1.29	0.39
2012	0.17	0.45	1.70	0.54	0.59	0.39	1.32	0.38
2013	0.20	0.43	0.58	0.58	0.91	0.36	1.09	0.36
2014	0.43	0.43	1.44	0.56	1.60	0.34	1.15	0.38
2015	0.31	0.45	1.59	0.57	1.89	0.40	1.81	0.39
2016	0.61	0.45	1.17	0.56	0.57	0.39	0.56	0.43
2017	0.15	0.46	0.58	0.60	0.45	0.37	1.21	0.43
2018	0.28	0.44	0.34	0.63	1.22	0.61	1.14	0.40
2019	0.23	0.46	1.83	0.55	1.00	0.39	0.84	0.38
2020	0.23	0.50	2.47	0.67	0.34	0.43	0.96	0.77
2021	0.51	0.47	2.40	0.60	1.16	0.45	0.99	0.47
2022	0.67	0.50	2.28	0.60	1.60	0.38	0.42	0.39
2023	0.43	0.48	0.92	0.62	0.51	0.44	0.60	0.49

Table A7. List of surveys used in the Conn indices and their associated sigma (σ^p) values, or the standard deviation of the process error. Benchmark and update values are provided for comparison.

	Survey	2019 Benchmark	2022 Update	2025 Update
Age 1+ Surveys	CT Long Island Sound Trawl	0.96	1.90	1.20
	DE Adult Trawl	0.88	0.44	0.60
	NJ Ocean Trawl	1.53	1.15	0.80
	MD Striped Bass Spring Gill Net	2.23	2.22	2.10
	VIMS Shad and River Herring Monitoring	0.24	0.21	0.20
	NC Program 915 Pamlico Sound Gill Net	0.92	0.71	0.50
	SEAMAP	0.4	0.52	0.50
	GA Ecological Monitoring Trawl	0.5	0.73	0.90
YOY Surveys	RI Coastal Trawl	2.96	2.94	2.90
	CT River Juvenile Alosine Seine	2.5	2.52	2.70
	CT Thames River Seine	3.16	3.16	3.20
	CT Long Island Sound Trawl	1.34	1.28	1.70
	NY Peconic Bay Small Mesh Trawl	3.78	3.58	2.20
	NY Western Long Island Seine	2.99	3.10	3.00
	NY Juvenile Striped Bass Beach Seine	1.18	2.09	2.10
	NJ Ocean Trawl	1.85	1.89	1.90
	NJ Delaware River Striped Bass Seine	1.81	1.81	1.60
	DE Inland Bays	11.34	4.93	4.90
	MD Coastal Bays Trawl	2.17	1.33	4.50
	MD Juvenile Striped Bass Seine	1.64	1.44	1.50
	VIMS Juvenile Fish and Blue Crab Trawl	1.31	1.22	1.30
	VIMS Juvenile Striped Bass Seine	3.05	1.50	1.30
	NC Program 120 Estuarine Trawl	0.82	1.00	1.00
	SC Electrofishing	0.92	0.97	0.90

Appendix Figures

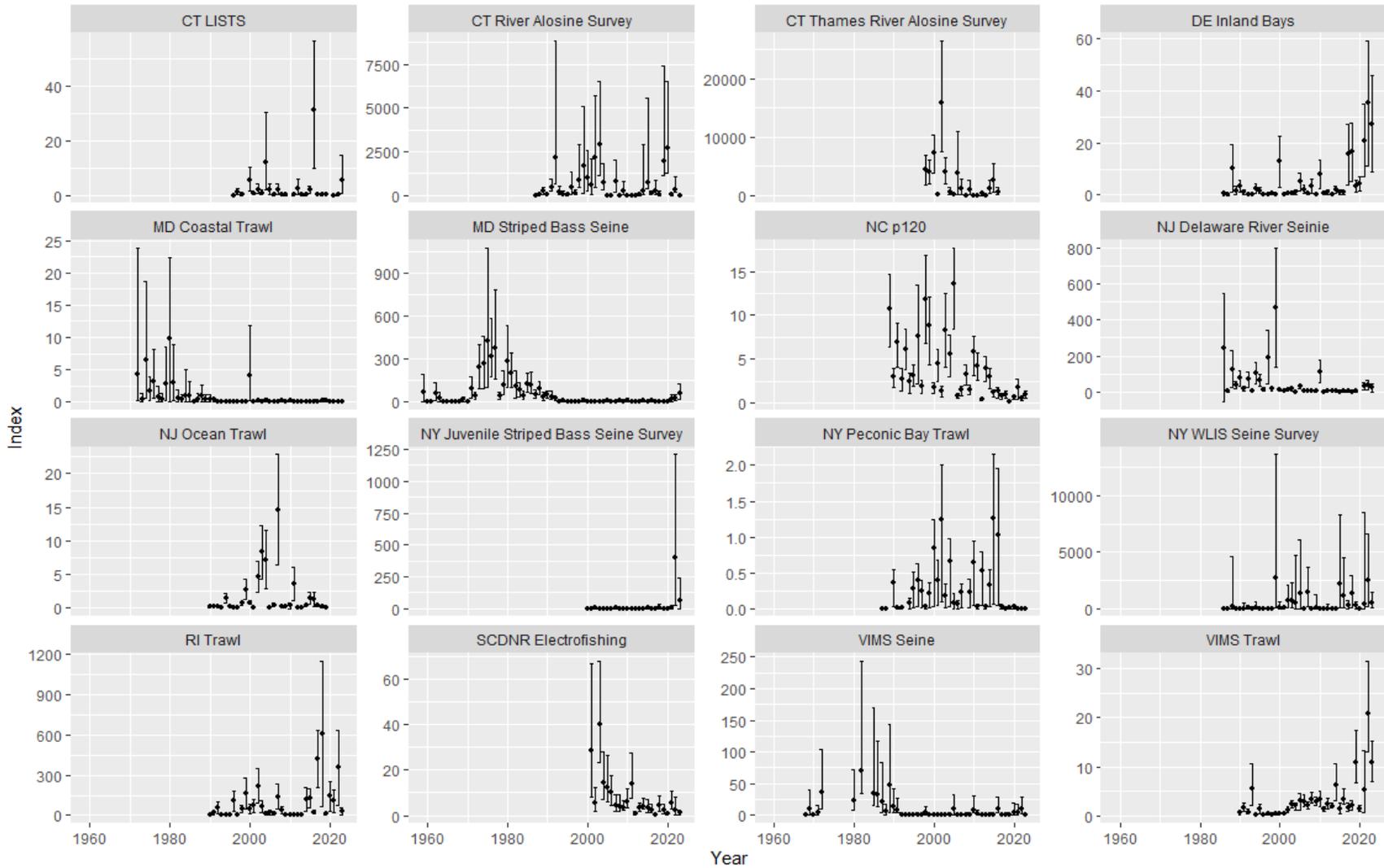


Figure A1. Individual YOY indices with 95% confidence intervals used in the coastwide YOY index.

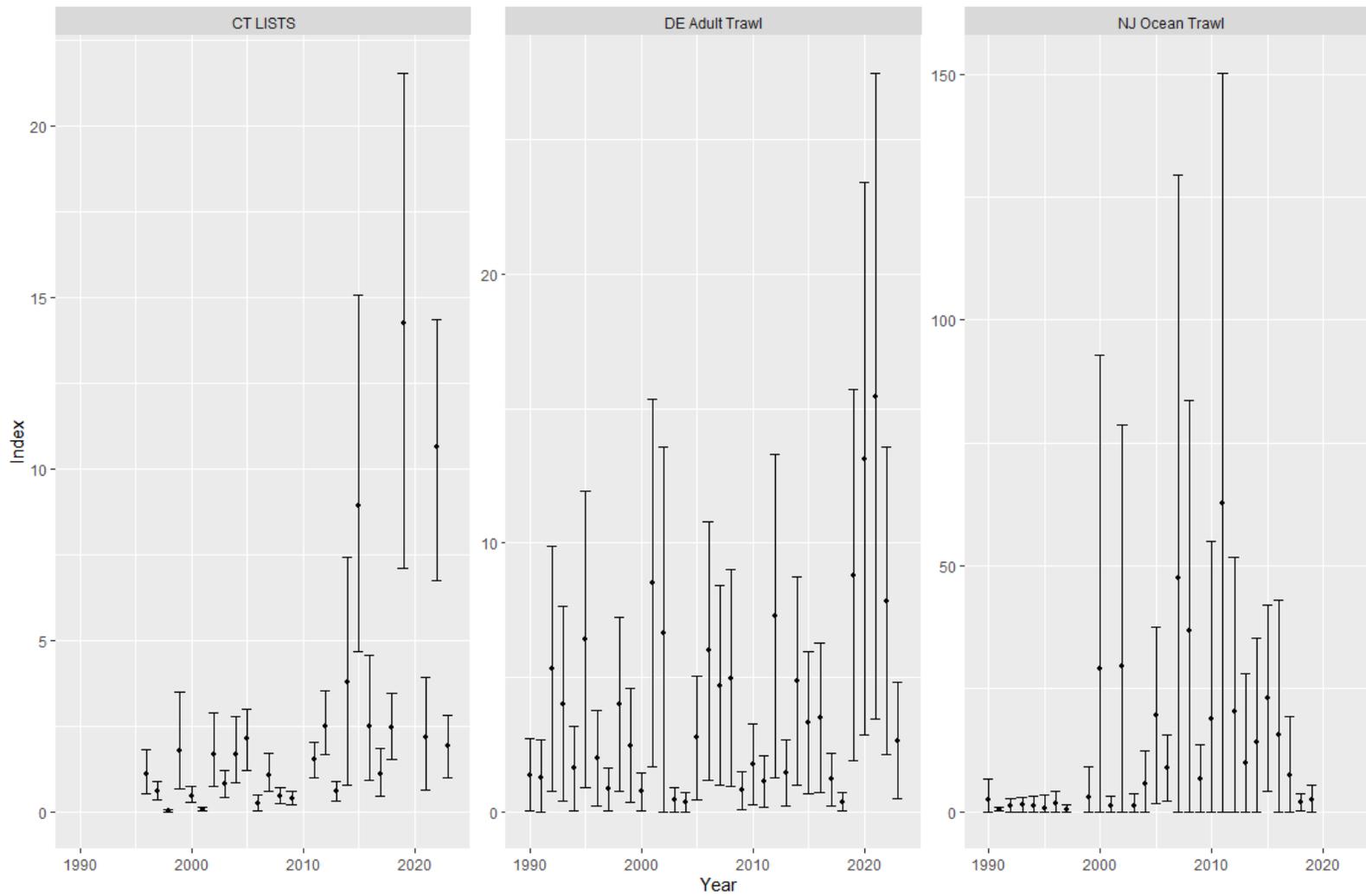


Figure A2. Individual adult indices with 95% confidence intervals used in the NAD index.

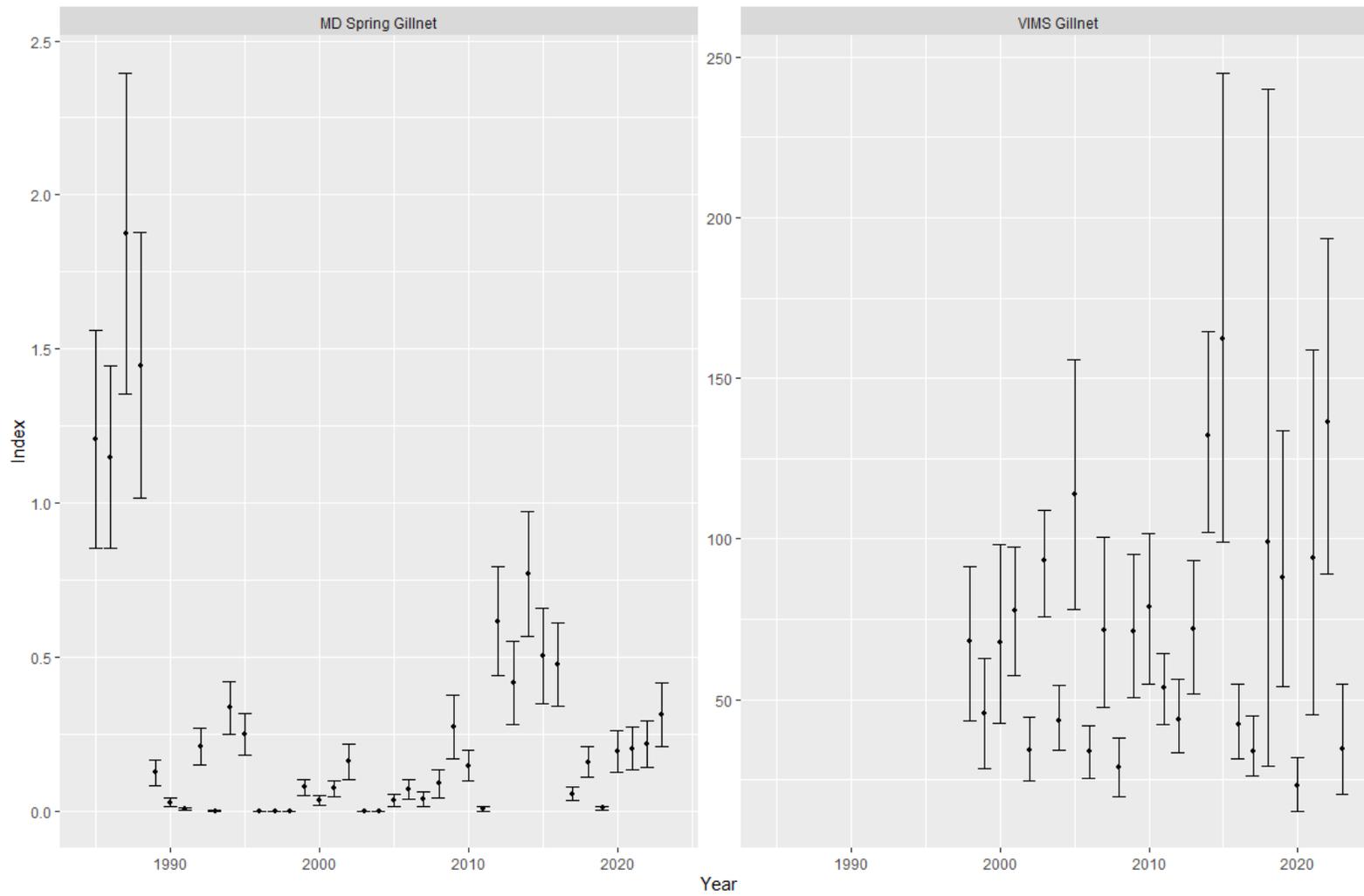


Figure A3. Individual adult indices with 95% confidence intervals used in the MAD index.

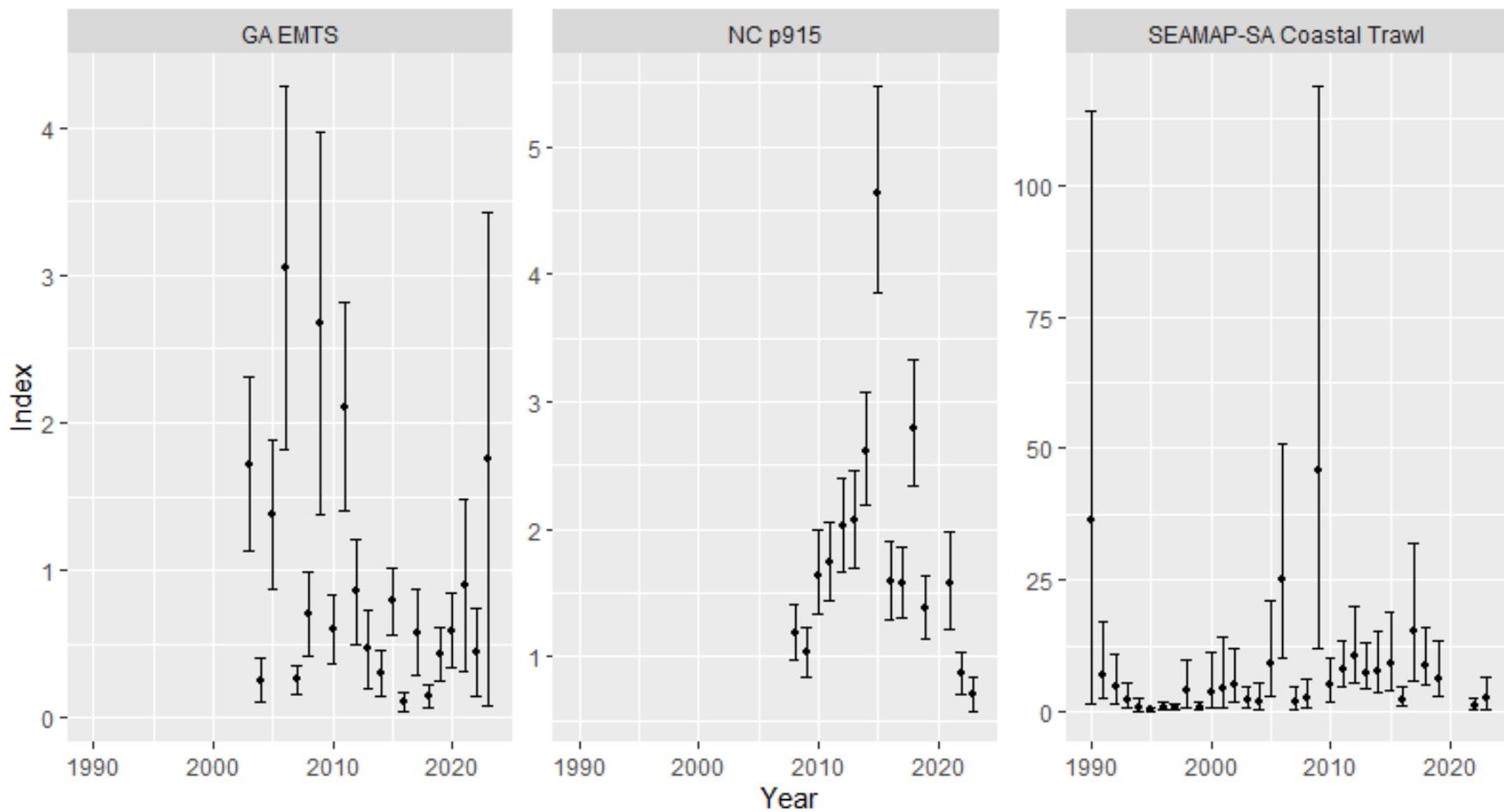


Figure A4. Individual adult indices with 95% confidence intervals used in the SAD index

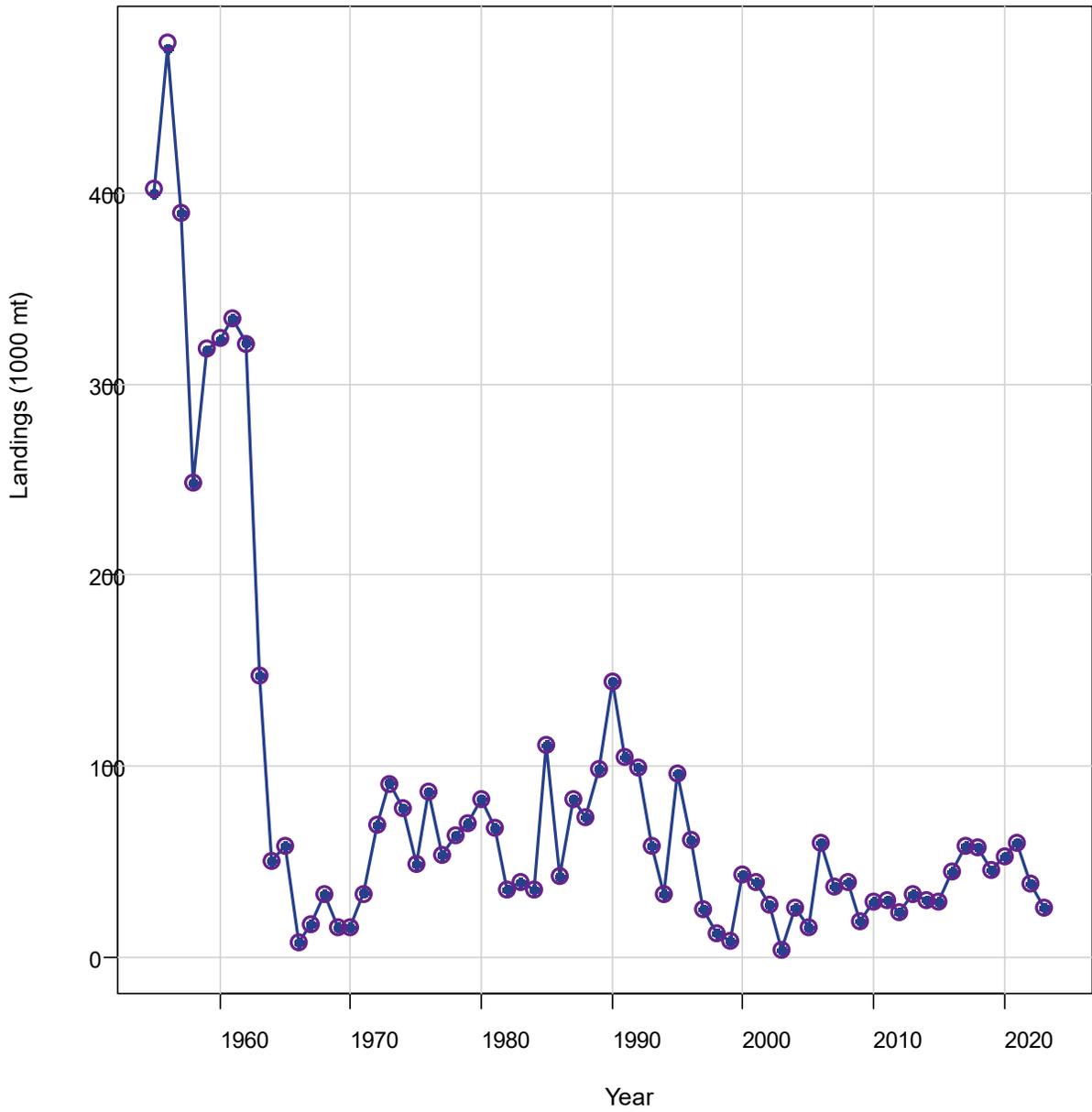


Figure A5. Predicted fit to the observed landings for the commercial reduction north fleet for 1955-2023. Predicted = solid circles + line; observed = open circles.

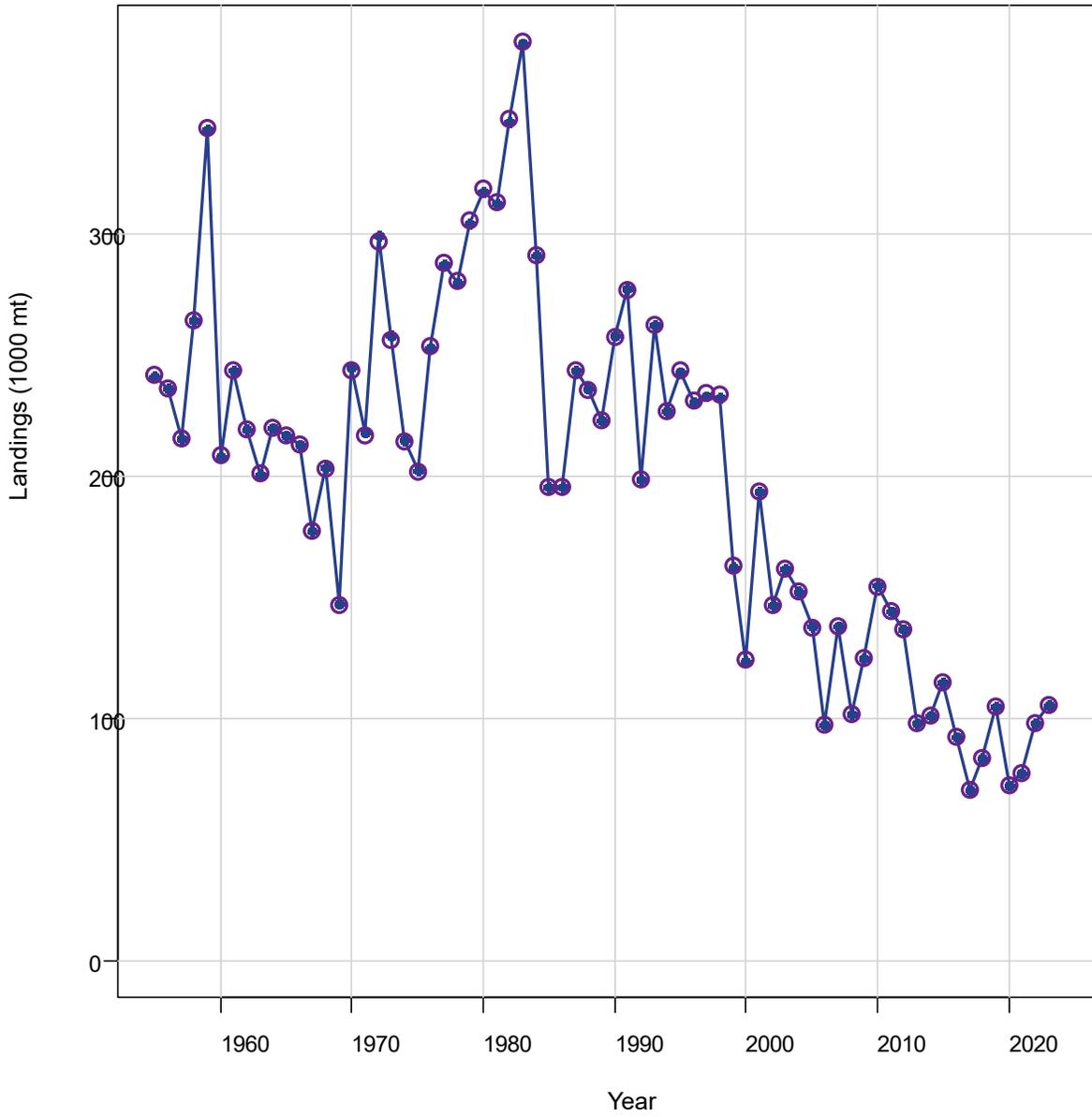


Figure A6. Predicted fit to the observed landings for the commercial reduction south fleet for 1955-2023. Predicted = solid circles + line; observed = open circles.

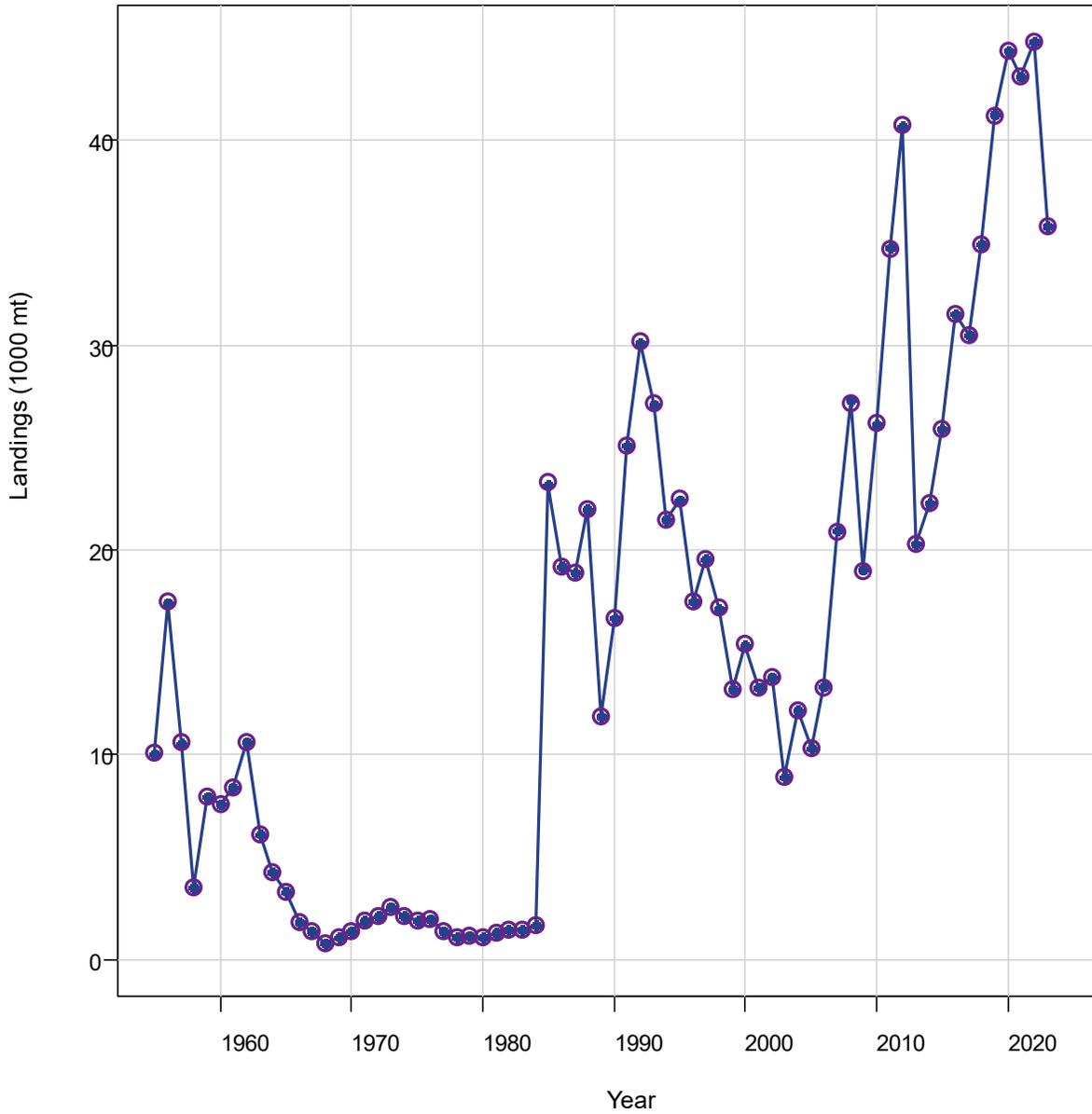


Figure A7. Predicted fit to the observed landings for the commercial bait north fleet for 1955-2023. Predicted = solid circles + line; observed = open circles.

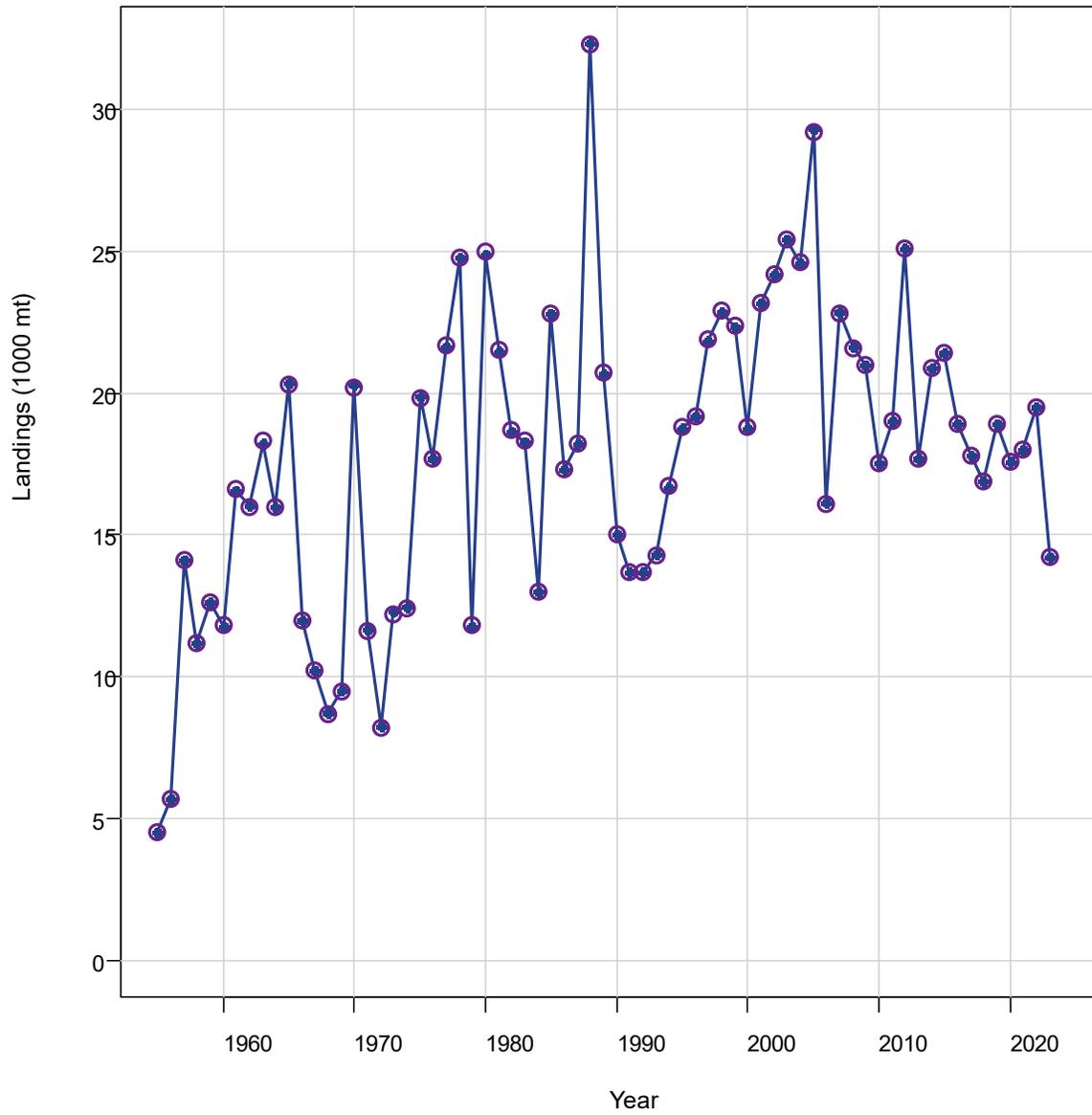


Figure A8. Predicted fit to the observed landings for the commercial bait south fleet for 1955-2023. Predicted = solid circles + line; observed = open circles.

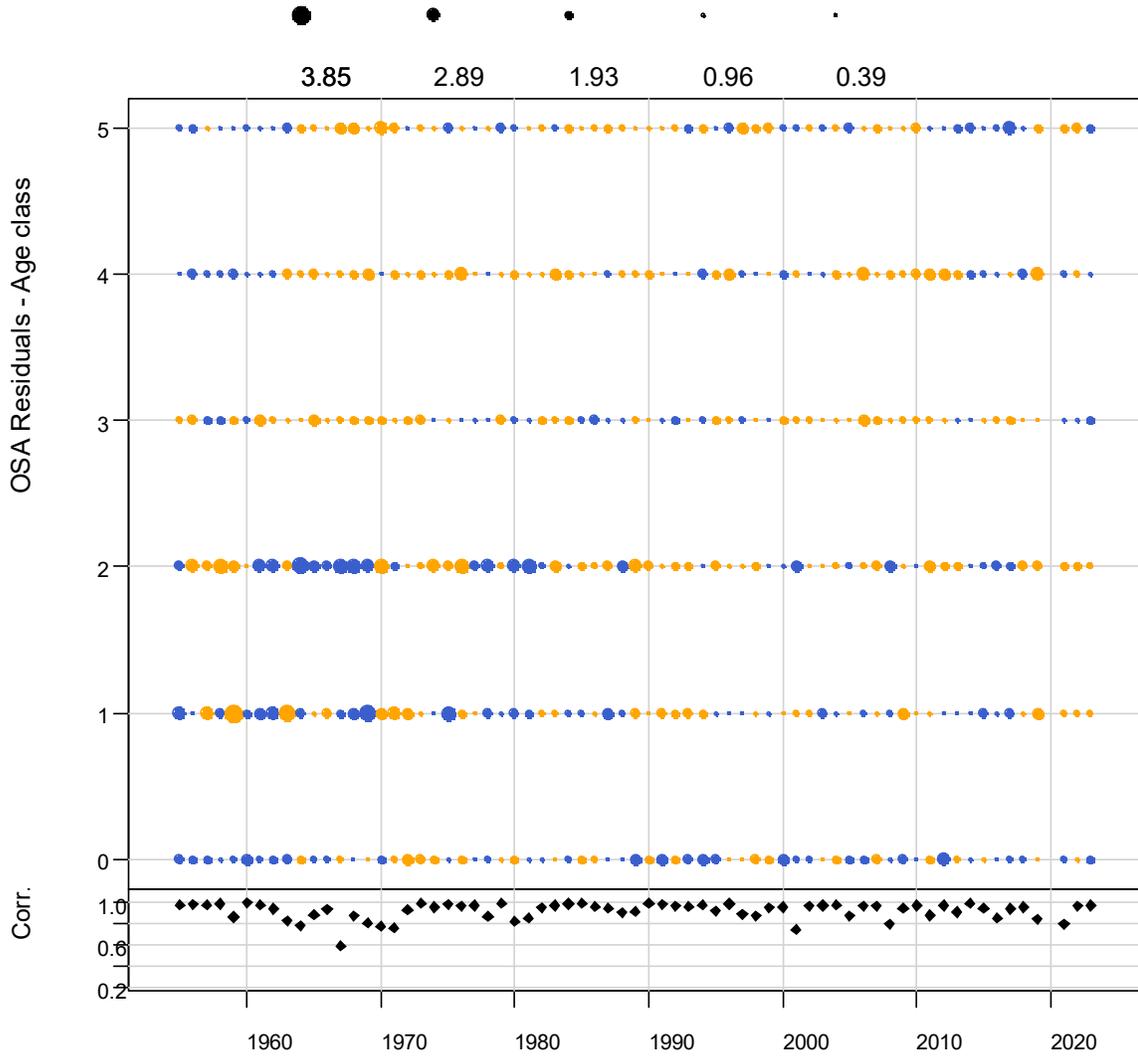


Figure A9. Bubble plot of the fits to the age compositions for the commercial reduction north fleet. Orange indicates an underestimate, while blue indicates an overestimate. OSA is one step ahead residuals. The bottom panel indicates the correlation between the observed data and the model prediction.

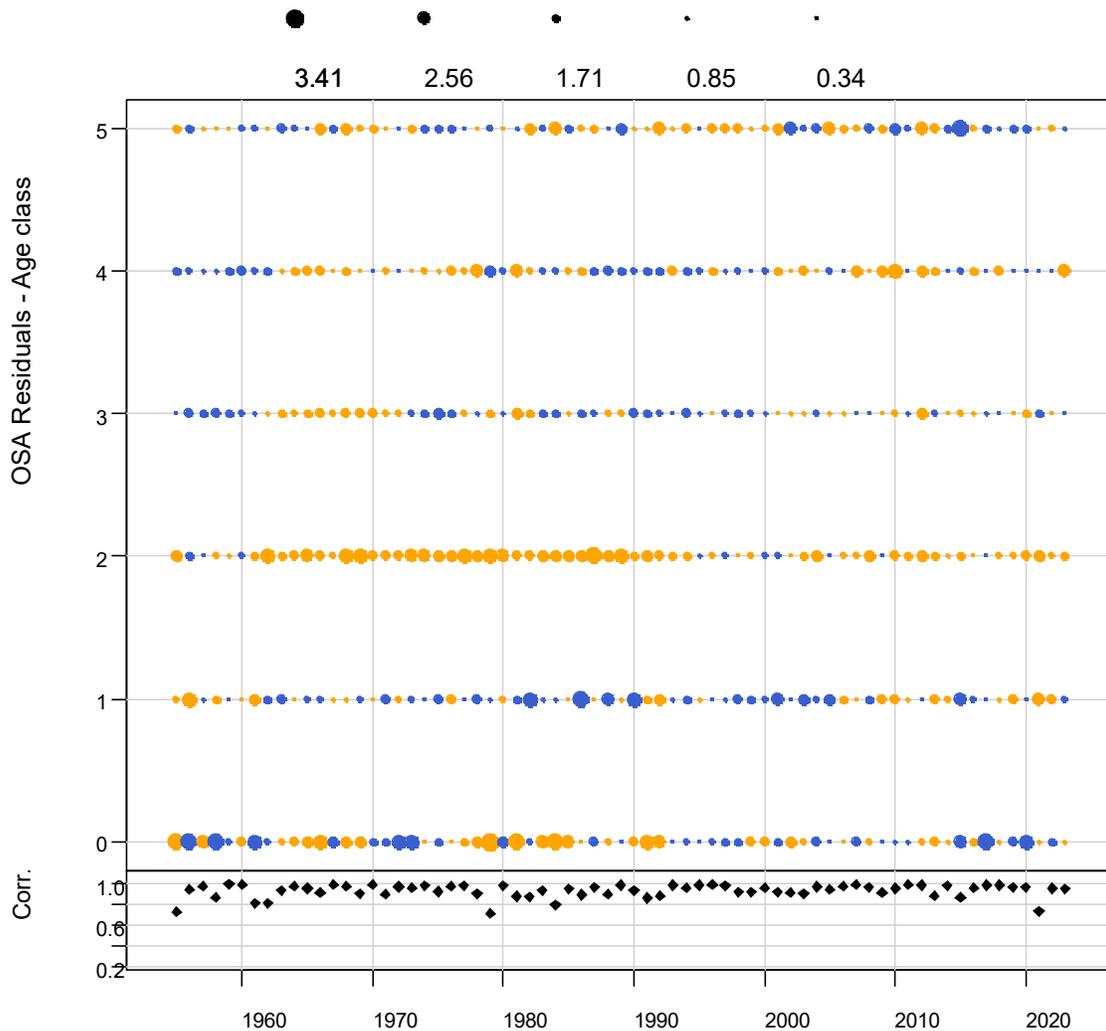


Figure A10. Bubble plot of the fits to the age compositions for the commercial reduction south fleet. Orange indicates an underestimate, while blue indicates an overestimate. OSA is one step ahead residuals. The bottom panel indicates the correlation between the observed data and the model prediction.

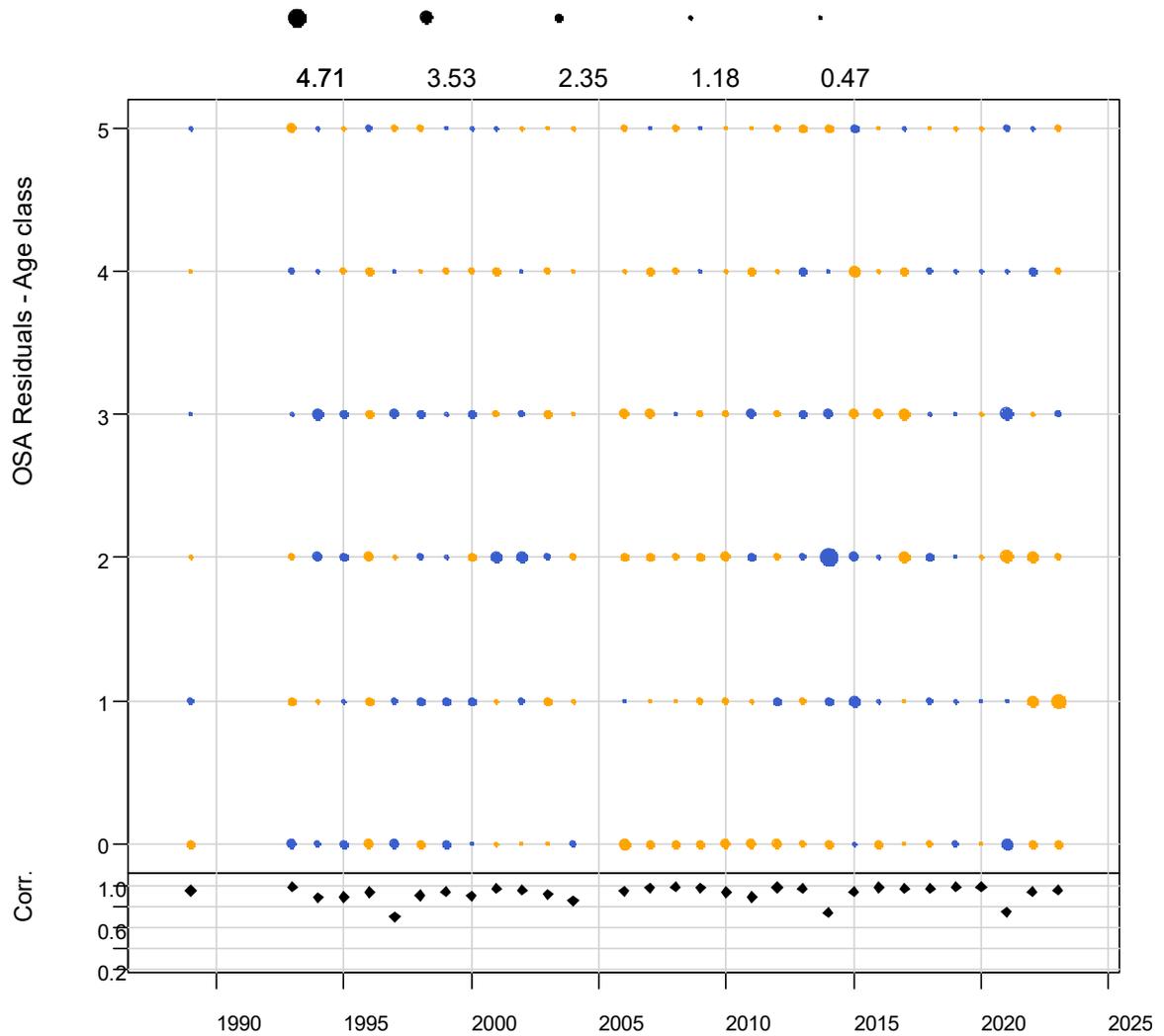


Figure A11. Bubble plot of the fits to the age compositions for the commercial bait north fleet. Orange indicates an underestimate, while blue indicates an overestimate. OSA is one step ahead residuals. The bottom panel indicates the correlation between the observed data and the model prediction.

