Atlantic States Marine Fisheries Commission

Tautog Management Board

October 27, 2025
1:00 – 2:30 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 (*M. Gates*)	1:00 p.m.
2. Board Consent • Approval of Agenda • Approval of Proceedings from May 2025	1:00 p.m.
3. Public Comment	1:05 p.m.
4. Consider 2025 Tautog Stock Assessment Update *(K. Drew)* **Possible Action** • Consider Acceptance of Stock Assessment Update for Management Use • Consider Management Response, if necessary	1:15 p.m.
5. Consider Approval of Fishery Management Plan Review and State Compliance for the 2024 Fishing Year *(J. Boyle)* **Action**	2:15 p.m.
6. Elect Vice-Chair **Action**	2:25 p.m.
7. Other Business/Adjourn	2:30 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.

MEETING OVERVIEW

Tautog Management Board
October 27, 2025
1:00 - 2:30 p.m.

Chair: Matt Gates (CT)	Technical Committee Chair: Sandra Dumais (NY)	Law Enforcement Committee Representative: Brian Scott (NJ)
Vice-Chair: Vacant	Advisory Panel Chair: Vacant	Previous Board Meeting: May 7, 2025
Voting Members: MA, RI, CT, NY, NJ, DE, MD, VA, NMFS (9 votes)		

2. Board Consent

- Approval of Agenda
- Approval of Proceedings from May 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 Tautog Stock Assessment Update (1:15-2:15 p.m.) Possible Action
Background • The TC met via webinar in September to review the draft of the stock assessment update and provide recommendations to the Stock Assessment Subcommittee. • The assessment updates the statistical catch-at-age model for each management region with data through 2024 (**Briefing Materials**).
Presentations • 2025 Stock Assessment Update by K. Drew
Board Actions for consideration • Consider management response, if necessary

5. Consider Approval of Fishery Management Plan Review and State Compliance for the 2024 Fishing Year (2:15-2:25 p.m.) Action
Background • State compliance reports were due May 1, 2025 • The Plan Review Team reviewed each state report and compiled the annual FMP Review **(Briefing Materials)**.

Presentations • Overview of the Tautog FMP Review by J. Boyle
Board Actions for consideration • Approve FMP Review for 2024 fishing year, state compliance reports, and *de minimis* requests.

6. Elect Vice-Chair

7. Other Business/Adjourn

Tautog

Activity level: Low

Committee Overlap Score: High (Menhaden, BERP, Summer Flounder, Scup, and Black Sea Bass)

Committee Task List
• Compliance reports due May 1st

TC Members: Sandra Dumais (Chair, NY), Craig Weedon (MD), Shakira Goffe (VA), Coly Ares (RI), Conor Davis (NJ), Colton Williamson (DE), David Ellis (CT), Elise Koob (MA), Alexei Sharov (MD), Samara Nehemiah (ASMFC Staff), Katie Drew (ASMFC Staff), James Boyle (ASMFC Staff)

SAS Members: Coly Ares (RI), Jessica Gorzo (NJ), Alexei Sharov (MD), Elise Koob (MA), Kelli Mosca (CT), Ben Wasserman (DE), Samara Nehemiah (ASMFC Staff), Katie Drew (ASMFC Staff), James Boyle (ASMFC Staff)

DRAFT PROCEEDINGS OF THE

ATLANTIC STATES MARINE FISHERIES COMMISSION

TAUTOG MANAGEMENT BOARD

The Westin Crystal City
Arlington, Virginia
Hybrid Meeting

May 7, 2025

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

TABLE OF CONTENTS

Call to Order, Chair Robert E. Beal 1
Approval of Agenda 1
Approval of Proceedings from October 16, 2023 1
Public Comment 1
Review Technical Committee Report on New York Study of Alternative Commercial Tags 1
Progress Update on the 2025 Tautog Stock Assessment Update 7
Adjournment 8

INDEX OF MOTIONS

1. **Approval of agenda** by consent (Page 1).

2. **Approval of Proceedings of October 16, 2023** by consent (Page 1).

3. **Move to elect Matt Gates as Chair of the Tautog Management Board** (Page 8). Motion Jason McNamee; second by Mike Luisi. Motion approved by unanimous consent (Page 8).

4. **Move to adjourn** by consent (Page 8).

ATTENDANCE

Board Members

Dan McKiernan, MA (AA)
Sarah Ferrara, MA, proxy for Rep. Armini (LA)
Jason McNamee, NJ (AA)
Eric Reid, RI, proxy for Sen. Sosnowski (LA)
Mattew Gates, CT, proxy for J. Davis (AA)
William Hyatt, CT (GA)
Robert LaFrance, CT, proxy for J. Gresko (LA)
Jesse Hornstein, NY, proxy for M. Gary (AA)
Emerson Hasbrouck, NY (GA)
Joe Cimino, NJ (AA)
Jeff Kaelin, NJ (GA)
Adam Nowalsky, NJ, proxy for Sen. Gopal (LA)
Rich Wong, DE, proxy for J. Clark (AA)
Roy Miller, DE (GA)
Michael Luisi, MD, proxy for L. Fegley (AA)
Pat Geer, VA, proxy for J. Green (AA)
Chris Wright, NMFS

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

Ex-Officio Members

Craig Weedon, Technical Committee Chair
Brian Scott, Law Enforcement Committee Rep.

Staff

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

The Tautog 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; Wednesday, May 7, 2025, and was called to order at 3:55 p.m. by Chair Robert E. Beal.

CALL TO ORDER

CHAIR ROBERT E. BEAL: Good afternoon, everyone. I want to call to order the meeting of the Tautog Management Board. My name is Bob Beal; and I am the stand-in chair for this meeting. The chair was Justin Davis from Connecticut, but he has taken a new job and no longer able to chair this meeting. I am the stand-in chair until we get to Agenda Item Number 6 and elect a new chair. I'll be looking forward to that.

APPROVAL OF AGENDA

CHAIR BEAL: For Agenda Item Number 2, Board Consent to see if there are any changes or additions to the agenda that was published in the briefing materials. Seeing none; that stands approved.

APPROVAL OF PROCEEDINGS

CHAIR BEAL: Next is Approval of Proceedings from October 2023, so it's been a while since this Board has got together. Are there any adjustments or changes to the proceedings from October of '23? Seeing no hands on that we will consider those proceedings approved.

PUBLIC COMMENT

CHAIR BEAL: Now it brings us to public comment. Is there any public comment on items not on the agenda today? When we get to Item Number 4 and 5, we'll give a brief opportunity for public comment if needed. I don't see any hands in the back of the room, because I don't see any people in the back of the room. Is there anyone online? No, no one on line, so that speeds this up.

With that, I should have introduced the folks that are up in the front here. To my left is Craig Weedon, a Chair of the Technical Committee from Maryland. To his left is Brian Scott, Law Enforcement Committee representative from New Jersey. To my right is James Boyle, to James's right is Dr. Katie Drew, helping out with any difficult assessment questions. That is who we've got up front here.

REVIEW TECHNICAL COMMITTEE REPORT ON NEW YORK STUDY OF ALTERNATIVE COMMERCIAL TAGS

CHAIR BEAL: With that, and Craig if you're ready, we will jump right into the presentation of the Technical Committee Review on New York's Study for Alternative Commercial Tags for Tautog. Take it away, Craig. Thank you for being here.

MR. CRAIG WEEDON: I'm going to run through New York DECs Feasibility Study, in response to the reported issues with the Commercial Tagging Program. The New York State Department and Environmental Conservation conducted a feasibility study last summer, to find a better tag for the live market. I put down some facts for those here. The Tagging Program was implemented in 2020. Years of work went into this, and New York was given an exception, and they implemented in 2021, due to the pandemic of COVID 19. The tag is considered successful by Law Enforcement and management, and we've seen that reporting has gone up, the price has gone up. Another fact, the tags selected at the time had to be used by the entire commercial fishery. There was no declaring if you were going to be a live fishery fisherman or the traditional fishery at the time, so everyone uses the same tag.

This assumption that it wouldn't change went into this study. Another fact, members of the live market industry are not satisfied with the tag performance. We've done surveys, and there has been a lot of written and verbal complaints about the tag. The live fishery really expects to have a high-quality fish without any marks on it when they sell it.

The free tags that were tested by New York was the Floy T-Bar Tag, the National Band and Tag Strap Tag, we call it the small tag, compared to the other tag that is currently being used now, and a Petersen Disk Tag. The Floy T-Bar Tag, we had high hopes for this, and during the test they used the Mark 3 applicator, it's like a pistol grip, and it can hold 25 tags in the magazine, and they're about $50.00.

The Small Strap Tag uses an applicator that is a little bit different than the current applicator. It costs a little less, and it helps the self-piercing of the tag, but it doesn't have a magazine in it to help secure the tag into the applicator, so the tags can fall out easier than the current method. The Petersen Disc Tag, I'll talk about that on the next slide.

New York tested that on a carcass, and they found it was difficult to apply to the operculum without two people or a special tool or assistance, so they removed that from the consideration of the test. In late June last year, 20 fish were delivered untagged in a live container, and they were about 15 to 22 inches, and they were dropped off at Kings Park, where DEC personnel picked it up and moved them east about 60 miles to a holding cage, they built.

This is a picture of the holding cage, it is 64-cubic feet, 8 x 4 x 2 feet in a PVC frame with a 1-inch mesh. Each fish had about 3.2 square feet. That was the density of the study for each fish. The water temperature was measured on Day 0 in the transport tank, and it was 59 degrees. They moved it 60 miles, took about an hour.

When they got to Mattituck Creek, they tested the water there and it was 70 degrees, and so they had a 20-minute acclimation, and they tagged the fish and put them in the cage. They came back on Day 2 and the water temperature was the same. Day 13 it bumped up to 73, and on Day 20 it was 78, and I couldn't find in the report on the last day, Day 30, what the temperature was.

They were put under stress, and that was one of their criticisms of the previous study that it was too pristine for the fish in the controlled environment. The fish survived with no food and increasing water temperatures. I'm going to talk about the T-Bar Tag first. There were 10 fish that had this applied, and it was in the posterior portion of the dorsal fin, using the Mark 3 insertion, which has a maximum depth of 3/8 inches.

Then the needle pushes it through, and it should go through the interstitial rays, and then the barbs should anchor behind the bony structure of the fish. This is a picture of it. These are the results, I'm going to read them to you. I took them from the report and just sorted them a little bit different so it was easier to explain. The tag type, these are all T-Bar, total length of the fish. They are all around 16, 17, 18 inches. The tagger comment on Day 0 was taken on Day 0. When they returned on Day 2, two of the fish died.

They necropsied the fish and found that those two fish, the tag was placed correctly and they were both retained. On Day 12 another fish died, and the tag was not deep enough, but it was still there in the fish. Four other fish at the end of the study were determined to have lost tags. This was kind of saddening for us, to read that.

But I went back and listened to a previous Board meeting, where Mr. Roy Miller suggested, he said you should be concerned maybe about using the T-Bar tag, the Tog might want to eat it. Maybe they did. You know their feeding behavior. Unfortunately, all those tags were lost, which is just, you know we can't have that.

Then the other three fish, they weren't so bad, and it was a minor petechia, a minor hole, a very minor hole. We didn't see necrotic lesions or anything like that. The advantages of the T-Bar are it holds 25 tags. It is a lot easier to tag the fish with the T-Bar tag. Unfortunately, you know, the disadvantage was, even though the tags passed the tug test, inserting you pull on it and they didn't come out.

They were either not deep enough or they were potentially preyed upon. The T-Bar tag cost a lot more than the current Strap Tag. Next slide, I'll talk about the smaller Strap Tag that has been tested before with success. This is to show on the operculum where the tag was inserted. That's how we do it now on the East Coast.