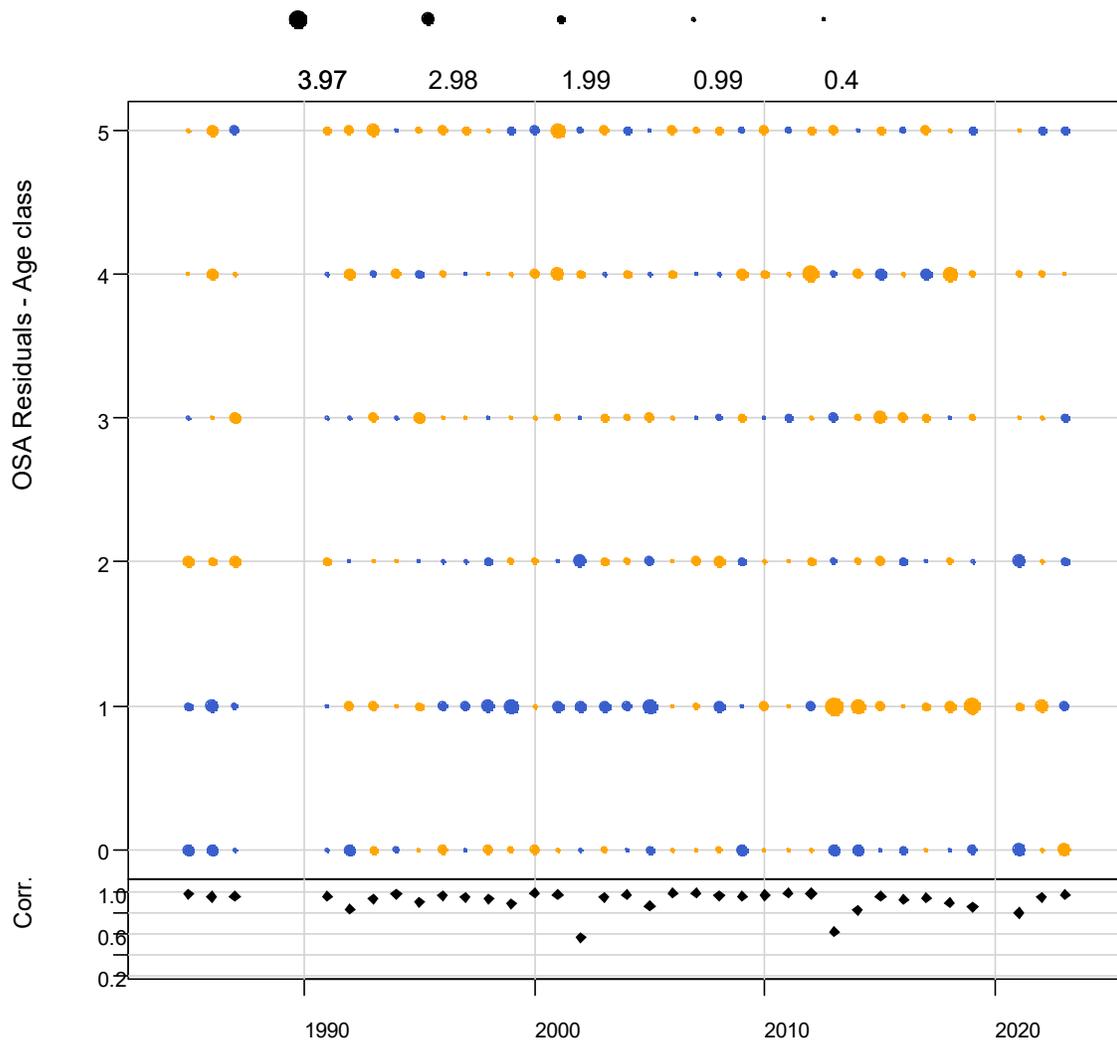


Figure A12. Bubble plot of the fits to the age compositions for the commercial bait south fleet. Orange indicates an underestimate, while blue indicates an overestimate. OSA is one step ahead residuals. The bottom panel indicates the correlation between the observed data and the model prediction.

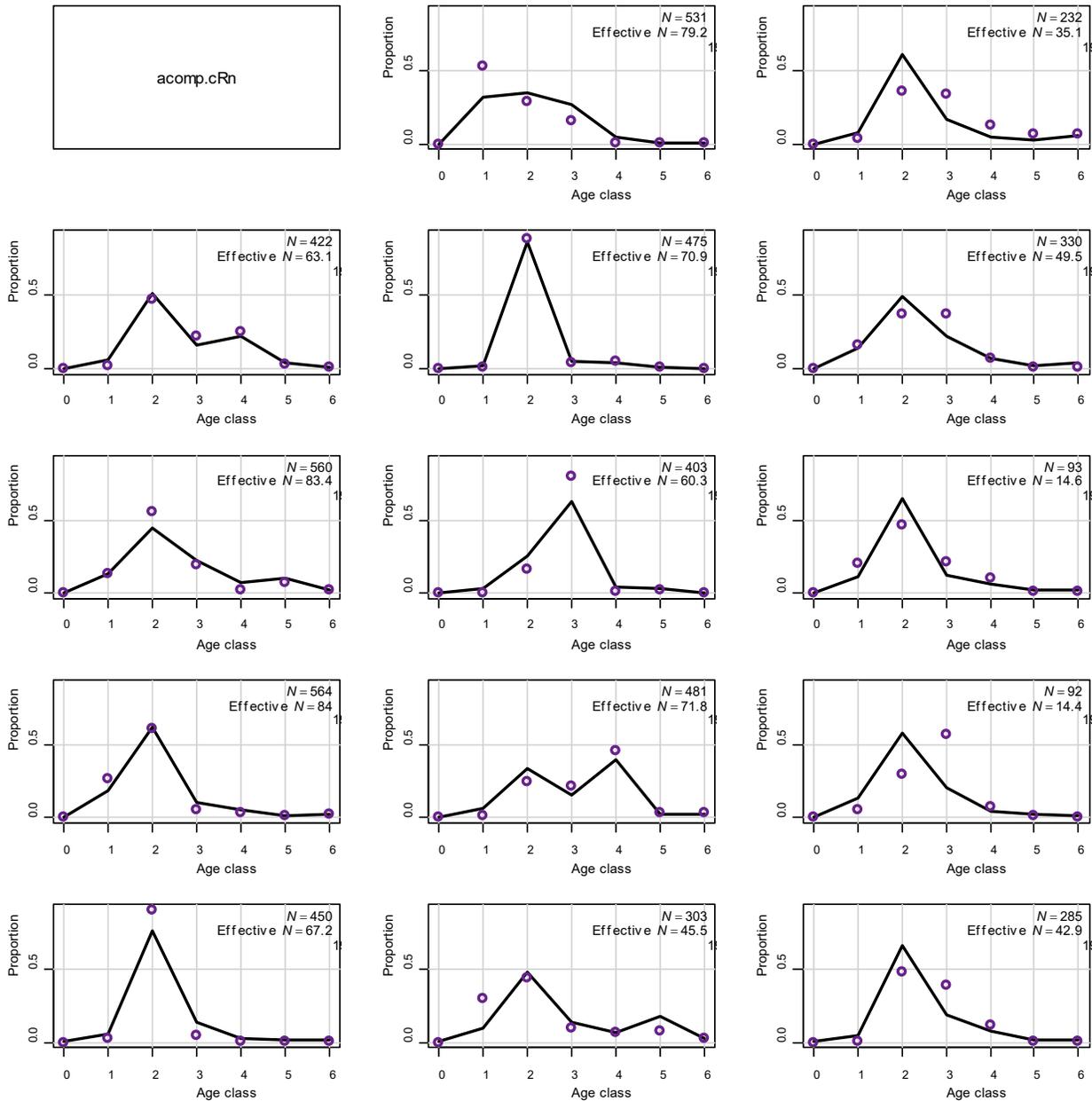


Figure A13. Annual age composition plots for the commercial reduction north fleet for 1955-2023. Open circles are the observed data, while the line indicates the model fit.

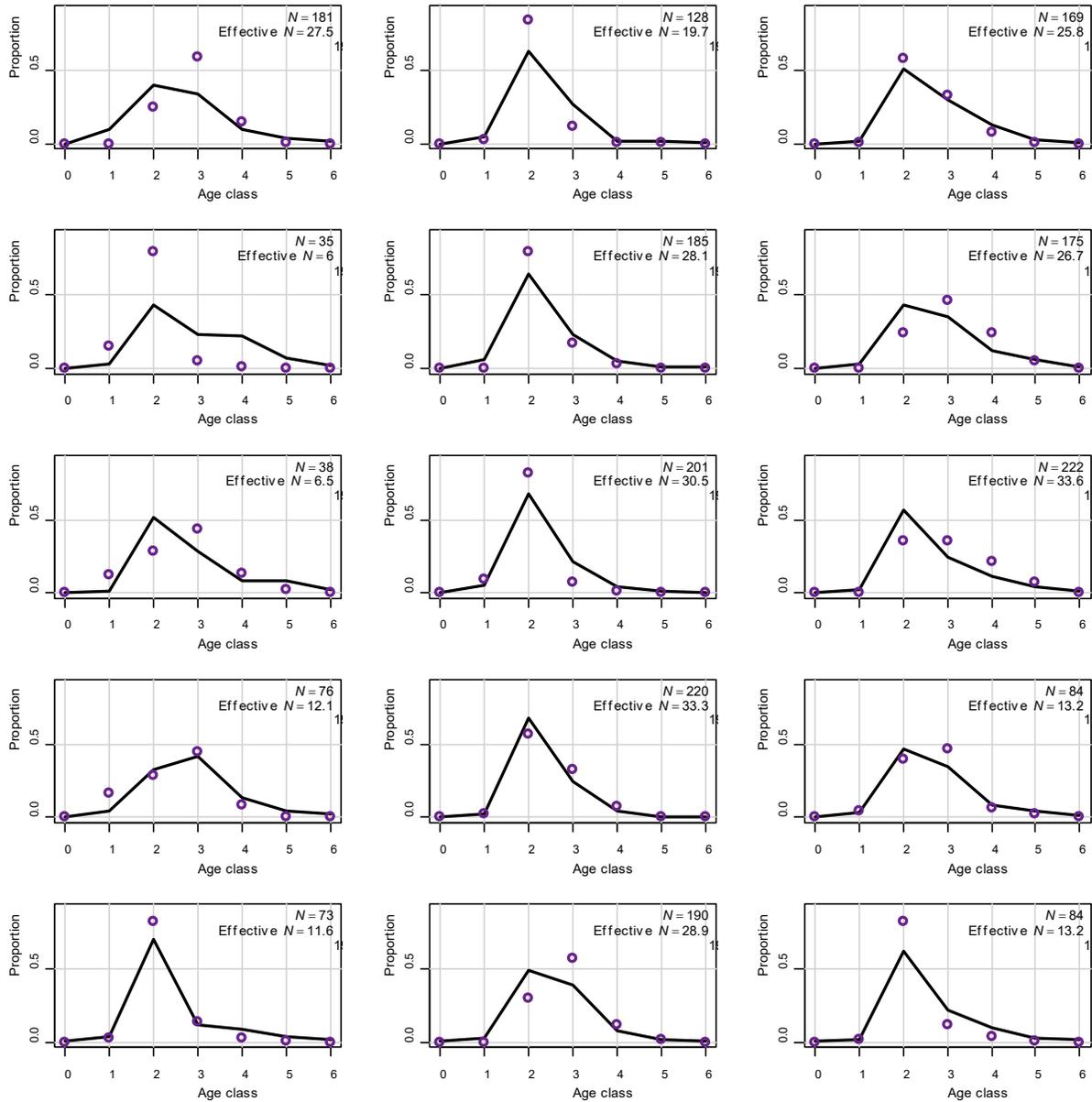


Figure A13. Continued

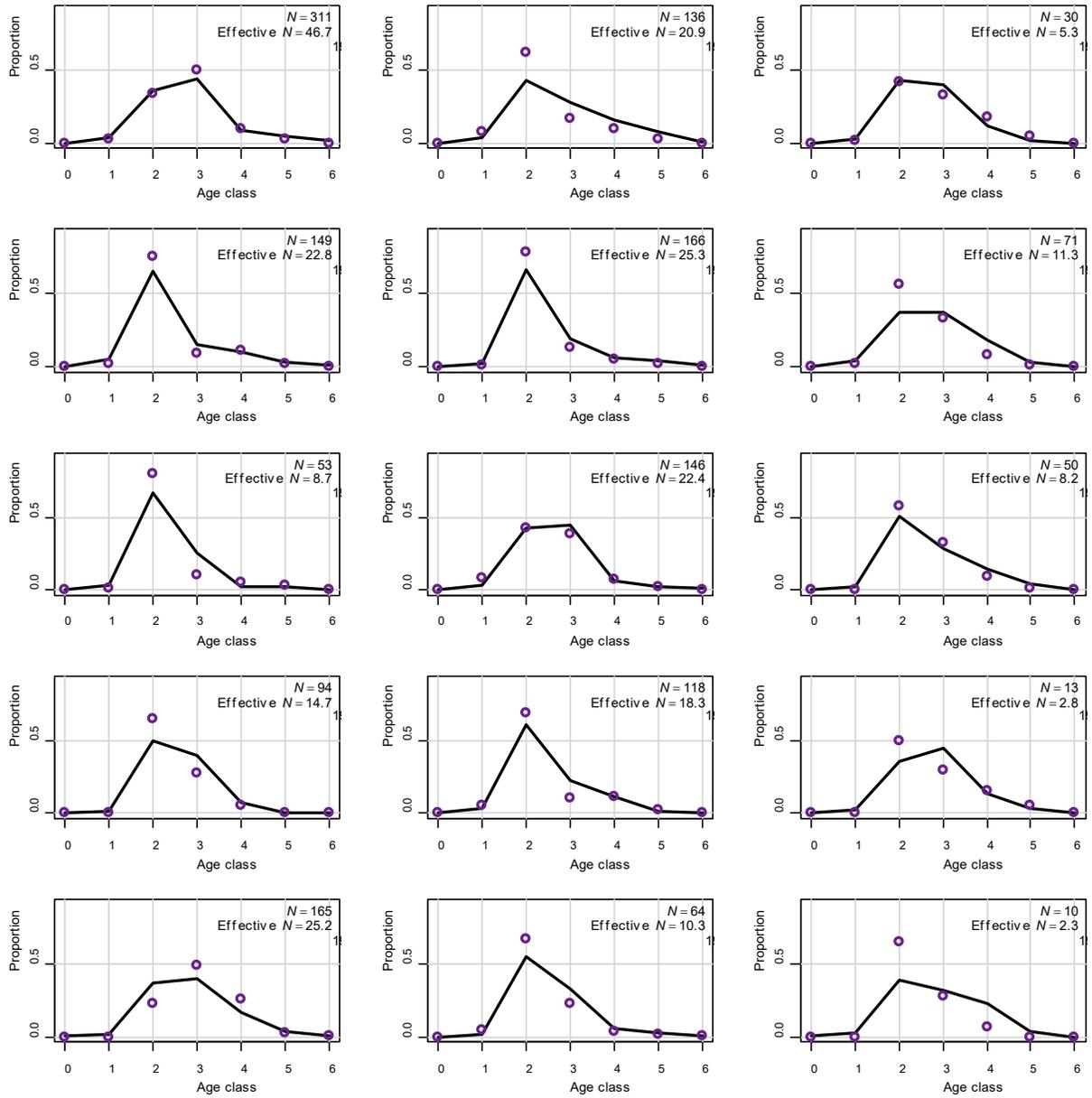


Figure A13. Continued

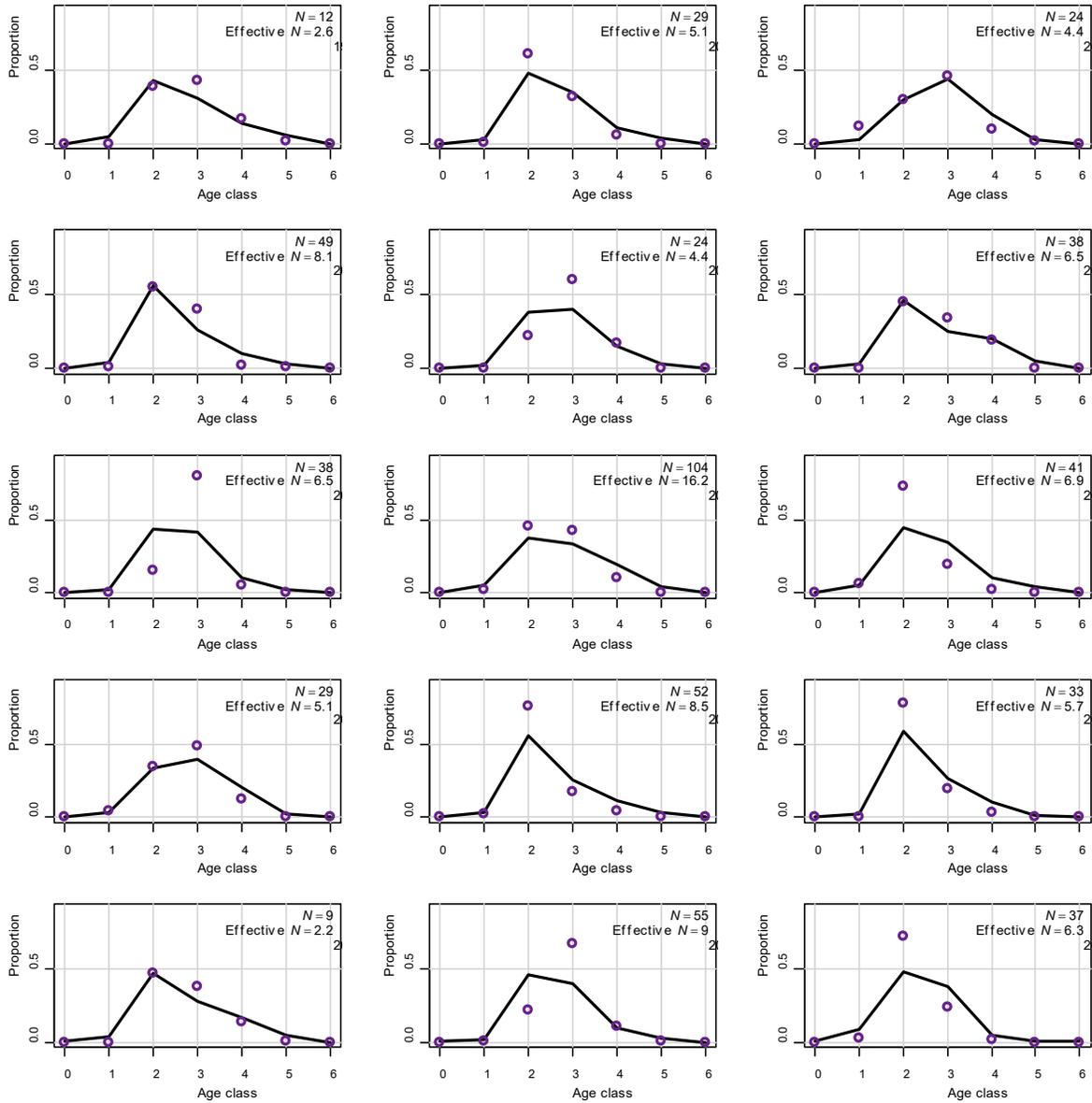


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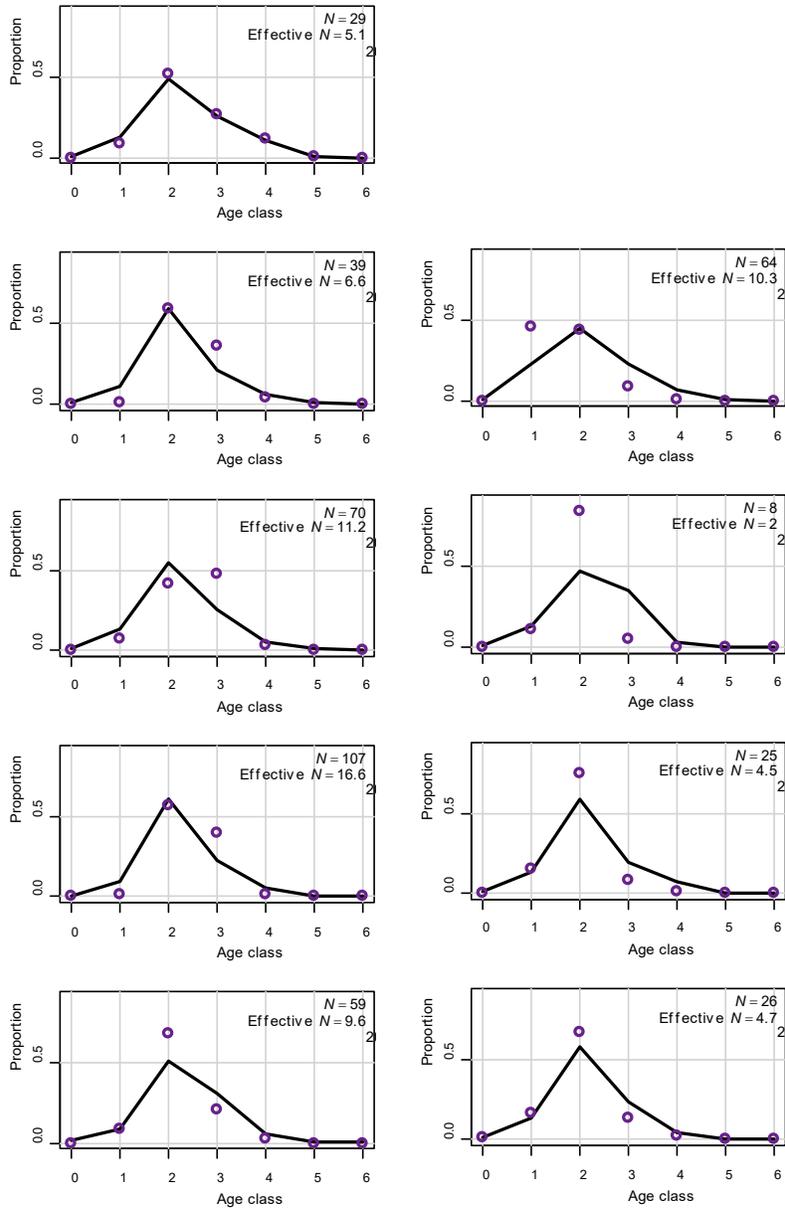


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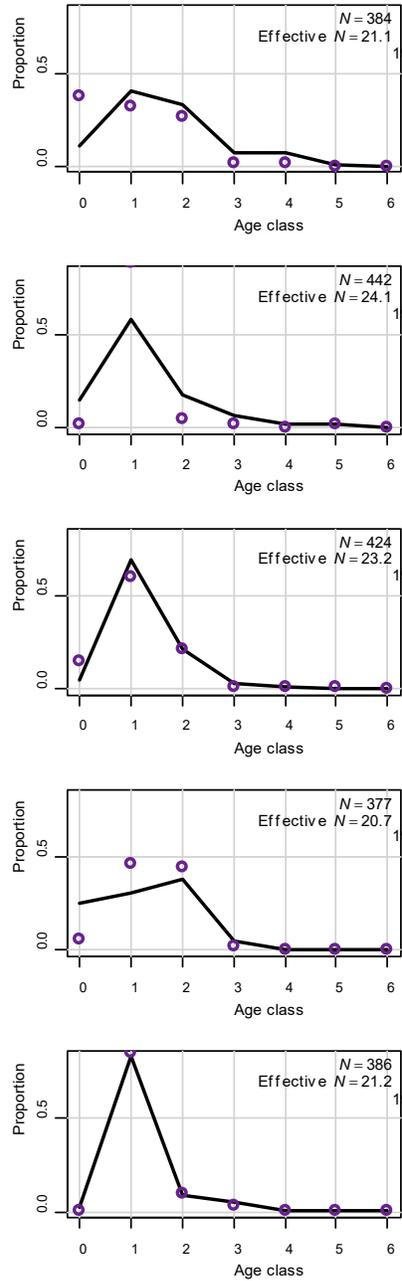


Figure A14. Annual age composition plots for the commercial reduction south fleet for 1955-2023. Open circles are the observed data, while the line indicates the model fit.

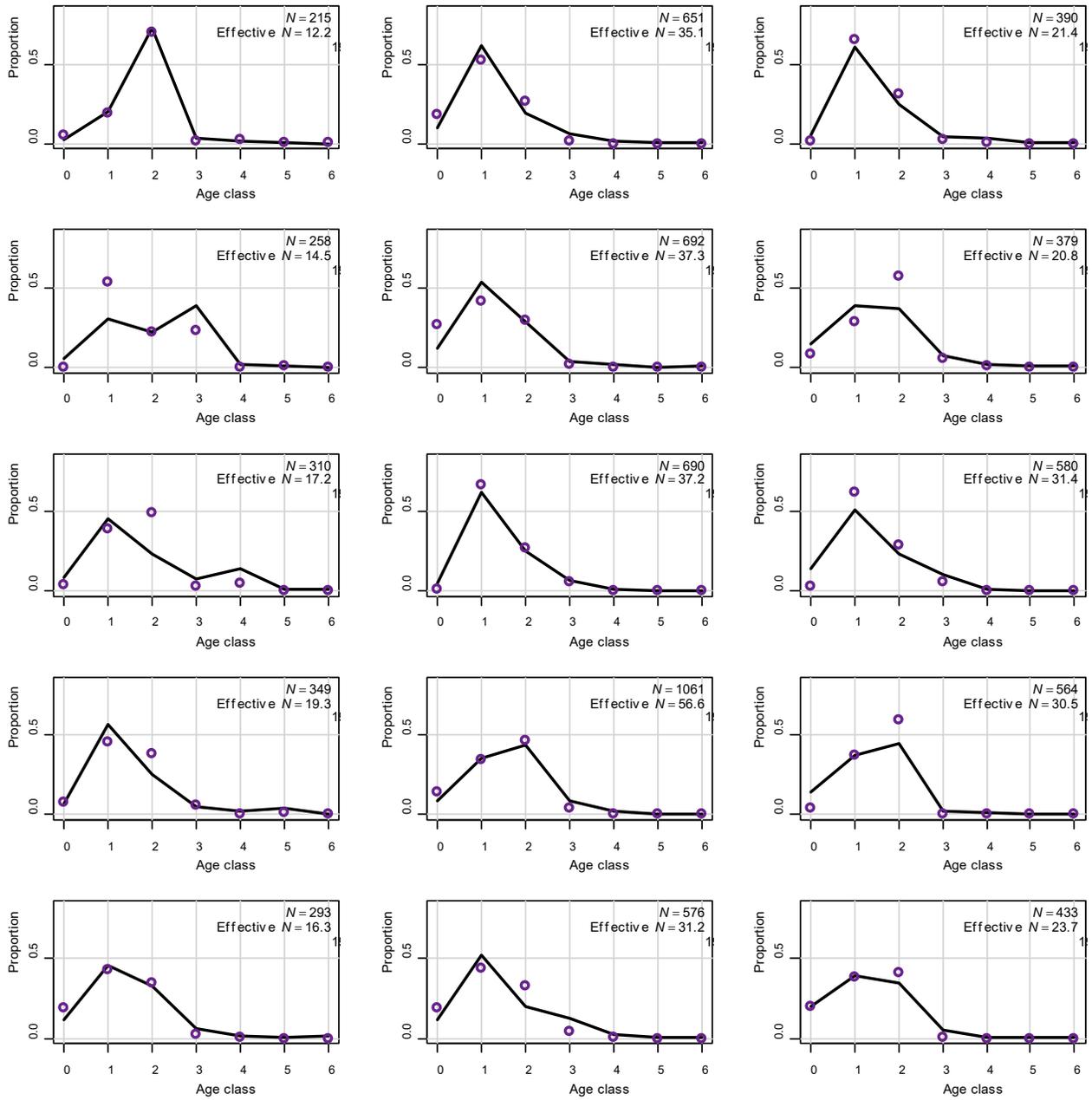


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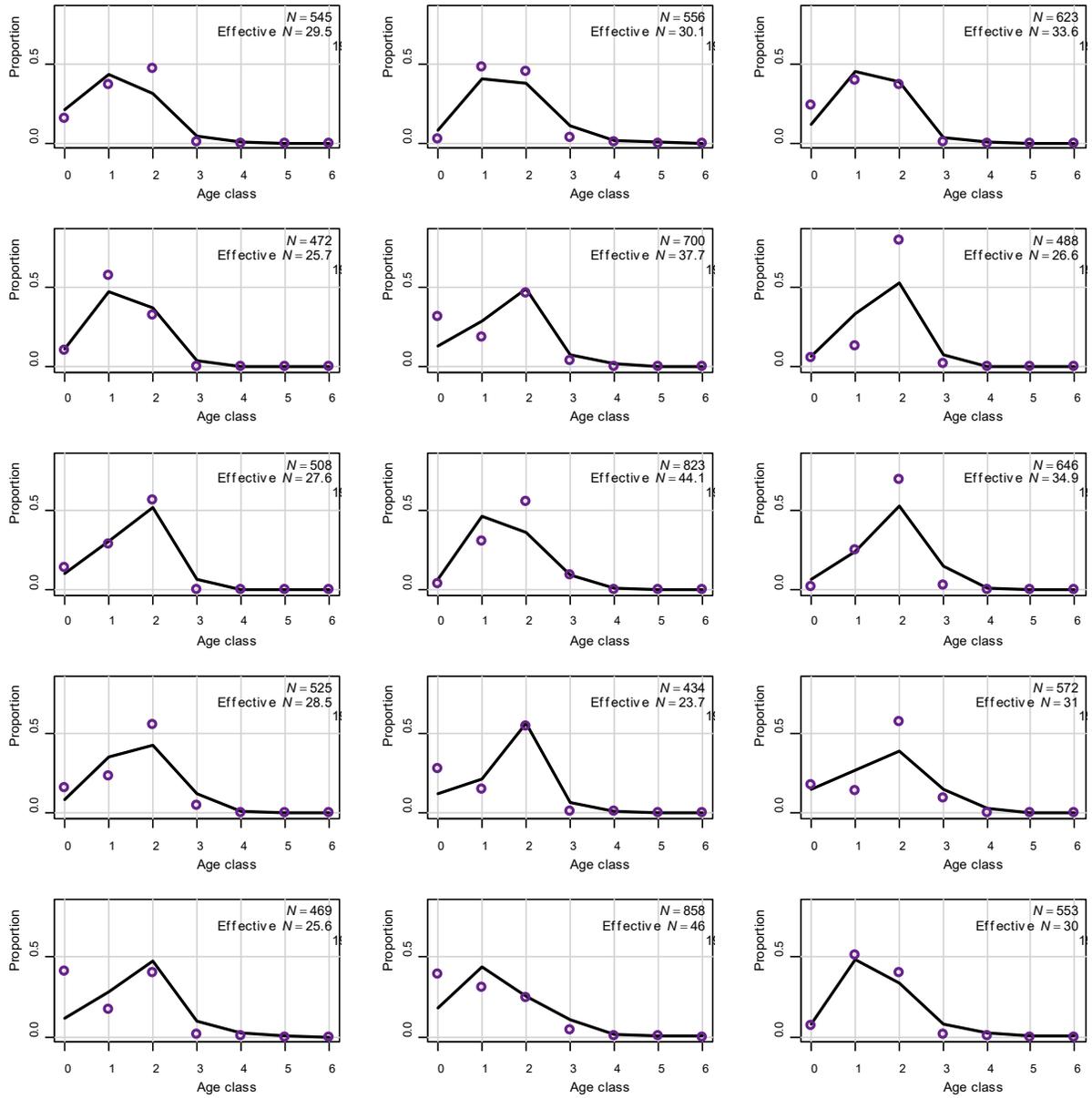


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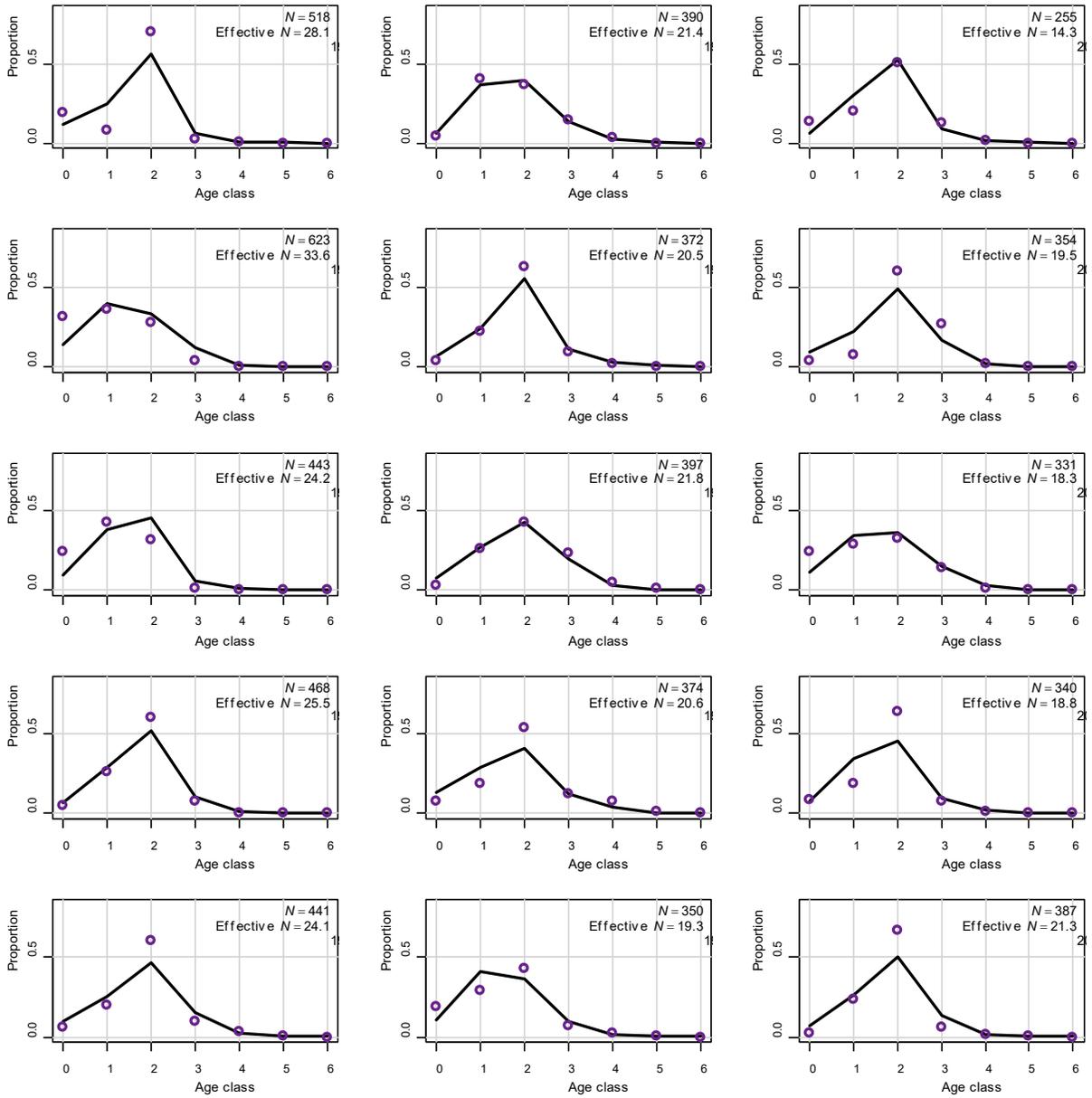


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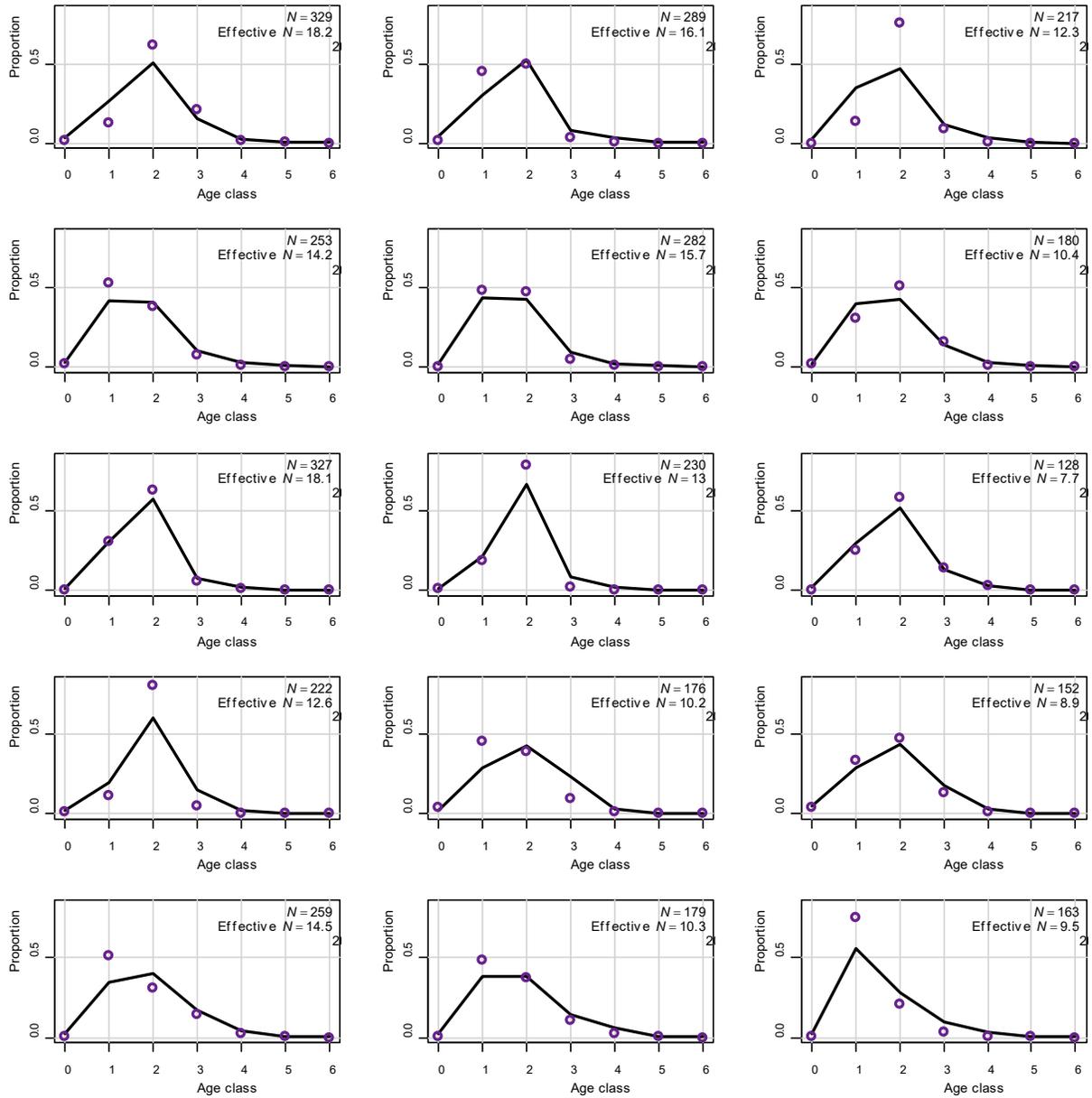


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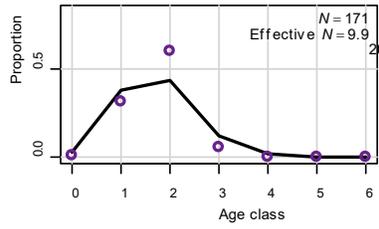
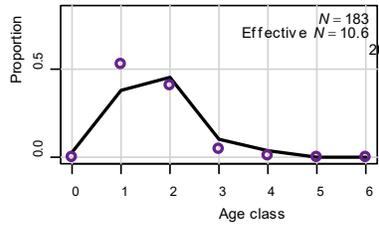
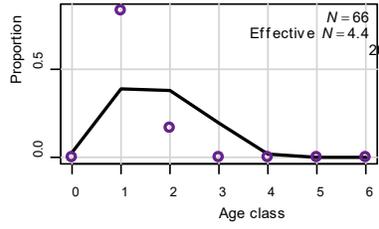
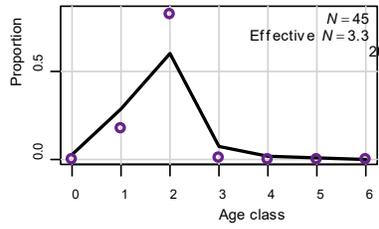


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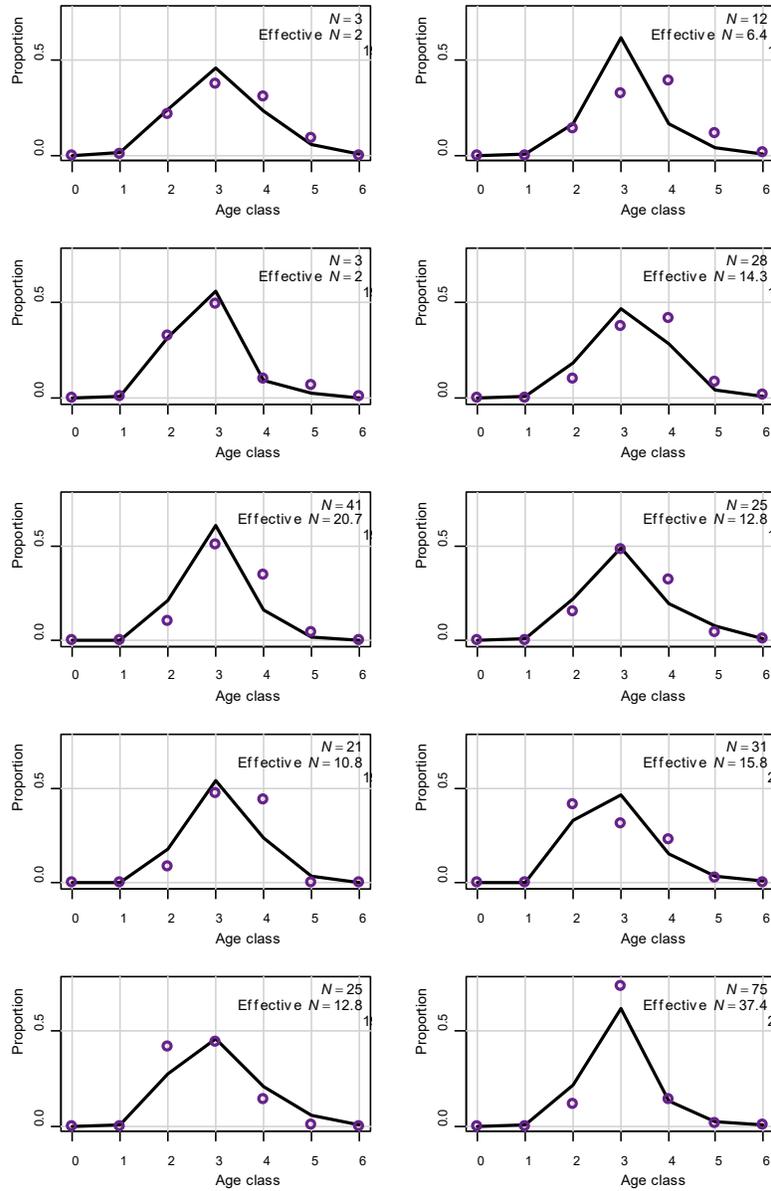


Figure A15. Annual age composition plots for the commercial bait north fleet for 1985-2023. Open circles are the observed data, while the line indicates the model fit.