These are the results from the Strap Tag, so three tag misfires. That means that the tagger, when he used the tool to put it in, they knew it wasn't inserted properly, but they left it in. They felt like they didn't want to take it out and reinsert. Two of those fish lost their tags, and there were signs of healing, because they didn't see the hole in the fish.

But loosing those tags was probably preventable if they reapplied the tag. The third misfire, the tag stayed in and there was minor gill damage and a tag hole. Then the remaining seven tags, no comment from the tagger, and they showed minor gill damage and a tag hole. Typical gill damage and a tag hole. I have a picture of typical gill damage after this.

Some gill damage, redness, gill damage, a wound, tag hole. No lesions necrotic skins and this was after 30 days. Inside the yellow circle you can see a little piece of the gill that has come off, right where the tag rests. That was one of the worst pictures from the study. The pros and cons. The advantage was that you could tell that the tag misfired or didn't lock in when it was applied.

Maybe best practices would be to reapply the tag. These smaller tags were less expensive; they are about 40% less than the current tag and there is a smaller tag hole. The disadvantage is everyone has got to buy a new applicator, there is no locking mechanism for the tag to seat in, and it still does create a hole that is susceptible to bacteria. You know all tags do that. These are the recommendations from New York DEC. Given the problems they encountered with the smaller Strap Tag and the T-Bar Tag, this study did not find a viable alternative to the current tag. They also discussed with the industry members that the cost will go up using the T-Bar Tag, and they weren't willing to absorb the cost. New York DEC is going to pause efforts right now to conduct another study until a better tag comes out or better technology. Then that concludes by brief.

CHAIR BEAL: Great, thank you, Craig. Any questions for Craig on the New York DEC Alternate Tag Study? Jason.

DR. JASON McNAMEE: Thanks, Craig, good report, appreciate it. Maybe this isn't a question for you. I'll direct it at you, but maybe it is a question for New York. You know the point of all of this was to see if we could find, you know people weren't happy about the tag we were using in the other states and New York, so we said if you can find a viable alternative, you know we're all interested in finding something that works better.

You know we could think about that. We did the study, it sounds like there wasn't a viable alternative, so does that like kind of end it until something new comes along for the state of New York, or is there like something else that is going to come along. Just curious as to whether we're moving forward or if there is some other process that is going to happen at this point.

MR. WEEDEN: Well, looking at the website for National Band and Tag, I noticed they have aluminum tags now, which could work, or maybe a lip tag. Even the small tag had problems at the very beginning, because the requirement for the number of tags New York requested was 200,000, so we had to have a space on the tag to fit all those, right?

James and I worked through with a smaller tag they could shift from numeric designators in the front to alphabetic, so that would give you 26 possible numbers instead of 10 and 9. I know there was talk about possibly creating a budget and looking at other alternatives, maybe. I've been thinking through it. It would be really hard to have a separate tag just for the live market, because I think fishermen provide to both markets, the live and the traditional. We should try to figure something out.

CHAIR BEAL: Jason, you have a follow up? It's all right, we'll go to Jesse then come back to you.

MR. JESSE HORNSTEIN: Just to respond to Jay. From New York's perspective, you know as of now the current tag is what we're going to move forward with. We don't have staff time to continue to test different tags. However, if there is something that comes about that is some new tag that's developed or something that is new that wasn't discovered before, you know we're still willing to test tags that meet the goals of the fishery management plan. But they also have to be cost effective to the masses. That is another factor you need to consider as well.

CHAIR BEAL: Great, thanks, Jesse. I'll go to Jason and then Dan.

DR. McNAMEE: No, that sounds good. Just thank you both, Craig and Jesse. From my perspective, yes, I thought this approach was good. You know I would be supportive of, if something new comes up and we want to do something systematic like this again, I'm supportive of that, just to sort of offer that for the record.

MR. WEEDEN: There was discussion in previous meetings to have fish tagged at the holding facility for where they all are, and then monitor them every two weeks. But I think the fish that look really bad are the ones that are held for a long time. I think it's encouraging to see that when a tag is not in the fish it does heal quickly.

CHAIR BEAL: Dan.

MR. DANIEL McKIERNAN: Thank you, Craig, good report. Do you have a sense of what the expectation is on the part of the dealers, how long they want to hold the fish and what kind of density and what temperatures? Because it seems to me those are the three factors that are probably contributing to the injury and the mortality or the reduced marketability. What are the needs?

MR. WEEDEN: My impression is, the ones that are complaining the most really don't want the fish to have any marks on them at all for the live market. It's a premium fish with high standards.

MR. McKIERNAN: Sorry, I'll repeat the question, what are the needs? What do they want?

MR. WEEDEN: I know we talked about a white paper to be developed. It took us a while to get a handle on how many live fish people in business there are, and it is not required on a compliance report or anything like that. It's difficult to get your arms around it. I think we were all a little bit surprised about the depth of the live fishery market that has come to surface over time.

MR. McKIERNAN: If I could follow up. You know I'll confess that I was probably the main person pushing for this. In Massachusetts we have a 60,000-pound quota, which is comparable to Rhode Islands with a 16-inch minimum size it's about a 3, 3.5, 4-pound fish. We are selling about 20,000 tautog, and so we feel we've got a pretty good handle on that. We're seeing stock growth.

We don't feel at this time that the commercial fishery and/or any poaching or unreported catch is subverting the recovery of this stock or the growth of the stock. Bottom line, I'm rather pleased with how we're managing tautog now. Our fishery doesn't open until September, and so we've got cooler temperatures there that maybe with the New York fishery being operated during the summer.

Maybe that might be adding to the stress that the fish are under. But I was interested to hear, I'm thinking back to five years ago. A program like this does just what you said, it actually creates a level of accountability and opens our eyes to how many fish are actually being caught, and where they are going. We had huge poaching problems; we would find trucks with like 1,000 live fish heading to New York. There were a whole lot of good reasons why we went down this road. I personally think that the overall stock status, I know there are many stock-lets within this fishery. I think they've really benefited, and I'm really pleased that we're going to continue with tagging with this level of accountability.