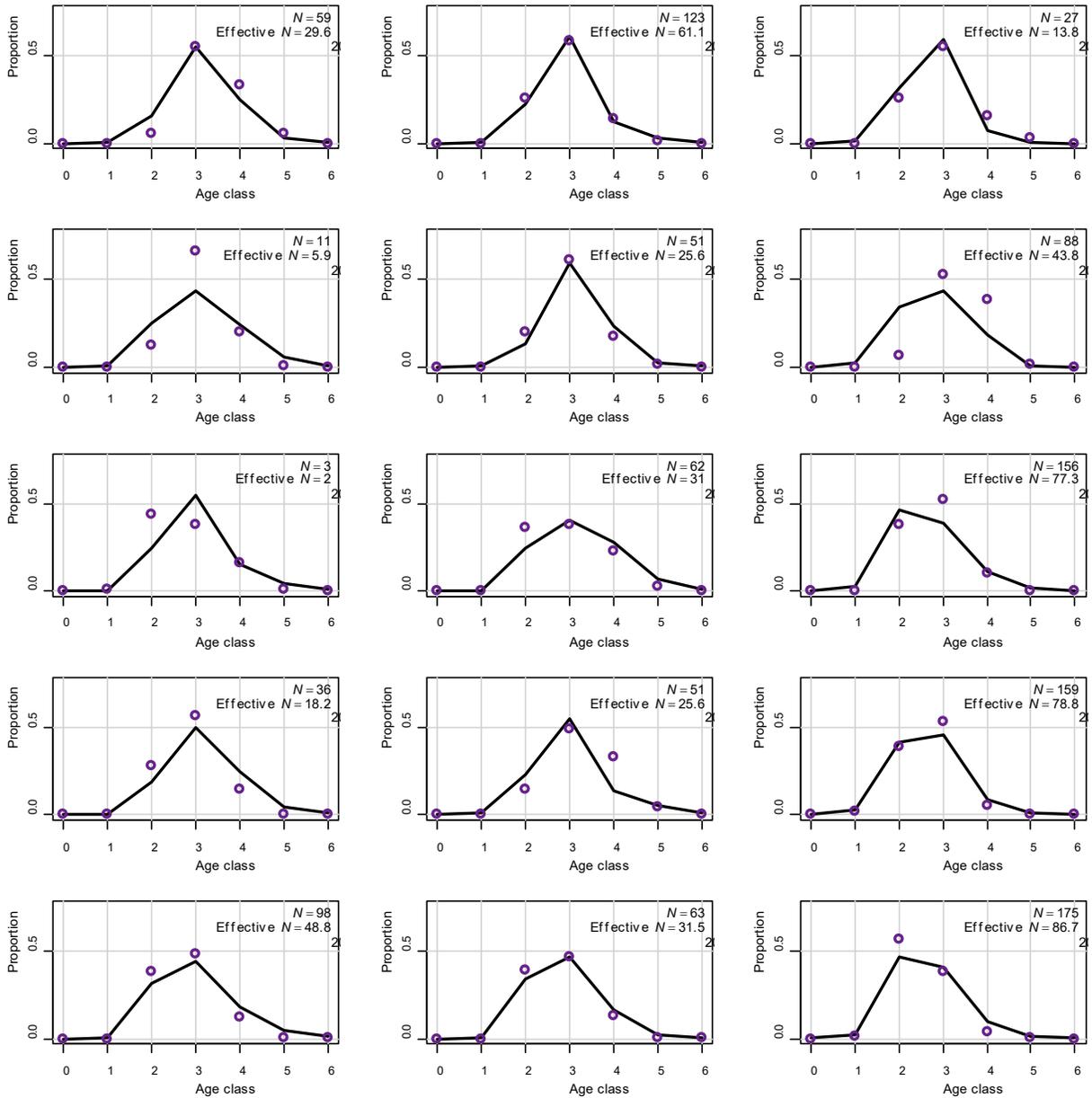


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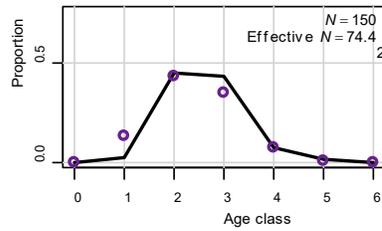
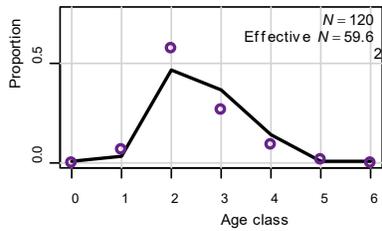
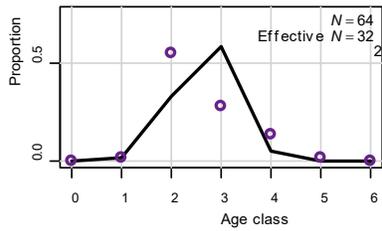
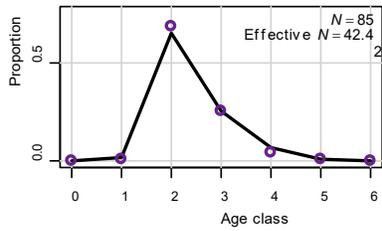
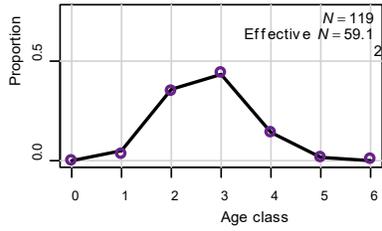
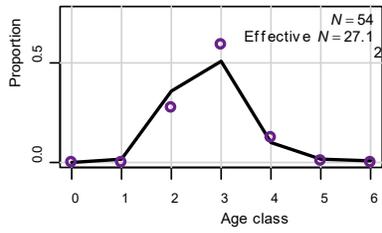


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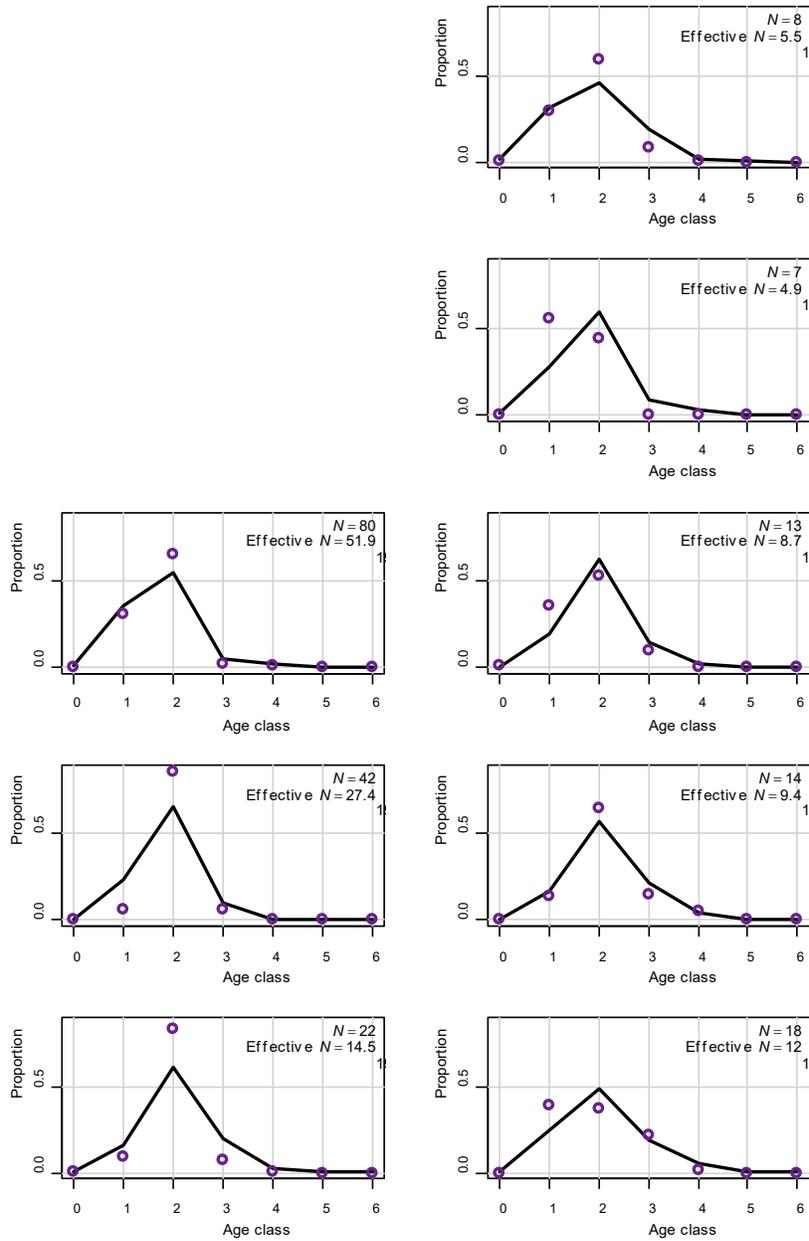


Figure A16. Annual age composition plots for the commercial bait south fleet for 1985-2023. Open circles are the observed data, while the line indicates the model fit.

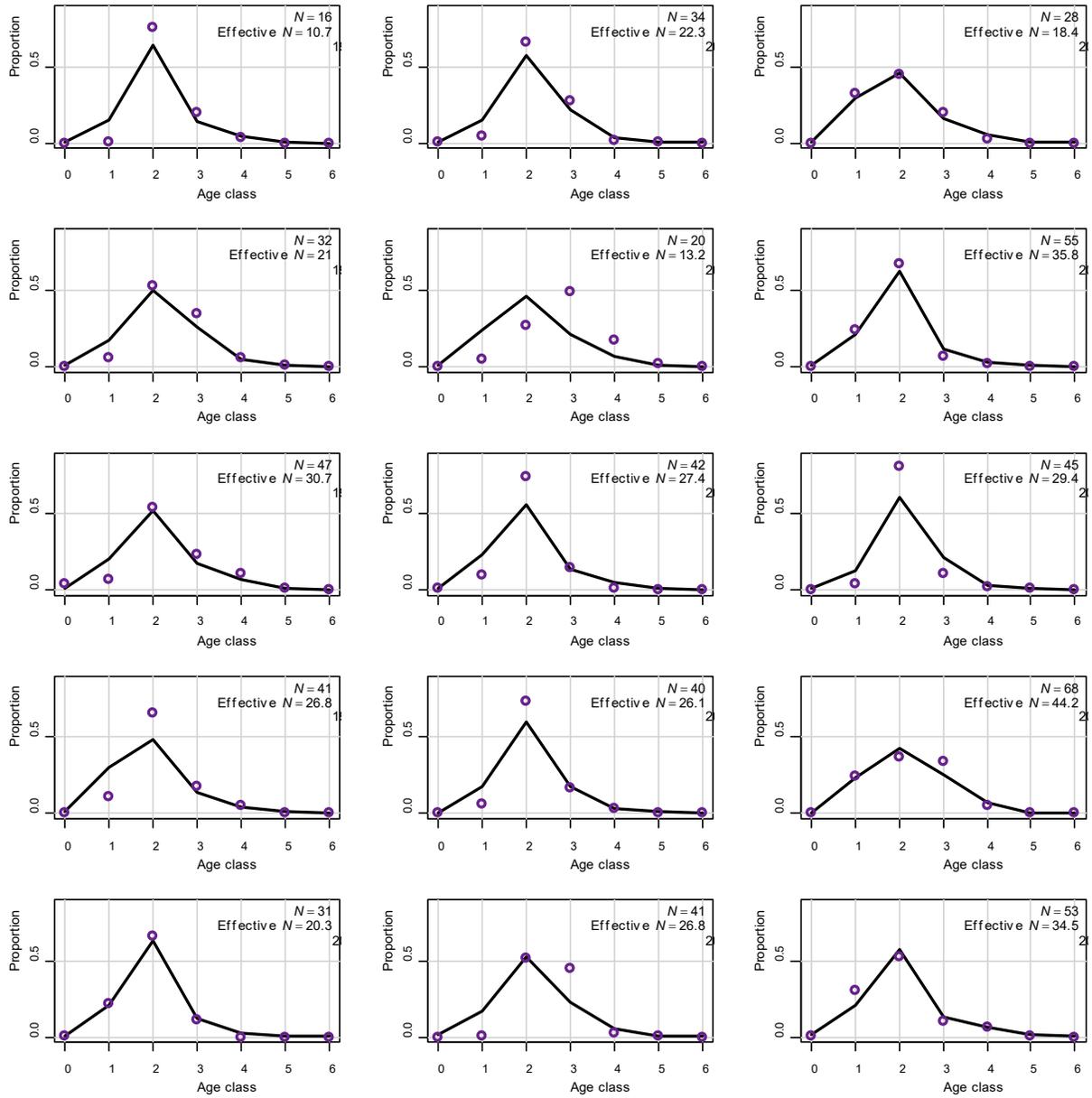


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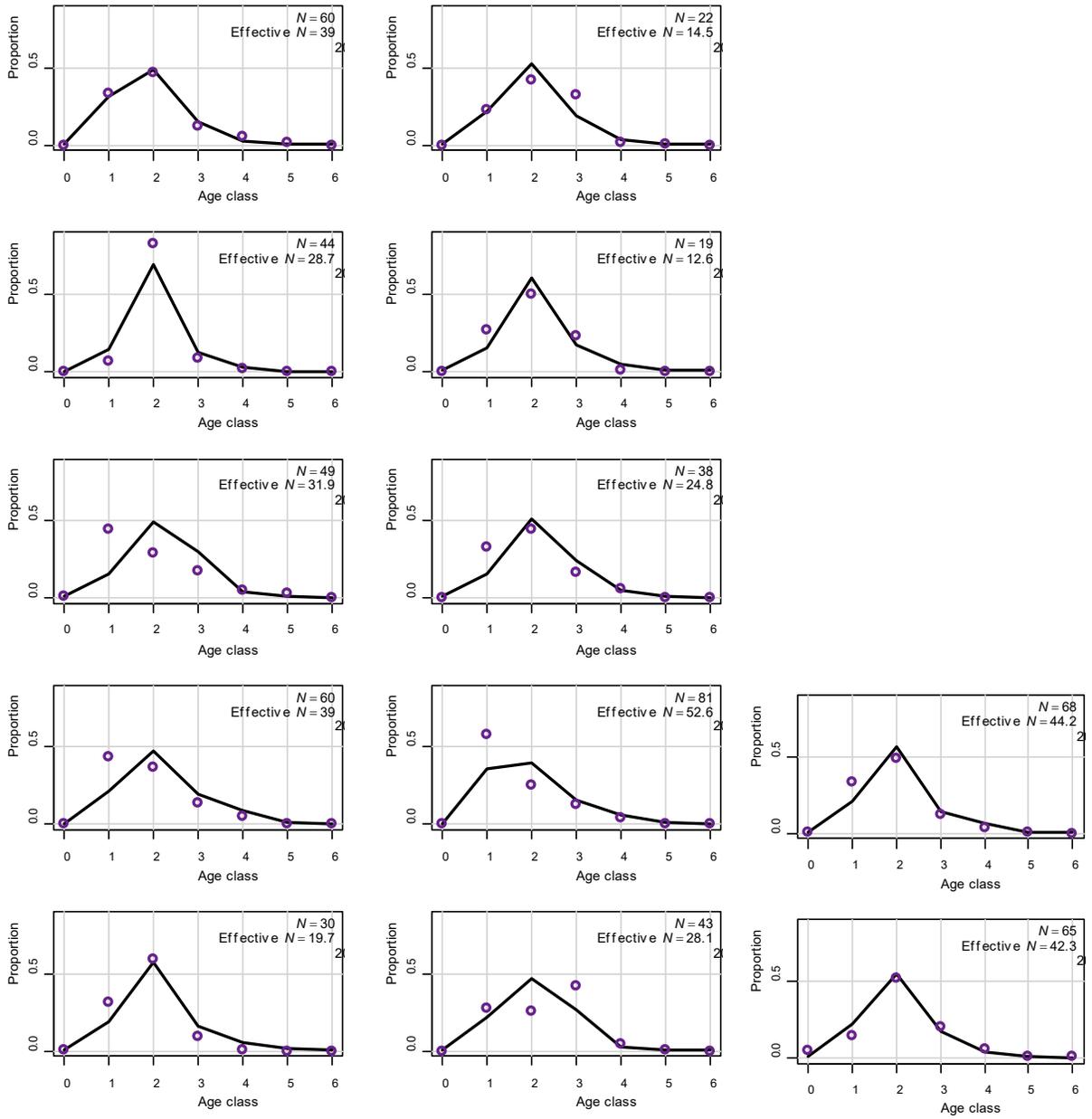


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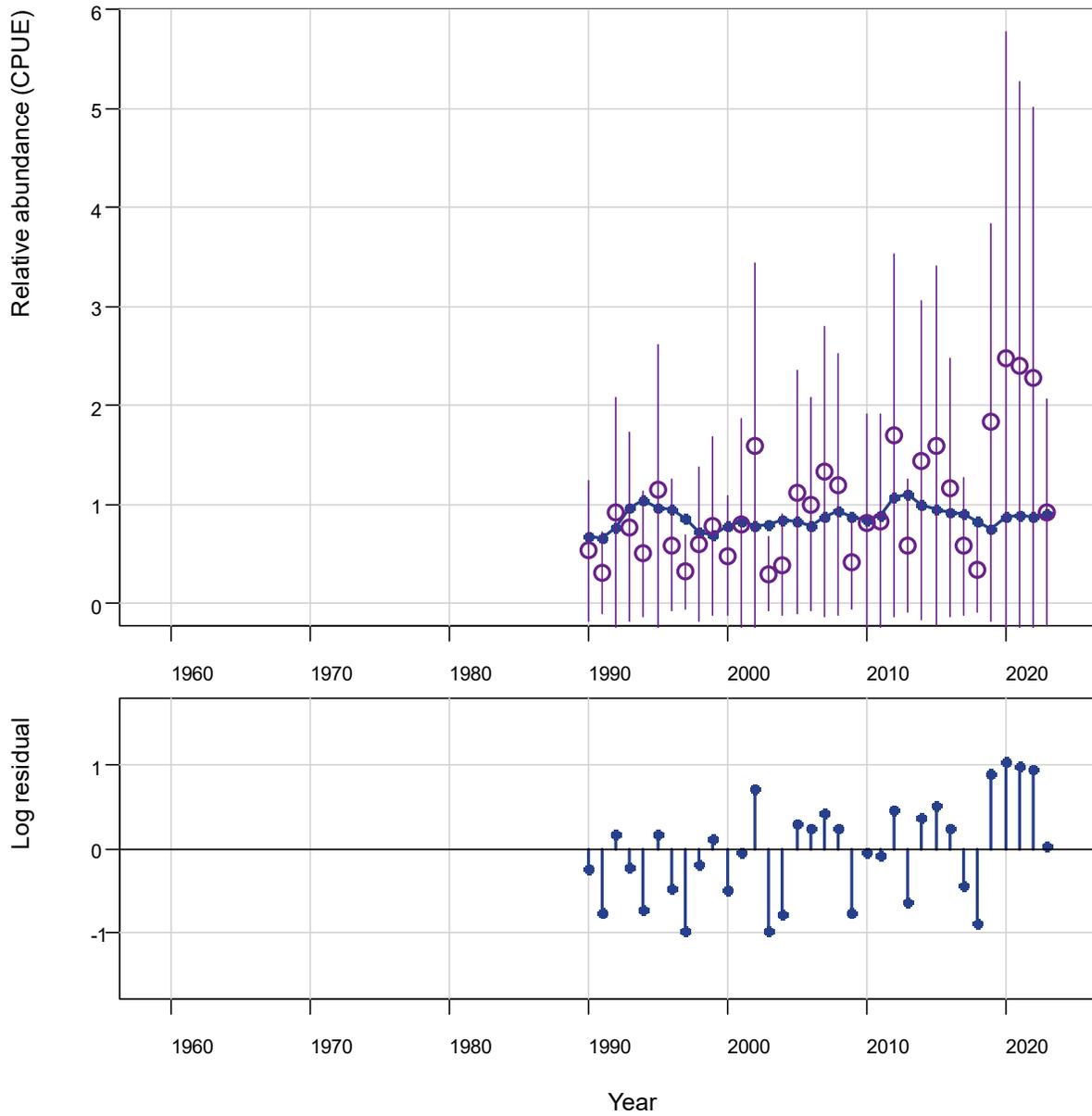


Figure A17. Predicted fit (blue, closed circle with line) to the observed (open circle) NAD index. The lower panel indicates the residual for each data point.

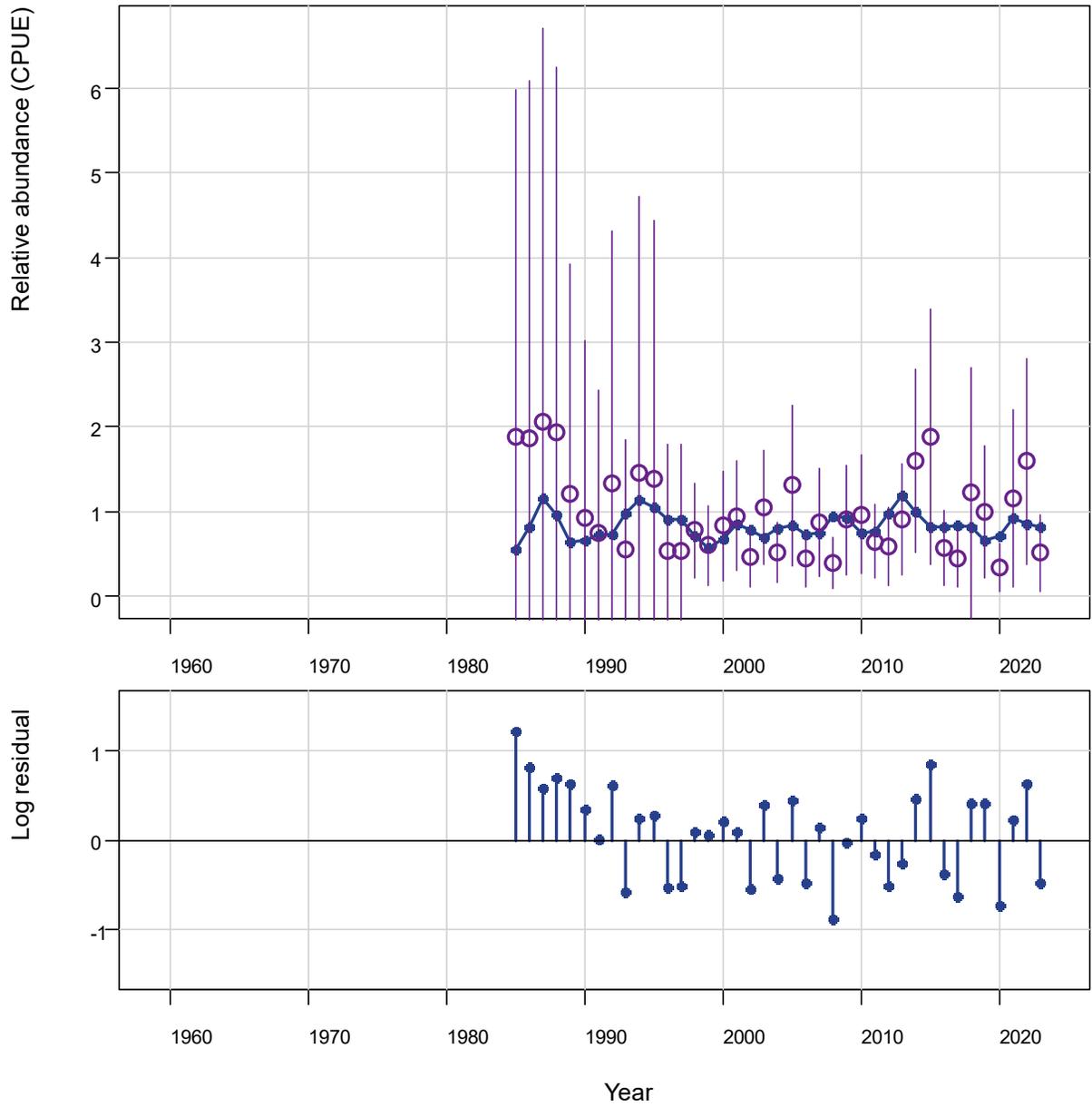


Figure A18. Predicted fit (blue, closed circle with line) to the observed (open circle) MAD index. The lower panel indicates the residual for each data point.

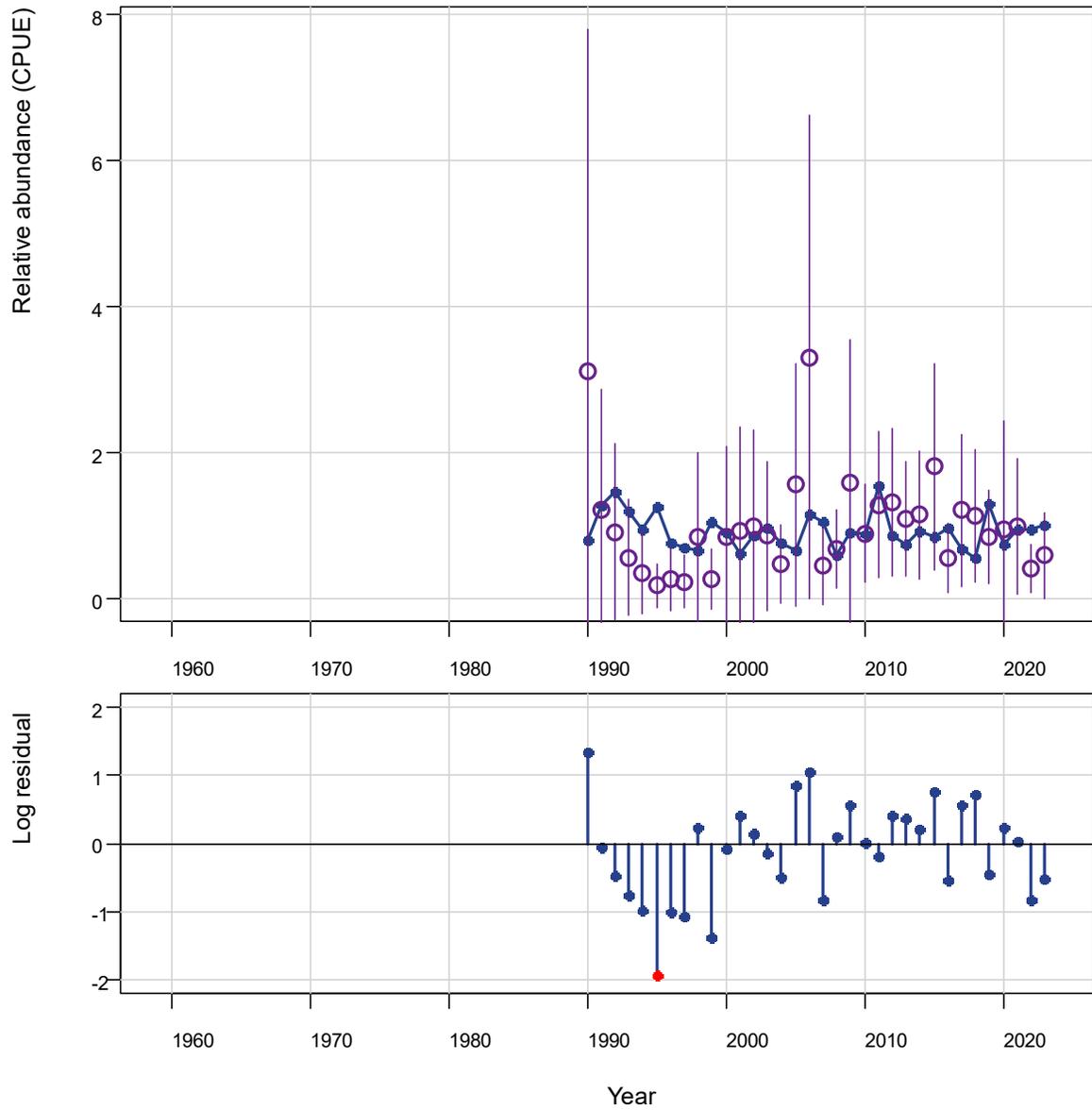


Figure A19. Predicted fit (blue, closed circle with line) to the observed (open circle) SAD index. The lower panel indicates the residual for each data point.

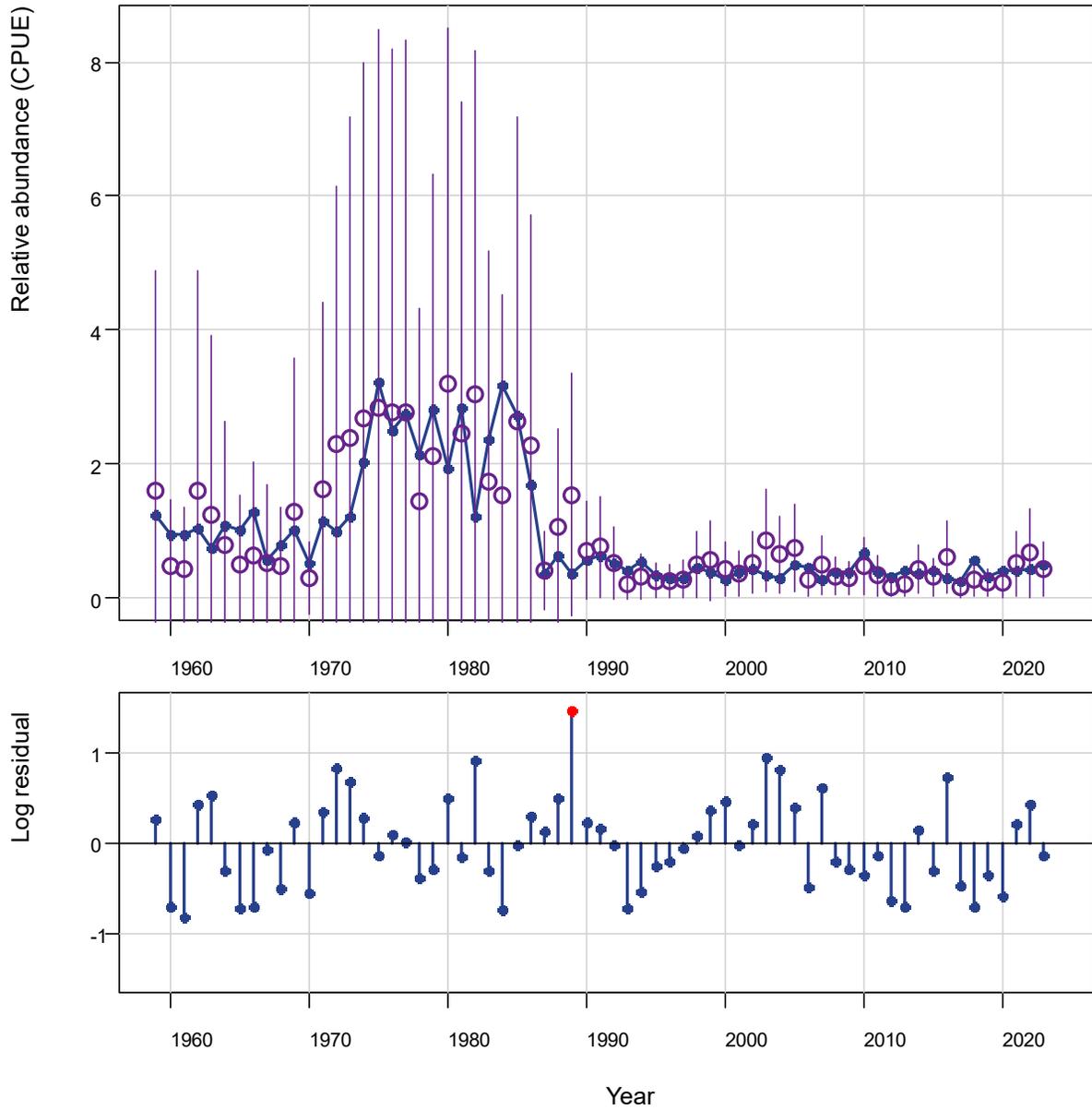


Figure A20. Predicted fit (blue, closed circle with line) to the observed (open circle) recruitment index. The lower panel indicates the residual for each data point.

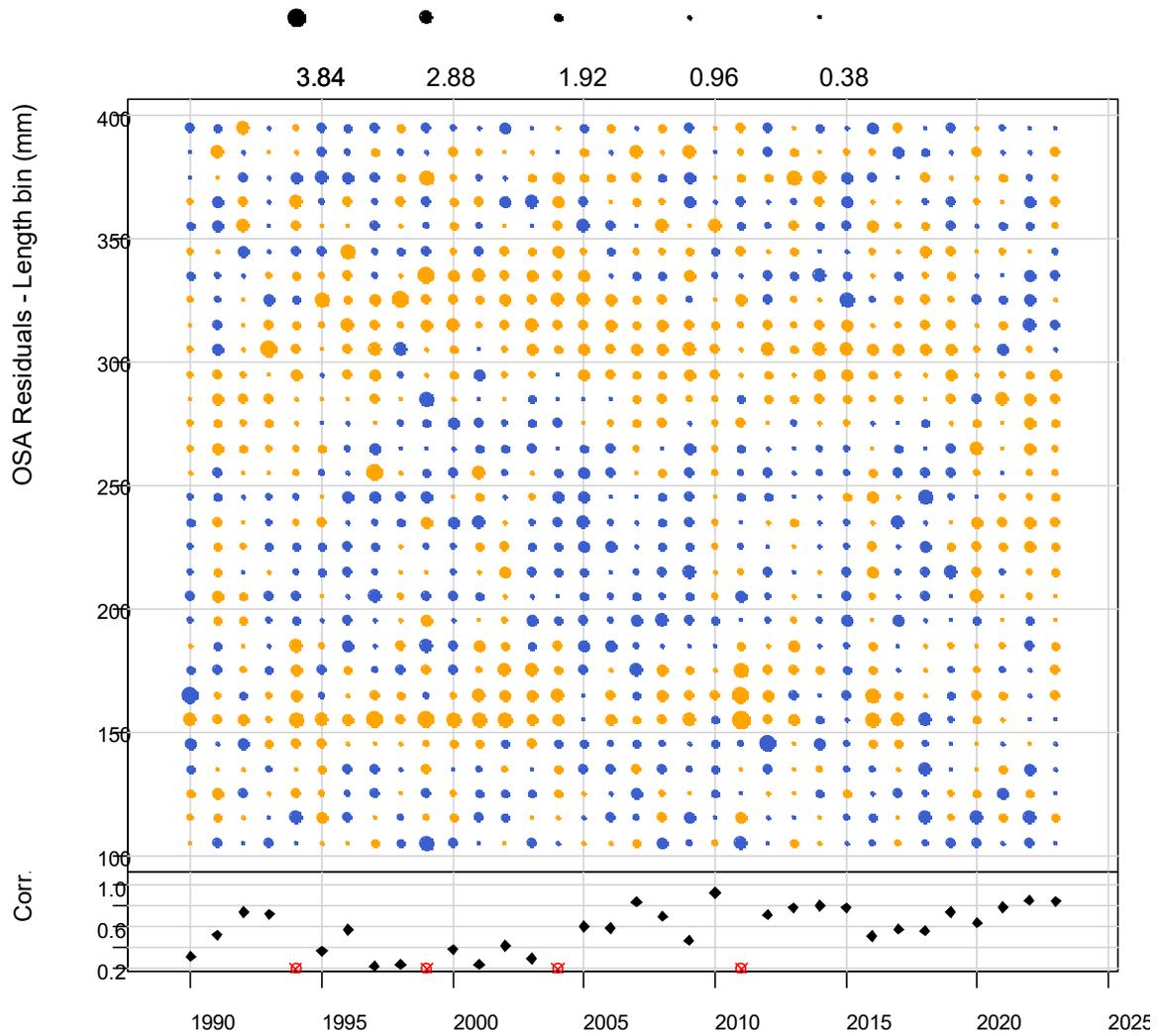


Figure A21. Bubble plot of the fits to the length compositions for the NAD index. Orange indicates an underestimate, while blue indicates an overestimate. OSA is one step ahead residuals. The bottom panel indicates the correlation between the observed data and the model prediction.

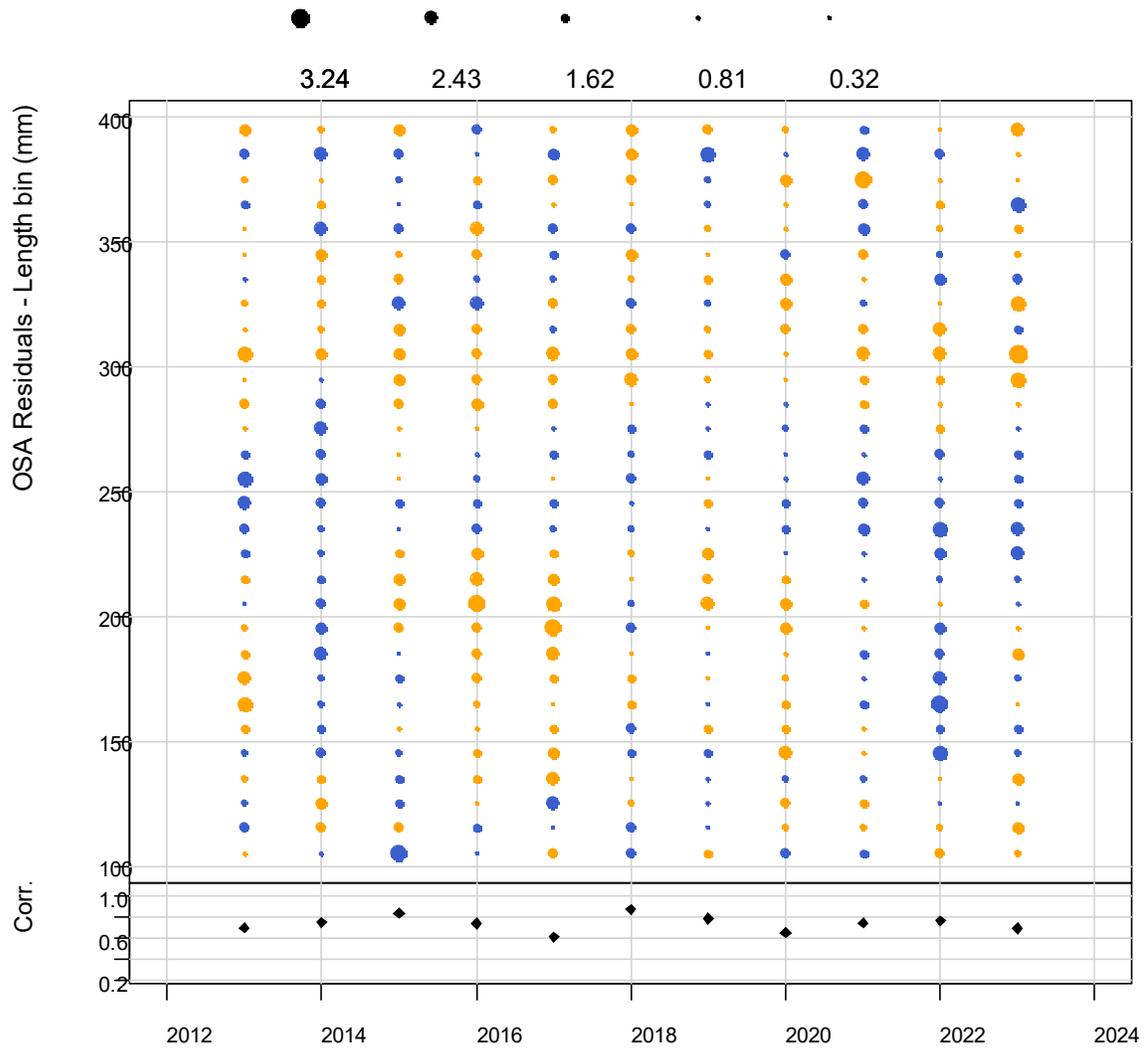


Figure A22. Bubble plot of the fits to the length compositions for the MAD index. Orange indicates an underestimate, while blue indicates an overestimate. OSA is one step ahead residuals. The bottom panel indicates the correlation between the observed data and the model prediction.

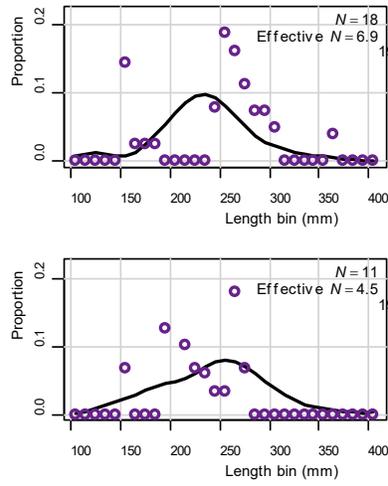


Figure A23. Annual length composition plots for the NAD index for 1990-2023. Open circles are the observed data, while the line indicates the model fit.

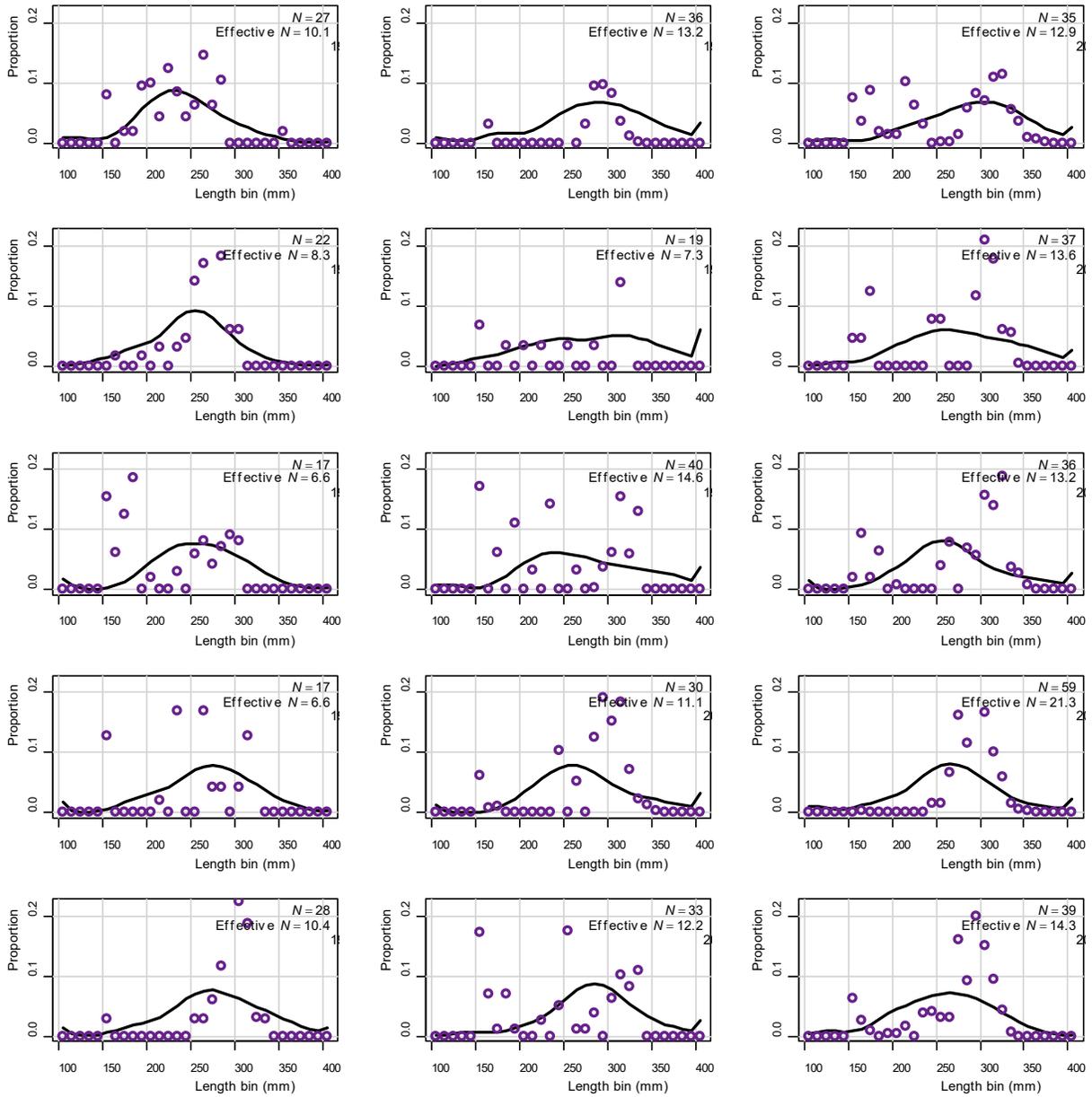


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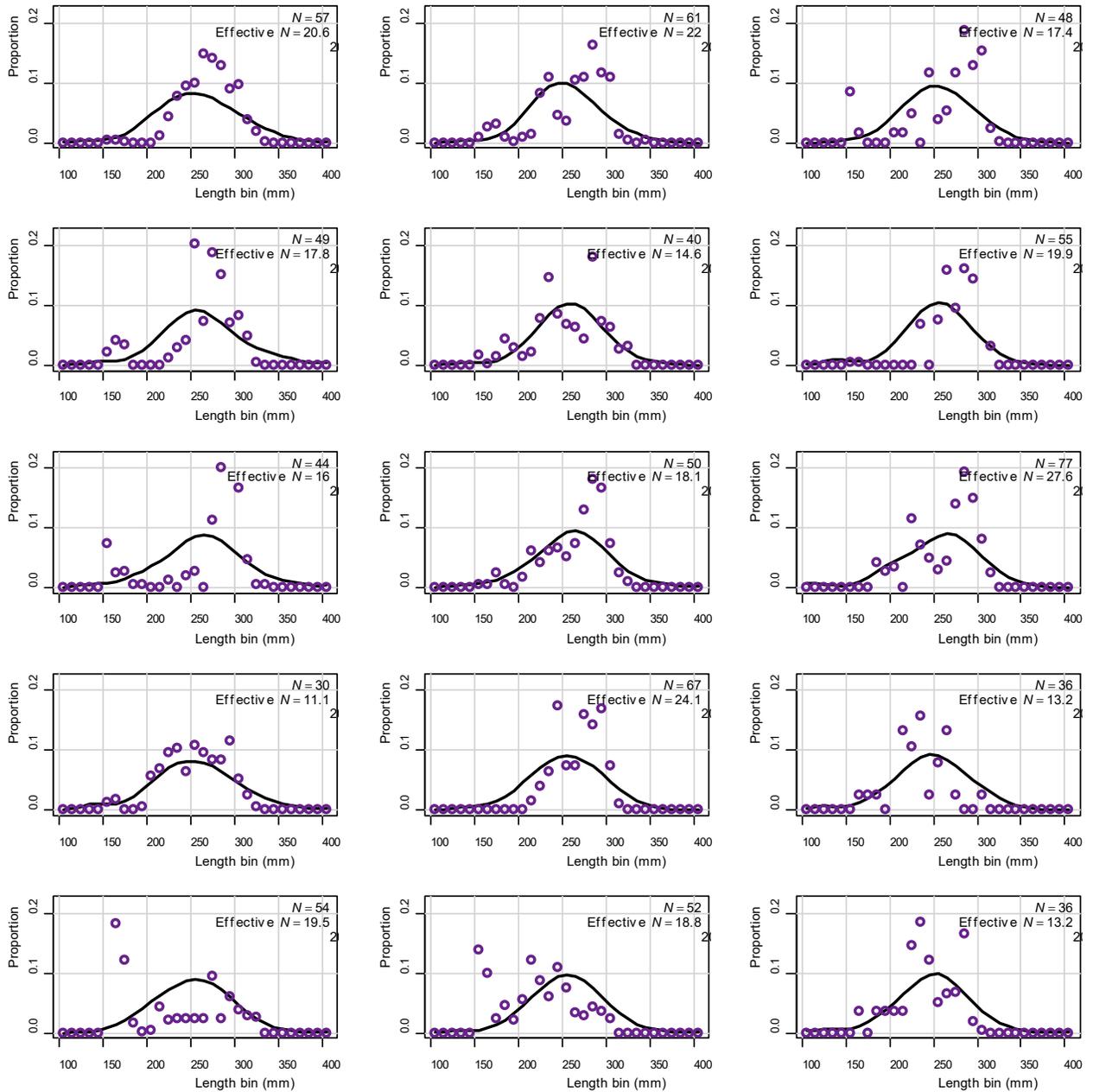


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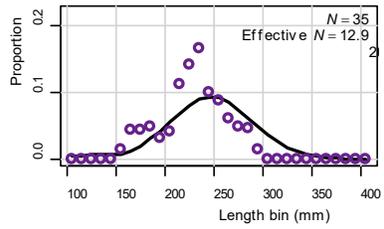
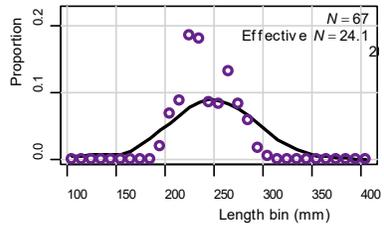


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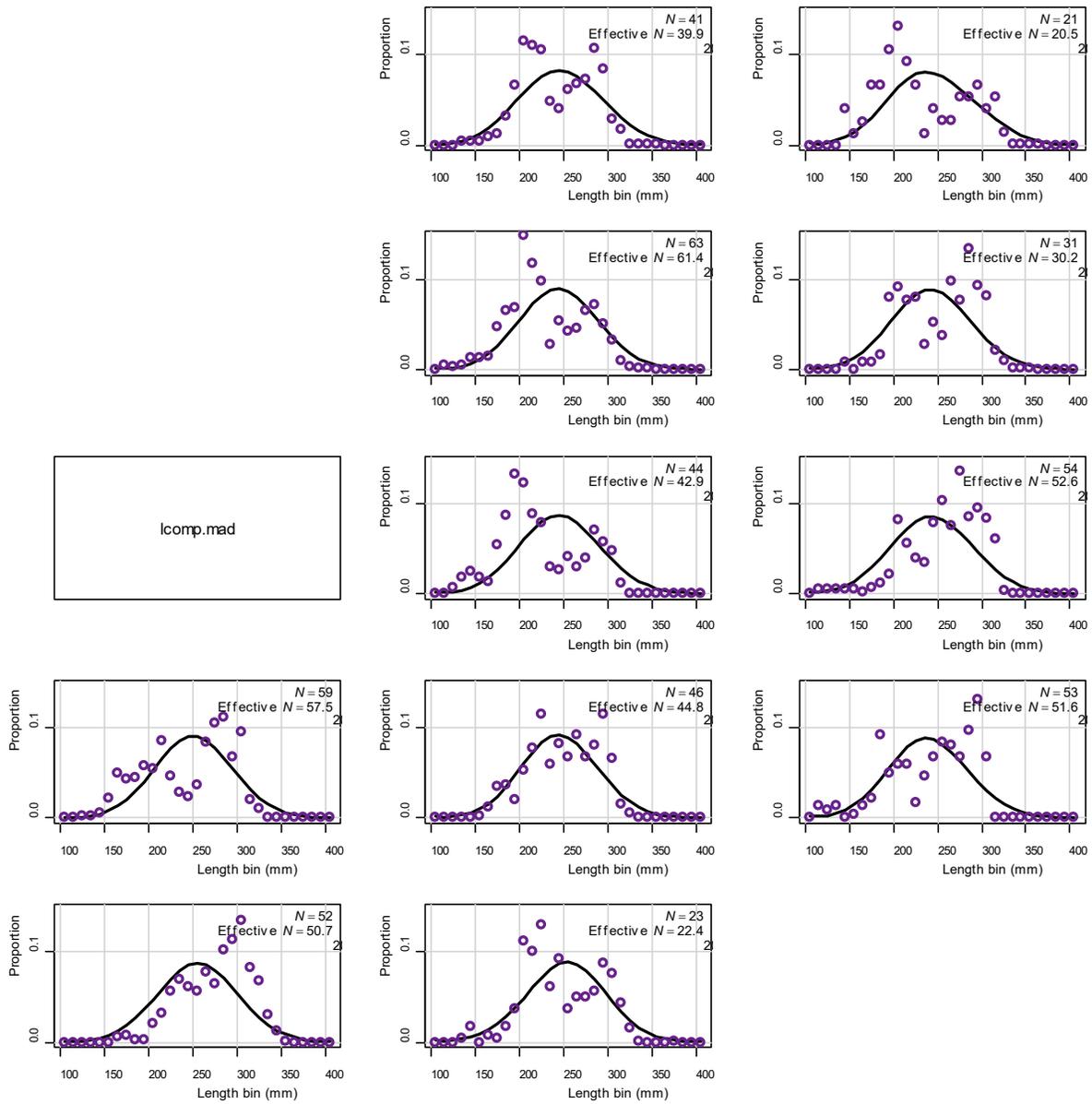


Figure A24. Annual length composition plots for the MAD index for 2013-2023. Open circles are the observed data, while the line indicates the model fit.

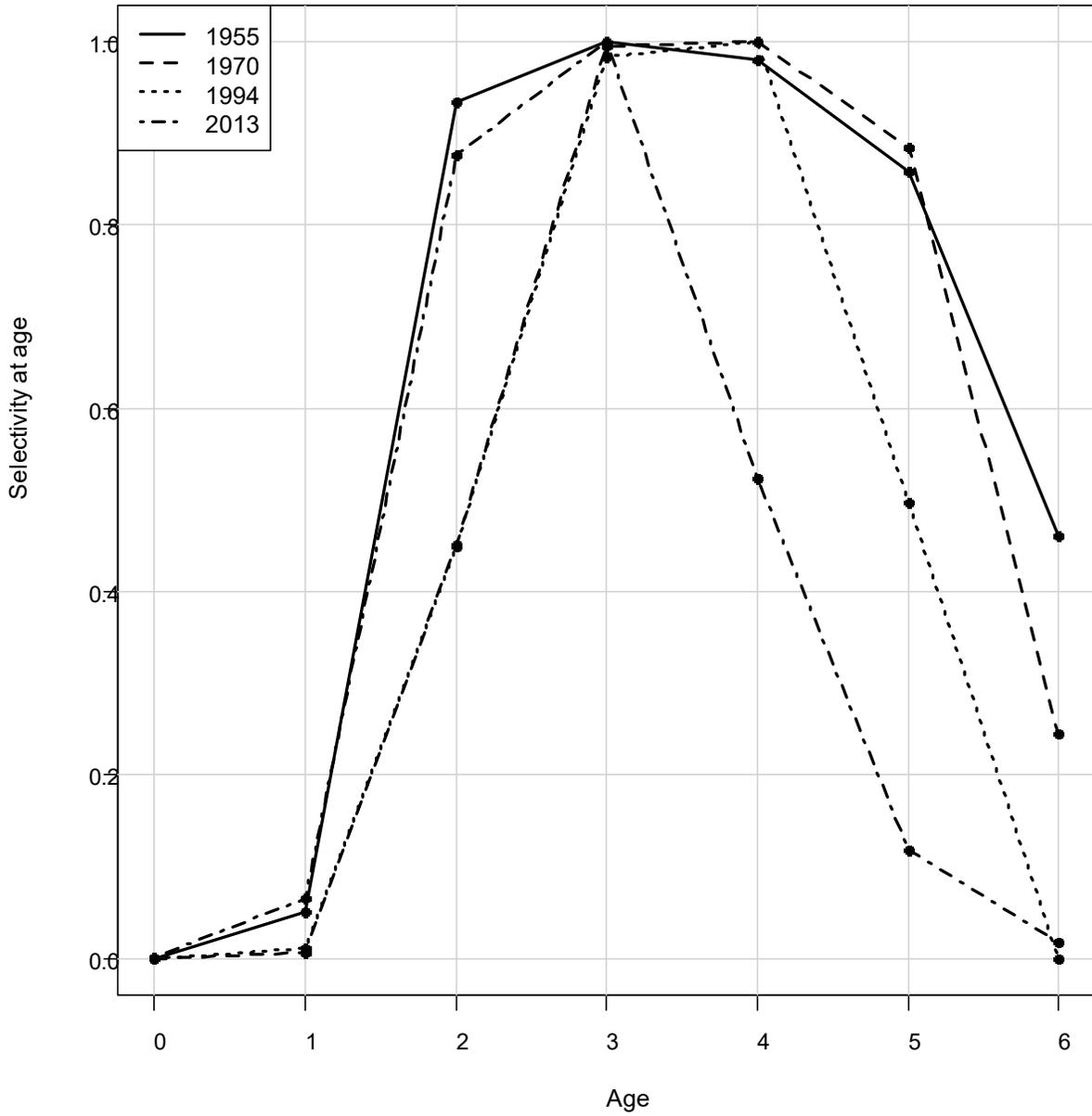


Figure A25. Estimated selectivity of the northern commercial reduction landings for 1955-1969, 1970-1993, 1994-2012, and 2013-2023.

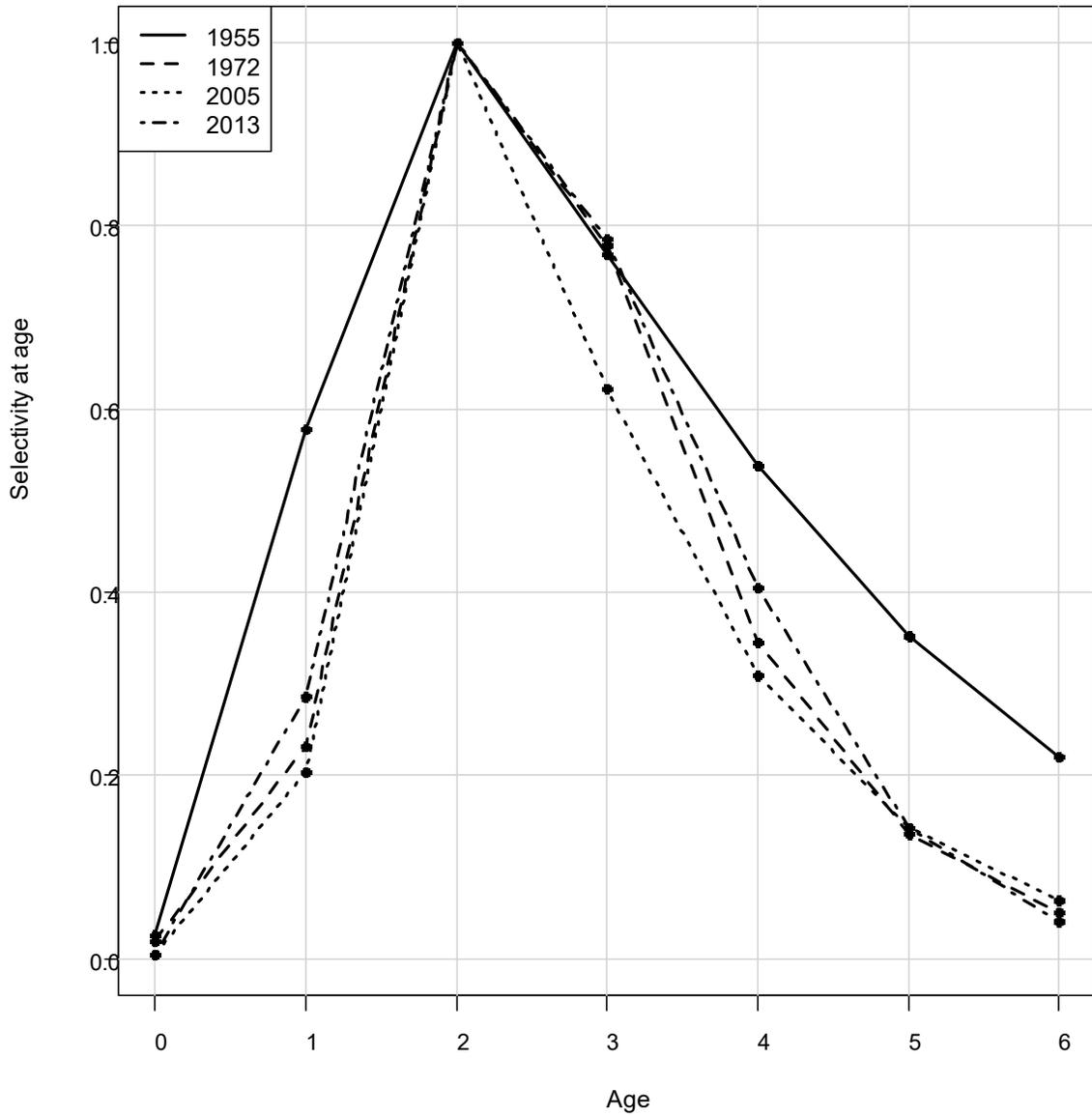


Figure A26. Estimated selectivity of the southern commercial reduction landings for 1955-1971, 1972-2004, 2005-2012, and 2013-2023.

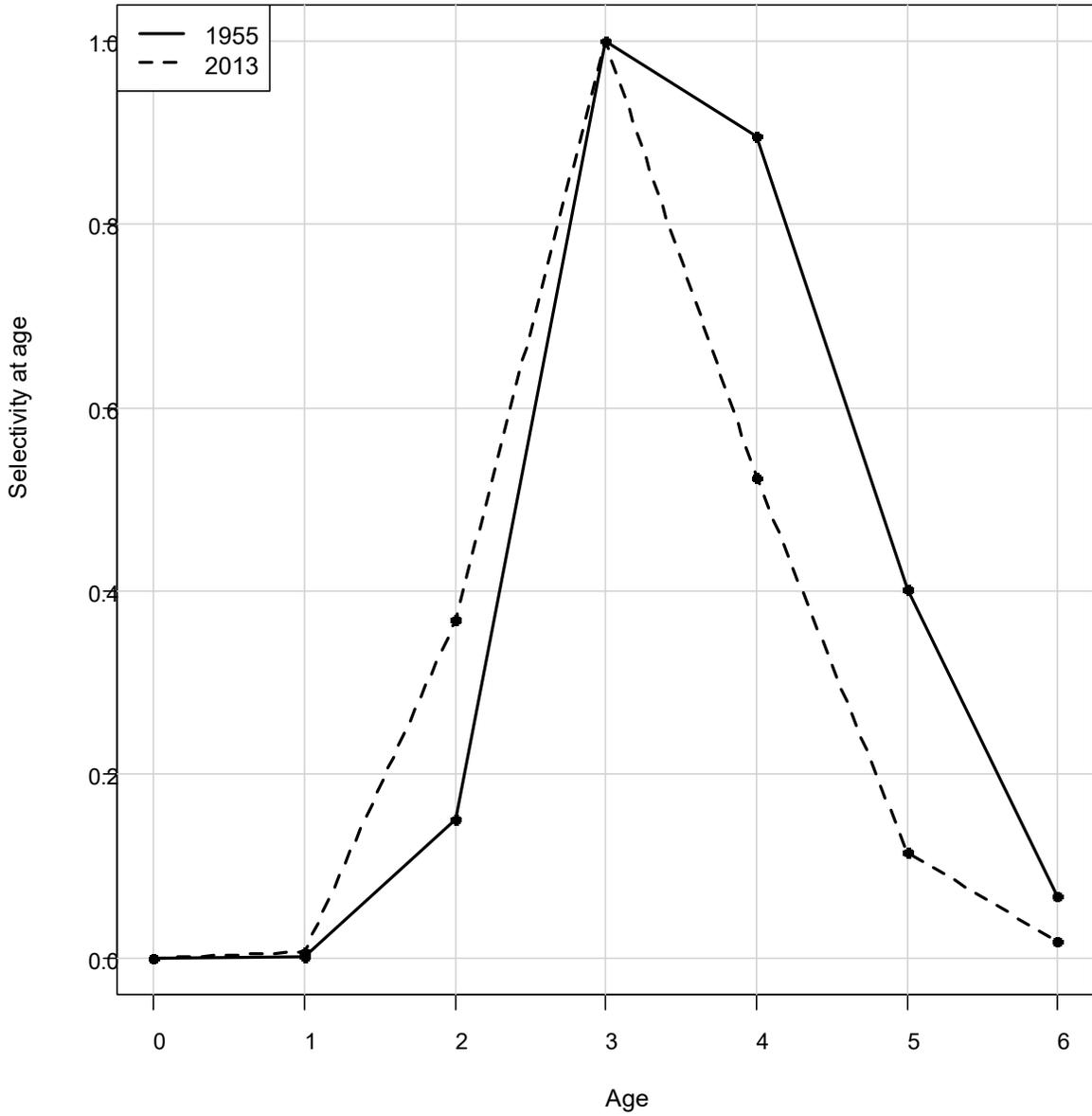


Figure A27. Estimated selectivity of the northern commercial bait landings for 1955-2012 and 2013-2023.

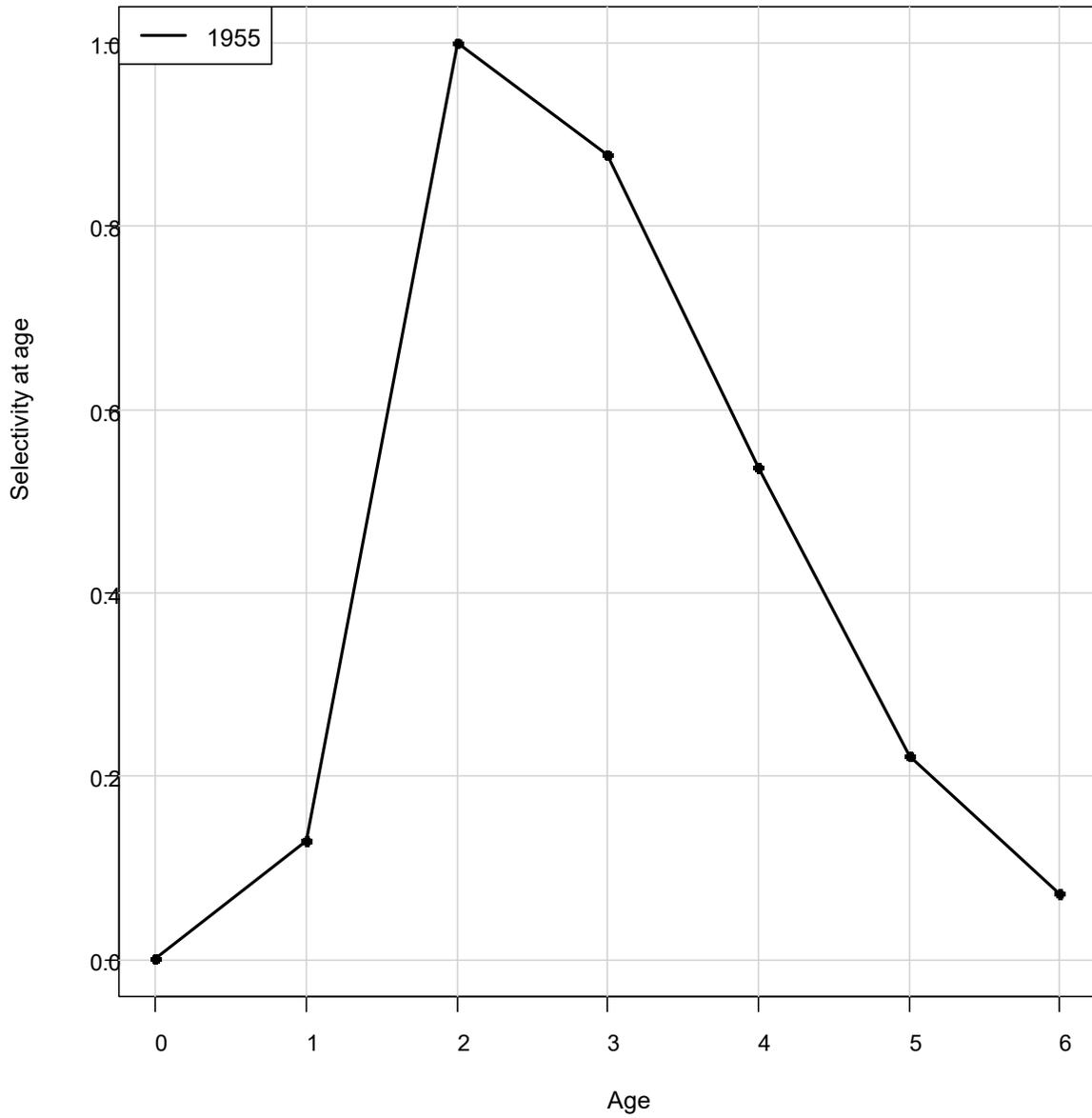


Figure A28. Estimated selectivity of the southern commercial bait landings for 1955-2023.

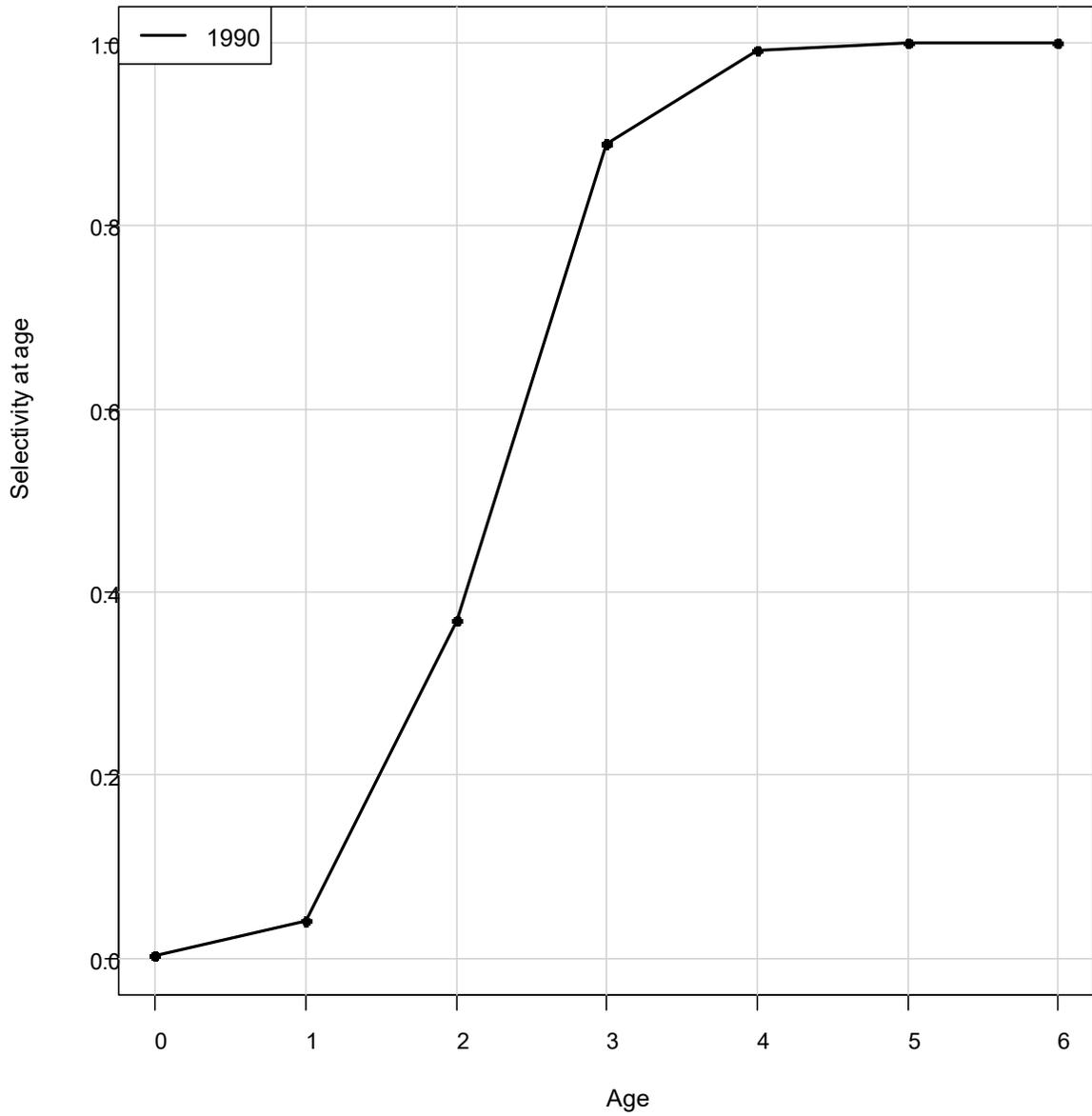


Figure A29. Estimated selectivity for the NAD index for 1990-2023.

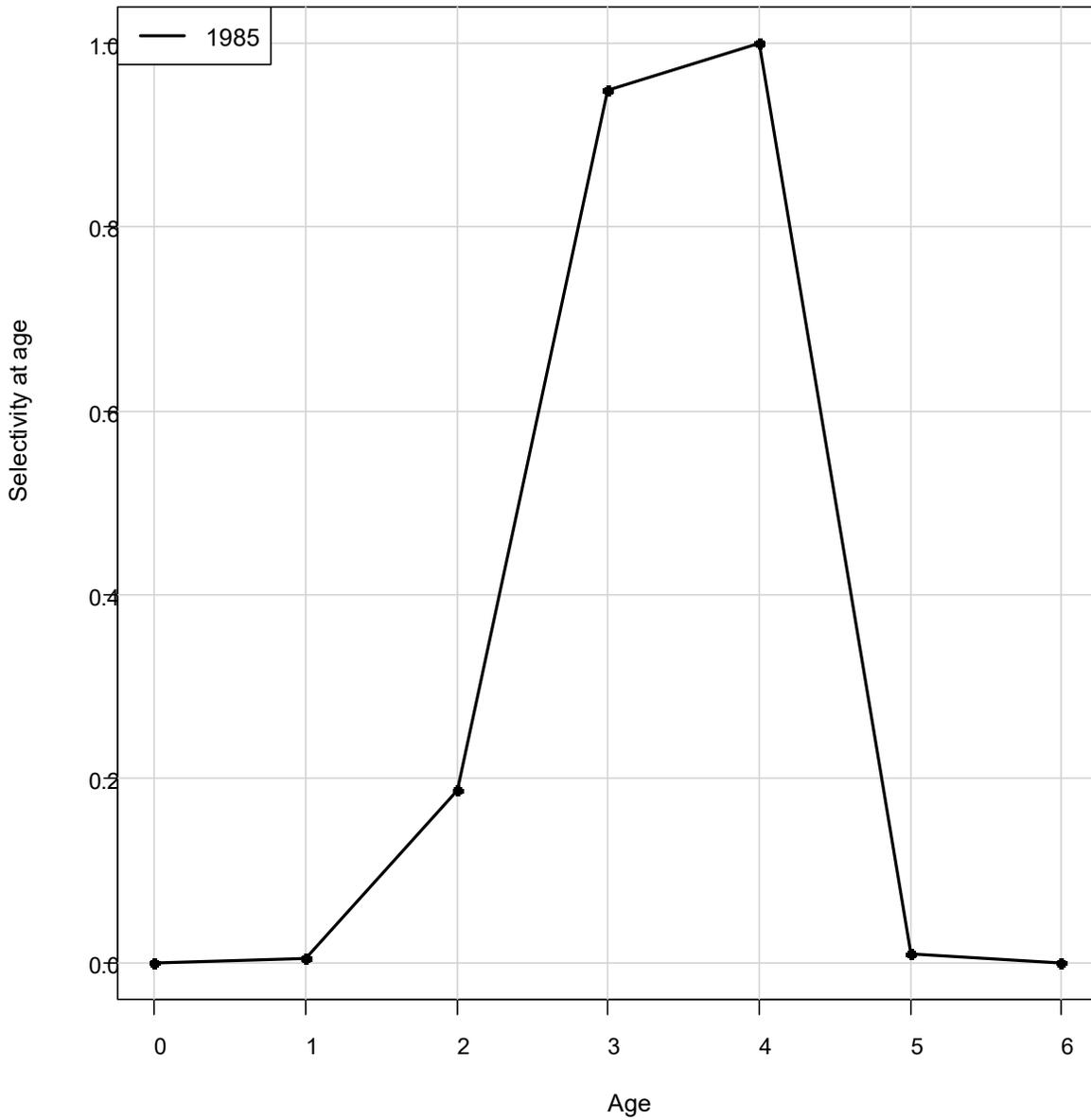


Figure A30. Estimated selectivity for the MAD index for 1985-2023.

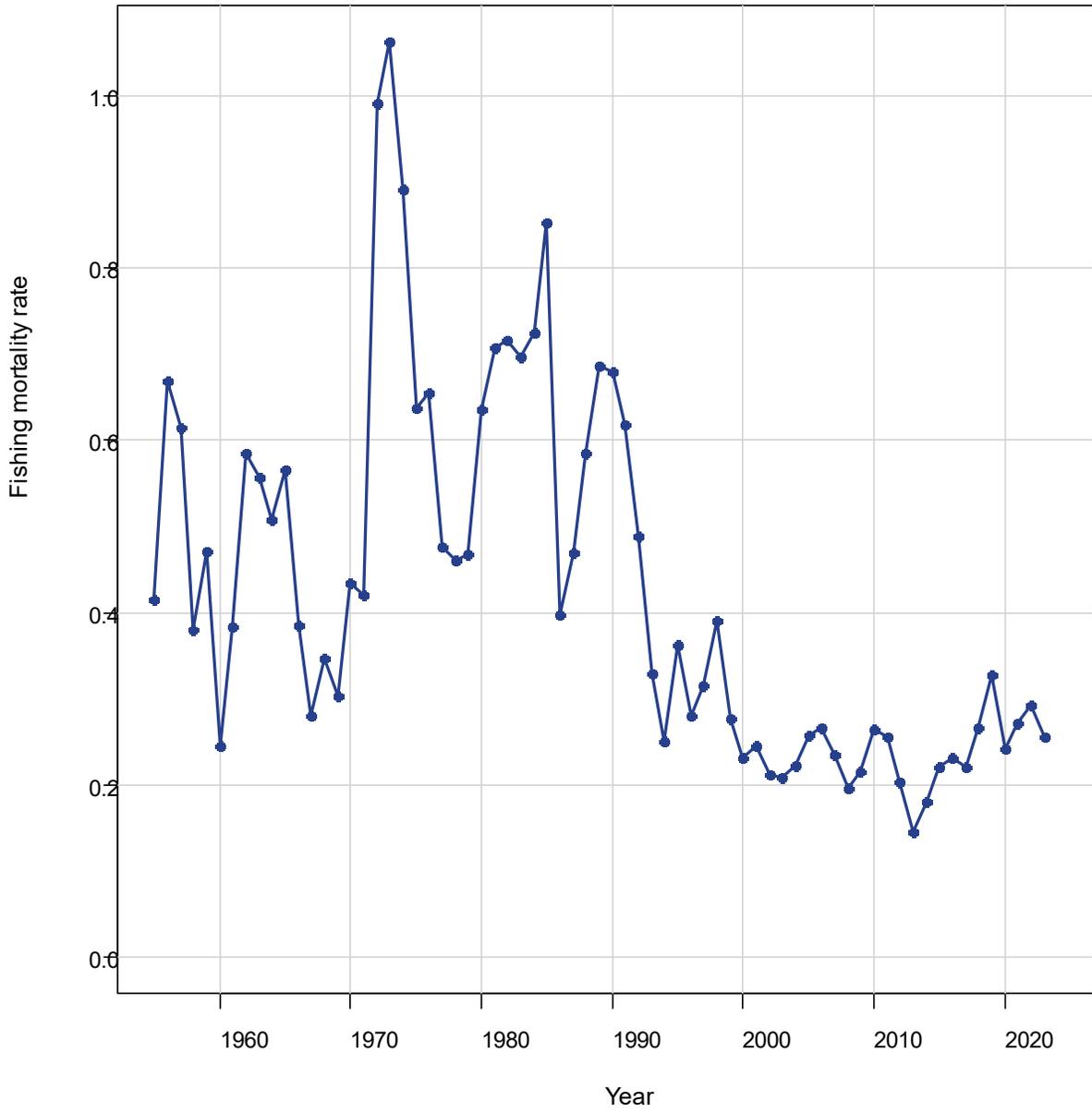


Figure A31. The full fishing mortality rate for 1955-2023.

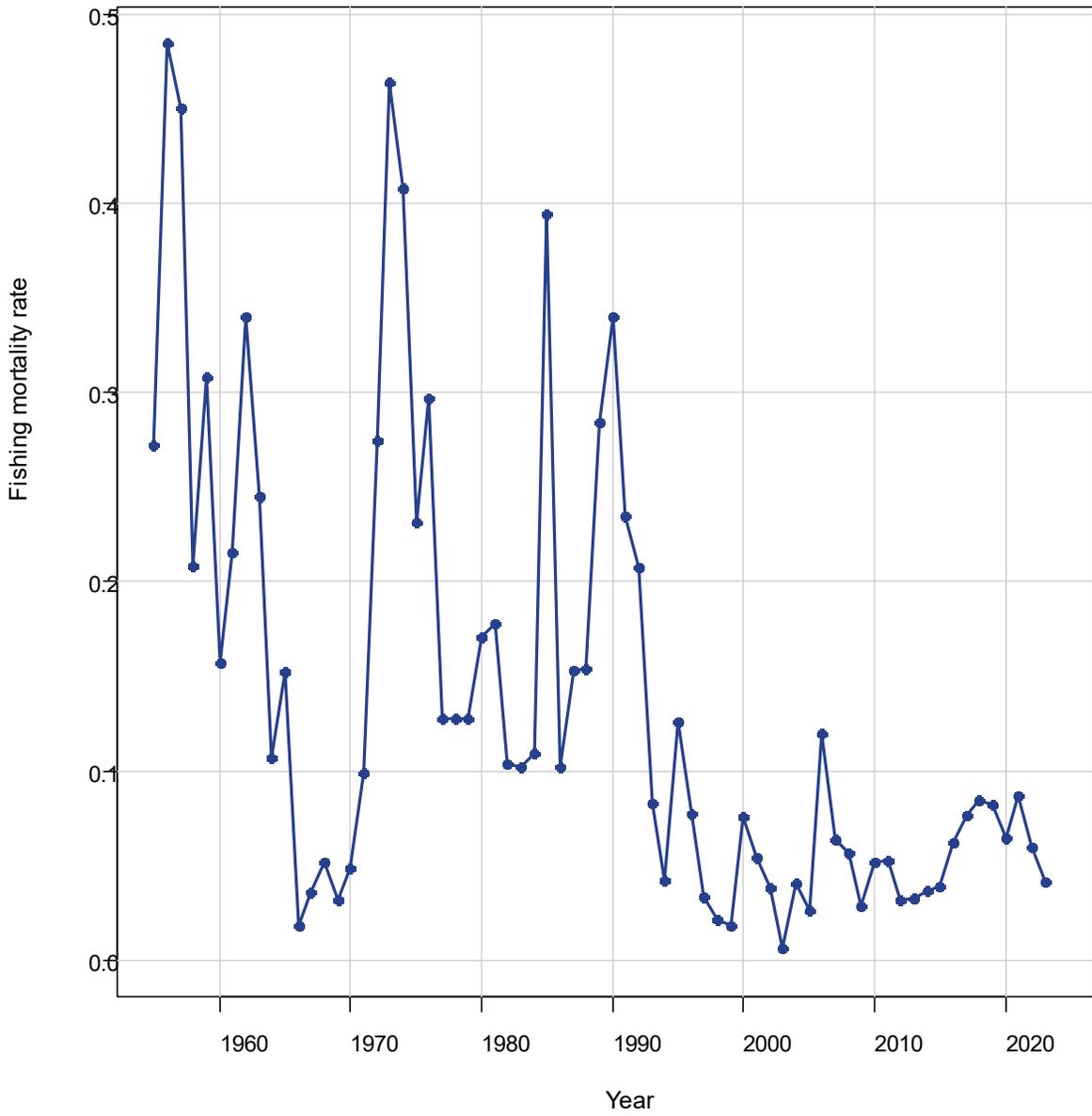


Figure A32. The full fishing mortality rate for the commercial reduction north fleet for 1955-2023.

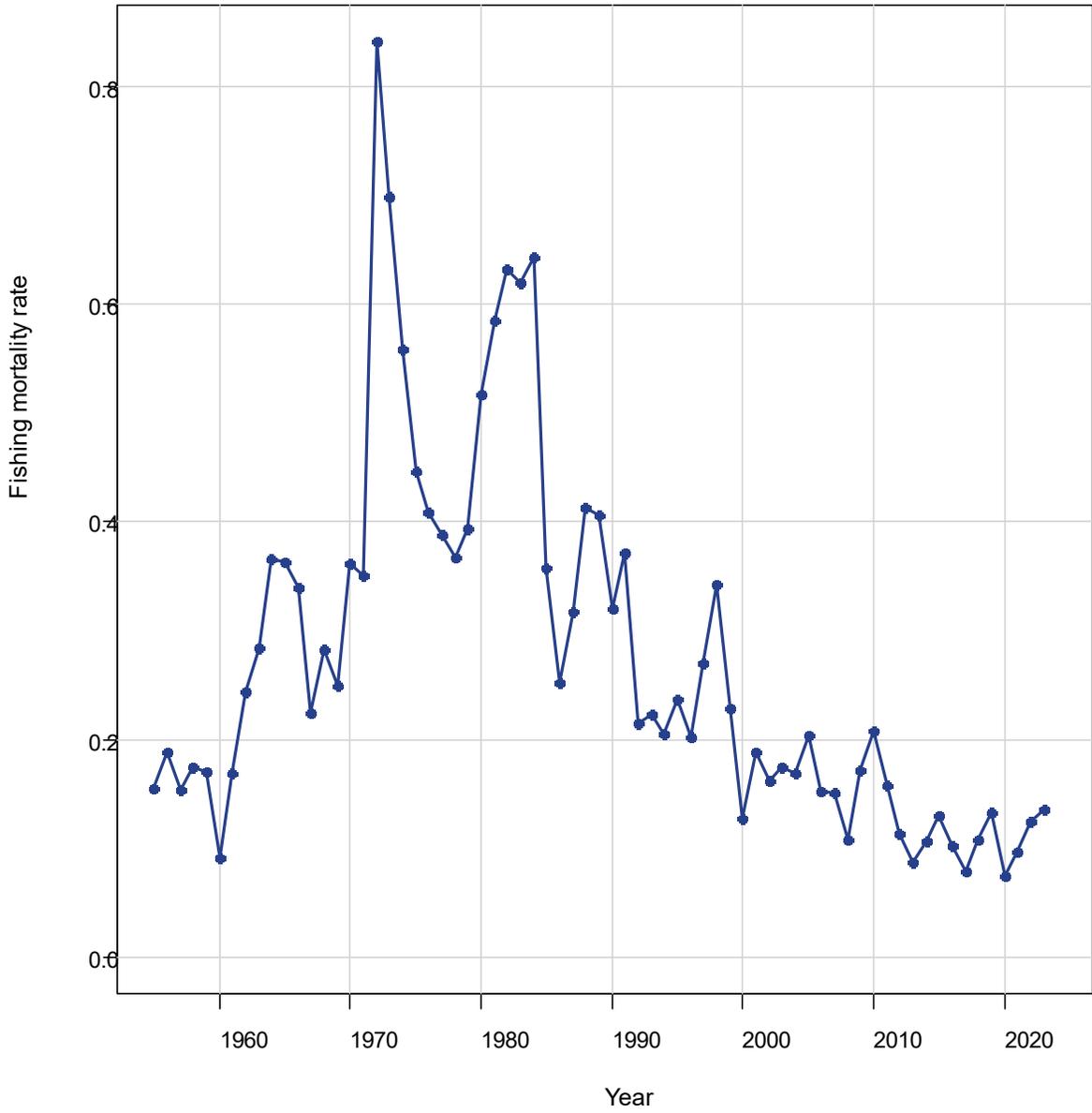


Figure A33. The full fishing mortality rate for the commercial reduction south fleet for 1955-2023.

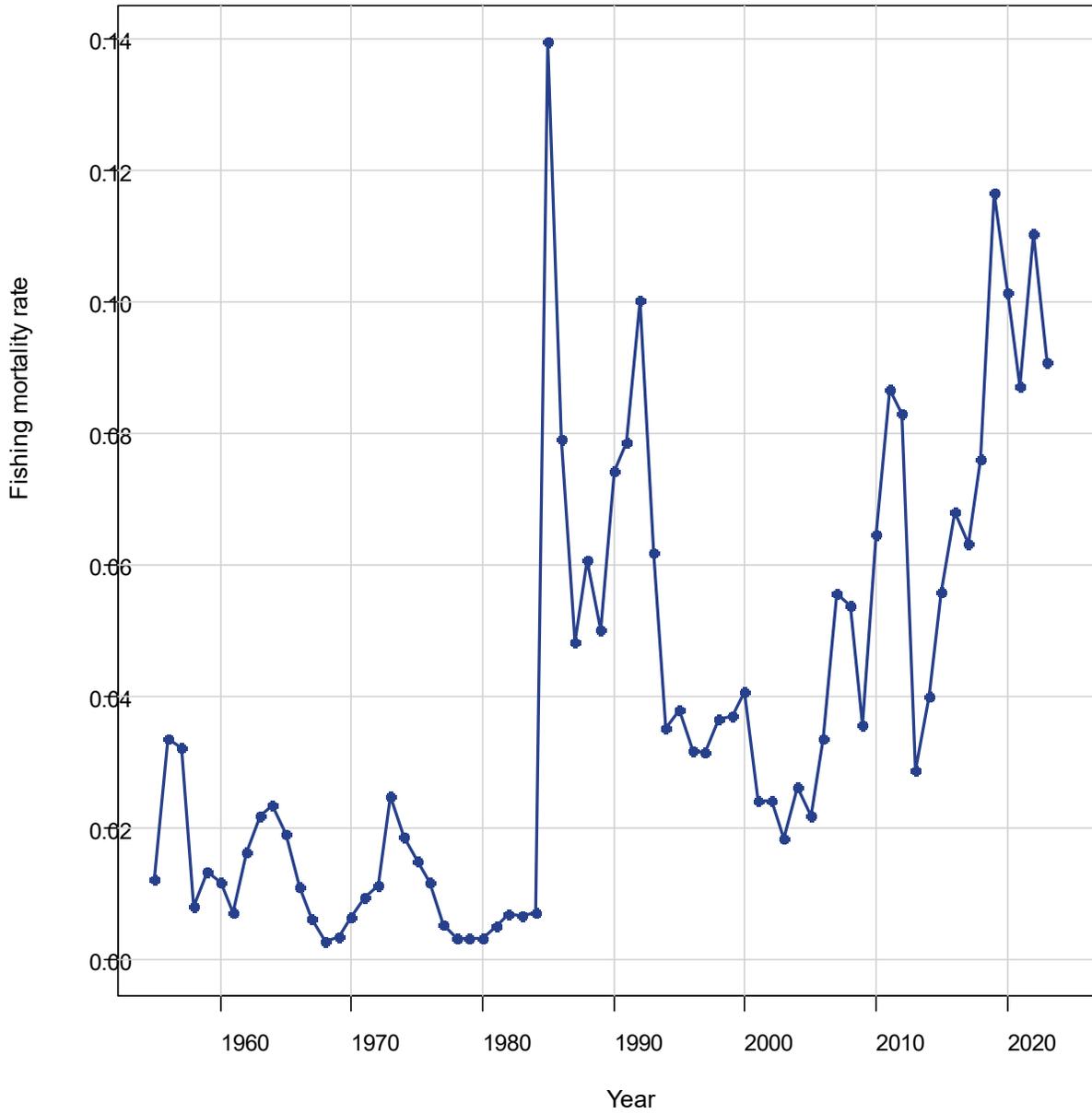


Figure A34. The full fishing mortality rate for the commercial bait north fleet for 1955-2023.

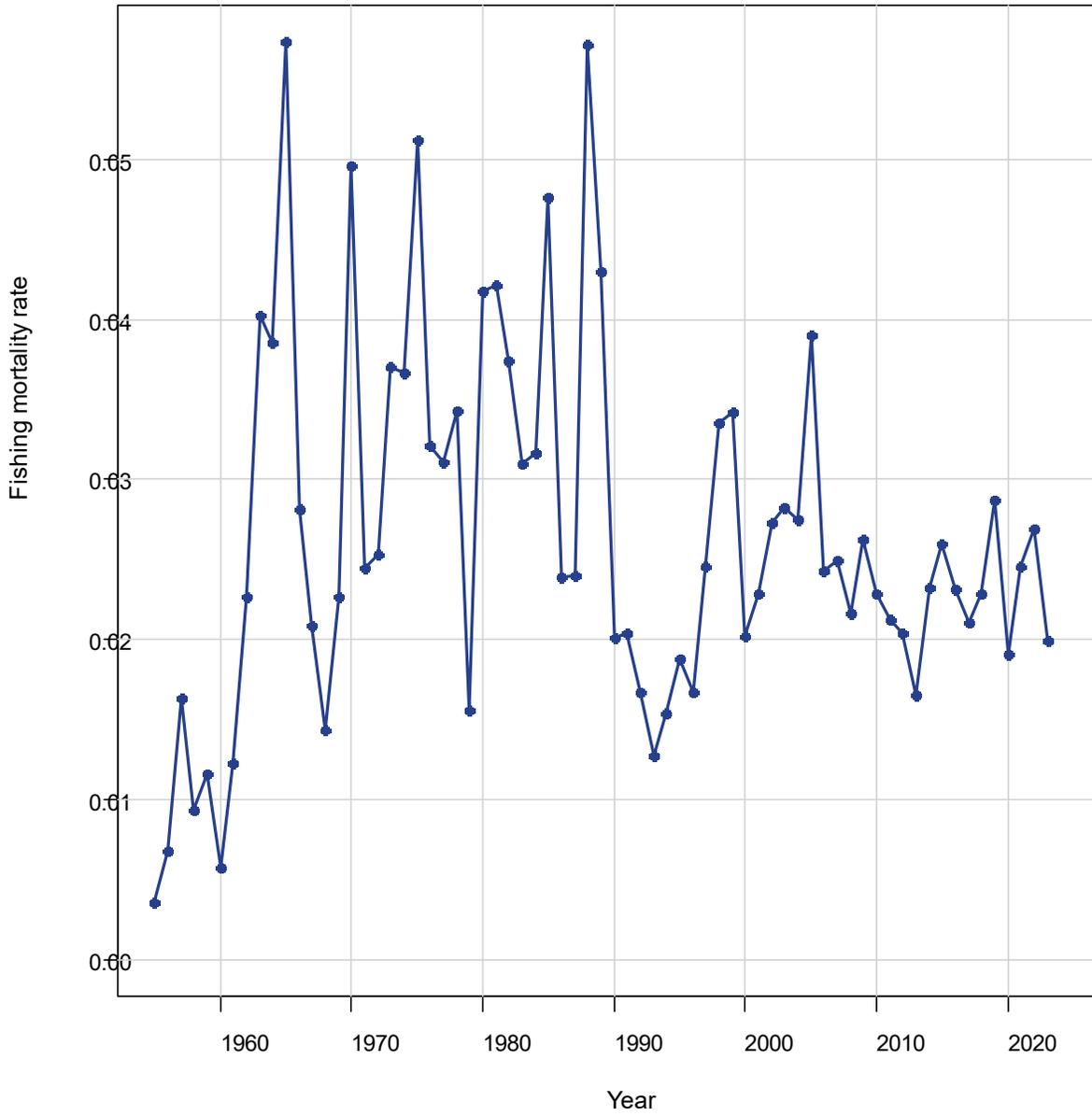


Figure A35. The full fishing mortality rate for the commercial bait south fleet for 1955-2023.