CHAIR BEAL: I think one of the "needs" that varies is how long they keep the fish and how long they want to keep the fish. But I don't know the answer to it. Are there hands over on this side? Yes, Roy.

MR. ROY W. MILLER: Craig, appreciate you taking the time to share these results with us. Could I ask a question concerning the original Strap Tag, which is a larger tag? In this particular experiment, no fish were set out with the tag that you previously deployed that was legal to use, is that correct? In other words, they weren't serving as a control.

MR. WEEDEN: Right, there was no current tag applied. It's been mentioned before at other meetings that the control could just be the other side of the fish that wasn't tagged, and showed no lesions. But there weren't 10 or 20 fish in there without tags in them. I mean, of course, that would be ideal. Did that answer your question?

MR. MILLER: I'm groping for the conclusion. The conclusion of this study is that it was not worth changing the tag. In other words, the lower rate of necrosis that we hoped for with a smaller tag, your results showed that the gill damage wasn't appreciably different than it was with the larger Strap Tag, or am I not correct in assuming that?

MR. WEEDEN: Right, that's what New York came up with. But I think there may be other concerns too, with the applicator and putting the numbers on, the state, the year, the number on the tag as well, and then having everyone buy a new applicator. That might have gone into their conclusion. But I don't think personally, I didn't think the results are that bad from the smaller tag study.

MR. MILLER: But apparently the results weren't effective enough for you to change what you are going to require in the way of tagging, am I right?

MR. WEEDEN: Right, it would be status quo. Personally, I wouldn't see an issue if someone would rather use a smaller tag, but it gets complicated with the administration of the program.

MR. MILLER: Do you feel like you sufficiently addressed at this point the handlers concern over the amount of necrosis they were seeing in their holding tanks, caused by the original Strap Tag? Do you feel like you addressed their concerns or not? I'm just curious.

MR. WEEDEN: No, because we lost tags, the fish died. I think having a side-by-side with industry with different tags would be more beneficial. Like it's really hard to keep a fish alive for 90 days, but the industry could do that and provide access in monitoring them. I mean I think that would be a way ahead. We really want to help them.

MR. MILLER: I know you do. Thank you.

CHAIR BEAL: Yes, Mike Luisi and then I think Jesse may have had his hand up.

MR. MICHAEL LUISI: This is a simple question, it's kind of getting away from the science part of it, just for a better understanding from my perspective. These fish are going to be served as a meal, right? That is the intent, right, they are kept alive. The scratches on the gill plate and the holes, how does that cause a problem with the sale of the fish for food?

Is it because of the appearance? Is it presented to the person purchasing it? Do they buy it and then eat it right away? Do they buy it and put it in a cooler of water and take it home? There is just a lot

I don't understand about the live market and how, is it in a restaurant, where the fish are in tanks?

Just not quite sure why it's so important that it doesn't fester a little bit, it's a hole in something, and if it festers a bit it is going to die relatively soon and be served as a meal. Maybe you can offer, or somebody that has the fishery that knows how they work can help me understand that.

MR. WEEDEN: I think the traditional practice came from countries that didn't have a lot of refrigeration, so you keep fish alive to show that they're healthy, and you don't have to refrigerate them. Yes, it's like buying a lobster out of the tank. Do you want to buy the one that has shell disease? Probably not.

If you're the middleman, you're probably not going to want to take on fish that have blemishes and put them in your tank, because they are expensive. I think they're up to like $4.50 a pound, and they were used to occasions. I think it's a valid concern, it's just how far can we go to find a tag that is going to work in captivity over 30 days?

CHAIR BEAL: I think Eric had a comment on the marketability of these fish.

MR. ERIC REID: You touched on it. It's an ornamental like big occasion fish, and they're served whole. It's an Asian kind of thing, Chinese, I think. But you know you walk by the restaurant and they are all swimming in the tank. You are exactly right; nobody wants the one that's laying on its side in the bottom of the tank. Nobody is buying that.

But it is not like they are filleted, they are served whole, so that is a big thing. Honestly, the real problem here is not the tag, it is how long these guys keep tautog in a swimming pool in their basement, because the price peaks at certain times of the year, because of holidays or whatever it may be. The fishery closes, I think 30 days is amateur hour.

They hold those fish a long time, because when the season ends, they have to hold them until a month, two months, who knows how long? Literally, in your basement with a little swimming pool in it. The shape of the tank, this means a lot. Usually it's a round tank, because a rectangle tank like that the fish get stuck in a corner.

They actually swim to the corner and they get stuck in the corner, then they hurt themselves from being in a corner. Because a round tank they swim around and then they don't get hurt. There is a lot to it, but I think the real problem is the time between the end of the season and the market peak. That is the real problem, it's not the tag, it's just the time. You are not going to solve that; you're not going to make anybody happy. I'm good with the way things are now, but the seller has got to be able to take care of his fish, so he supplies the market with what he wants.

CHAIR BEAL: Good, thanks, Eric. I had Jesse, and then I think Rich, you had your hand up as well.

MR. HORNSTEIN: I was just going to respond quick to Roy about the smaller tags. Yes, some of the issues with the misfiring is why it wasn't looked at further. But before we would consider changing tag or moving along that path, you know we want to make sure a tag was tested, you know in a facility, in a holding tank that a fisherman has, to make sure that the lesions don't show up there. You know not just in our experimental kind of set up, so we would want to see it actually in the market, to make sure that they are not seeing the same issues that they see now.

CHAIR BEAL: Rich, go ahead, please.

MR. RICHARD WONG: Thank you, Jesse, that actually helps with my question. What I was curious about, what are the industry holding practices, because this study is informative, but I feel like if they are in high densities in a closed recirculating system with not much water volume, it doesn't' matter what tag you have in there, you are going to have lesions and infections. But these animals were held in situ at the dock. I agree with Eric and Jesse, it would have to be tested in conditions similar to how the industry actually is holding these fish.