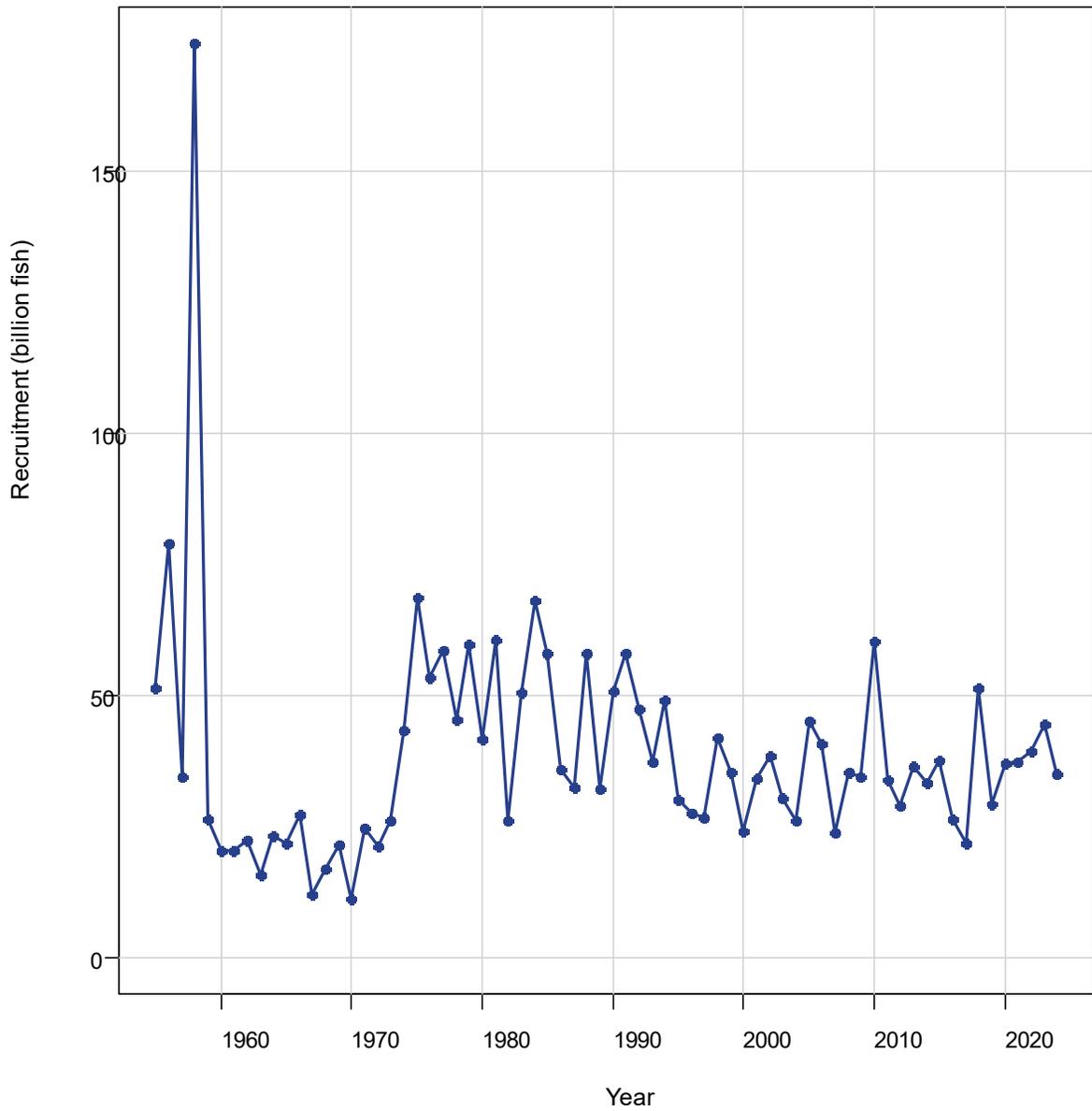


Figure A36. The estimated time series of recruitment for 1955-2023. The 2024 point is a projected recruitment point.

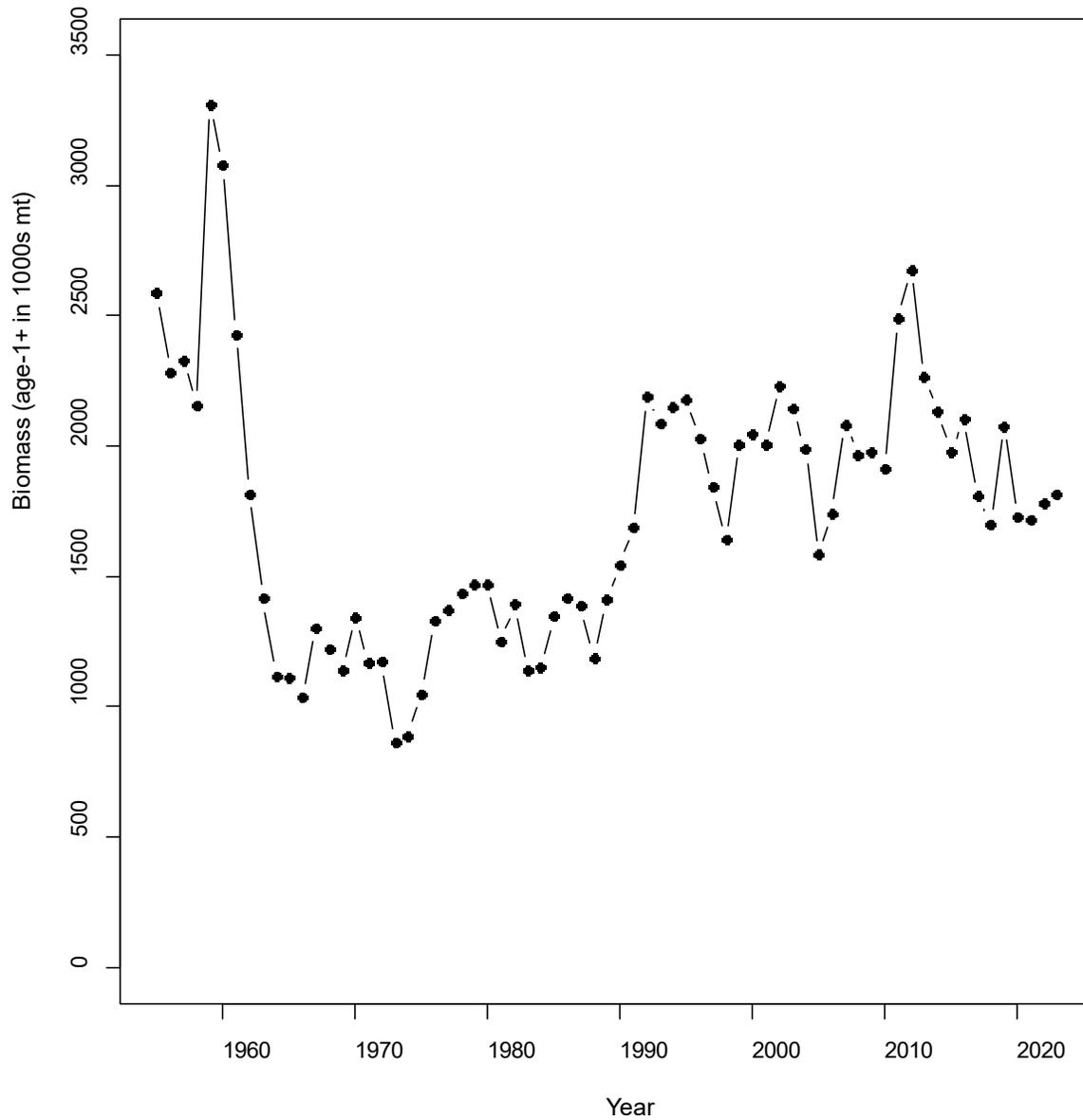


Figure A37. Age-1+ biomass in 1000s of mt for 1955-2023.

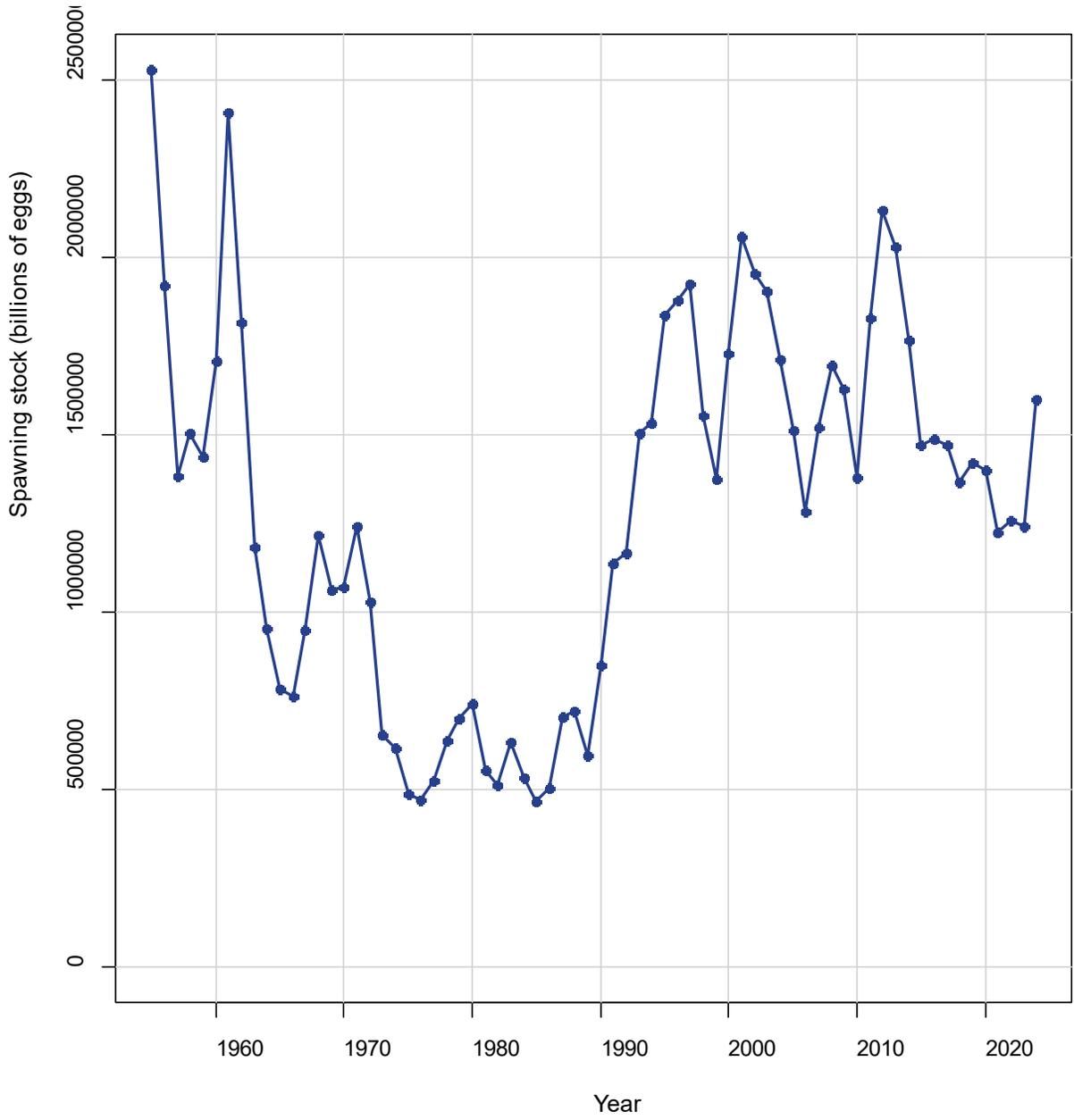


Figure A38. Fecundity in billions of ova for 1955-2023. The 2024 value is a projected value.

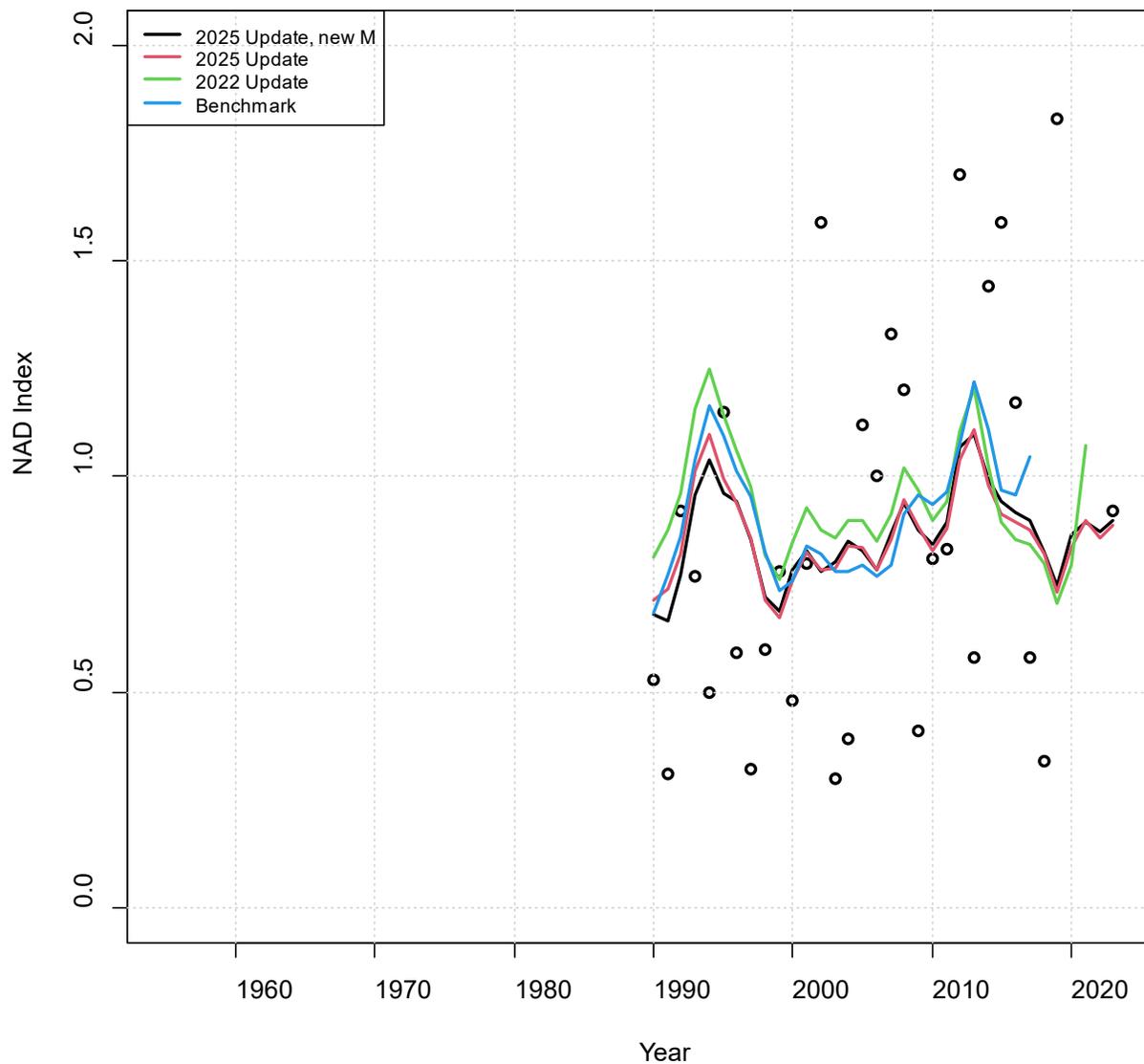


Figure A39. Fit to the observed (open circles) NAD index for the base run for this update assessment with a new natural mortality value (M), the 2025 update assessment as a continuity run, the 2022 update assessment, and the last benchmark assessment.

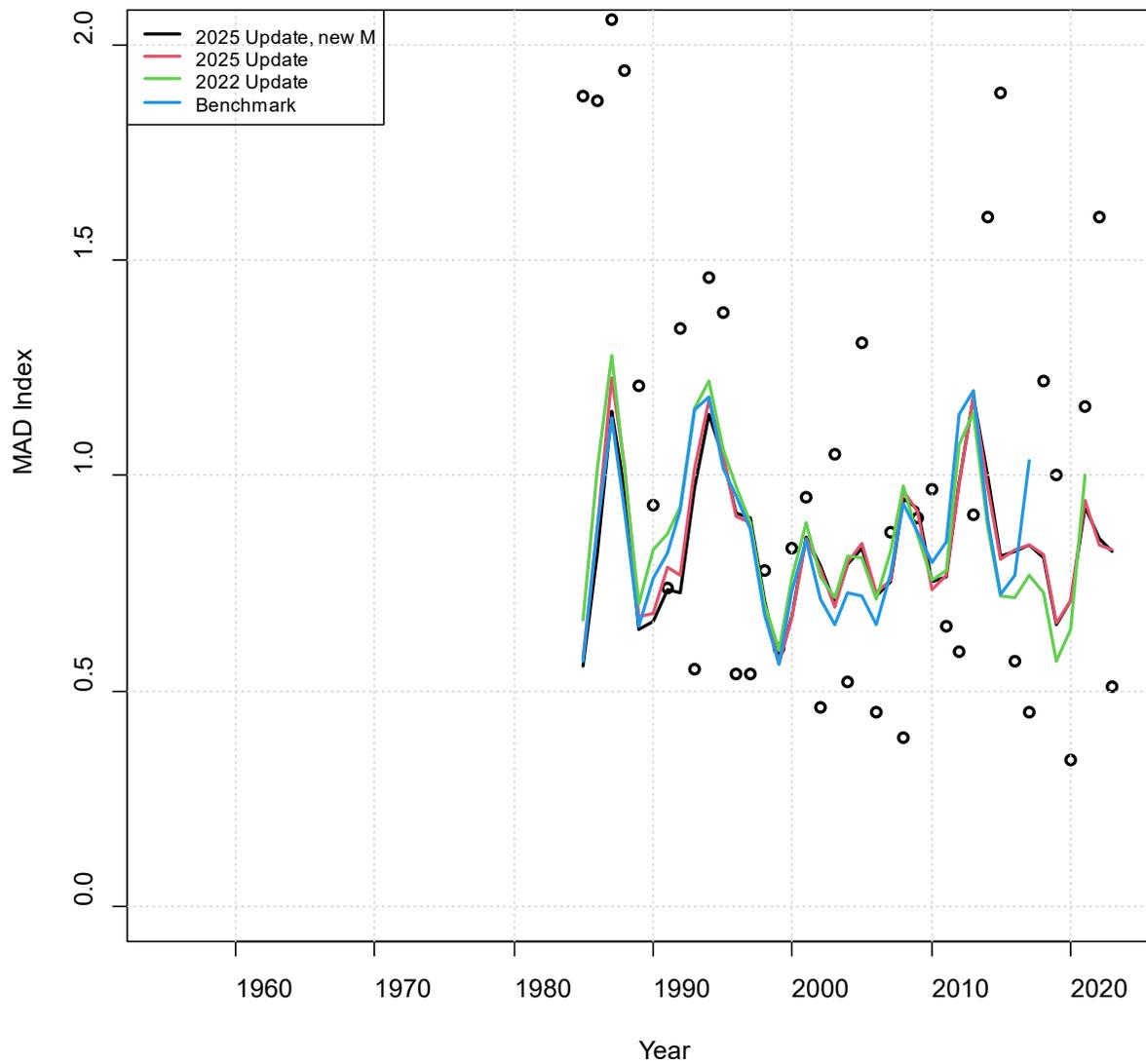


Figure A40. Fit to the observed (open circles) MAD index for the base run for this update assessment with a new natural mortality value (M), the 2025 update assessment as a continuity run, the 2022 update assessment, and the last benchmark assessment.

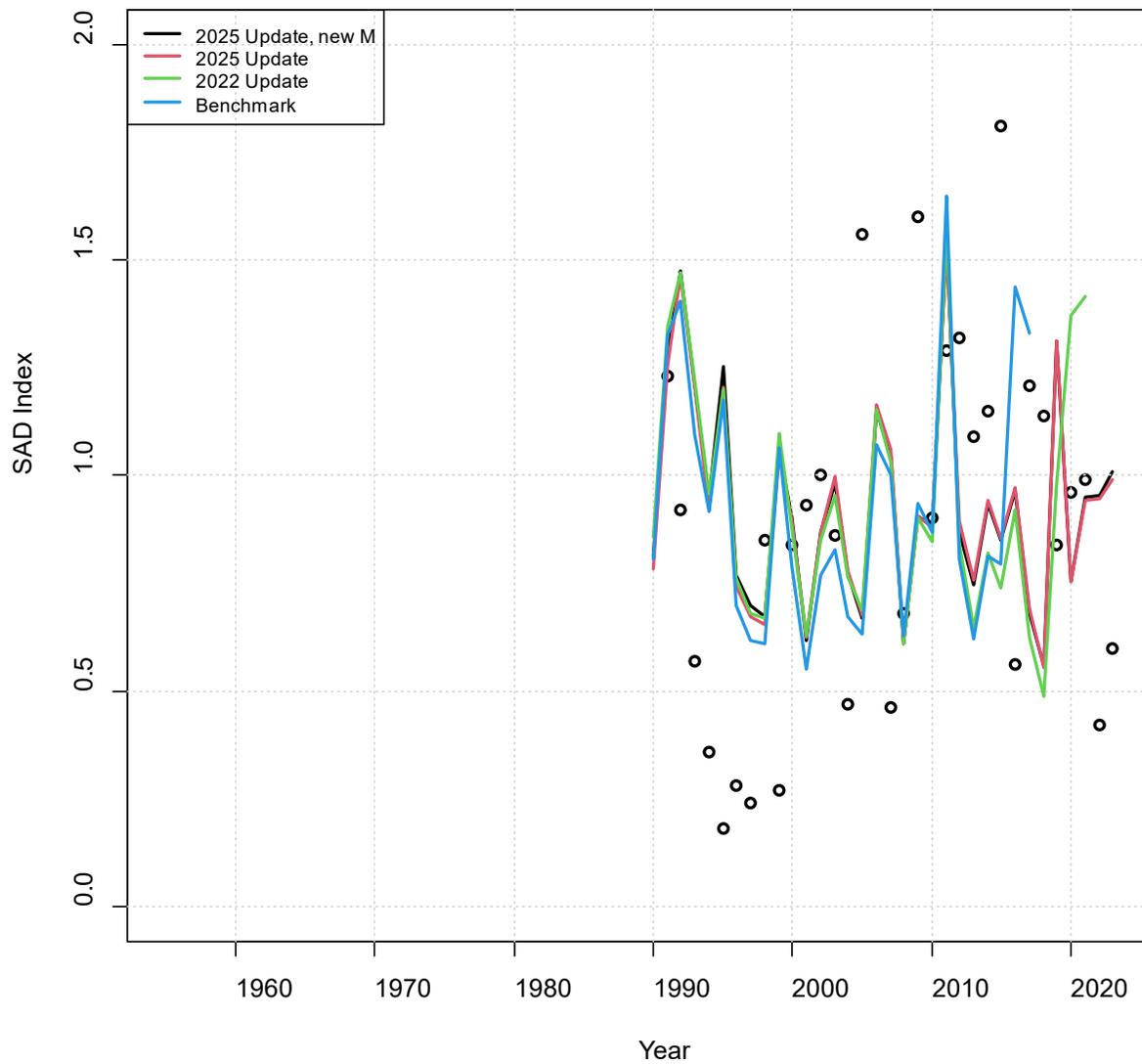


Figure A41. Fit to the observed (open circles) SAD index for the base run for this update assessment with a new natural mortality value (M), the 2025 update assessment as a continuity run, the 2022 update assessment, and the last benchmark assessment.

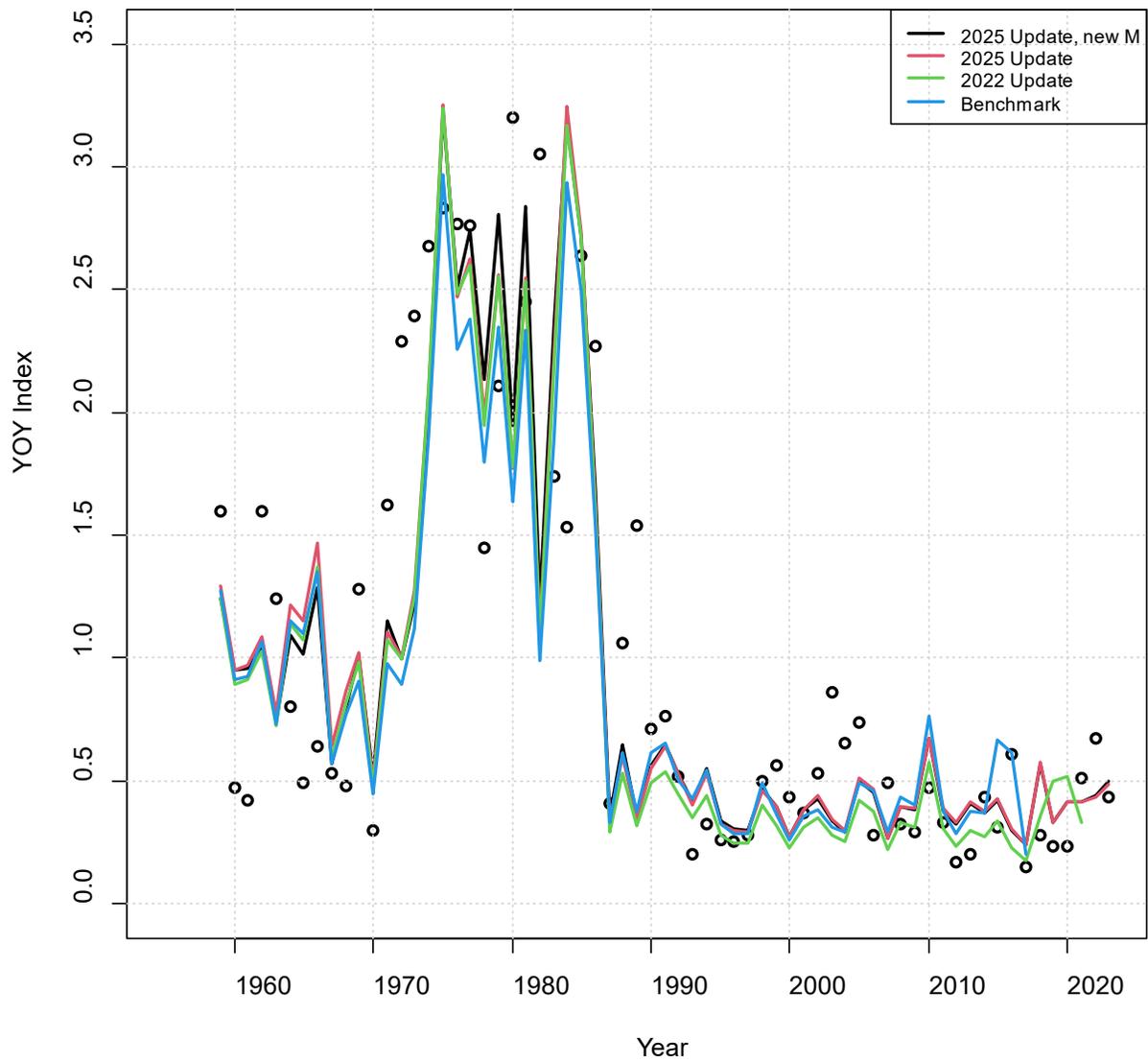


Figure A42. Fit to the observed (open circles) recruitment index for the base run for this update assessment with a new natural mortality value (M), the 2025 update assessment as a continuity run, the 2022 update assessment, and the last benchmark assessment.

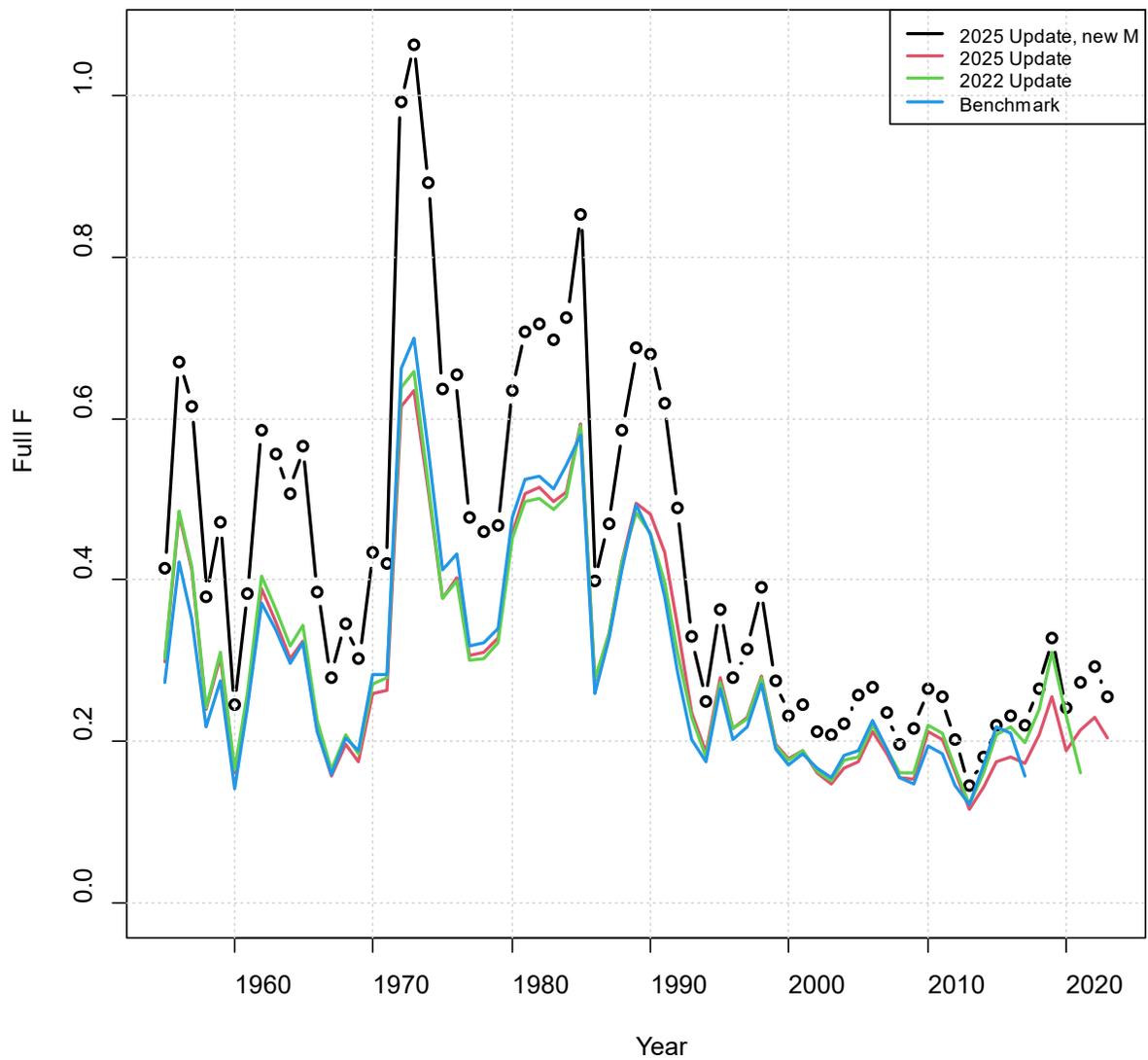


Figure A43. Estimates of the full fishing mortality rate for the base run for this update assessment with a new natural mortality value (M), the 2025 update assessment as a continuity run, the 2022 update assessment, and the last benchmark assessment.

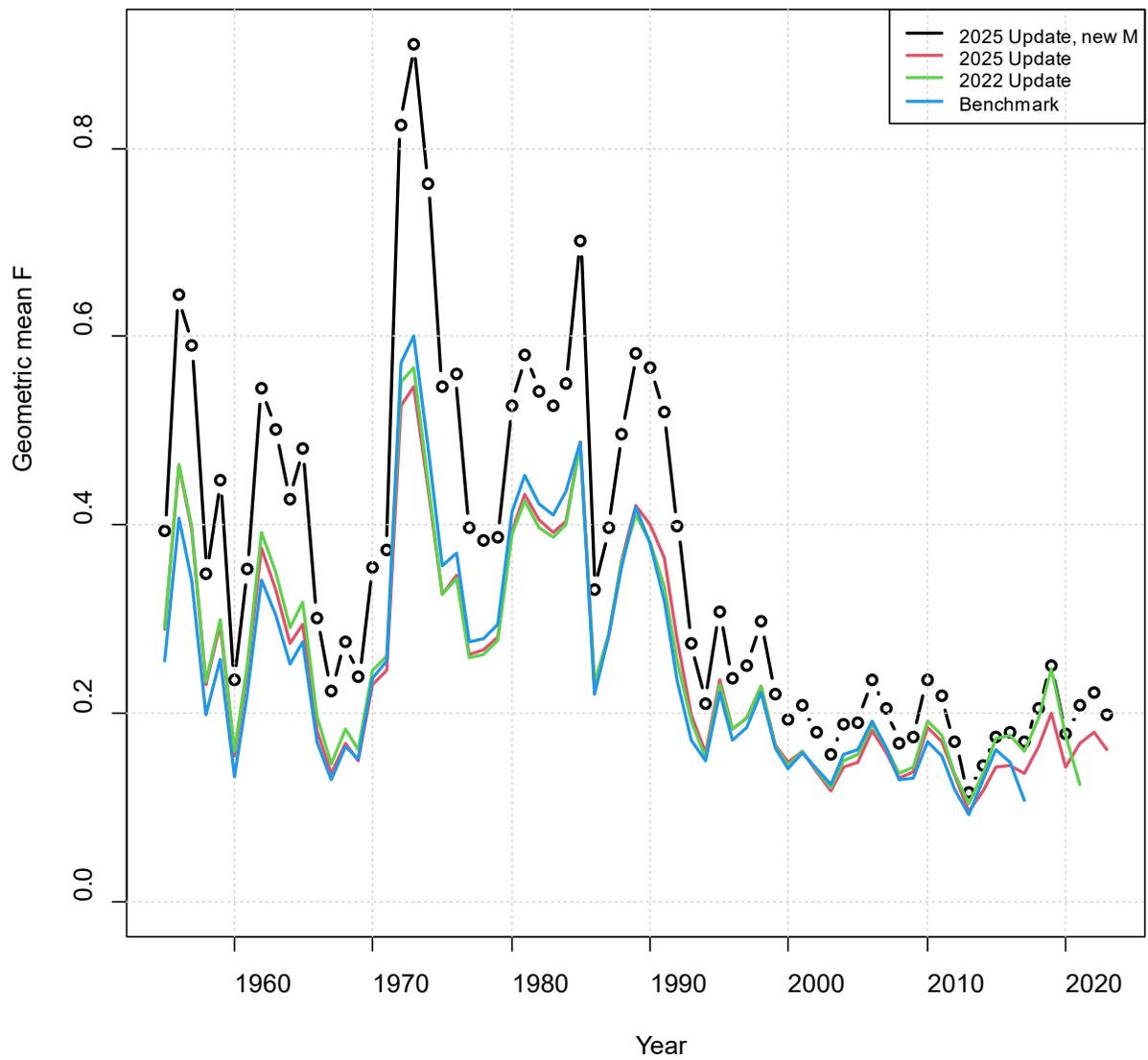


Figure A44. Estimates of the geometric mean fishing mortality rate for ages-2 to -4 for the base run for this update assessment with a new natural mortality value (M), the 2025 update assessment as a continuity run, the 2022 update assessment, and the last benchmark assessment.

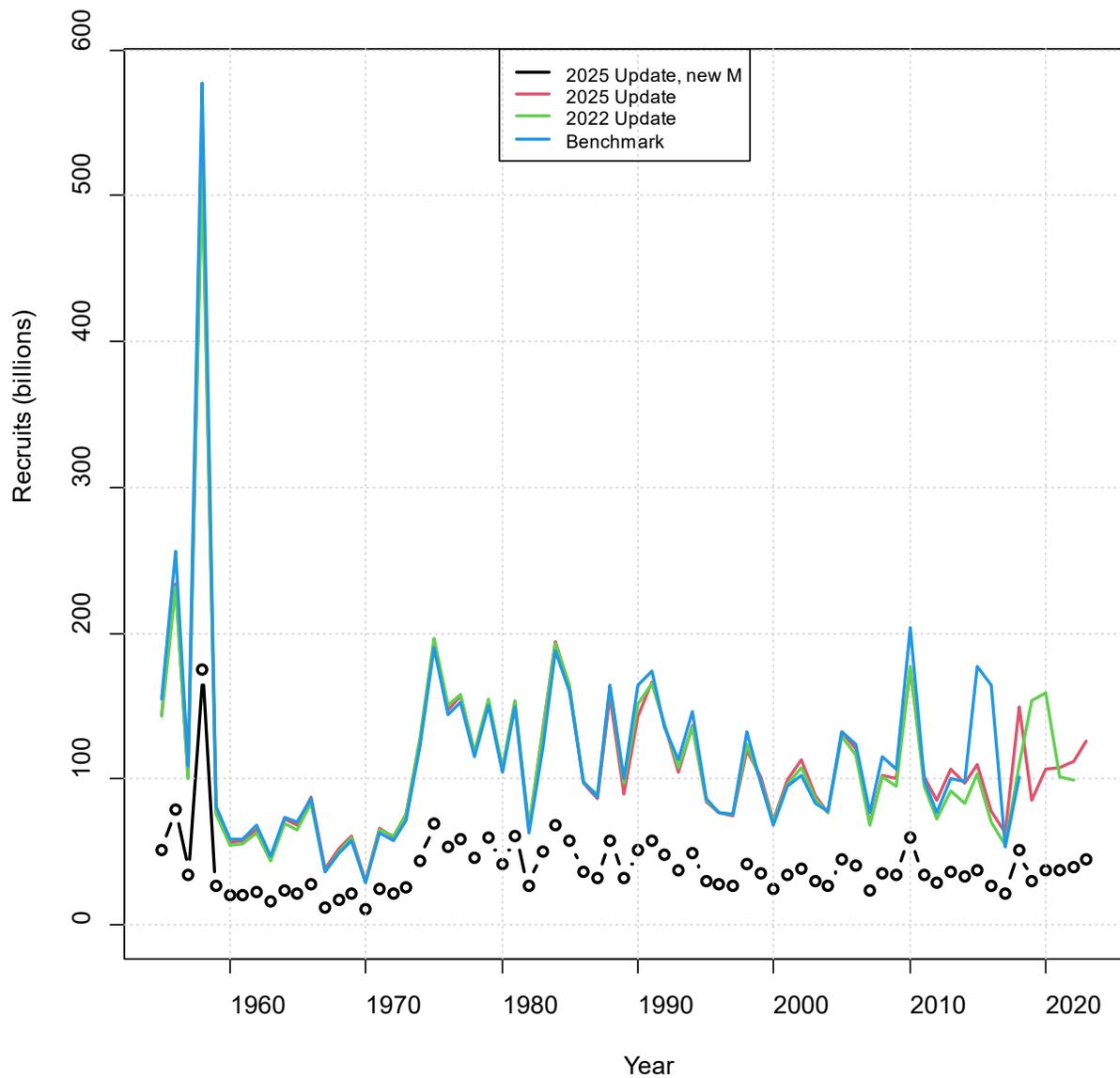


Figure A45. Estimates of the recruitment time series for the base run for this update assessment with a new natural mortality value (M), the 2025 update assessment as a continuity run, the 2022 update assessment, and the last benchmark assessment.

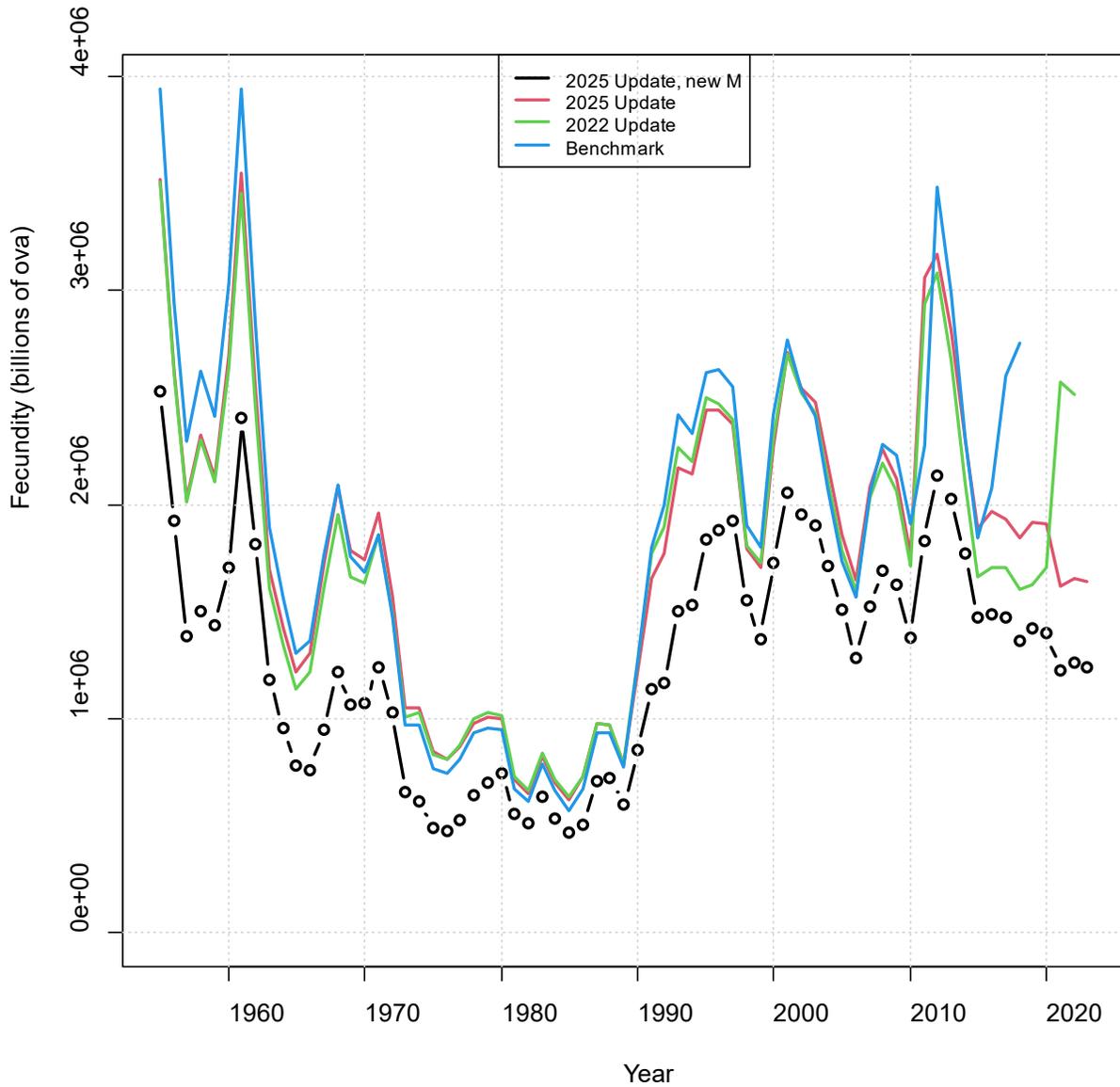


Figure A46. Estimates of the fecundity (billions of ova) for the base run for this update assessment with a new natural mortality value (M), the 2025 update assessment as a continuity run, the 2022 update assessment, and the last benchmark assessment.

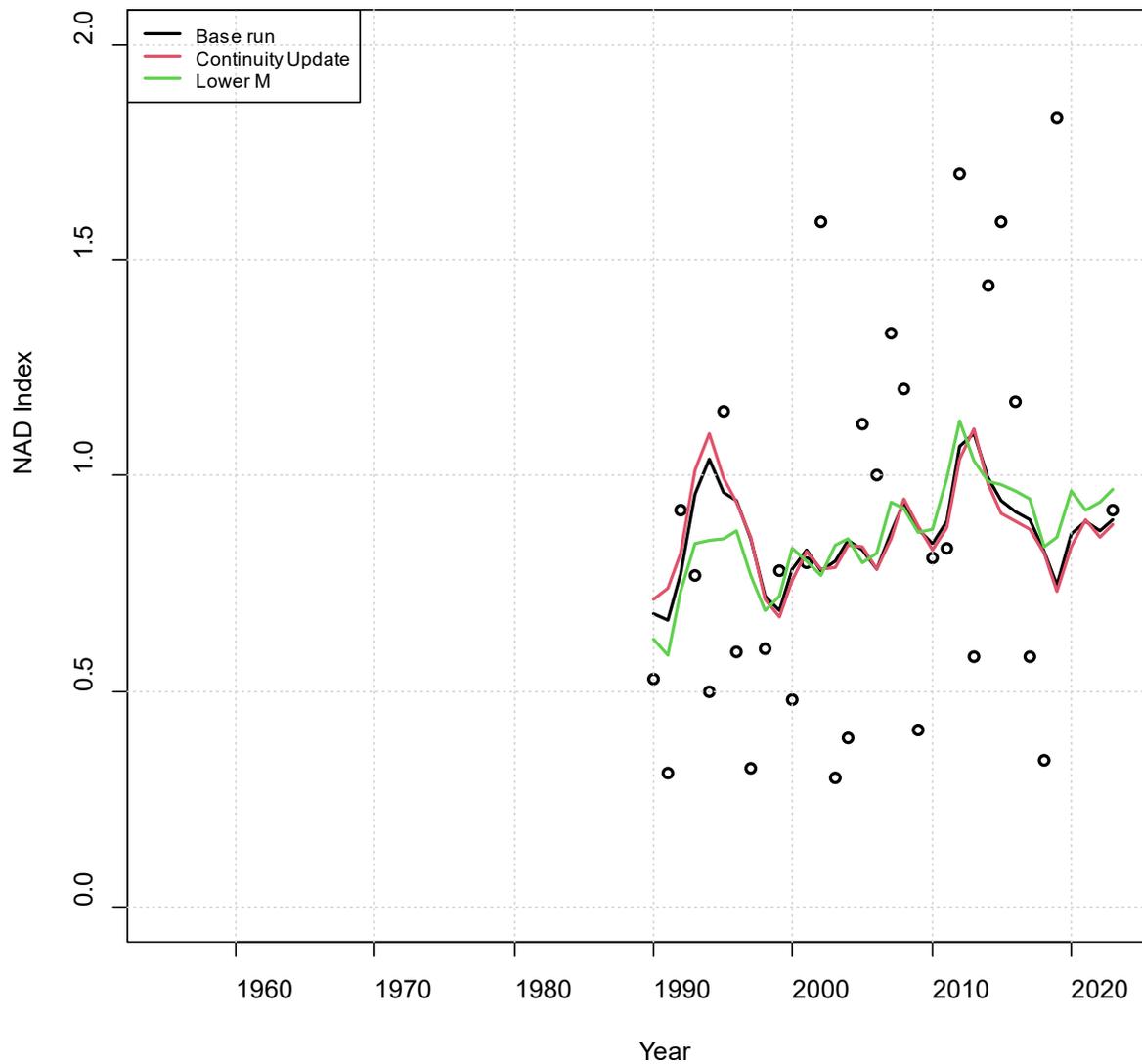


Figure A47. Fit to the observed (open circles) NAD index for the base run for this update assessment with a new natural mortality value (M), the 2025 update assessment as a continuity run, and a sensitivity run with a lower M.

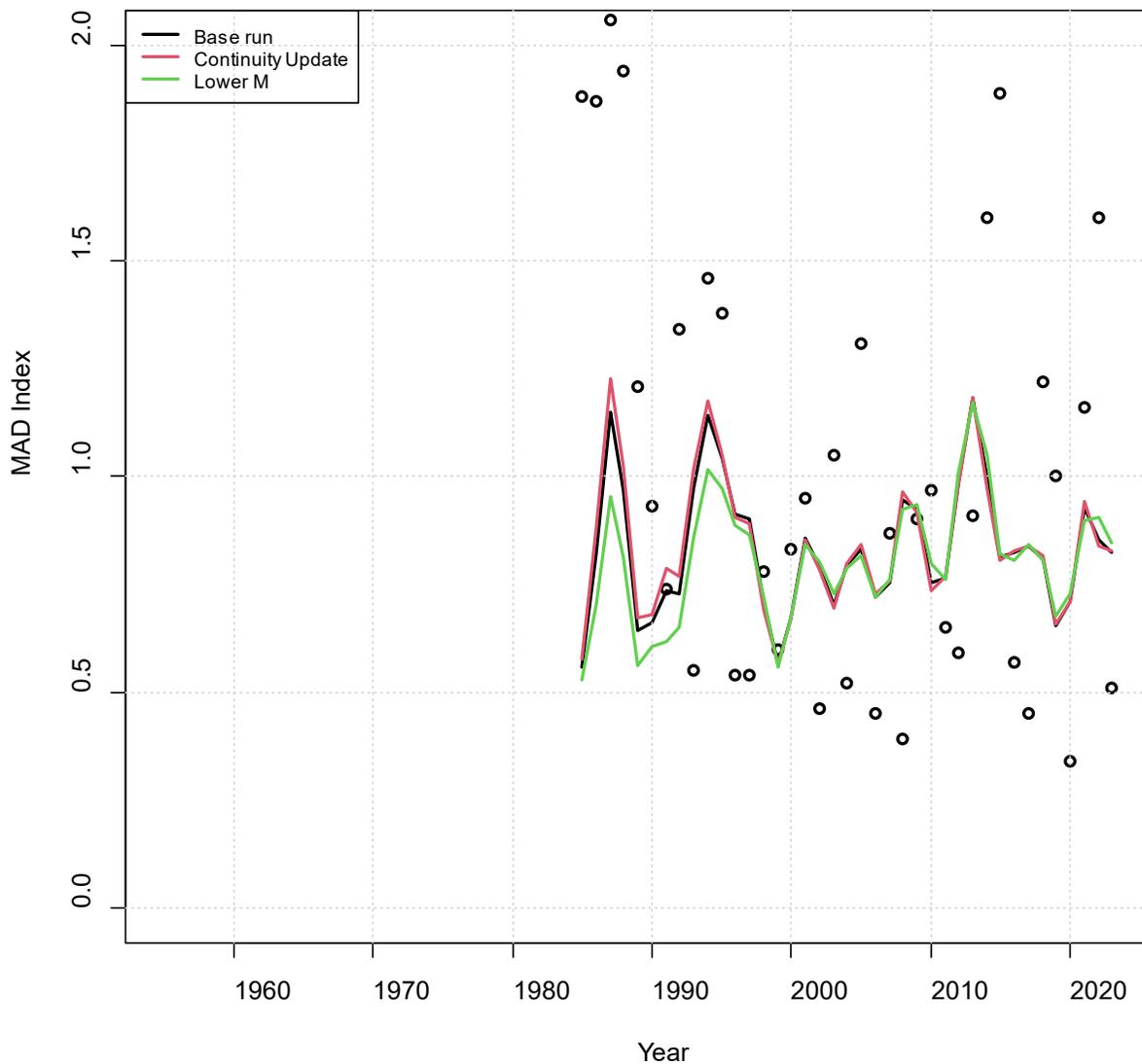


Figure A48. Fit to the observed (open circles) MAD index for the base run for this update assessment with a new natural mortality value (M), the 2025 update assessment as a continuity run, and a sensitivity run with a lower M.

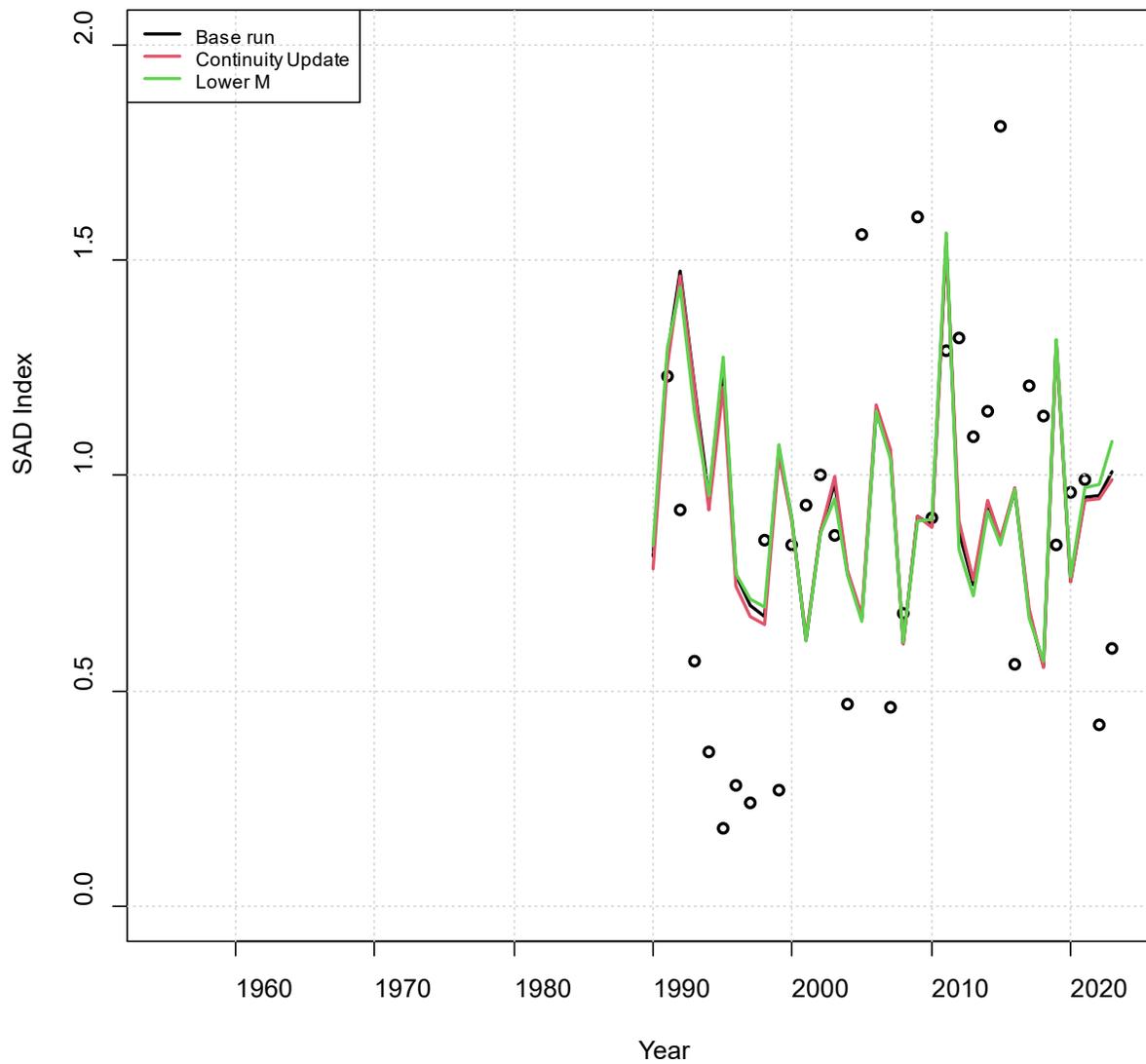


Figure A49. Fit to the observed (open circles) SAD index for the base run for this update assessment with a new natural mortality value (M), the 2025 update assessment as a continuity run, and a sensitivity run with a lower M .

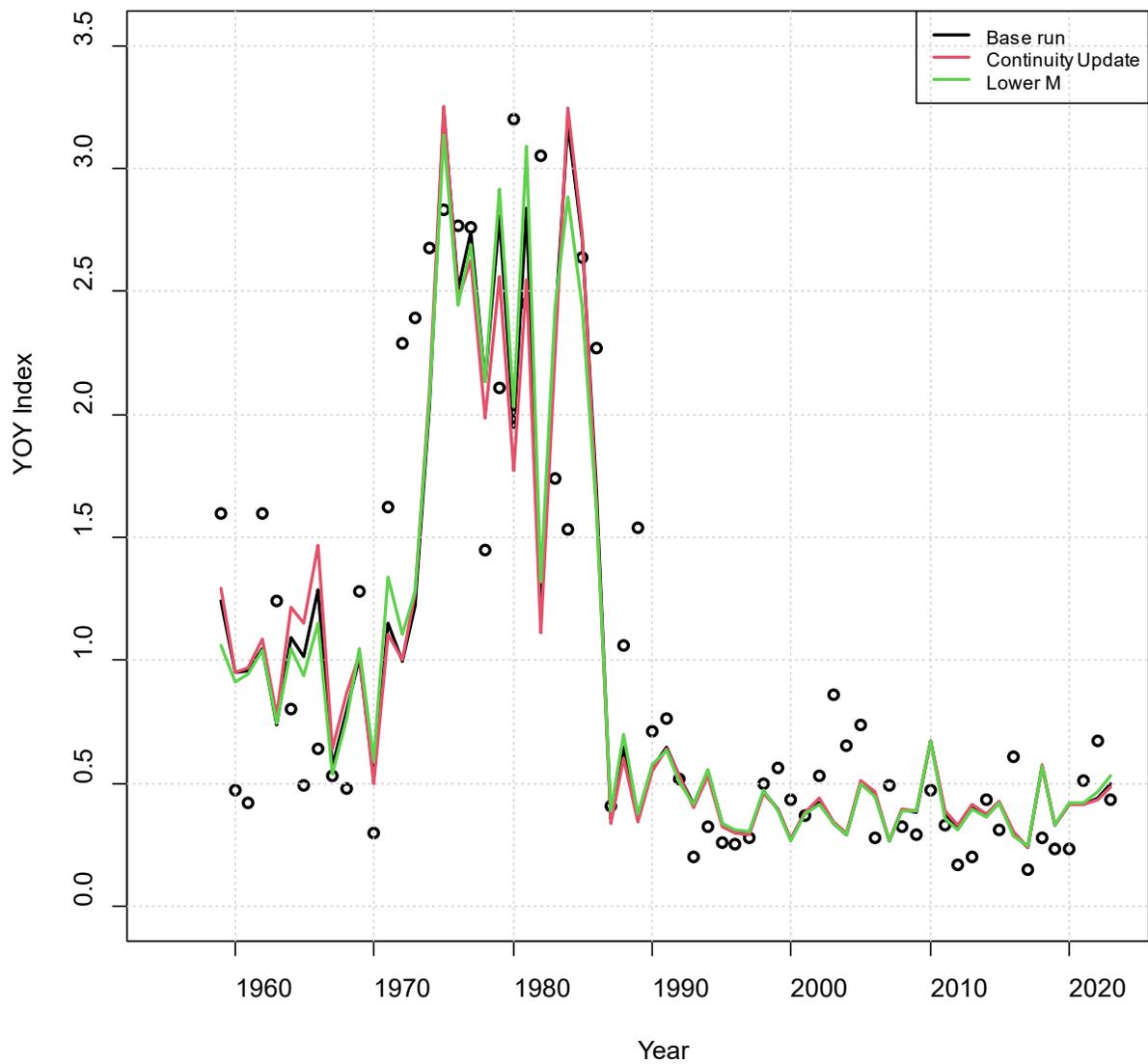


Figure A50. Fit to the observed (open circles) recruitment index for the base run for this update assessment with a new natural mortality value (M), the 2025 update assessment as a continuity run, and a sensitivity run with a lower M.

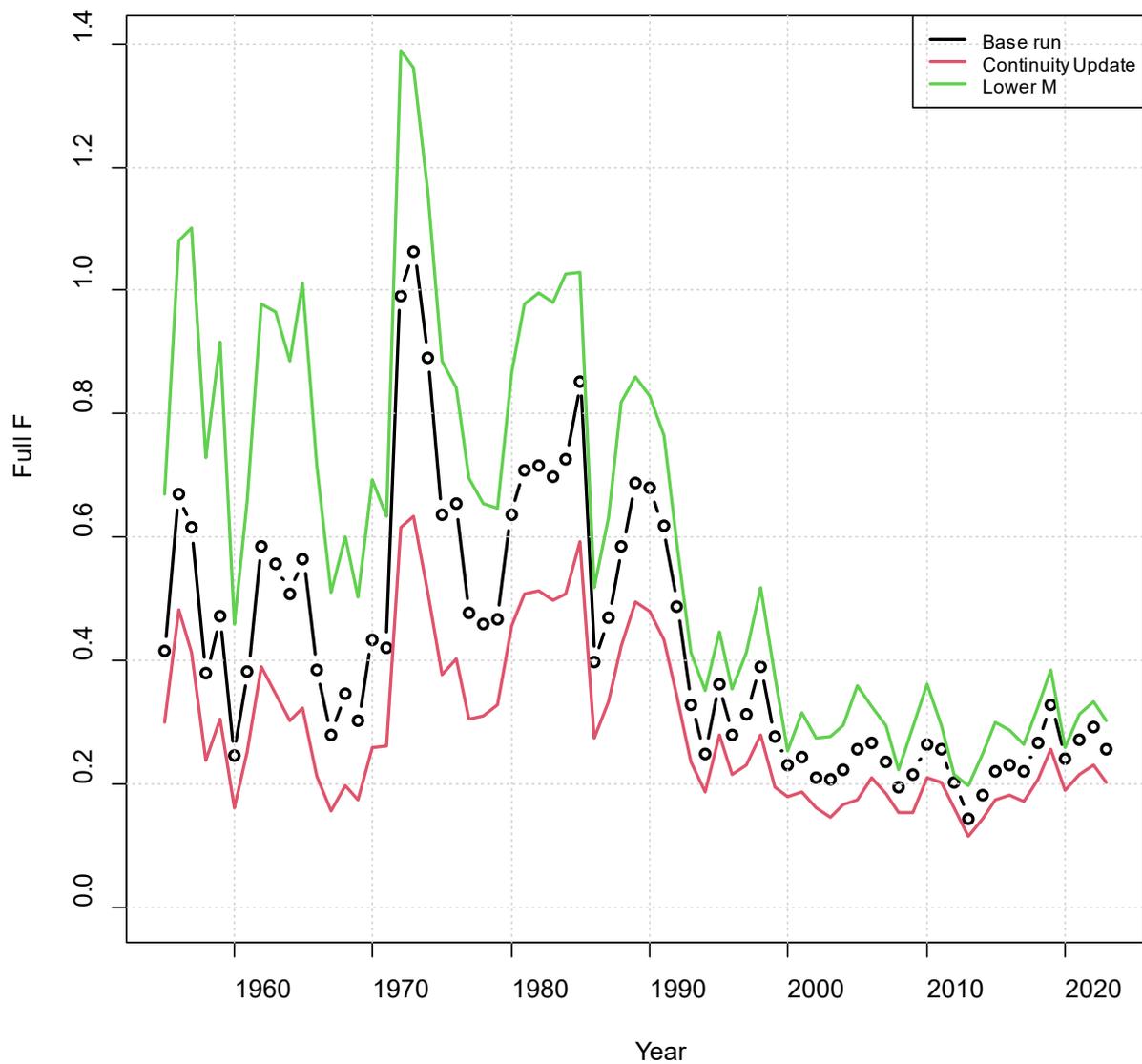


Figure A51. Estimates of the full fishing mortality rate for the base run for the base run for this update assessment with a new natural mortality value (M), the 2025 update assessment as a continuity run, and a sensitivity run with a lower M.

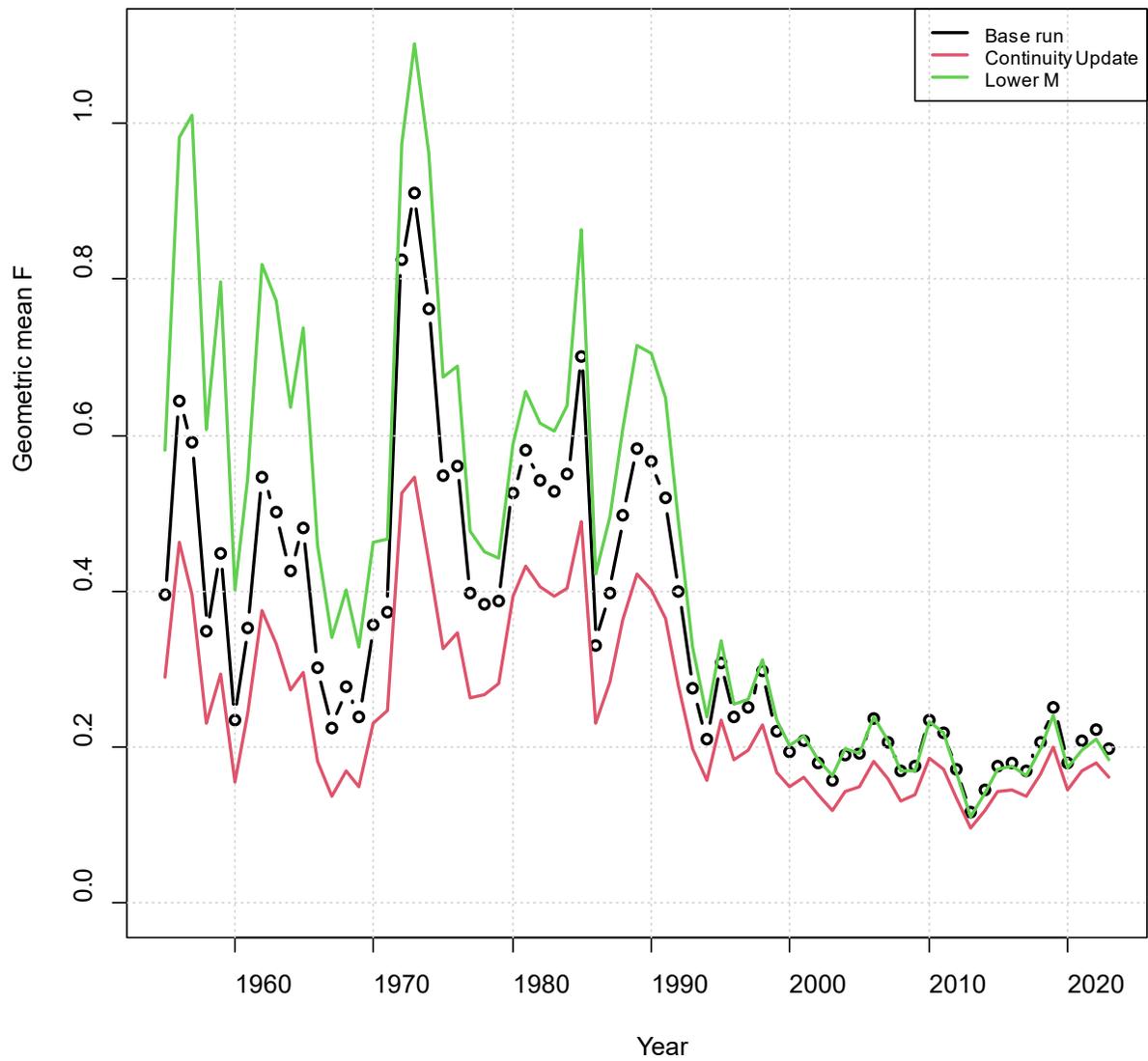


Figure A52. Estimates of the geometric mean fishing mortality rate for ages-2 to -4 for the base run for this update assessment with a new natural mortality value (M), the 2025 update assessment as a continuity run, and a sensitivity run with a lower M .

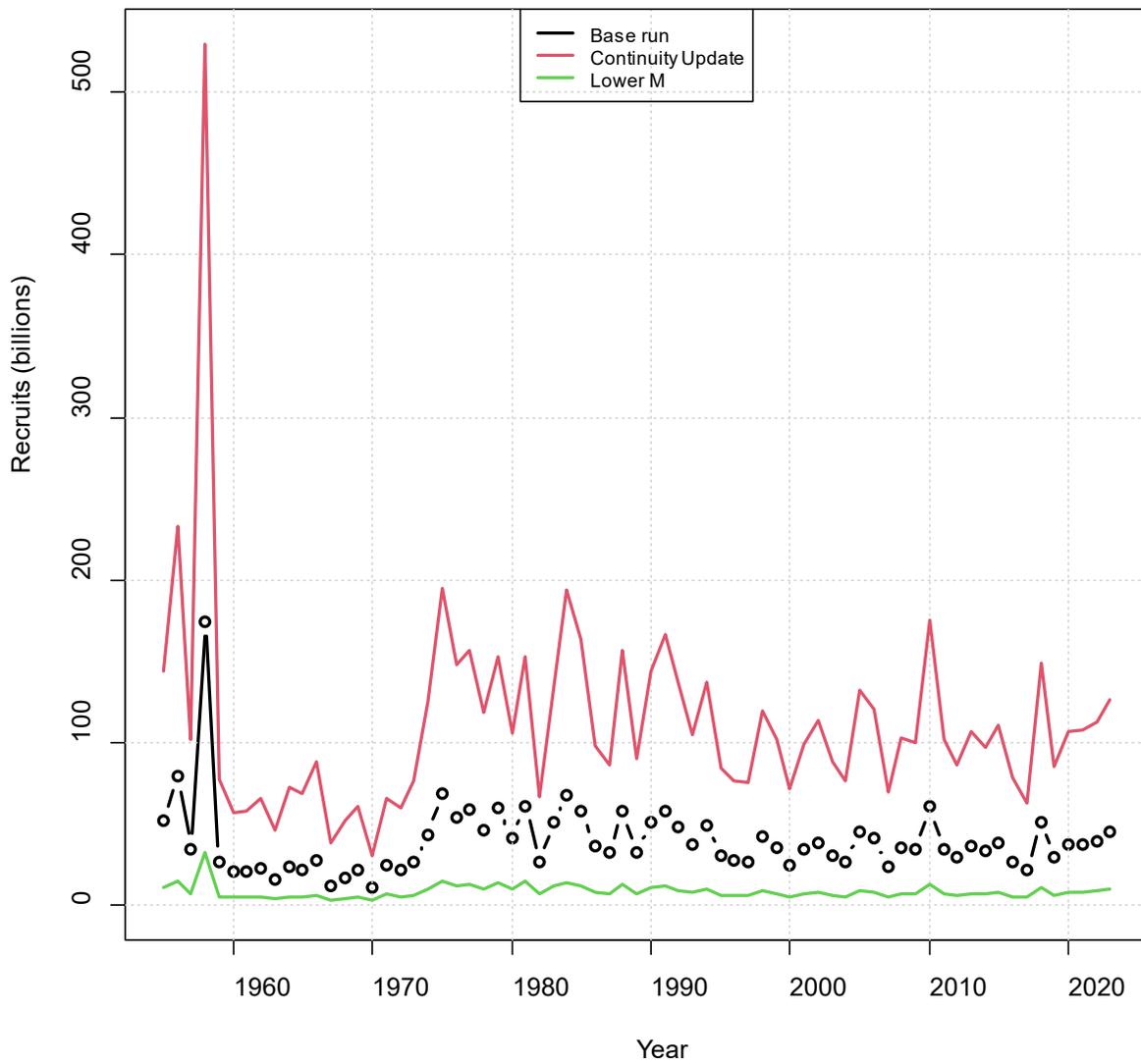


Figure A53. Estimates of the recruitment time series for the base run for this update assessment with a new natural mortality value (M), the 2025 update assessment as a continuity run, and a sensitivity run with a lower M .

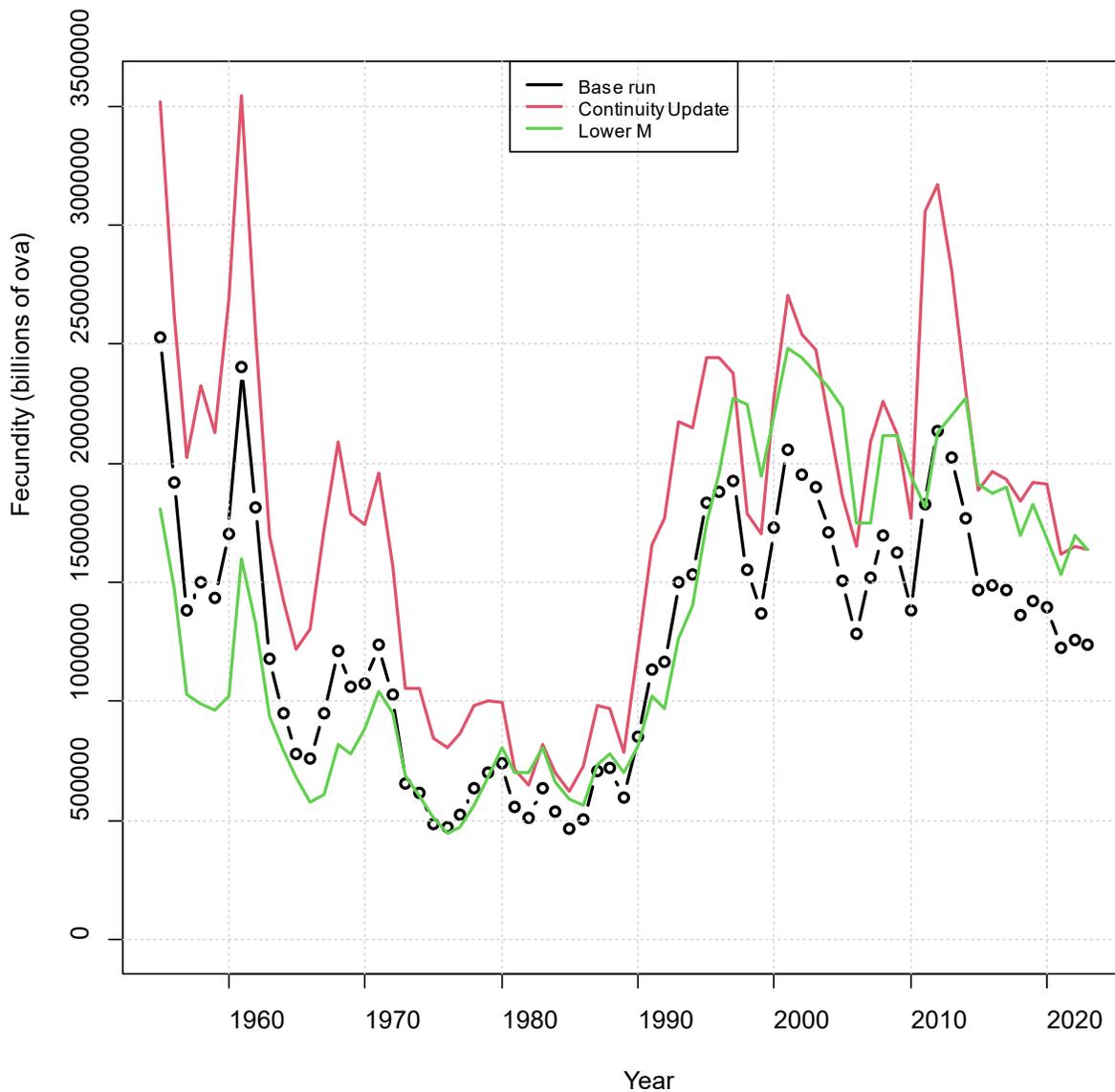


Figure A54. Estimates of the fecundity (billions of ova) for the base run for this update assessment with a new natural mortality value (M), the 2025 update assessment as a continuity run, and a sensitivity run with a lower M.

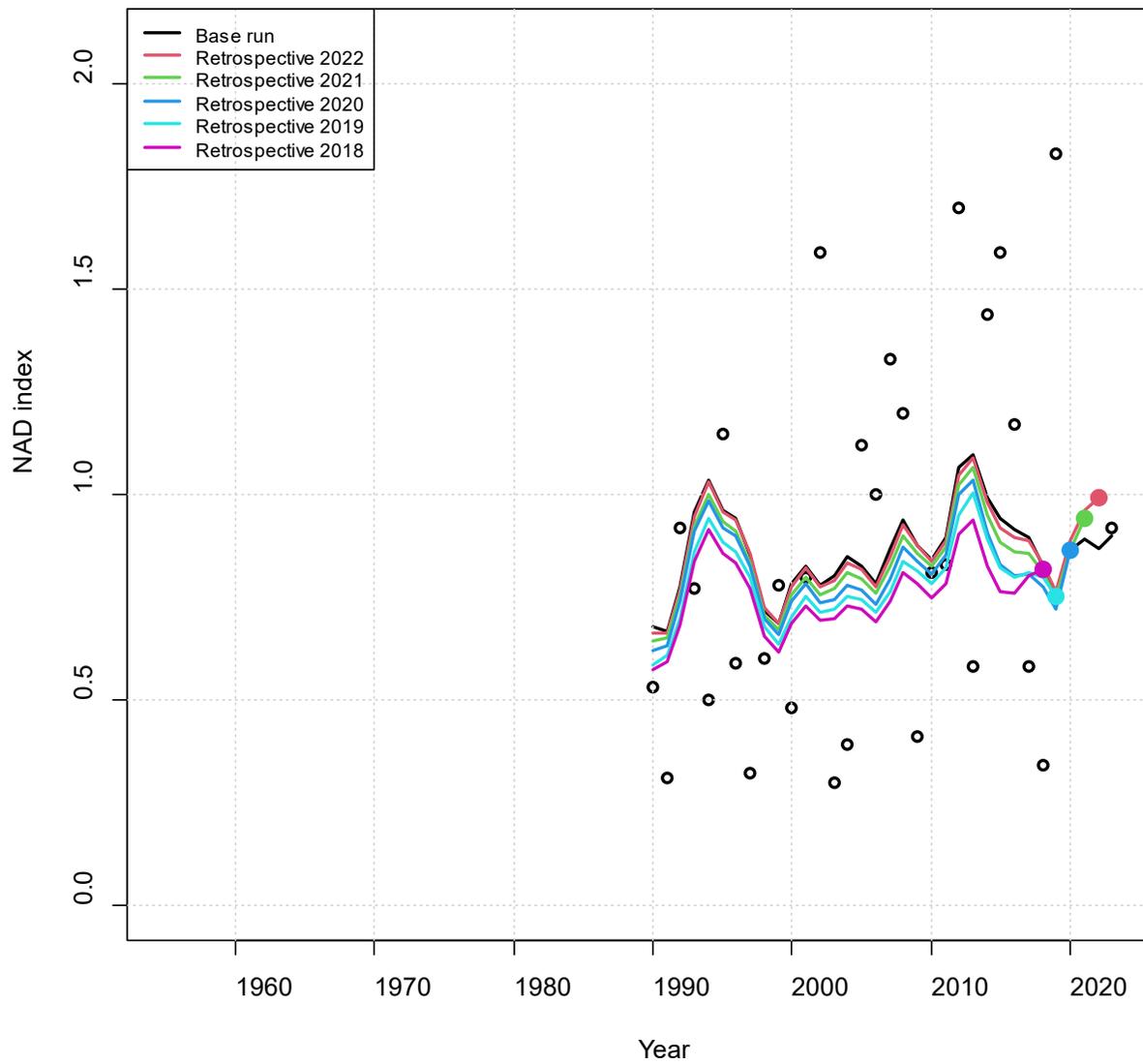


Figure A55. Fit to the observed (open circles) NAD index for the retrospective analysis with terminal years from 2023 to 2018.

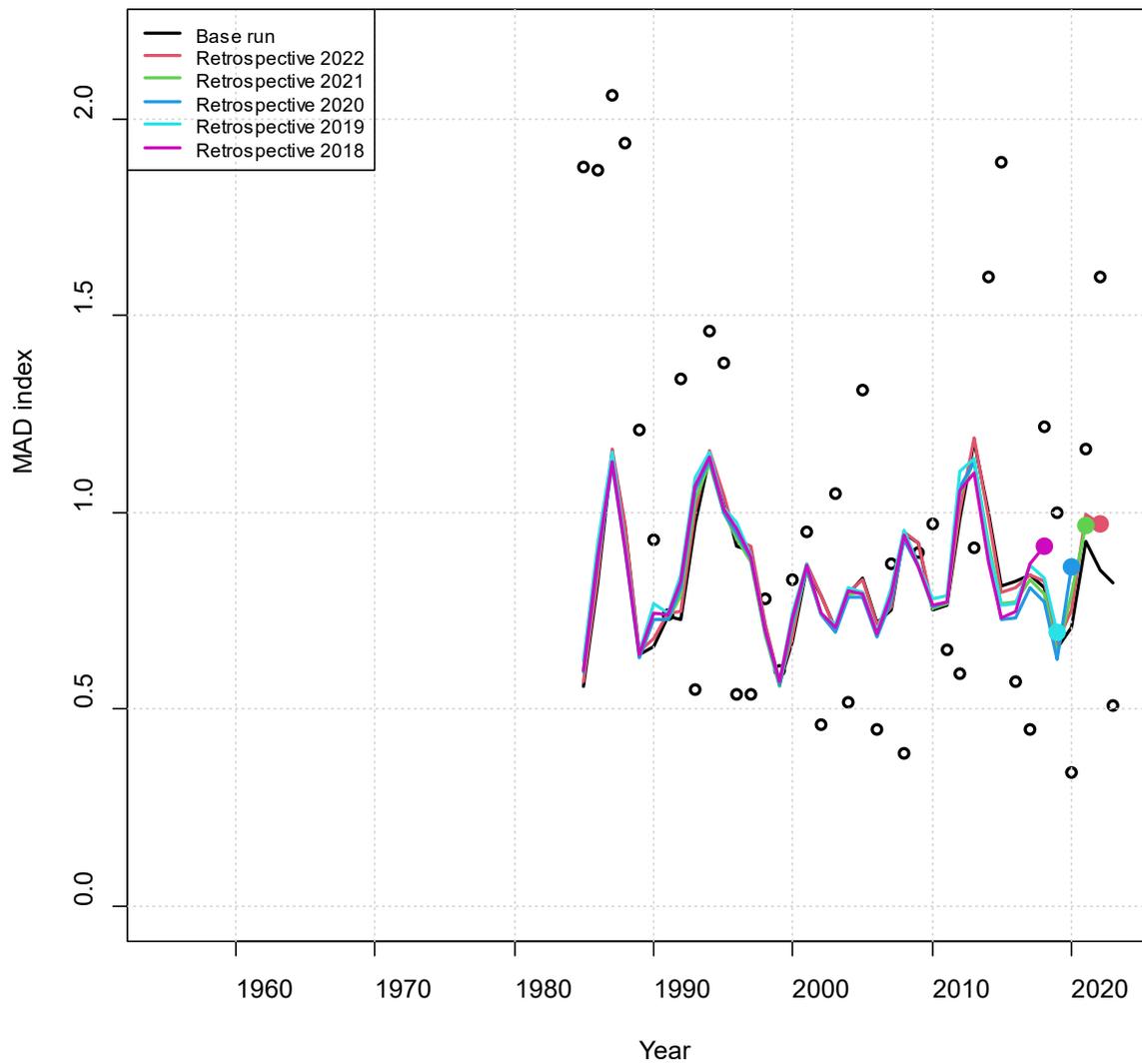


Figure A56. Fit to the observed (open circles) MAD index for the retrospective analysis with terminal years from 2023 to 2018.

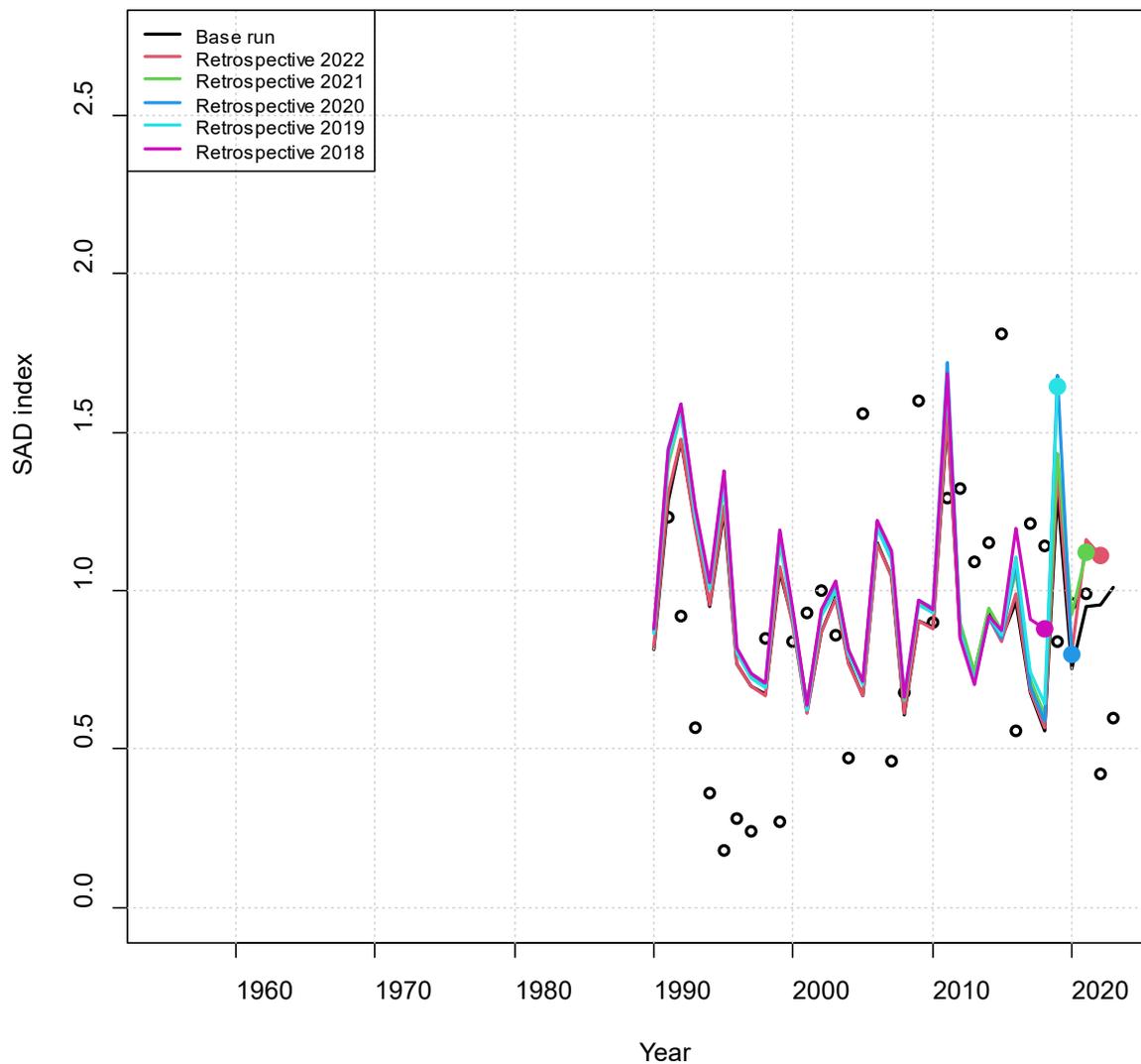


Figure A57. Fit to the observed (open circles) SAD index for the retrospective analysis with terminal years from 2021 to 2016.

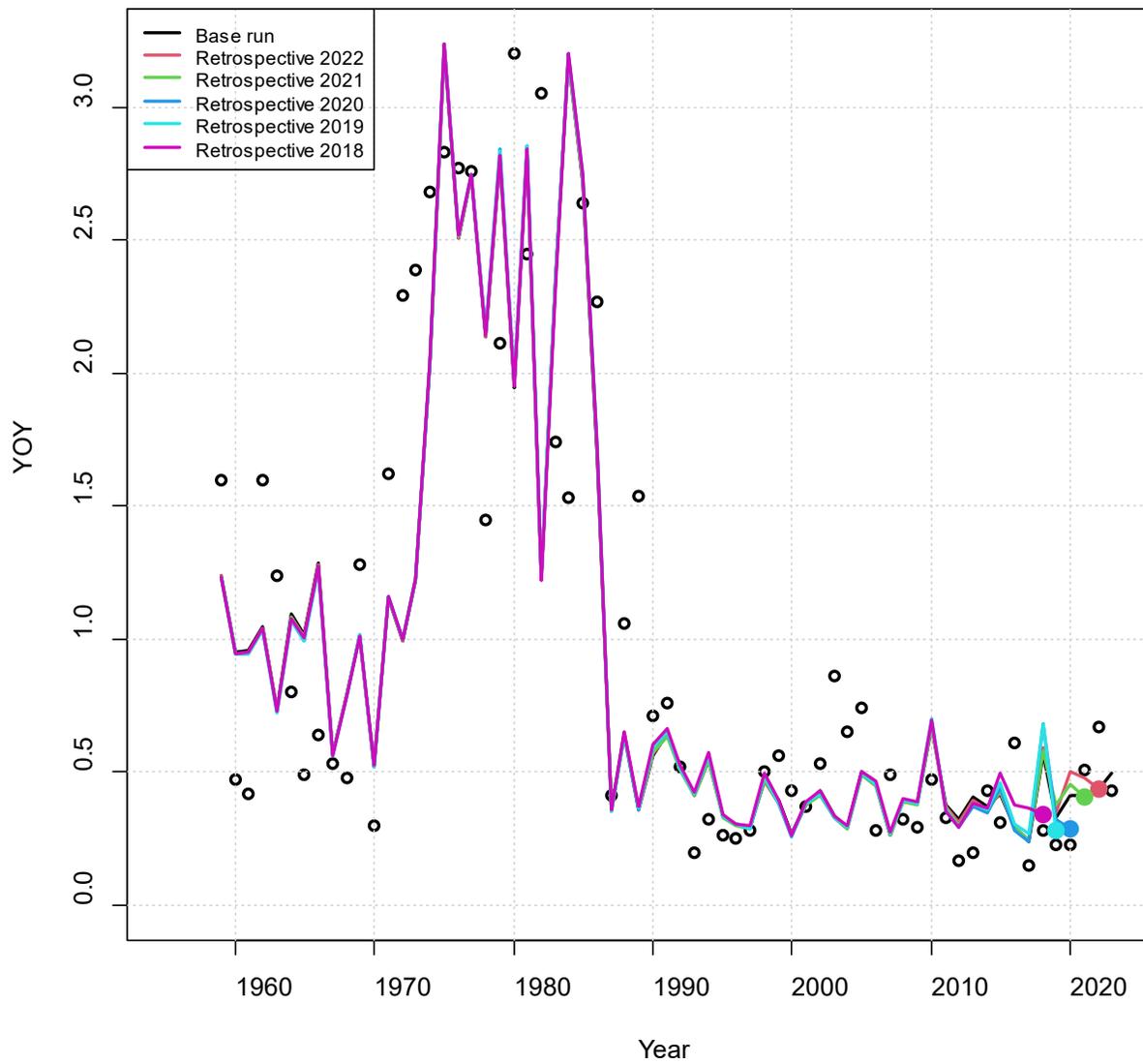


Figure A58. Fit to the observed (open circles) recruitment index for the retrospective analysis with terminal years from 2023 to 2018.

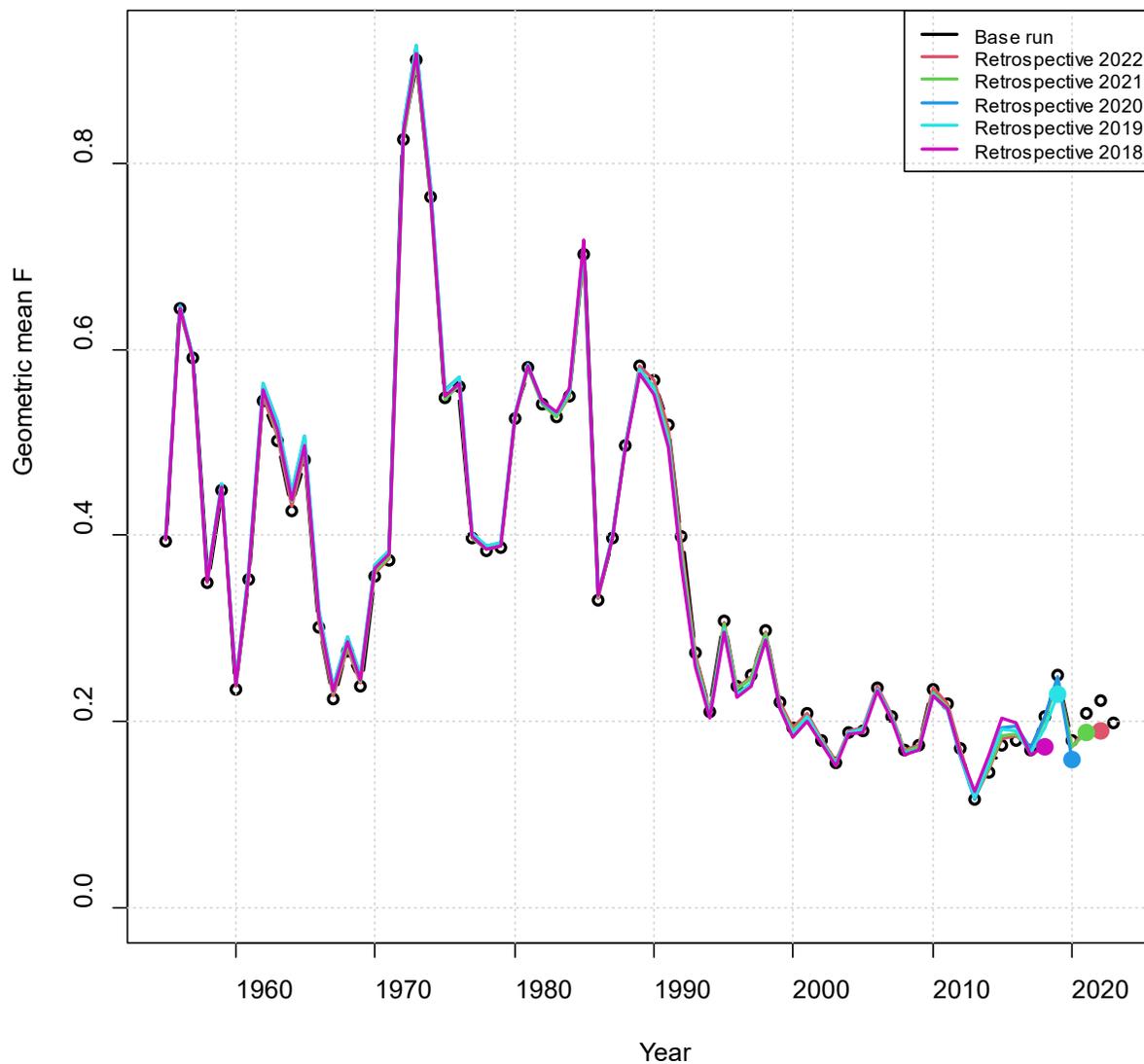


Figure A59. Estimates of the geometric mean fishing mortality rate for ages-2 to -4 for the retrospective analysis with terminal years from 2023 to 2018.