CHAIR BEAL: I think that is all the hands I saw. I guess the question for the Board is, is everyone comfortable with status quo with the understanding that if a new tag type comes along and there is time and/or resources, financial resources to do some more studies on this, then we'll go down that road and study the alternate tags, should there be an opportunity to do that.

Is everybody comfortable with that, or is that kind of where we are? I see no objections and a lot of heads nodding yes, so we'll accept that as the plan moving forward. We'll keep an eye on this and see where it goes. With that we'll got to Agenda Item Number 5, which is, Dr. Drew will give an update on the Tautog Stock Assessment, please, Katie.

PROGRESS UPDATE ON THE 2025 TAUTOG STOCK ASSESSMENT UPDATE

DR. KATIE DREW: This will be a much shorter update than the previous stock assessment update I gave at the last meeting. Yes, we have formed the Stock Assessment Subcommittee. I think you guys approved that over e-mail, and we have good representation in all regions. There are several people who are sort of new to the ASMFC process, like new hires and newly involved in the SAS.

We're really excited to get them onboard and into the process, and learning and bringing new fresh blood to this SAS and hopefully to future SASs, so we are meeting regularly to discuss data processing as we move forward with the assessment. We have data through 2023 submitted, and the deadline for the 2024 data is May 16.

Hopefully we should have all of our data soon, and can move into the data processing and modeling components, so that we can present this to everyone at the October meeting of this year. Obviously, I think maybe the one thing we talked about as a TC that you guys maybe have thought through already, maybe not, is the fact that we will not have the newly calibrated MRIP data as part of this, because this assessment will be completed this year, and the new estimates are not scheduled to come out until basically, this time next year.

The TC did talk about this briefly, and we feel that given the potential for delays in that MRIP calibration, and kind of how long its been since this species has had an assessment update, that it's really not worth it to try to wait out that process, especially given that we don't really know that things are going to be available next year at this time anyway, to keep us on tack, for even a one year delay.

But maybe that is just something you guys would want to think about is, we will not be having that calibrated data included in this assessment. I think that is something we would look for though for the next benchmark assessment. But yes.

CHAIR BEAL: Are there any magnets involved?

DR. DREW: Not to my knowledge.

CHAIR BEAL: Better that way. Questions, I've got Joe and then Dan.

MR. JOE CIMINO: Katie, it's been a while since I was part of this, but are all the regional assessments doing something similar, or are they still kind of based on the data available you have maybe different models. One of the things I'm just curious about when you mention this is, how much can we kind of interpret? Some of these are pretty simplistic. If we see the changes in catch to say, maybe this particular assessment should be rerun, based on the fact there was a change in catch, or we could just make some assumptions.

DR. DREW: All the regional assessments use AFAC, so we are using the same model in all of the regions. All of the regions except the DelMarVa Region have fishery independent and fishery dependent indices in them. The DelMarVa Region only has a fishery dependent CPUE at this point, the MRIP index.

I think we can definitely maybe do a sensitivity run around something like; everybody is throwing this 30% reduction out across the board. We can look at maybe what is the potential impact of, if catch is lower or if effort is lower, what is the impact of that on the assessment and on stock status.

Generally, in the past we've just seen with the MRIP changes you sort of scale everything, but it doesn't really affect status, and so we would likely expect something similar in this case, but we can look into that any maybe provide guidance to the Board about, we're right on the edge with this region, but this region we're pretty confident about where we are, at part of the results.

CHAIR BEAL: All set, Joe. Dan.

MR. McKIERNAN: Katie, a few minutes ago Craig had mentioned that the tagging program actually creates a new level of accountability, or it reveals the scale of the commercial fishery, which is great. Are you seeing that in the early assessments that because of the better enumeration of commercial landings, and I'm not suggesting there is a growth in that sector, it is just more accounted for. Is that part of the story that will be coming out in the assessment?

DR. DREW: I think we'll definitely be looking at or reporting on those trends in commercial landings, which we have seen an increase, especially in New York, which does have a very, probably the most robust commercial fishery out of all of these regions. Obviously, it's hard to tease out how much of that is better reporting versus increased effort or increased catch rate.

It's also hard to sort of hindcast how much we might have been missing in the past. But I will say, obviously, the dominant fishery for all of these regions is the recreational fishery. A small increase in the commercial due to better reporting, is not going to have a huge impact on the final assessment results.

CHAIR BEAL: Other questions for Katie. All right, seeing none, for those of you tracking along this week, there is going to be a number of stock assessment presentations at the annual meeting for at least lobster, menhaden and tautog. I don't know if there are any others. That is probably enough and then some.

Be prepared, the annual meeting is going to be pretty tech heavy, and a lot of important results come out at that meeting. Seeing no other hands that brings us to Agenda Item Number 6, which is the election of a Vice Chair. Sorry, I'm sorry, a Chair, an actual Chair. Jason McNamee.

DR. McNAMEE: Yes, I have a motion, Mr. Chair. I **move to elect Matt Gates from the great state of Connecticut as the next Board Chair for the Tautog Management Board.**

CHAIR BEAL: Thank you, Jason, is there a second to that motion? Mike Luisi, thank you. **Are there any objections to electing Matt Gates as the Chair of the Tautog Management Board?** You are not getting off that easy, Joe. **I see no objections, congratulations, Matt**, appreciate it. That brings us to Other Business.

ADJOURNMENT

CHAIR BEAL: Is there anything else to come before the Menhaden Management Board. Oh my gosh, I'm brainless, Tautog Management Board. Seeing none; any hands online. Seeing no one in the room or online, we are going to **close the Tautog Management Board and thank you** all.