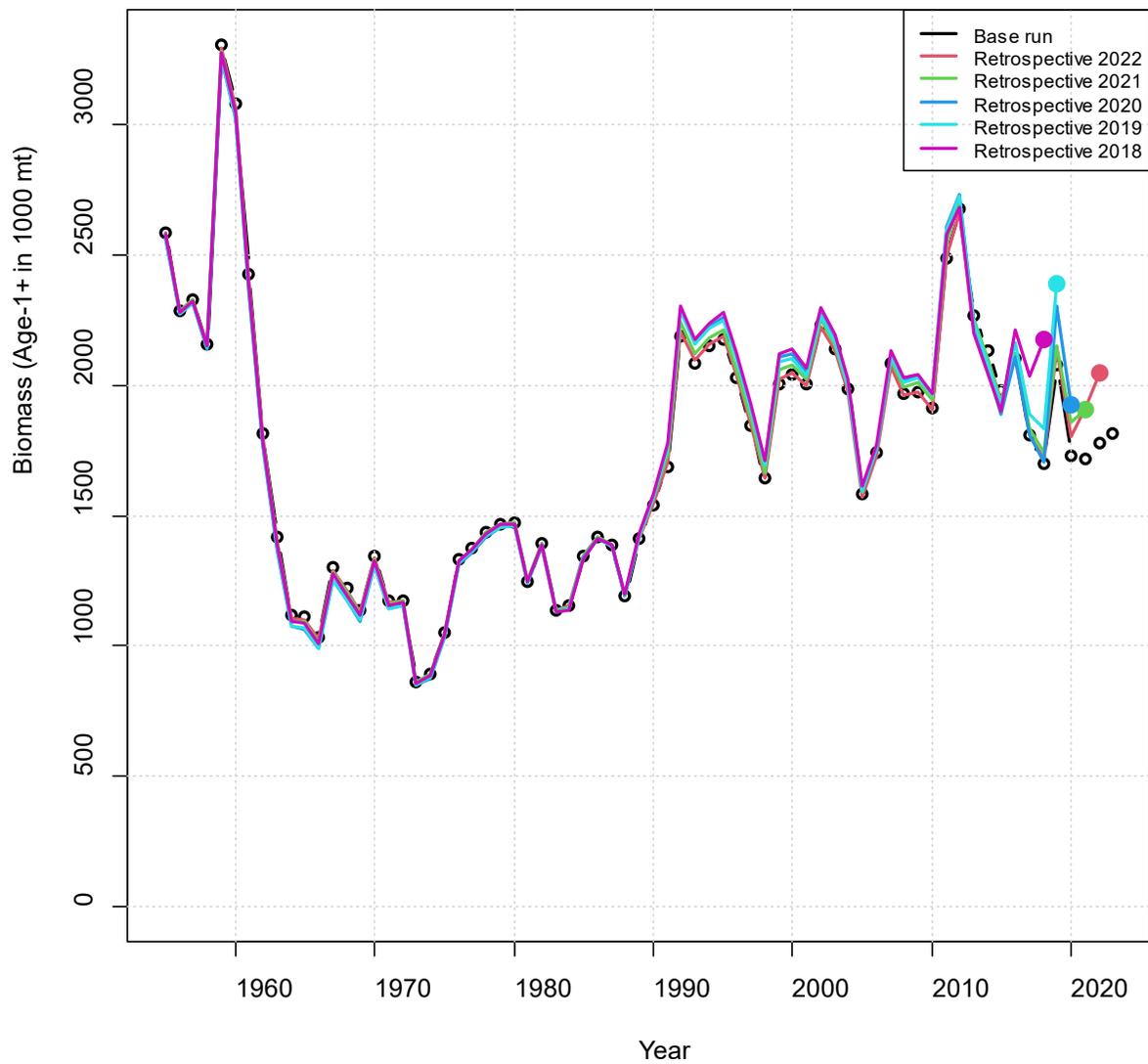


Figure A60. Estimates of the age-1+ biomass for the retrospective analysis with terminal years from 2023 to 2018.

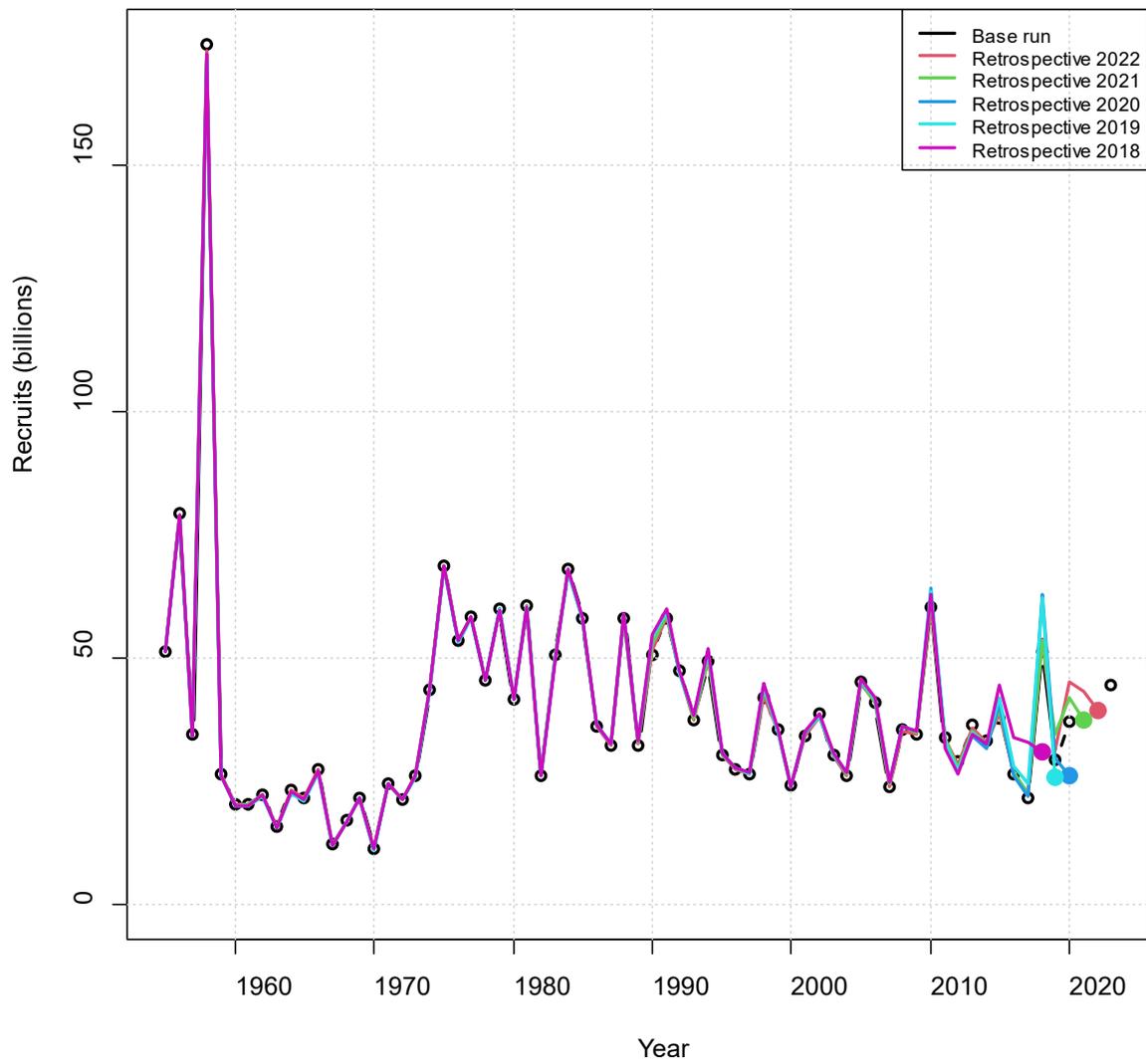


Figure A61. Estimates of the recruitment for the retrospective analysis with terminal years from 2023 to 2018.

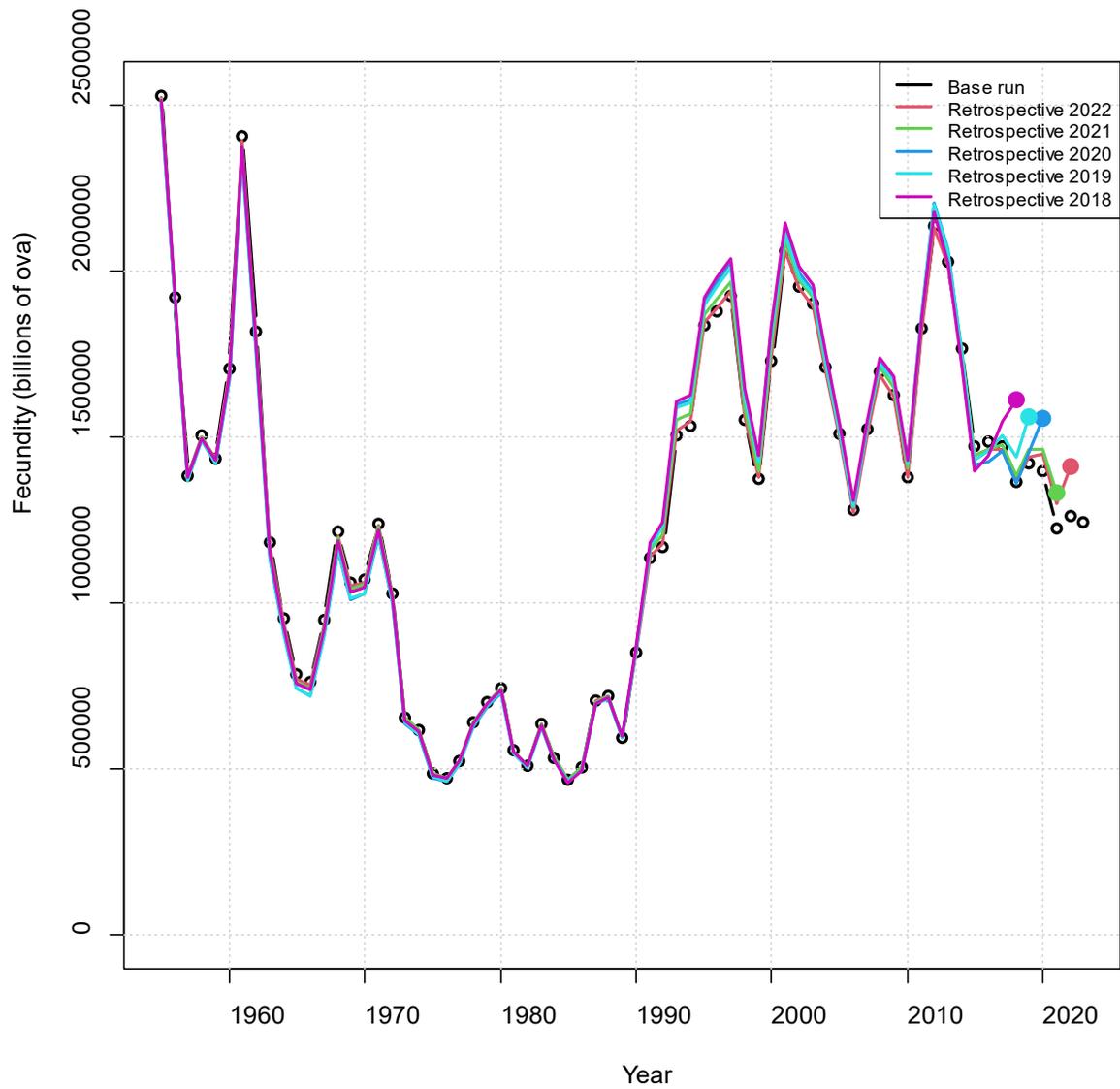


Figure A62. Estimates of the fecundity (billions of ova) for the retrospective analysis with terminal years from 2023 to 2018.

Single-Species Research Recommendations

The following is the complete list of research recommendations from the single-species benchmark assessment (SEDAR 2020a).

Research recommendations are broken down into two categories: future research and data collection, and assessment methodology. While all recommendations are high priority, the first recommendation is the highest priority. Each category is further broken down into recommendations that can be completed in the short term and recommendations that will require long term commitment. For the single-species assessment, the SAS recommends an update be considered in three years and a new benchmark be considered in six years.

Future Research and Data Collection

Short Term

1. Continue current level of sampling from bait fisheries, particularly in the Mid-Atlantic and New England. Analyze sampling adequacy of the reduction fishery and effectively sample areas outside of that fishery (e.g., work with industry and states to collect age structure data and biological data outside the range of the fishery).
2. Place observers on boats to collect at-sea samples from purse-seine sets, or collect samples at dockside during vessel pump-out operations (as opposed to current top of hold sampling) to address sampling adequacy.
3. Evaluate which proportion of bait landings by state are captured by gear versus which proportion are sampled for length and age composition to determine if current biosampling requirements are appropriate and adequate.
4. Continue to improve data validation processes for the bait fishery through ACCSP.
5. Conduct an ageing workshop to assess precision and error among readers with the intention of switching bait fishery age reading to state ageing labs.
6. Re-age historic old age samples (i.e., ages >7) to confirm the max age of Atlantic menhaden.
7. Investigate the relationship between fish size and school size to address selectivity (specifically addressing fisher behavior related to harvest of specific school sizes).
8. Investigate the relationship between fish size and distance from shore (addressing selectivity).

Long Term

1. Develop and implement a menhaden-specific, multi-year coastwide fishery-independent index of adult abundance-at-age with ground-truthing for biological information (e.g., size and age composition). A sound statistical design is essential. Ideally, it should be done coast-wide, but area-specific surveys that cover the majority of the population and are more cost-effective could provide substantial improvements over the indices currently used in the assessment.

2. Continue age-specific studies on spatial and temporal dynamics of spawning (where, how often, how much of the year, batch spawning, etc.)
3. Conduct an ageing validation study, making sure to sample older age classes.
4. Continue to investigate environmental covariates related to productivity and recruitment on a temporal and spatial scale.
5. Consider other ageing methods for the future, such as the use of Fourier transform near infrared spectroscopy (FT-NIRS).

Assessment Methods

Short Term

1. Investigate index standardization to improve CVs and explore methods of combining indices at a regional or coastwide level.
2. Explore the covariance between life history parameters to improve the understanding of uncertainty in the model.
3. Explore the error structure between MCMC and MCB.
4. Perform simulation testing on the Deyle et al. method used in the projections and determine if recruitment is accurately tracked by the method and improve short term projections.
5. Conduct a Management Strategy Evaluation (MSE).

Long Term

1. Continue to monitor model diagnostics given that the model is not robust to anomalous year-classes in the terminal year.
2. Develop a seasonal spatially-explicit model once sufficient age-specific data on movement rates of menhaden are available.

Ecological Reference Point Research Recommendations

The following is the complete list of research recommendations from the ecological reference point stock assessment (SEDAR 2020b).

The Ecological Reference Point Work Group (ERP WG) endorsed the research recommendations laid out in the single-species assessment to improve the understanding of Atlantic menhaden population dynamics, especially the recommendations to develop an Atlantic menhaden-specific coastwide fishery-independent index of adult abundance and to continue to investigate environmental covariates related to productivity and recruitment on a temporal and spatial scale.

In addition, the ERP WG identified a number of research needs to improve the multispecies modeling efforts and the development of ecological reference points for Atlantic menhaden, as well as process considerations to fully implement ecosystem-based fishery management.

Future Research and Data Collection

Short term

1. Expand collection of diet and nutrition data along the Atlantic coast to provide seasonally and regionally stratified annual, year-round monitoring of key predator diets to provide information on prey abundance and predator consumption. This could be done through existing data collection programs.

Long term

1. Improve monitoring of population trends and diet data in non-fish predators (e.g., birds, marine mammals) and data-poor prey species (e.g., bay anchovies, sand eels, benthic invertebrates, zooplankton, and phytoplankton) to better characterize the importance of Atlantic menhaden and other forage species to the ecosystem dynamics.

Modeling Needs

Short term

1. Conduct a management-strategy evaluation (MSE) to identify harvest strategies that will maximize the likelihood of achieving the identified ecosystem management objectives.
2. Continue development of the NWACS-MICE model to incorporate recruitment deviations (from external models or primary productivity time series) to better capture the productivity dynamics of Atlantic menhaden and other species.
3. Continue development of the VADER model to include bottom-up effects of Atlantic menhaden abundance on key predator species.
4. Continue development of the NWACS-FULL model to bring other species up to date and continue exploring the impacts of fishing on higher trophic level predators like birds and mammals.

Management Process Needs

Short term

1. Develop a coordinated timeline of assessments and assessment updates for Commission-managed species in order to provide the most up-to-date multispecies inputs for the NWACS-MICE model during ERP assessment updates.

Long term

1. Develop a plan to coordinate management of Atlantic menhaden and their predator species across management Boards. This will require changes to the way the Commission has historically operated. These species are currently managed by separate Boards within the Commission, and management objectives, including *F* and *B* targets for each species, are set independently of each other. For successful ecosystem-based fishery management, consistent management objectives for individual species and the ecosystem should be set holistically with the engagement of all managers and stakeholders.



Atlantic States Marine Fisheries Commission

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MEMORANDUM

TO: Atlantic Menhaden Management Board

FROM: Atlantic Menhaden Technical Committee and Ecological Reference Point Workgroup

DATE: October 9, 2025

SUBJECT: Stock Projections to Inform 2026-2028 Total Allowable Catch Levels

The Atlantic Menhaden Management Board (Board) will discuss the 2026-2028 total allowable catch (TAC) for Atlantic menhaden at its October 2025 meeting. 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. If the Board does not set a TAC for 2026 by December 31, 2025, next year's TAC will automatically be set at the level of the 2025 TAC (233,550 mt).

Since the implementation of coastwide quota management the TAC has varied but has overall increased from 170,800 metric tons for 2013–2014 to 233,550 mt for 2023-2025 (Table 1). Table 2 provides each jurisdiction's Addendum I allocations.

At the May meeting, the Board tasked the Atlantic Menhaden Technical Committee (TC) with developing projections using the ecological reference points (ERPs) and the single-species assessment model (Beaufort Assessment Model, or BAM). Specifically, the Board requested the following projections:

- The TACs that have a 40%-60% probability of exceeding the ERP target, in 5% increments, using 2026-2028 combined and as separate years.
- The percent risk of exceeding the ERP target and threshold if the current TAC was changed by -20% to +20% in 5% increments, including 0% (the current TAC).

This memo outlines the methods for the projections and the results of the analysis that the Board requested to support the specifications process.

TAC Setting Process

As in recent years, the TAC has been informed by the results of projection analysis, which explores a range of TAC alternatives to determine the percent risk of exceeding the ERP reference points adopted in 2020:

- **ERP target:** the maximum fishing mortality rate (F) on Atlantic menhaden that sustains Atlantic striped bass at their biomass target when striped bass are fished at their F

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target and the other ERP species in the model (bluefish, spiny dogfish, weakfish, and Atlantic herring) are fished at their current levels

- **ERP threshold:** the maximum F on Atlantic menhaden that keeps Atlantic striped bass at their biomass threshold when striped bass are fished at their F target and the other ERP species in the model (bluefish, spiny dogfish, weakfish, and Atlantic herring) are fished at their current levels

Monte Carlo Bootstrap (MCB) runs of the base model run from the BAM are used as the basis for the projection analysis (see main stock assessment update report for details on BAM base run and MCB runs).

Sources of Uncertainty

Single-Species Model

The projections have the same methods and assumptions as those run for the benchmark assessment. It is important to note that key uncertainties about natural mortality and fecundity are accounted for in the projections. Additionally, during the benchmark assessment (SEDAR 2020), the SAS used a new procedure for projecting recruitment. Instead of assuming a static median value for recruitment, as is done for many assessment projection methodologies and as was done in the past, recruitment was projected using nonlinear time series analysis methods (Deyle et al 2018). Nonlinear time series analysis methods project recruitment based on how recruitment has changed in the past under similar conditions. This is done for each MCB run to account for uncertainty. Thus, uncertainty is recognized in the recruitment time series and the methods used for projections adequately accounted for that uncertainty using the best scientific methods available. As usual, projections are highly uncertain and subject to model assumptions (i.e., no changes in fishing effort, seasonality of the fishery is not modeled, there is no structural model uncertainty in projections).

The assumption that the full 2023-2025 TAC would be utilized in 2024 and 2025 is also a source of uncertainty, as compliance report data indicated that only 80% of the TAC was landed in 2024. After the initial presentation of results to the TC and SAS, sensitivity runs were conducted using the 2024 bait and reduction landings from the compliance reports and assuming either (1) full utilization of the TAC in 2025, or (2) 80% utilization of the TAC in 2025.

The TC used the Commission's Retrospective Pattern Advice flowchart (ASMFC 2024) to determine whether a retrospective adjustment was warranted. The estimates of Mohn's rho for F ($\rho=-0.09$) and fecundity ($\rho=0.12$) were within the acceptable limits for a short-lived species. The rho values for both values were closer to zero than in the 2022 assessment update, indicating a smaller retrospective pattern in the 2025 update. The retrospectively adjusted value of fecundity was within the 90% confidence intervals of the unadjusted estimate, and all of the retrospective peels for fecundity were inside the confidence intervals of the base run. However, the adjusted value of F and 2 of the 3 most recent peels were outside the confidence intervals. Because F is not used in the projections, and because adjusting F would not change stock status, the TC elected not to apply a retrospective adjustment for the projections. The TC noted that the confidence intervals on F were extremely narrow in the 2025 update, which

likely affected the outcome of the flowchart for that metric. The TC also recommended that the Assessment Science Committee review the flowchart performance in this case and consider revising the guidance document to provide explicit guidance on situations where the recommendations for F and spawning stock biomass or fecundity are different.

Ecological Reference Point Model

The projections do not incorporate any uncertainty around the ERP target and threshold values, because there is not a comprehensive, quantitative way to estimate that uncertainty in the current model framework. Better quantification of uncertainty around the reference points themselves was a recommendation from the 2025 peer review panel (SEDAR 2025), but some of the uncertainty can be captured through sensitivity runs. Uncertainty in the ecological reference points includes both model uncertainty and ecosystem uncertainty. The ecosystem model was sensitive to the relationship between spiny dogfish and striped bass, and small changes in the parameters of that relationship affected striped bass's ability to rebuild to their biomass target under different combinations of striped bass and menhaden F rates. A sensitivity run where spiny dogfish diet composition data was adjusted to reflect the assumption that not all of the biomass estimated by the new spiny dogfish assessment was present within the ERP model domain resulted in a lower F target for Atlantic menhaden compared to the base run.

Uncertainty about future ecosystem conditions also contributes to uncertainty in the ERP target and threshold. For example, in the base run, it was assumed that the current low recruitment regime that Atlantic herring were experiencing at the end of the time-series would persist into the future. A sensitivity run was done where it was assumed that Atlantic herring recruitment would return to the long-term average, which resulted in a slightly higher ERP target, indicating Atlantic menhaden could experience a higher F rate and striped bass would remain at their biomass target when Atlantic herring were more abundant.

Results

The TACs with a 40%-60% probability of exceeding the F target are presented in Table 3. The probabilities of exceeding the F target and threshold for a range of TACs representing a 20% decrease to a 20% increase from the current TAC are presented in Table 4, and the probability of falling below the ERP fecundity target and threshold for those TACs is shown in Table 5.

Instead of providing figures for all the scenarios the Board requested, the TC provided figures of the fecundity, recruits, F , and landings for the current TAC (233,550 mt), a TAC of 106,100 mt (associated with a 40% probability of exceeding the F target in 2026), and a TAC of 280,260 mt (an increase of 20% from the status quo TAC). These three plots provide the bounds of the highest and lowest risk scenarios requested by the Board, in comparison to the status quo scenario (Figure 1 - Figure 3).

The assumption about levels of removals in 2024 and 2025 had a minimal effect on the results. The estimates of the combined year TACs that would have a 40%-60% probability of achieving the ERP F target for 2026-2028 were approximately 1,000-4,000 mt greater under the lower

2024-2025 removals assumptions (Table 6 - Table 7). The risk of exceeding the ERP F target and threshold under the status quo TAC showed at most a 1% difference in risk (Table 8).

The TACs with the 40%-60% probability of achieving the F target are significantly lower than the current TAC and the TACs with the same risk levels presented in 2022. This is driven largely by the change in natural mortality (M) in the single-species model: the lower M used in 2025 resulted in a lower biomass compared to the 2022 update (Figure 4)(ASMFC 2025). The time-series average of age-1+ biomass for the 2025 update with the lower M was 37% lower than the time-series average of the 2022 update. In addition, the 2022 update showed a large increase in biomass at the end of the time-series that was not present at the end of the 2025 update. As a result, the 2021 biomass that was projected forward to inform the 2023-2025 TAC options was approximately 60% higher than the 2023 biomass, which is informing the 2026-2028 TAC.

In addition, the ERP F target changed as a result of the benchmark assessment (SEDAR 2025): the ERP target from the 2020 benchmark was 0.19 and the ERP target from the 2025 benchmark is 0.15. Although the change in the ERP F target appears relatively small, it did have an impact on the scale of the projections. The probability of exceeding the ERP target for a specific TAC in Table 4 were higher for the new, lower ERP target, and the TACs required to have a 40%-60% probability of exceeding the ERP target were lower for the new ERP target. This change in the ERP target was due to both the lower estimate of menhaden biomass going into the ERP models as a result of the lower M in the single-species model, and also to other factors including an increase in spiny dogfish biomass estimates, refinements to other inputs like diet data, and changes to the model structure (SEDAR 2025).

In addition, it is important to note that the values for the ERP target and threshold were based on the definitions currently used in management. The Board can use the ecosystem model developed through the ERP benchmark assessment (SEDAR 2020, SEDAR 2025) to evaluate the trade-offs between predator biomass and menhaden fishing mortality under different ecosystem assumptions and consider choosing a different ERP target and threshold definition to best meet their management objectives for Atlantic menhaden. If the Board redefined the ERP target and threshold – for example, using different assumptions about the biomass levels of other species in the ecosystem in the future or about striped bass fishing mortality – the values of the reference points and the associated TACs would change.

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Southeast Data, Assessment, and Review (SEDAR). 2025. SEDAR 102 Stock Assessment Report – ASMFC Atlantic Menhaden and Ecological Reference Points. SEDAR, North Charleston, SC. 424 pp. Available online: <https://sedarweb.org/assessments/sedar-102-asmfc-atlantic-menhaden/>

Tables

Table 1. History of Atlantic menhaden TAC levels.

TAC Period	TAC (mt)
2013-2014	170,800
2015-2016	187,880
2017	200,000
2018-2020	216,000
2021-2022	194,400
2023-2025	233,550

Table 2. Allocation of the coastwide Atlantic menhaden TAC by state, as set by Addendum I to Amendment 3.

State	Allocation (%)
ME	4.80%
NH	1.19%
MA	2.12%
RI	0.81%
CT	0.33%
NY	0.84%
NJ	11.00%
PA	0.01%
DE	0.27%
MD	1.17%
PRFC	1.09%
VA	75.21%
NC	0.37%
SC	0.25%
GA	0.25%
FL	0.29%

Table 3. The TACs associated with a 40-60% probability of exceeding the ERP F target for 2026-2028 combined and as separate years. For the combined years, the TAC is chosen such that the probability of exceeding the F target for 2026-2028 is no greater than the specified percent in any one year.

Probability of exceeding the ERP F Target	TAC for 2026-2028	2026 TAC	2027 TAC	2028 TAC
40%	106,100	106,100	111,800	120,900
45%	107,400	107,400	113,500	123,000
50%	108,450	108,450	115,300	124,800
55%	109,700	109,700	117,000	127,200
60%	111,000	111,000	119,200	129,700

Table 4. Percent risk of exceeding the ERP F target and ERP F threshold for different TAC projections.

TAC (Status quo -/+)	Probability of Exceeding the ERP F Target			Probability of Exceeding the ERP F Threshold		
	2026	2027	2028	2026	2027	2028
186,840 (-20%)	100%	100%	100%	0%	0%	0%
198,518 (-15%)	100%	100%	100%	0%	0%	0%
210,195 (-10%)	100%	100%	100%	0%	1%	1%
221,872 (-5%)	100%	100%	100%	0%	1%	1%
233,550 (0%)	100%	100%	100%	1%	4%	4%
245,228 (+5%)	100%	100%	100%	1%	10%	8%
256,905 (+10%)	100%	100%	100%	4%	18%	14%
268,583 (+15%)	100%	100%	100%	11%	29%	23%
280,260 (+20%)	100%	100%	100%	22%	41%	32%

Table 5. Percent risk of falling below the ERP fecundity target and ERP fecundity threshold for different TAC projections.

TAC (Status quo -/+)	Probability of Falling Below the ERP Fecundity Target			Probability of Falling Below the ERP Fecundity Threshold		
	2026	2027	2028	2026	2027	2028
186,840 (-20%)	52%	52%	46%	2%	4%	4%
198,518 (-15%)	52%	54%	49%	2%	4%	5%
210,195 (-10%)	52%	56%	51%	2%	5%	5%
221,872 (-5%)	52%	58%	54%	2%	6%	7%
233,550 (0%)	52%	59%	57%	2%	6%	8%
245,228 (+5%)	52%	61%	59%	2%	7%	9%
256,905 (+10%)	52%	62%	61%	2%	8%	10%
268,583 (+15%)	52%	64%	64%	2%	8%	12%
280,260 (+20%)	52%	66%	66%	2%	9%	13%

Table 6. Sensitivity run results showing the TACs associated with a 40-60% probability of exceeding the ERP *F* target for 2026-2028 for the scenario using 2024 landings from compliance reports and assuming full utilization of the TAC in 2025.

Probability of exceeding the ERP <i>F</i> Target	TAC for 2026-2028	2026 TAC	2027 TAC	2028 TAC
40%	107,100	107,100	111,900	120,900
50%	109,500	109,500	115,500	124,800
60%	112,200	112,200	119,600	129,700

Table 7. Sensitivity run results showing the TACs associated with a 40%-60% probability of exceeding the ERP *F* target for 2026-2028 for the scenario using 2024 landings from compliance reports and assuming 80% utilization of the TAC in 2025.

Probability of exceeding the ERP <i>F</i> Target	TAC for 2026-2028	2026 TAC	2027 TAC	2028 TAC
40%	110,200	110,200	112,900	120,900
50%	112,600	112,600	116,600	124,900
60%	115,100	115,100	120,300	129,700

Table 8. Sensitivity run results showing the percent risk of exceeding the ERP *F* target and ERP *F* threshold for status quo TAC projections under different assumptions about 2024 and 2025 removals.

Assumption for 2024 and 2025 Removals	Probability of Exceeding the ERP Target			Probability of Exceeding the ERP Threshold		
	2026	2027	2028	2026	2027	2028
2024 & 2025 = full TAC utilization	100%	100%	100%	1%	4%	4%
2024 = compliance report data 2025 = full TAC utilization TAC	100%	100%	100%	1%	4%	4%
2024 = compliance report data 2025 = 80% TAC utilization	100%	100%	100%	0%	3%	3%

Figures

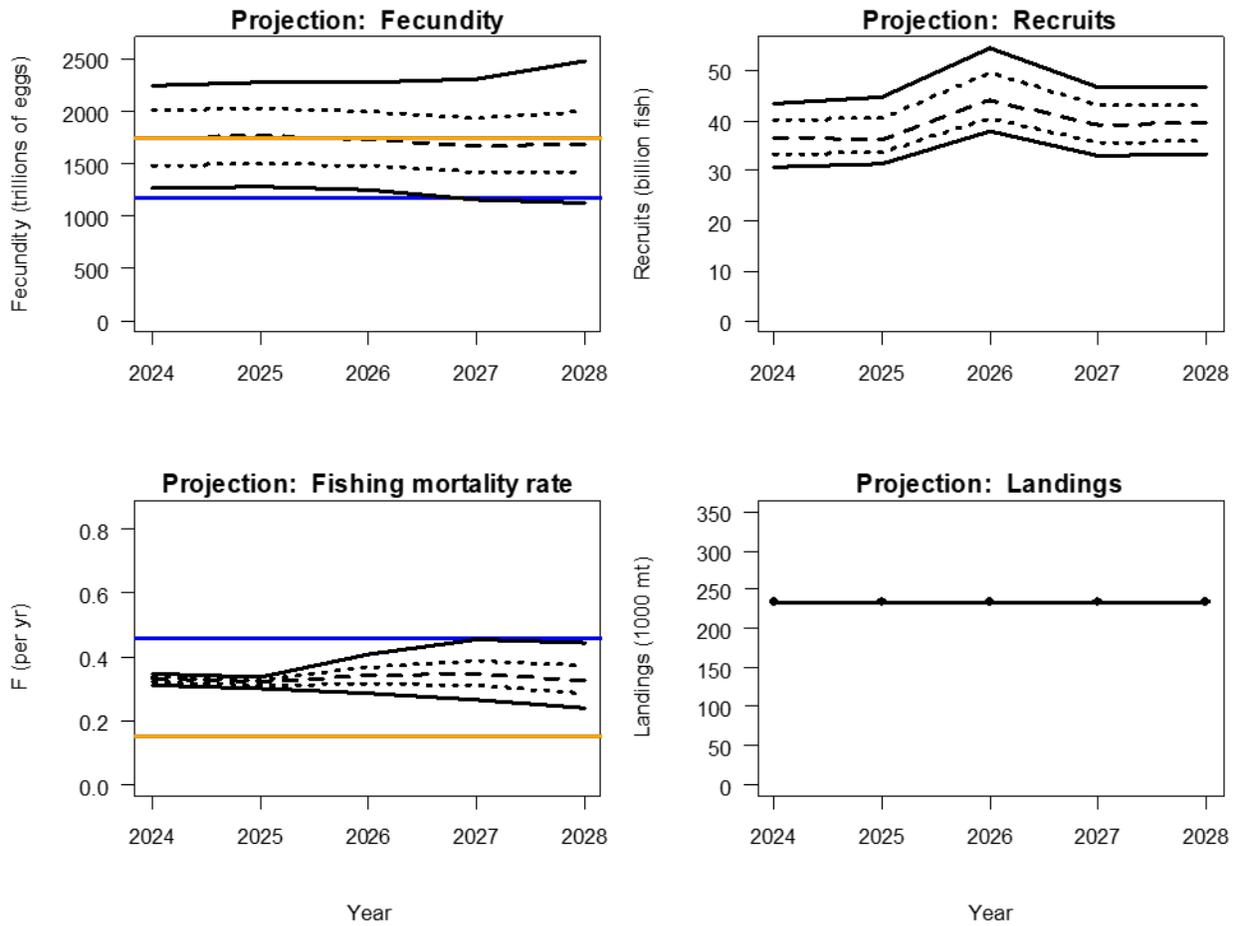


Figure 1. Fecundity, full fishing mortality rate, and recruits projected from 2024 to 2028 for a coastwide total allowable catch of 233,550 mt. The orange lines represent ERP target fishing mortality rate and fecundity, while the blue lines represent the ERP threshold fishing mortality rate and fecundity. The dashed black line is the 50th percentile (median), the dotted black lines are the 25th and 75th percentiles, and the solid black lines are the 5th and 95th percentiles.

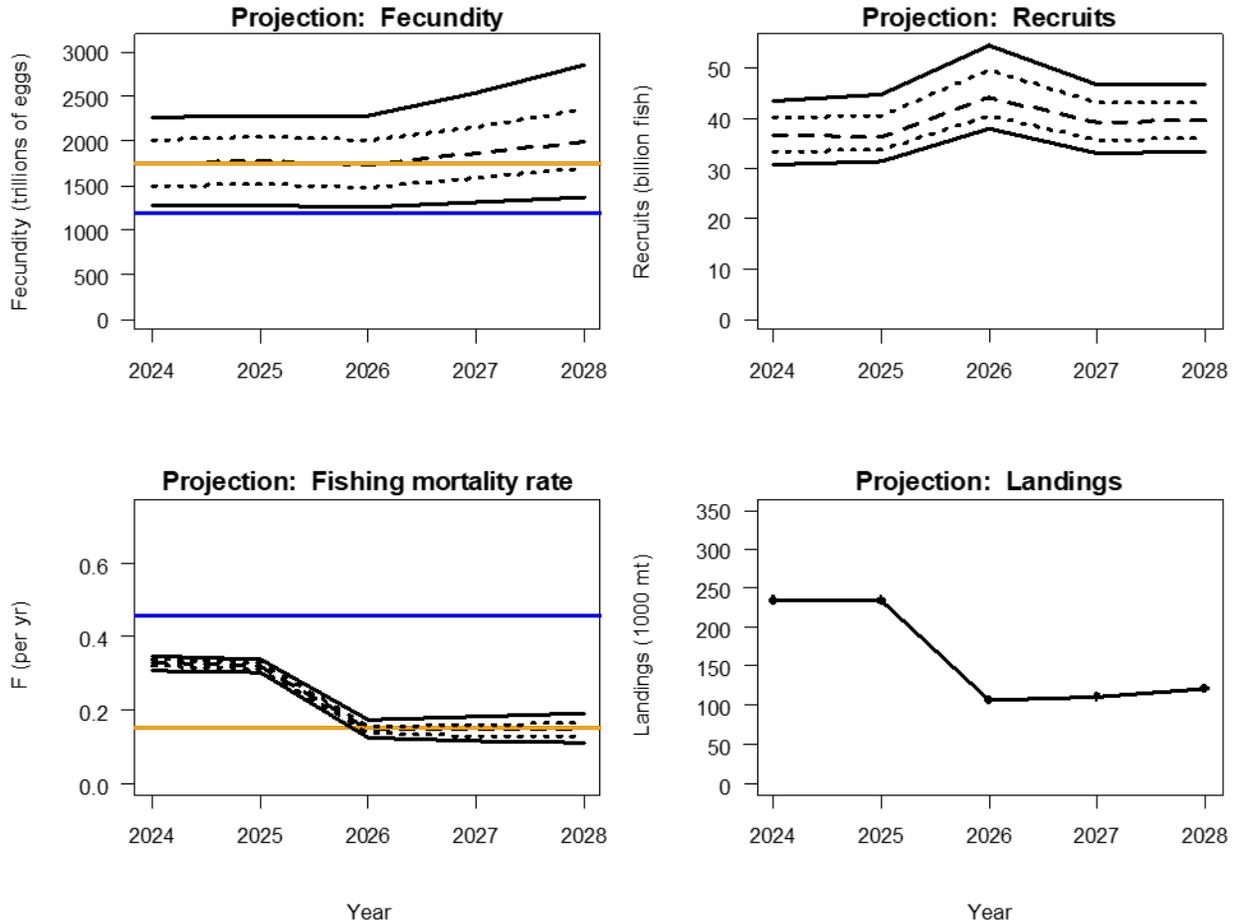


Figure 2. Fecundity, full fishing mortality rate, and recruits projected from 2024 to 2028 for a coastwide total allowable catch with a 40% probability of exceeding the ERP F target (106,100 mt). The orange lines represent ERP target fishing mortality rate and fecundity, while the blue lines represent the ERP threshold fishing mortality rate and fecundity. The dashed black line is the 50th percentile (median), the dotted black lines are the 25th and 75th percentiles, and the solid black lines are the 5th and 95th percentiles.

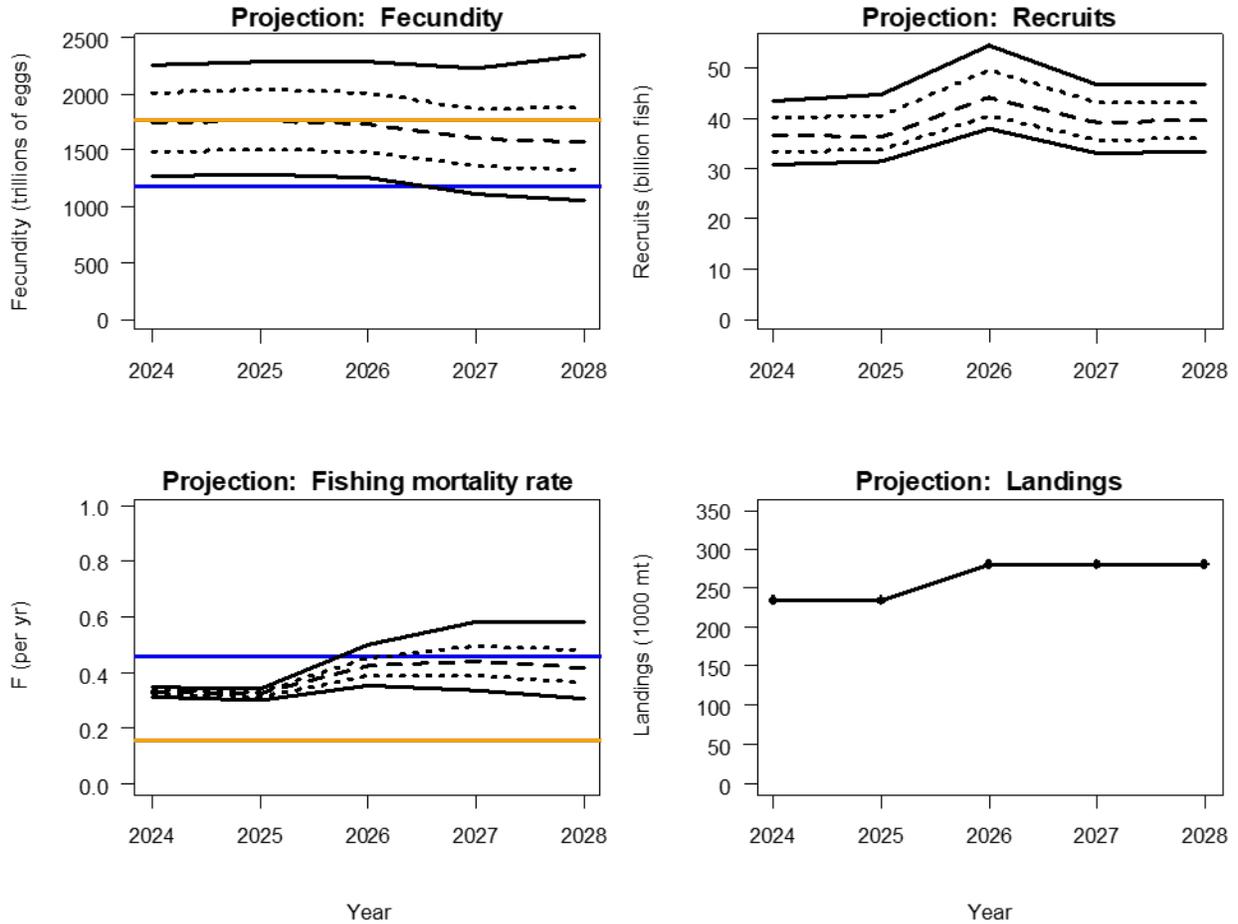


Figure 3. Fecundity, full fishing mortality rate, and recruits projected from 2024 to 2028 for a 20% increase to the coastwide total allowable catch (280,260 mt). The orange lines represent ERP target fishing mortality rate and fecundity, while the blue lines represent the ERP threshold fishing mortality rate and fecundity. The dashed black line is the 50th percentile (median), the dotted black lines are the 25th and 75th percentiles, and the solid black lines are the 5th and 95th percentiles.

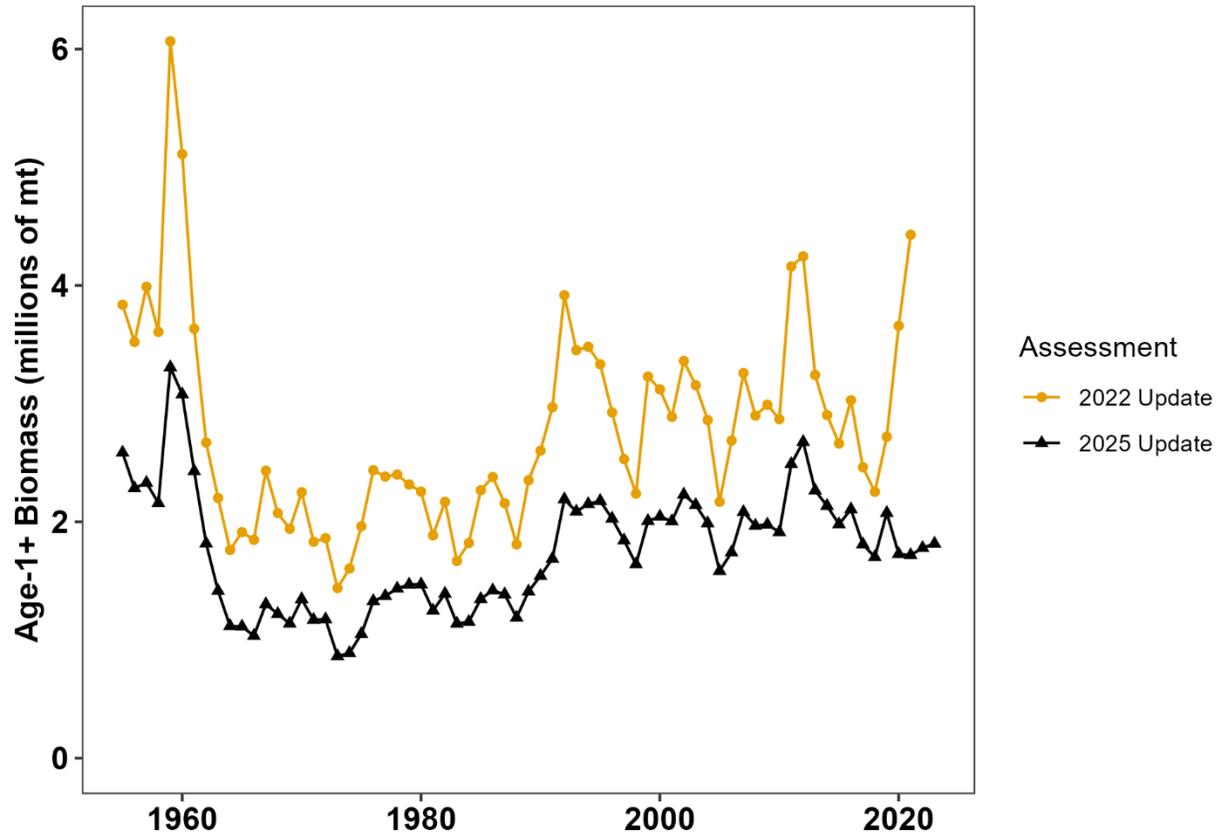
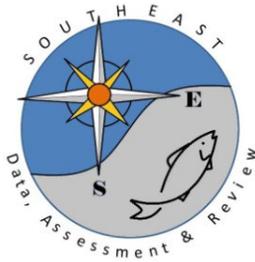


Figure 4. Age-1+ biomass estimates from the 2022 update and the 2025 update of the Atlantic menhaden single-species assessment model.