(Whereupon the meeting adjourned at 4:33 p.m. on Wednesday, May 7, 2025)

Atlantic States Marine Fisheries Commission

Tautog Regional Stock Assessment Update 2025

Vision: Sustainably Managing Atlantic Coastal Fisheries

Atlantic States Marine Fisheries Commission

Tautog Regional Stock Assessment Update

Prepared by the
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EXECUTIVE SUMMARY

Tautog is assessed and managed in four stock regions: the Massachusetts-Rhode Island (MARI) region, the Long Island Sound (LIS) region, the New Jersey-New York Bight (NJ-NYB) region, and the Delaware-Maryland-Virginia (DMV) region. This stock assessment is an update to the existing benchmark assessment for tautog (ASMFC 2015, ASMFC 2016); the previous assessment update was completed in 2021 (ASMFC 2021). This assessment updates the accepted statistical catch-at-age model for each region with commercial and recreational fishery catch data and indices of relative abundance from fishery-independent and fishery-dependent data sources through the terminal year of 2024

Total removals have remained constant or increased since the last assessment update in all regions. The MRIP CPUE index has also shown an increasing trend in the most recent years in all regions. This trend was consistent with the trend in other age-1+ fishery-independent indices in the MARI and LIS regions, but not in the NJ-NYB region, where the signals from the indices were more mixed. No fishery-independent indices were used in the DMV region.

Stock status varied from region to region. Tautog were not overfished in the MARI, LIS, and NJ-NYB regions, but were overfished in the DMV region. Tautog were not experiencing overfishing in the MARI or LIS regions but were experiencing overfishing in the NJ-NYB region and DMV region. Stock status did not change for the MARI or LIS regions from the 2021 update, but did change for the NJ-NYB and DMV regions. The NJ-NYB region went from being overfished but not experiencing overfishing in the 2021 update to not being overfished but experiencing overfishing in this update. The DMV region was previously not overfished or experiencing overfishing, but was considered overfished and experiencing overfishing as a result of the 2025 update.

All regions showed major retrospective patterns in *F* and SSB. The MARI, LIS, and NJ-NYB assessments overestimated *F* and underestimated SSB, while the pattern was reversed in the DMV region. This pattern was also seen in the 2021 update but appeared to have worsened during the 2025 update. The terminal year values of *F* and SSB were no longer within the confidence intervals of the model estimates and stock status did change for some regions for either *F* or SSB if the retrospective pattern was adjusted for. As a result, the SAS adjusted for the retrospective pattern for SSB and *F* in all regions, including in the short-term projections.

Investigating and resolving the worsening retrospective pattern in the assessment should be a high priority for the next benchmark. In addition, several new fishery-independent surveys, including pot-and-trap surveys more appropriate for tautog, have been initiated since the 2016 benchmark and will have long enough time-series if a new benchmark is initiated in 2027 or later.

Table 1. Stock status of tautog in the MARI, LIS, NJ-NYB, and DMV regions.

Spawning Stock Biomass				
Region	**Target**	**Threshold**	**2024**	**Status**
MARI	6,143 mt	4,595 mt	9,572 mt	Not overfished
LIS	9,799 mt	7,349 mt	13,718 mt	Not overfished
NJ-NYB	7,910 mt	5,929 mt	7,900	Not overfished
DMV	4,400 mt	3,236 mt	2,687 mt	Overfished
Retrospective adjustment applied to SSB for all regions				

Fishing Mortality				
Region	**Target**	**Threshold**	**2024**	**Status**
MARI	0.27	0.46	0.26	Not overfishing
LIS	0.25	0.35	0.25	Not overfishing
NJ-NYB	0.20	0.33	0.44	Overfishing
DMV	0.18	0.29	0.36	Overfishing
Retrospective adjustment applied to F for all regions.				

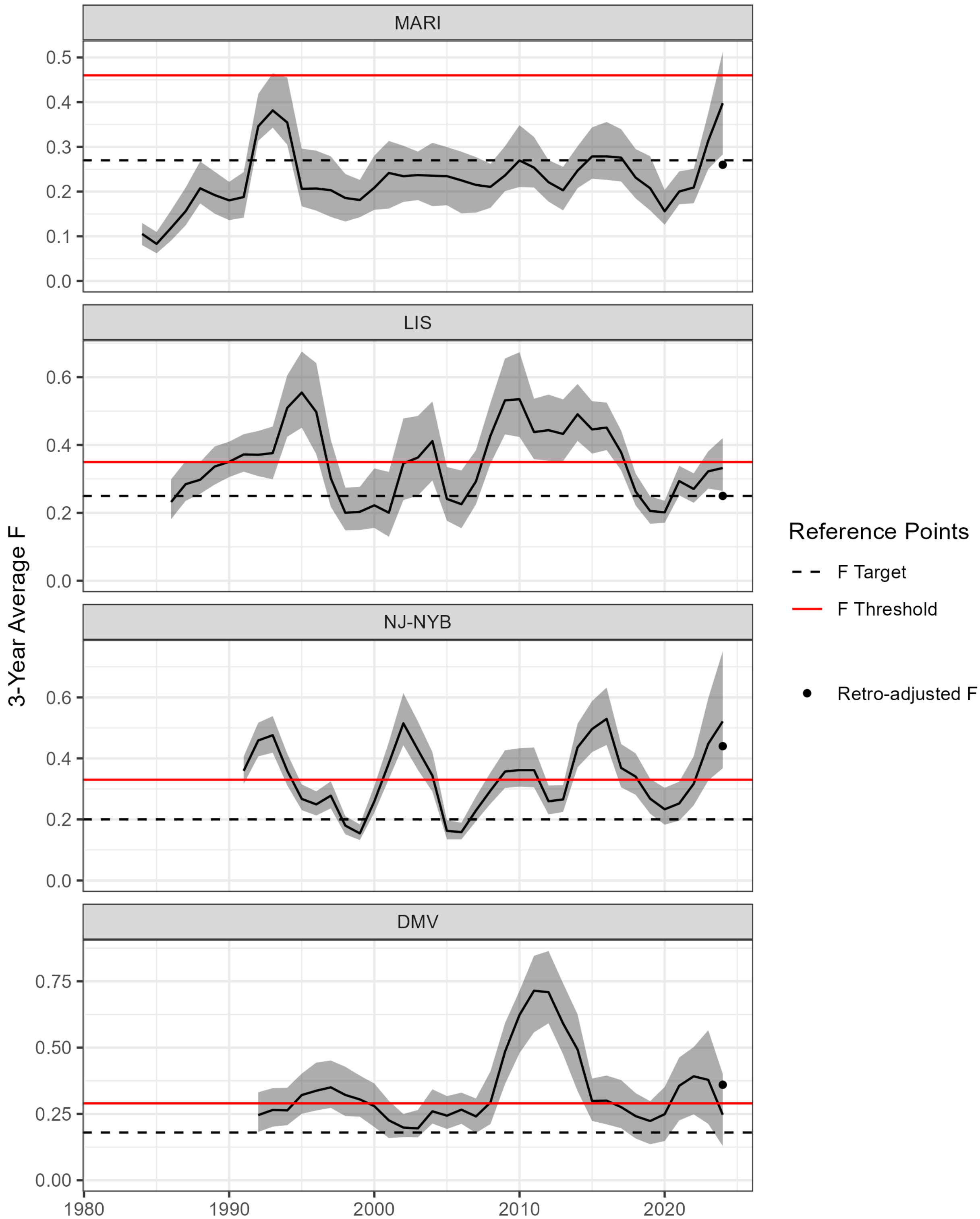

Figure 1. Three-year average fishing mortality rates for tautog in the MARI, LIS, NJ-NYB, and DMV regions plotted with the *F* target and threshold for each region. Shaded areas indicate the 95% confidence interval of the estimates. The retrospectively adjusted values were used to assess overfishing status in 2024.

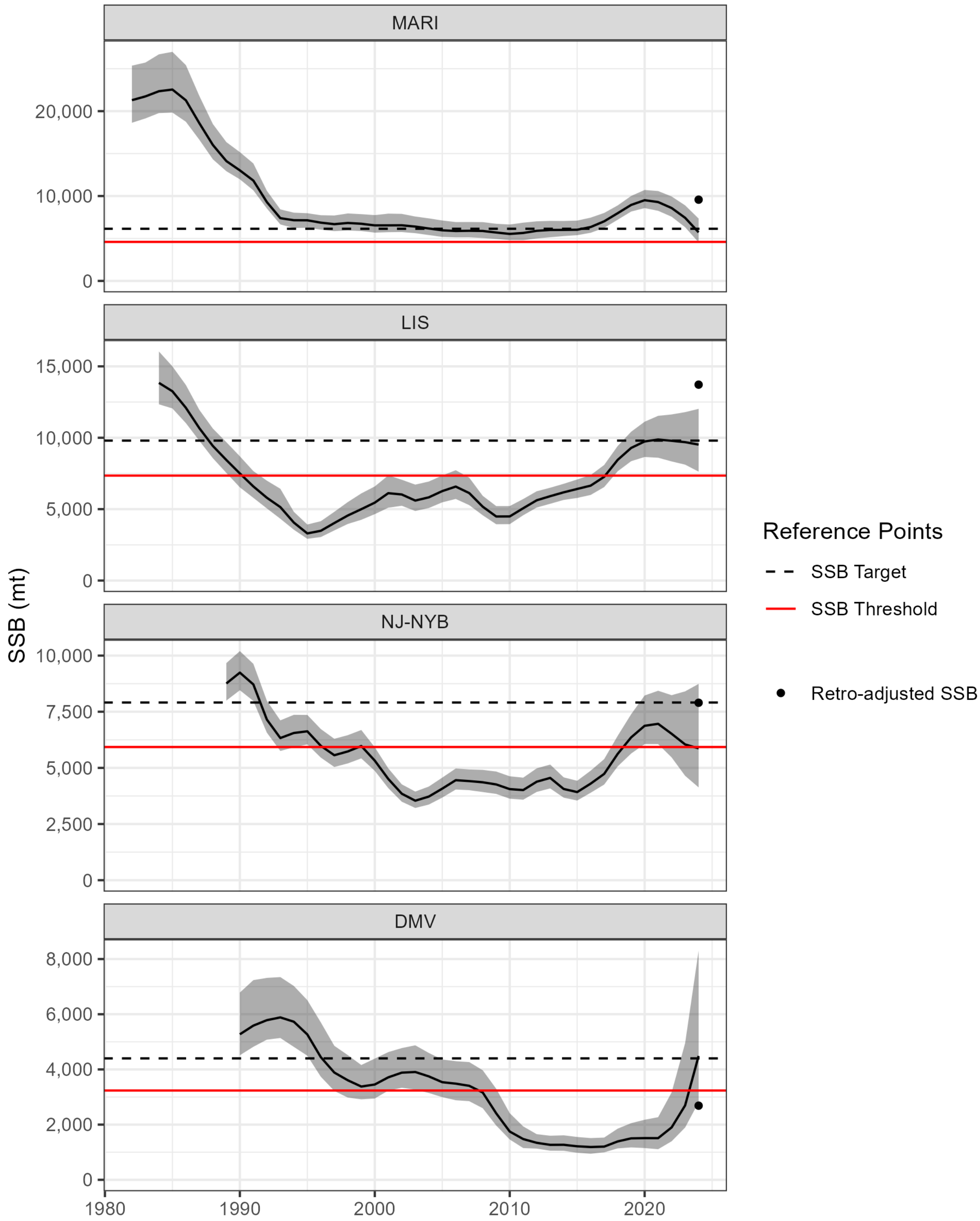

Figure 2. Spawning stock biomass of tautog in the MARI, LIS, NJ-NYB, and DMV regions plotted with the SSB target and threshold for each region. Shaded areas indicate the 95% confidence interval of the estimates. The retrospectively adjusted values were used to assess overfished status in 2024.