SEDAR

SouthEast Data, Assessment, and Review

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Phone: (843) 571-4366 Fax: (843) 769-4520 SEDARweb.org

TO: Robert Beal, Executive Director, ASMFC
Pat Campfield, Director, Fisheries Science Program, ASMFC

FROM: Emily Ott, SEDAR Coordinator

DATE: October 9, 2025

RE: Availability of SEDAR 102 Atlantic Menhaden and Ecological Reference Points Final Stock Assessment Report

The final SEDAR Stock Assessment Report (SAR) report documenting the findings of the assessment process for SEDAR 102 Atlantic Menhaden and Ecological Reference Points is complete.

You may download the SAR via this link:

<https://sedarweb.org/assessments/sedar-102-asmfc-atlantic-menhaden/>

Documentation of all SEDAR 102 materials, including submitted working papers and reference documents are available on the SEDAR website along with the complete stock assessment report.

If additional information or clarification is needed, please contact me.

Cc: SEDAR Steering Committee
Amy Schueller

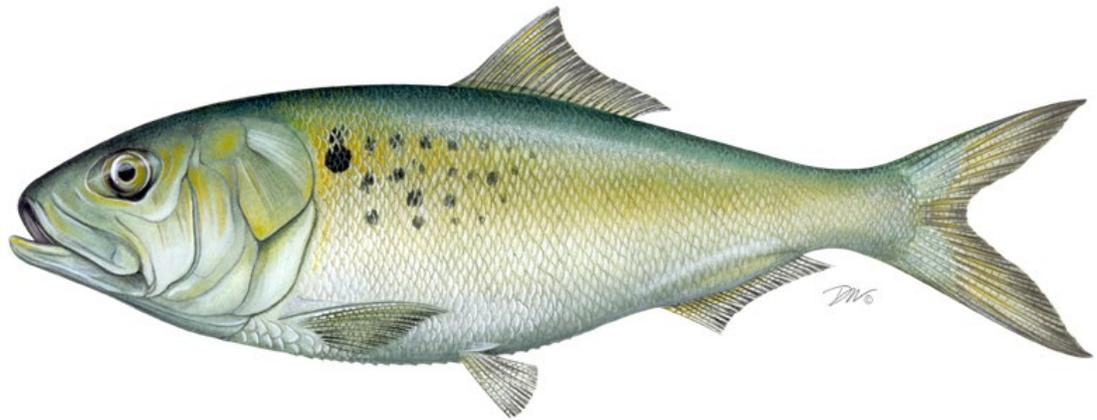


ATLANTIC STATES MARINE FISHERIES COMMISSION

REVIEW OF THE INTERSTATE FISHERY MANAGEMENT PLAN

FOR ATLANTIC MENHADEN
(*Brevoortia tyrannus*)

2024 FISHING YEAR



Prepared by the Plan Review Team



Sustainable and Cooperative Management of Atlantic Coastal Fisheries

**REVIEW OF THE ASMFC FISHERY MANAGEMENT PLAN AND STATE COMPLIANCE FOR
ATLANTIC MENHADEN (*Brevoortia tyrannus*) FOR THE 2023 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 Workgroup
<u>Stock Status:</u>	Not overfished, and overfishing is not occurring relative to the current ecological reference points (2022 Single-Species 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 interest in the Atlantic menhaden management program.

The first coastwide fishery management plan (FMP) for Atlantic menhaden was passed in 1981. The 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.

[Amendment 1](#), implemented in 2001, provided specific biological, ecological and socioeconomic management objectives. Addenda I and V revised the biological reference points for menhaden and specified that stock assessments are to occur every three years. Although Amendment 1 did not implement any recreational or commercial management measures, Addenda II through IV instituted a harvest cap on the reduction fishery in Chesapeake Bay. Specifically, Addendum II implemented a harvest cap for 2006-2010 fishing seasons; before its first year of implementation, Addendum III revised the cap amount to be the average landings from 2001 to 2005 (or 109,020 mt); and Addendum IV extended the provisions of Addendum III through 2013.

[Amendment 2](#), implemented in 2012, established a 170,800 metric ton (mt) total allowable catch (TAC) for the commercial fishery beginning in 2013. This TAC represented a 20% reduction from average landings between 2009 and 2011. This Amendment also used the 2009-2011 period to allocate the TAC among 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 day for non-directed fisheries that operate after a jurisdiction's quota has been landed. 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; the intent of this provision is to accommodate cooperative fishing practices that traditionally take place in Chesapeake Bay. The Amendment also reduced the Chesapeake Bay reduction fishery harvest cap by 20% to 87,216 mt.

Amendment 2 also enabled the Board to set aside 1% of the coastwide TAC for episodic events. Episodic events are times and areas where Atlantic menhaden are available in more abundance than they normally occur. Technical Addendum I to Amendment 2 established a mechanism for New England states from Maine to Connecticut¹ to use the set aside, which includes a qualifying definition of episodic events, required effort controls to scale a state's fishery to the set aside amount, and a timely reporting system to monitor the set aside. Any unused set aside

¹ At its May 2016 meeting, the Board added New York as an eligible state to harvest under the set aside.

quota as of October 31 is redistributed to jurisdictions on November 1 based on the Amendment 2 allocation percentages.

In 2015, the TAC was increased by 10% to 187,880 mt for the 2015 and 2016 fishing years. In 2016, the Board again increased the TAC by 6.45% to 200,000 mt for the 2017 fishing year.

Atlantic menhaden are managed under [Amendment 3](#). Approved in November 2017, the Amendment maintained the management program’s single-species biological reference points until the review and adoption of menhaden-specific ecological reference points (ERPs) as part of the 2019 benchmark stock assessment process. In doing so, the Board placed development of menhaden-specific ERPs as its highest priority and supported the efforts of the ERP Workgroup to reach that goal. Amendment 3 also changed commercial quota allocations in order to strike an improved balance between gear types and jurisdictions. The Amendment allocated a baseline quota of 0.5% to each jurisdiction, and allocated the rest of the TAC based on average landings between 2009 and 2011. This measure provides fishing opportunities to states that 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 2009-2011 landings period. The Amendment also prohibits the rollover of unused quota; maintains the quota transfer process; maintains the bycatch provision (which was rebranded as the ‘incidental catch/small-scale fisheries’ (IC/SSF) provision and applicable gear types were defined) and the episodic event set aside program (EESA) for the states of Maine – New York. Finally, the Amendment reduced 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.

[Addendum I](#), implemented in 2023, modifies Amendment 3 by creating a three-tiered system for minimum allocations to the states, with Pennsylvania receiving 0.01%; South Carolina, Georgia, Connecticut, Delaware, North Carolina, and Florida receiving 0.25%; and the remaining states continuing to receive a minimum of 0.5%. Furthermore, the Addendum allocates the remainder of the TAC, excluding the 1% reserved for the EESA, on a state-by-state basis based on landings history of the fishery from 2018, 2019, and 2021. Regarding the IC/SSF provision, the Addendum codifies the ability for states to elect to divide their quotas into sectors, enabling individual sectors to enter into the provision at different times. Additionally, the Addendum removes purse seines as a permitted small-scale directed gear, thereby, prohibiting them from harvesting under the IC/SSF provision. Finally, the Addendum

State	Addendum 1 Allocations (%)
ME	4.80%
NH	1.19%
MA	2.12%
RI	0.81%
CT	0.33%
NY	0.84%
NJ	11.00%
PA	0.01%
DE	0.27%
MD	1.17%
PRFC	1.09%
VA	75.21%
NC	0.37%
SC	0.25%
GA	0.25%
FL	0.29%

counts IC/SSF landings against the TAC and if IC/SSF landings cause the TAC to be exceeded, then the Board must take action to modify one or both of permitted gear types and trip limits under the provision.

In August 2020, the Board formally approved the use of ERPs to manage Atlantic menhaden, with Atlantic striped bass as the focal species in maintaining their population. Atlantic striped bass was chosen for the ERP definitions because it was the most sensitive predator fish species to Atlantic menhaden harvest, so an ERP target and threshold sustaining striped bass would likely provide sufficient forage for other predators under current ecosystem conditions. For the development of the ERPs, all other focal species in the model (bluefish, weakfish, spiny dogfish, and Atlantic herring) were assumed to be fished at 2017 levels.

In November 2022, the Board approved a TAC for 2023-2025 of 233,550 mt, based on the ERPs. The new TAC represents a 20% increase from the 2021-2022 TAC level. Based on projections, the probability of exceeding the ERP fishing mortality target of 0.19 is 2% in 2023, 22% in 2024, and 28.5% in 2025.

II. Status of the Stock

In February 2020, the Board accepted the results of the [Single-Species](#) and [Ecological Reference Point \(ERP\)](#) Benchmark Stock Assessments and Peer Review Reports for management use. These assessments were peer-reviewed and approved by an independent panel of scientific experts through the 69th SouthEast, Data, Assessment and Review (SEDAR) workshop. The single-species assessment acts as a traditional stock assessment using the Beaufort Assessment Model (BAM), a statistical catch-at-age model that estimates population size-at-age and recruitment. According to the model, the stock is not overfished or experiencing overfishing relative to the current single-species reference points.

The ERP assessment evaluates the health of the stock in an ecosystem context, and indicates the fishing mortality rate (F) reference points for menhaden should be lower to account for the species' role as a forage fish². The ERP assessment uses the Northwest Atlantic Coastal Shelf Model of Intermediate Complexity for Ecosystems (NWACS-MICE) to develop Atlantic menhaden ERPs. NWACS-MICE is an ecosystem model that focuses on four key predator species (striped bass, bluefish, weakfish, and spiny dogfish) and three key prey species (Atlantic menhaden, Atlantic herring, and bay anchovy). These species were chosen because diet data indicate they are top predators of Atlantic menhaden or are key alternate prey species for those predators.

The ERP assessment indicates the F reference points for menhaden should be lower than the single-species reference points, but it also concluded that the final ERP definitions, including the appropriate harvest level for menhaden, depend on the management objectives for the

² it should be noted, however, that the conservative TAC the Board has set for recent years is consistent with the ERP F target provided in the ERP Assessment

ecosystem (i.e., management objectives for both Atlantic menhaden and its predators). Accordingly, instead of proposing a specific ERP definition, the assessment recommends a combination of the BAM and the NWACS-MICE models as a tool for managers to evaluate trade-offs between menhaden harvest and predator biomass.

Atlantic menhaden are now managed by menhaden-specific ERPs as indicated above. The ERP target is the maximum F on Atlantic menhaden that sustains Atlantic striped bass at their biomass target when striped bass are fished at their F target, a measure of the intensity with which the population is being fished, is used to evaluate whether the stock is experiencing overfishing. The ERP threshold is the maximum F on Atlantic menhaden that keeps Atlantic striped bass at their biomass threshold when striped bass are fished at their F target. Population fecundity, a measure of reproductive capacity, is used to evaluate whether the stock is overfished. According to the 2022 single-species stock assessment update, the 2021 estimate of fecundity was above both the ERP FEC target and threshold, and the 2021 estimate of fishing mortality was below the ERP F target and threshold, indicating the stock was neither overfished nor experiencing overfishing. The next ERP benchmark stock assessment and single-species assessment update are underway and scheduled to be presented to the Board in 2025.

III. Status of the Fishery

Commercial

Total commercial Atlantic menhaden landings in 2024, including directed, incidental catch, and EESA landings, are estimated at 186,155 mt (410.4 million pounds), an approximate 12% increase relative to 2023 and 80% of the coastwide commercial TAC of 233,550 mt (514.9 million pounds). There were no reported landings from the incidental catch fishery in 2024 (Table 1).

Reduction Fishery

The 2024 harvest for reduction purposes is estimated at 134,382 mt (296 million pounds), a 15% increase from 2023 and 1.2% above the previous 5-year average of 132,723 mt (293 million pounds) (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 2024 from state compliance reports, including directed, incidental catch, and EESA landings, is 51,773 mt (114.1 million pounds). This represents a 4% increase from 2023 and a 9% decrease compared to the previous 5-year average (Table 2; Figure 3). New Jersey (42%), Maine (24%), Virginia (17%), and Massachusetts (11%) landed the four largest shares in 2024.

Incidental Catch and Small-Scale Fisheries Landings

There were no reported landings from the incidental catch fishery in 2024 (Table 4).

Episodic Events Set Aside Program

The 2024 EESA quota was 2,336 mt (5.15 million pounds). Maine began harvesting under the EESA program on September 2nd and continued until their EESA fishery closed on October 31st. Preliminary estimates reported landings of 2,928,330 pounds. Based on the preliminary estimate, 2,220,556 pounds of leftover set aside was redistributed to the states on November 5th. However, late reporting resulted in a final estimate of 3,063,095 pounds landed under the EESA fishery (Table 5), resulting in an overage of 134,765 pounds. In December 2024 and July 2025, Maine transferred a total of 134,765 pounds to cover the overage (see Table 7).

Chesapeake Bay Reduction Fishery Cap (cap)

Amendment 3 implemented a 51,000 mt harvest cap for the reduction fishery in the Chesapeake Bay. The cap for 2024 was set once again at 51,000 mt with harvest remaining under the limit in 2023. Reported reduction landings from Chesapeake Bay in 2024 were less than 51,000 mt and below the cap.

Recreational

Menhaden are important bait in many recreational fisheries; some recreational fishermen use cast nets to capture menhaden or snag them with hook and line for use as bait, both dead and alive. The Marine Recreational Information Program (MRIP) estimate for Atlantic menhaden harvest (A + B1) in 2024 is 943,427 pounds (PSE of 19.40) which is a 21% decrease from 2023 (1.2 million pounds).

Additionally, it is important to note recreational harvest is not well captured by 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 beach. However, since menhaden caught by recreational fishermen are often used as bait during their trip, they are typically not part of the catch that is seen by the surveyor completing the intercept.

Quota Transfers

There were 3 state-to-state transfers in 2024 (Table 8), a decrease from 5 in 2023. Quota transfers were generally pursued to ameliorate overages. One of the purposes of the commercial allocation changes in Addendum I to Amendment 3 was to reduce the need for quota transfers, and the PRT notes the significant decrease in transfers since 2022.

IV. Status of Research and Monitoring

Commercial fisheries monitoring

Reduction fishery - In 2024, the NMFS Southeast Fisheries Science Center Beaufort Laboratory in Beaufort, North Carolina, continued to monitor landings and collect biological samples from the Atlantic menhaden purse-seine reduction fishery. The Beaufort Laboratory processes and ages all reduction samples collected on the East Coast. In addition, the purse-seine reduction fishery continued to provide Captains Daily Fishing Reports (CDFRs) to the Beaufort Laboratory where NMFS personnel enter data into a database for storage and analysis. Starting in 2025,

CDFR collection and landings monitoring are being conducted by the Virginia Marine Resources Commission.

Bait fishery - Per Amendment 3, states are required to implement a timely quota monitoring system to maintain menhaden harvest within the TAC and minimize the potential for quota overages. The Standard Atlantic Fisheries Information System (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 few years:

- Anstead, K. A., K. Drew, D. Chagaris, A. M. Schueller, J. E. McNamee, A. Buchheister, G. Nessler, J. H. Uphoff Jr., M. J. Wilberg, A. Sharov, M. J. Dean, J. Brust, M. Celestino, S. Madsen, S. Murray, M. Appelman, J. C. Ballenger, J. Brito, E. Cosby, C. Craig, C. Flora, K. Gottschall, R. J. Latour, E. Leonard, R. Mroch, J. Newhard, D. Orner, C. Swanson, J. Tinsman, E. D. Houde, T. J. Miller, and H. Townsend. 2021. The path to an ecosystem approach for forage fish management: A case study of Atlantic menhaden. *Front. Mar. Sci.* 8: 607657.
- Chagaris D., K. Drew, A. M. Schueller, M. Cieri, J. Brito, and A. Buchheister. 2020. Ecological Reference Points for Atlantic Menhaden Established Using an Ecosystem Model of Intermediate Complexity. *Front. Mar. Sci.* 7:606417.
- Deyle, E., A. M. Schueller, H. Ye, G. M. Pao, and G. Sugihara. 2018. Ecosystem-based forecasts of recruitment in two menhaden species. *Fish and Fisheries* 19(5): 769-781.
- Drew, K., M. Cieri, A. M. Schueller, A. Buchheister, D. Chagaris, G. Nessler, J. E. McNamee, and J. H. Uphoff. 2021. Balancing Model Complexity, Data Requirements, and Management Objectives in Developing Ecological Reference Points for Atlantic Menhaden. *Front. Mar. Sci.* 8: 608059.
- Liljestrand, E.M., M.J. Wilberg, and A.M. Schueller. 2019. Estimation of movement and mortality of Atlantic menhaden during 1966-1969 using a Bayesian multi-state mark recapture model. *Fisheries Research* 210: 204-213.
- Liljestrand, E.M., M. J. Wilberg, and A. M. Schueller. 2019. Multi-state dead recovery mark-recovery model performance for estimating movement and mortality rates. *Fisheries Research* 210: 214-233.
- Lucca, B. M., and J. D. Warren. 2019. Fishery-independent observations of Atlantic menhaden abundance in the coastal waters south of New York. *Fisheries Research* 218: 229-236.

- Nessler, G. M., and M. J. Wilberg. 2019. A performance evaluation of surplus production models with time-varying intrinsic growth in dynamic ecosystems. *Canadian Journal of Fisheries and Aquatic Sciences* 76(12): 2245-2255.
- Schueller, A.M., A. Rezek, R. M. Mroch, E. Fitzpatrick, and A. Cheripka. 2021. Comparison of ages determined by using an Eberbach projector and a microscope to read scales from Atlantic menhaden (*Brevoortia tyrannus*) and Gulf menhaden (*B. patronus*). *Fishery Bulletin* 119(1): 21-32.

Theses and Dissertations of Potential Interest:

- McNamee, J. E. 2018. A multispecies statistical catch-at-age (MSSCAA) model for a Mid-Atlantic species complex. University of Rhode Island.

V. Implementation of FMP Compliance Requirements

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

Quota Results

The Board set the TAC at 233,550 mt (514.9 million pounds) for 2023-2025 based on the adopted ERPs. 1% is set aside for episodic events. States may relinquish all or part of its annual quota by December 1st of the previous year. Delaware relinquished one million pounds of quota, which was redistributed to the states according to procedures outlined in Addendum I to Amendment 3 and is reflected in the 2025 Preliminary Quota in Table 7.

Table 7 also contains 2024 state-specific quotas and directed harvest. The final quotas for 2024 account for one million pounds of quota relinquished by Delaware, state-to-state transfers (Table 8), and transfers to the EESA. Based on preliminary 2024 landings, no states incurred an overage.

Quota Monitoring

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.

Menhaden purse seine and bait seine vessels (or snapper rigs) are required to submit CDFRs. Maine, New York, and Virginia fulfilled this requirement in 2024. 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 DMF and fill out daily trip level logbooks. New Hampshire also does not require the specific CDFR, but does require daily, trip-level reporting from dealers and monthly trip-level reporting from harvesters. Massachusetts requires trip level reporting for all commercial fishermen. Menhaden purse seine fisheries do not currently operate in all other jurisdictions in the management unit.

Biological Monitoring Requirements

Amendment 3 maintains biological sampling requirements for non *de minimis* states as follows:

- One 10-fish sample (age and length) per 300 mt landed for bait purposes for Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Delaware; and
- One 10-fish sample (age and length) per 200 mt landed for bait purposes for Maryland, Potomac River Fisheries Commission, Virginia, and North Carolina

Table 9 provides the number of 10-fish samples required and collected for 2024. These are based on the best available 2024 total bait landings data (including directed, incidental, and EESA landings) provided to the Commission by the states. In 2024, most states and jurisdictions met the requirement.

The PRT has regularly discussed whether a sufficient number of age and length samples are being collected from different commercial gear types as well as regions, and whether substituting samples from fishery-independent sources is appropriate for meeting the requirement. In September 2025, the Technical Committee reviewed the biosampling requirement. The TC did not recommend any reductions in sample size and will complete further analyses to develop a recommendation. Additionally, the PRT notes that recently NOAA updated their sampling protocol to collect 5-fish samples for both the reduction and the Virginia purse-seine bait fisheries. The PRT recommends the TC include a review of the appropriate sample size by gear in their analysis and recommendation for the bait fishery requirement.

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 did not have the current reporting structure to require a quantity of gear field by harvesters or dealers. In recent years, NC DMF staff have worked to develop a proxy method to estimate effort but this approach likely would not work for developing an adult CPUE index.

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 previously approved a *de minimis* exemption for New Hampshire, South Carolina and Georgia from implementation of timely reporting. The states of Pennsylvania, North Carolina, South Carolina, Georgia, and Florida requested and qualify for *de minimis* status for the 2024 fishing season.

VI. Plan Review Team Recommendations and Notable Comments

Management Recommendations

- The PRT recommends that the *de minimis* requests from Pennsylvania, North Carolina, South Carolina, Georgia, and Florida, be approved.

VII. Literature Cited

Atlantic States Marine Fisheries Commission (ASMFC). 2022. Atlantic Menhaden Stock Assessment Update. Prepared by the ASMFC Atlantic Menhaden Stock Assessment Subcommittee. 127 pp.

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

SEDAR. 2020. SEDAR 69 – Atlantic Menhaden Benchmark Stock Assessment Report. SEDAR, North Charleston SC. 691 pp. available online at: <http://sedarweb.org/sedar-69>

SEDAR. 2020. SEDAR 69 - Atlantic Menhaden Ecological Reference Points Stock Assessment Report. SEDAR, North Charleston SC. 560 pp. available online at: <http://sedarweb.org/sedar-69>

Table 1. Directed, bycatch, and episodic events set aside landings in 1000s of pounds for 2024 by jurisdiction. Source: 2024 ASMFC state compliance reports for Atlantic menhaden. NA = not applicable.

State	Directed	Incidental Catch	EESA
ME	24,035	-	3,063
NH	2,434	-	-
MA	12,346	-	-
RI	1,905	-	-
CT	48	-	-
NY	1,164	-	-
NJ	48,112	-	NA
PA	0	-	NA
DE	46	-	NA
MD	1,032	-	NA
PFRC	692	-	NA
VA	315,124	-	NA
NC	359	-	NA
SC	0	-	NA
GA	0	-	NA
FL	41	-	NA

Table 2. Atlantic menhaden reduction and bait landings in thousand metric tons, 1990-2024.

	Reduction Landings (1000 mt)	Bait Landings (1000 mt)
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	50.2
2019	151	58.1
2020	125	59.6
2021	137	58.4
2022	134	60.1
2023	117	49.8
2024	134	51.8
Avg 2019-2023	133	57.2

Table 3. Incidental fishery landings by state in 1000s of pounds, 2013-2024. Only states that have reported incidental catch landings are listed. Average total incidental catch landings for the time series is 7.1 million pounds.

State	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
ME		-	-	506	5,374	2,995	10,751	13,605	11,771	15,602	-	-
MA								49	174	595	-	-
RI	16	99	70	40	136	-	-	-	C	-	-	-
CT	0	-	10	-	124	-	-	-	C	-	-	-
NY	0	325	769	281	807	-	-	282	310	-	-	-
NJ	0	626	241	196	-	204,240	-	20	C	-	-	-
DE	76	112	92	21	29	-	-	-	-	-	-	-
MD	2,864	2,201	1,950	996	-	-	-	-	-	-	-	-
PRFC	1,087	1,112	455	106	670	-	-	-	-	-	-	-
VA	268	2,232	2,103	326	-	110,281	-	-	-	1,784	-	-
FL	65	126	302	111	264	-	-	-	-	-	-	-
Total	4,377	6,831	5,992	2,581	7,404	3,215	10,751	13,957	12,336	16,152	0	0

Table 4. Total incidental landings (1000s of pounds), number of trips, and number of states reporting landings in the incidental catch fishery, 2013-2024.

Year	Landings (1000s of pounds)	Number of Trips	Number of states landing
2013	4,377	2,783	6
2014	6,831	5,275	8
2015	5,992	4,498	9
2016	2,581	2,222	9
2017	7,407	2,108	7
2018	3,310	1,224	3
2019	10,751	3,113	1
2020	13,957	3,565	4
2021	12,336	3,099	6
2022	17,980	4,134	3
2023	0	0	0
2024	0	0	0
Total	85,522	32,021	

Table 5. Episodic Events Set-Aside (EESA) fishery quota, landings, and participating states by year. *The 2022 overage was partially covered by a quota transfer and the remainder was deducted from the 2023 set aside.

Year	States Declared Participation	EESA Quota (MT)	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%
2019	ME	2,160	1,995	92.4%
2020	ME & MA	2,160	2,080	96.3%
2021	ME, MA, RI	1,944	2,213	113.8%
2022	ME, MA	1,944	1,992	102.4%
2023*	ME	2,317	1,274	55.0%
2024	ME	2,336	1,389	59.5%

Table 6. State quota reporting timeframes in 2024. The **bold** text indicates which reporting program (dealer or harvesters) the states use to monitor its quotas. **Blue text** indicates changes from 2022.

State	Dealer Reporting	Harvester Reporting	Notes
ME	monthly	daily/weekly	Harvesters must report same day during directed and episodic event trips; harvesters report daily trips weekly for trips <6,000 lbs. Harvest reports are used for quota monitoring.
NH	daily	monthly	Exempt from timely reporting. Implemented daily, transaction 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/daily	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 through the FWC Marine Fisheries Trip Ticket system until 75% of quota is projected to have been met, then weekly phone calls to dealers who have been reporting menhaden landings until the directed fishery is closed.

Table 7. Results of 2024 quota accounting in pounds. The 2025 base quotas account for the redistribution of relinquished quota by Delaware (1 million pounds).

State	2024 Base Quota*	Returned Set Aside	Transfers^	Final 2024 Quota	Overages	2025 Base Quota*
ME	24,510,314	101,576	1,082,246	25,694,136		24,510,314
NH	6,052,530	16,206	-2,000,000	4,068,736		6,052,530
MA	10,838,902	38,344	1,700,000	12,577,245		10,838,902
RI	4,147,882	7,396	-500,000	3,655,278		4,147,882
CT	1,693,471	1,938		1,695,410		1,693,471
NY	4,298,217	8,092		4,306,309		4,298,217
NJ	56,172,891	248,021		56,420,912		56,172,891
PA	50,974	-		50,974		50,974
DE	375,998	471		376,469		375,998
MD	5,947,968	15,722		5,963,690		5,947,968
PRFC	5,547,544	13,870		5,561,313		5,547,444
VA	384,172,558	1,765,072		385,937,630		384,172,558
NC	1,892,146	2,857		1,895,003		1,892,146
SC	1,274,601	1	-700,000	574,602		1,274,601
GA	1,274,352	-	-500,000	774,352		1,274,352
FL	1,490,464	1,000		1,491,464		1,490,464
Total	509,740,712	2,220,566		511,961,278		509,740,712

*Includes redistributed relinquished quota for that year and any overages from the previous season.

^Includes inter-state transfers and transfers to the EESA quota.

Table 8. State-to-state transfers of menhaden commercial quota for the 2024 Fishing year.

Transfer Date	ME	NH	MA	RI	CT	NY	NJ	PA	DE	MD	PRFC	VA	NC	SC	GA	FL
7/18/24			1,200,000											-700,000	-500,000	
9/6/24			500,000	-500,000												
11/5/24	2,000,000	-2,000,000														
Total	2,000,000	-2,000,000	1,700,000	-500,000										-700,000	-500,000	

Table 9. Biological monitoring results for the 2024 Atlantic menhaden bait fishery.

*Age samples are still being processed

State	#10-fish samples required	#10-fish samples collected	Age samples collected	Length samples collected	Gear/Comments
ME	41	44	440	440	37 samples from directed fishery, 5 during EESA / 37 samples from PS, 7 samples gillnets
NH	4	4	40	40	Purse Seine
MA	19	19	195	195	All purse seine
RI	3	5	54	54	Floating fish trap, Purse seine, Otter Trawl (84 additional FI samples available)
CT	1	1	13	13	cast net
NY	2	20	202	202	cast net, seine net
NJ	71	78	780	780	Purse Seine
	2	-	-	-	Other Gears
DE	1	3	33	33	Gill Net
MD	2	21	371	777	Pound net
PRFC	2	4	40	40	pound net
VA	1	2	21	21	Pound Net
	1	19	192	192	Gill Net
NC	1	2	21	175	gillnet
Total	151	222	1622	2962	

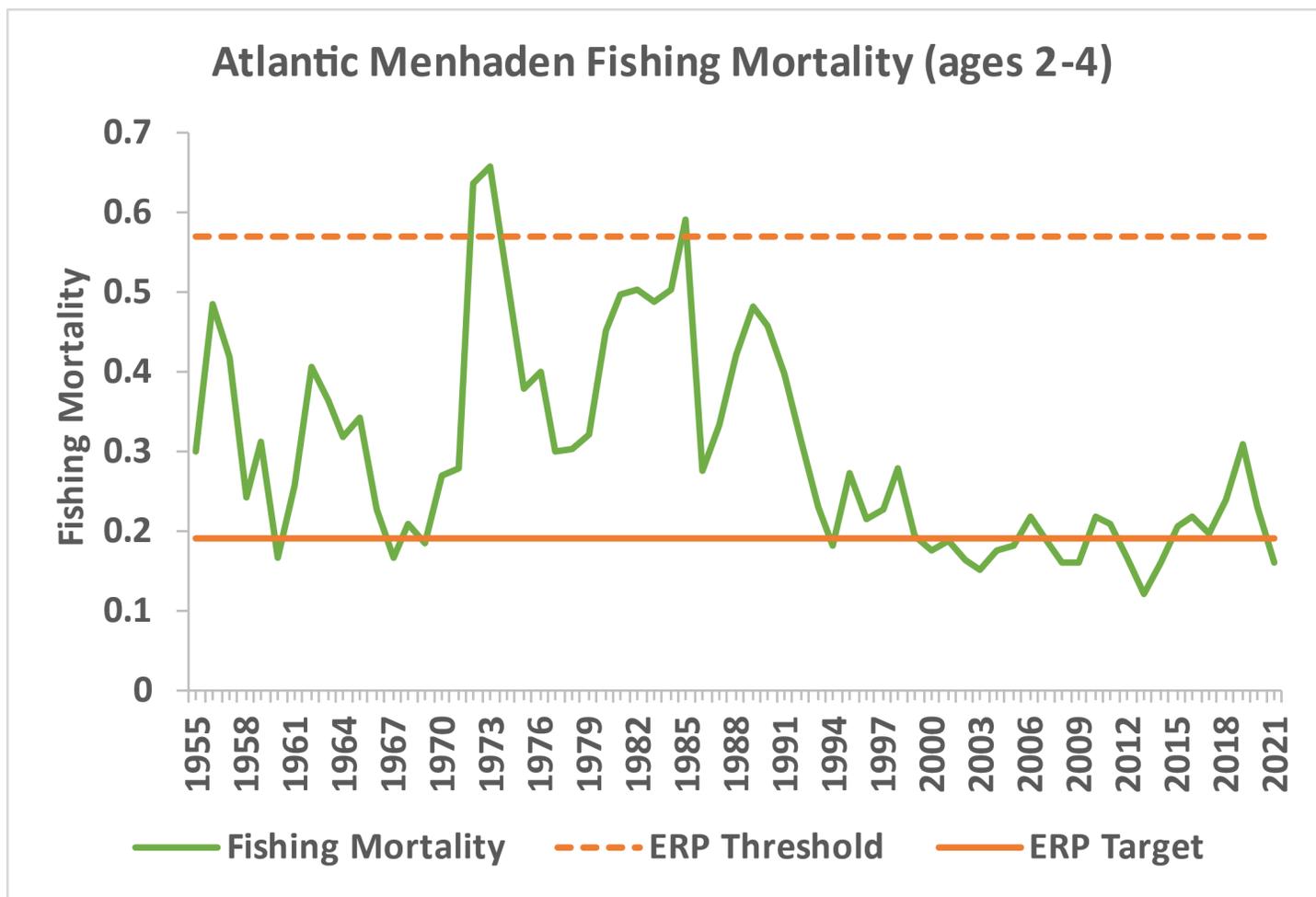


Figure 1. Fishing mortality, 1955-2021. The ERP fishing mortality reference points are $F_{\text{target}} = 0.19$ and $F_{\text{threshold}} = 0.57$. $F_{2017} = 0.16$. Source: ASMFC 2022.

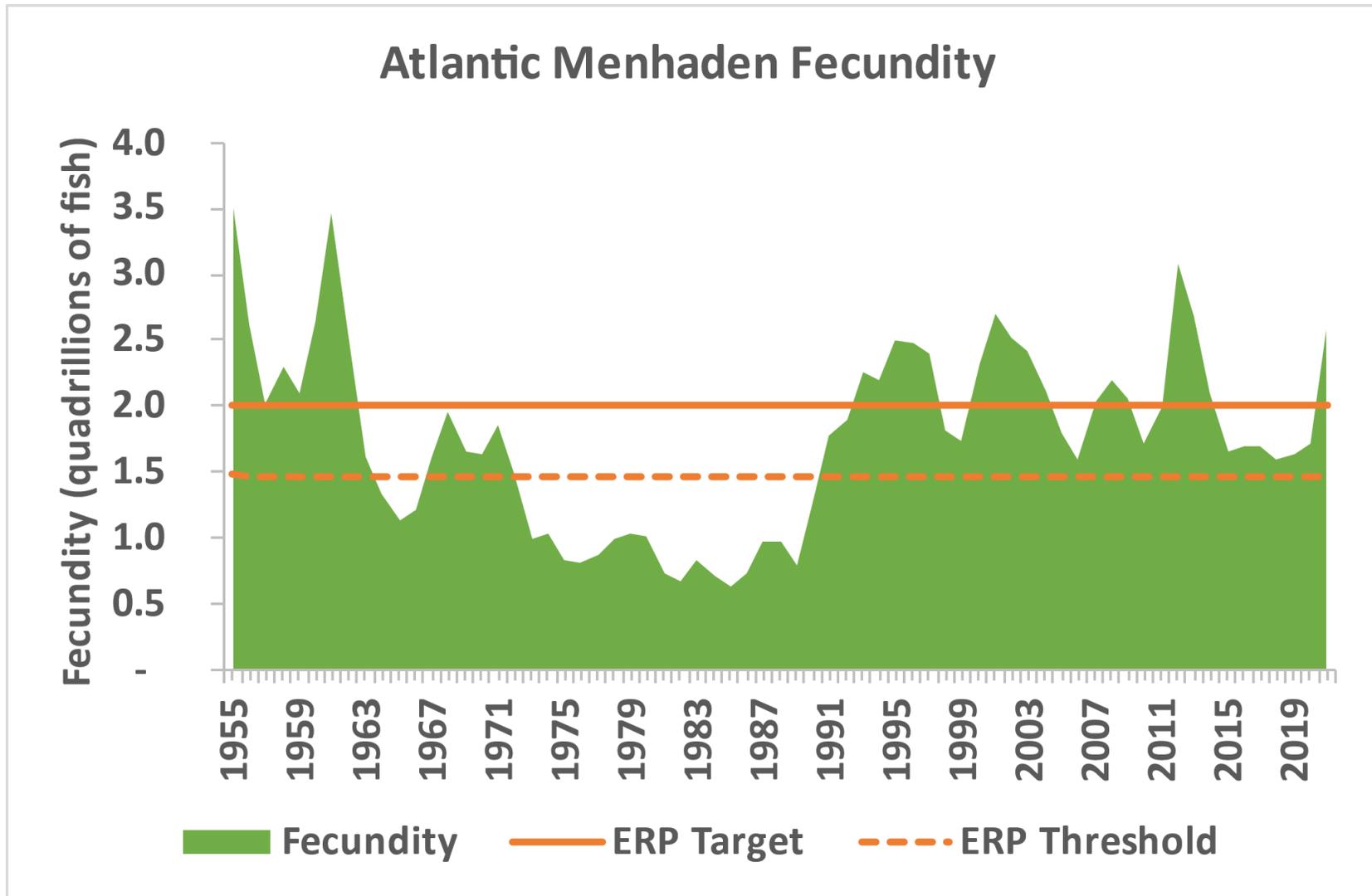


Figure 2. Atlantic menhaden fecundity, 1955-2021. The ERPs for population fecundity are $FEC_{target} = 2,003,986$ (billions of eggs), and $FEC_{threshold} = 1,492,854$ (billions of eggs). Source: ASMFC 2022.

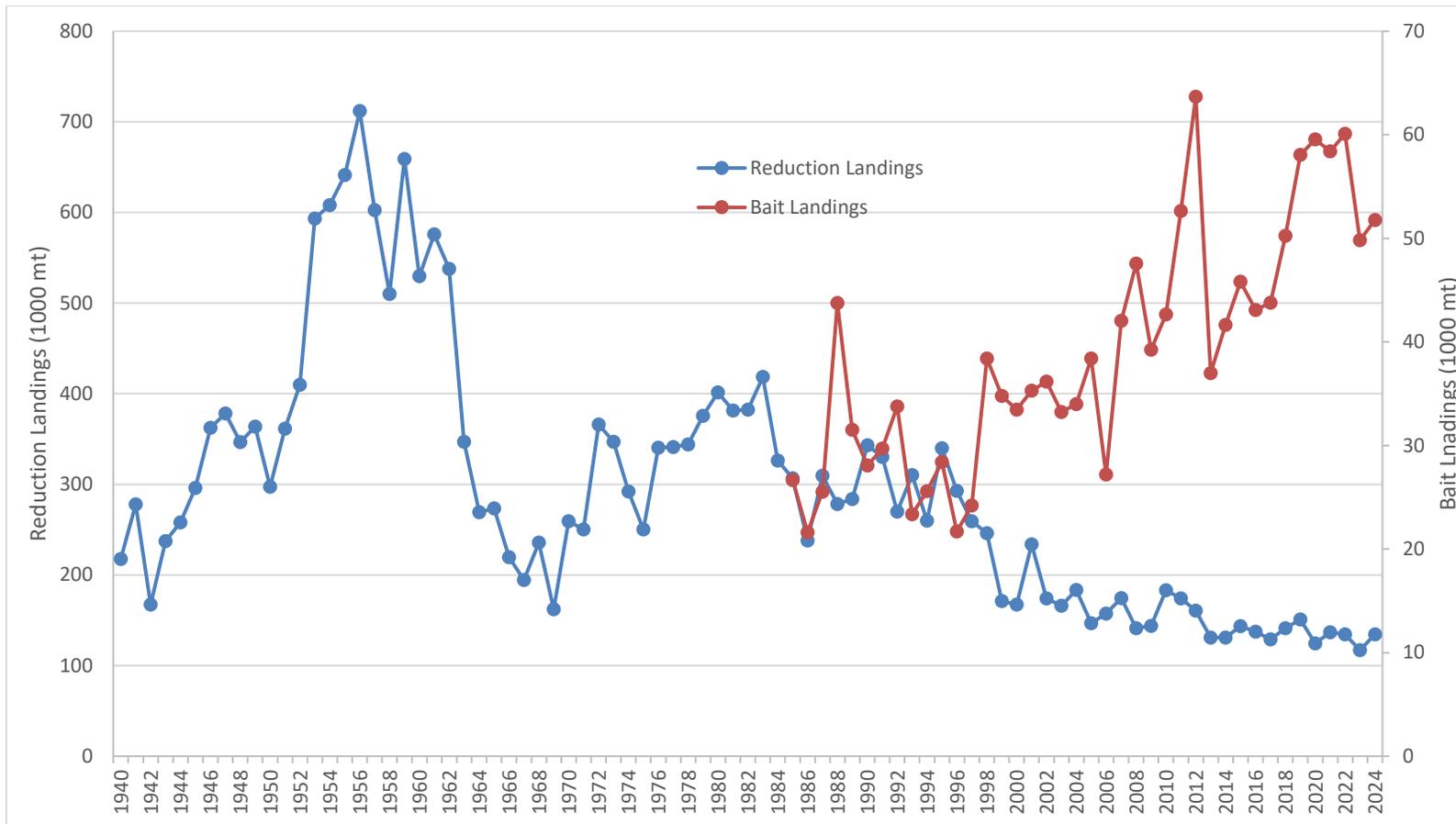


Figure 3. Landings from the reduction purse seine fishery (1940–2024) and bait fishery (1985–2024) for Atlantic menhaden. Note: there are two different scales on the y-axes.

James Boyle

From: G2W2
Sent: Monday, August 11, 2025 9:30 AM
To: James Boyle
Subject: FW: [External] [New] Meeting feedback

-----Original Message-----

From: Susan Laume <slaume08@gmail.com>
Sent: Friday, August 8, 2025 12:11 PM
To: G2W2 <G2W2@asmfc.org>
Subject: [External] [New] Meeting feedback

James and Commission Members

I appreciate your invitation to provide feedback on your Summer 2025 meeting.

It's disheartening to see the plight of Ospreys kicked so far down the road by the Commission's process. While the Commission debates which type team will do a study, the well defined list of possible management actions without taking any cautionary steps, and newly how large an area to encompass, our keystone species is left hanging... I fear, literally, as chicks die in their nests.

I'm embarrassed that Virginia's representatives would suggest delaying action, and vote against taking any action, because our team apparently lacks depth. Surely this cannot be correct that we could not find qualified Virginian representatives.

If the Commission cannot act with more prompt due diligence, then its input and decisions risk being layed aside by the legislature; not the best place for nuanced actions.

Susan Laume
Springfield VA

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From: [Tom Lilly](#)
To: [Tina Berger](#)
Cc: [Bob Beal](#)
Subject: [External] Fwd: Menhaden board responsibility
Date: Wednesday, September 17, 2025 7:19:36 AM

Tina will you please include this for the Menhaden board for their October 28 meeting? Can you advise if the new Chesapeake bay PRT has produced any meeting notes or other documentation at this time and let us know how we can access that?

Sent from my iPhone

Begin forwarded message:

From: Tom Lilly <foragematters@aol.com>
Date: September 16, 2025 at 8:03:42 PM EDT
To: James Boyle <JBoyle@asmfc.org>, John Clark <john.clark@delaware.gov>, Gary Marty <martin.gary@dec.ny.gov>
Subject: Menhaden board responsibility

Sent from my iPhone

To James, John and Marty

I would appreciate it if you three could find time to answer these questions as I believe that each of you has responsibility for a different component of this problem.

I noticed that the next menhaden board meeting in Delaware has “consider guidance to the PRT on Chesapeake Bay management” on the agenda .

Can you please advise us if that PRT has been formed and if so, the membership and what have been their activities and reports to date ? are records of these activities available?

Also, please advise what the current instructions are from the board to the PRT as to what they are to be accomplishing.

Finally, please advise what the current status is of the work group on protective options, and a reference to the options they have suggested beyond their written long report to the board and advise if the work group options are “dead in the water” or just what is their status as to consideration by the board. If the protective options are not dead then what action could be taken to restore them to the board for consideration.?

I would like to be able to give the answers to these questions to the people interested in protecting Chesapeake Bay. Thank you for your consideration and as usual, I would be glad to discuss this with you at any time at 443-235-4465
sincerely, Tom Lilly.

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James Boyle

From: Tim Prosko <TimProsko@protonmail.com>
Sent: Friday, August 15, 2025 1:30 PM
To: James Boyle
Subject: [External] Restrict Menhaden Mass Netting to 10 Miles

James,

please include my comment in the next meeting.

The NOAA continue to fail the fish species and continuing to do it again with the Menhaden. Please restrict all mass net fishery to 10 miles from the shore. If you're going to use airplanes, large fishing vessels, small fishing vessels, nets, sonar, and go all out to fish for Menhaden then at least give the Menhaden fish a chance and only mass net fish 10 miles from shore.

- **Atlantic Cod:** This is perhaps the most famous example of overfishing in the region. Cod populations were once so abundant that they were a cornerstone of fishing industries for centuries. However, the introduction of modern, powerful trawlers in the 20th century led to a catastrophic decline in stocks, pushing some populations to the brink of commercial extinction.
- **Haddock:** Haddock stocks, particularly those on the Georges Bank and in the North Sea, have also been severely depleted by overfishing. Like cod, they are a valuable groundfish species often caught by trawling.
- **Herring:** A historically abundant and commercially important pelagic (open-water) fish, herring stocks have faced significant overfishing, particularly in the North Sea. Large industrial vessels with vast nets targeted these fish in a systematic way.
- **Mackerel:** Mackerel is one of the most economically valuable fish in the Northeast Atlantic. Despite being a highly migratory species, it has been systematically overfished for decades due to a lack of agreement on quotas among coastal states.
- **Blue Whiting:** Similar to mackerel and herring, this pelagic species has also been heavily overfished in the region due to ongoing disputes over catch limits.
- **Atlantic Halibut:** Once a common and very large fish in the region, Atlantic halibut populations were drastically reduced. Today, stocks are at a very low level, and a rebuilding plan is in place to allow for a limited, managed harvest.
- **Plaice and Sole:** While some stocks of these species have seen some recovery due to long-term management measures, they have historically been subject to overfishing, particularly by demersal trawl fleets.
- **Whiting:** Several whiting stocks in the Northeast Atlantic, such as those in the Irish and Celtic Seas, have been identified as being severely depleted.
- **Rays, Skates, and Sturgeons:** These species are often caught as bycatch in trawl nets, and their populations have declined significantly due to a combination of overfishing and habitat destruction.
- **Weakfish:** Also known as "gray trout," weakfish have experienced significant population declines, particularly in the Mid-Atlantic region. Overfishing in the past was a major contributing factor to their population crash.

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