Table of Contents

Executive Summary 1
List of Tables 8
List of Figures 9
Massachusetts-Rhode Island Region 1
Executive Summary 1
TOR 1. Update fishery-dependent data (landings, discards, catch-at-age, etc.) that were used in the previous peer-reviewed and accepted benchmark stock assessment. 1
TOR 2. Update fishery-independent data (abundance indices, age-length data, etc.) that were used in the previous peer-reviewed and accepted benchmark stock assessment. 3
TOR 3. 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. 3
TOR 4. 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. 4
TOR 5. Update the biological reference points or trend-based indicators/metrics for the stock. Determine stock status. 5
TOR 6. Conduct short term projections when appropriate. Discuss assumptions if different from the benchmark and describe alternate runs. 5
TOR 7. 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. 6
References 7
List of Appendices 7
Tables 8
Figures 12
Long Island Sound Region 22
Executive Summary 22
TOR 1. Update fishery-dependent data (landings, discards, catch-at-age, etc.) that were used in the previous peer-reviewed and accepted benchmark stock assessment. 22
TOR 2. Update fishery-independent data (abundance indices, age-length data, etc.) that were used in the previous peer-reviewed and accepted benchmark stock assessment. 23
TOR 3. 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. 24
TOR 4. 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. 24
TOR 5. Update the biological reference points or trend-based indicators/metrics for the stock. Determine stock status. 25

TOR 6. Conduct short term projections when appropriate. Discuss assumptions if different from the benchmark and describe alternate runs. 25
TOR 7. 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. 26
References 27
List of Appendices 27
Tables 28
Figures 32
New Jersey – New York Bight Region 42
Executive Summary 42
TOR 1. Update fishery-dependent data (landings, discards, catch-at-age, etc.) that were used in the previous peer-reviewed and accepted benchmark stock assessment. 42
TOR 2. Update fishery-independent data (abundance indices, age-length data, etc.) that were used in the previous peer-reviewed and accepted benchmark stock assessment. 43
TOR 3. 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. 43
TOR 4. 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. 44
TOR 5. Update the biological reference points or trend-based indicators/metrics for the stock. Determine stock status. 45
TOR 6. Conduct short term projections when appropriate. Discuss assumptions if different from the benchmark and describe alternate runs. 46
TOR 7. 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. 46
References 46
List of Appendices 46
Tables 47
Figures 51
Delaware-Maryland-Virginia Region 61
Executive Summary 61
TOR 1. Update fishery-dependent data (landings, discards, catch-at-age, etc.) that were used in the previous peer-reviewed and accepted benchmark stock assessment. 61
TOR 2. Update fishery-independent data (abundance indices, age-length data, etc.) that were used in the previous peer-reviewed and accepted benchmark stock assessment. 63
TOR 3. 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. 63
TOR 4. 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. 64
TOR 5. Update the biological reference points or trend-based indicators/metrics for the stock. Determine stock status. 66
TOR 6. Conduct short term projections when appropriate. Discuss assumptions if different from the benchmark and describe alternate runs. 67
TOR 7. 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. 68
References 68
List of Appendices 69
Tables 70
Figures 76
Regional Appendices 86

LIST OF TABLES

Table 1. Stock status of tautog in the MARI, LIS, NJ-NYB, and DMV regions. 2
Table 2. Total removals in metric tons by sector for the MARI region. 8
Table 3. Indices used in the ASAP model for the MARI region. 9
Table 4. Model structure and life history information used in the MARI stock assessment.......... 9
Table 5. Spawning stock biomass, recruitment, annual F, and 3-year average F estimated for the MARI region. 10
Table 6. SSB and F reference points from 2021 and 2025 updates for the MARI region............ 11
Table 7. Stock status for the MARI region. 11
Table 8. Short-term projection results for the MARI region under status quo removals. 11
Table 9. Total removals in metric tons by sector for the LIS region. 28
Table 10. Indices used in the ASAP model for the LIS region. 29
Table 11. Model structure and life history information used in the LIS stock assessment.......... 29
Table 12. Spawning stock biomass, recruitment, annual F, and 3-year average F estimates for the LIS region. 30
Table 13. SSB and F reference points from 2021 and 2025 updates for the LIS region. 31
Table 14. Stock status for the LIS region with adjusted estimates of SSB and F. 31
Table 15. Projection results for the LIS region.. 31
Table 16. Annual removals by sector (in metric tons) for the NJ-NYB region. 47
Table 17. Indices used in the ASAP model for the NJ-NYB region. 48
Table 18. Model structure and life history information used in the NJ-NYB stock assessment. 48
Table 19. Spawning stock biomass, recruitment, annual F, and 3-year average F estimates for the NJ-NYB region. 49
Table 20. SSB and F reference points from the 2021 update and the 2025 update for the NJ-NYB region. 50
Table 21. Stock status for the NJ-NYB region. 50
Table 22. Short-term projection results for the NJ-NYB region. 50
Table 23. Total removals in metric tons by sector for the DMV region. 70
Table 24. Indices used in the ASAP model for the DMV region. 71
Table 25. Time series of the MRIP index for the DMV region.. 72
Table 26. Model structure and life history information used in the stock assessment. 73
Table 27. Spawning stock biomass in metric tons, recruitment (millions of age-1 fish), annual fishing mortality (*F*), and 3-year average *F* estimates for the DMV region. 74
Table 28. SSB and *F* reference points from 2021 and 2025 assessment updates for the DMV region. 75
Table 29. Stock status for the DMV region. 75
Table 30. Projection results for the DMV region. 75

LIST OF FIGURES

Figure 1. Three-year average fishing mortality rates for tautog in the MARI, LIS, NJ-NYB, and DMV regions plotted with the *F* target and threshold for each region. 3
Figure 2. Spawning stock biomass of tautog in the MARI, LIS, NJ-NYB, and DMV regions plotted with the SSB target and threshold for each region. 4
Figure 3. Total removals by sector for the MARI region. 12
Figure 4. Indices of abundance used in the ASAP model for the MARI region. 13
Figure 5. Estimates of the annual full *F* for the MARI region from the 2021 update and the 2025 update. 14
Figure 6. Estimates of spawning stock biomass for the MARI region from the 2021 update and the 2025 update. 15
Figure 7. Estimates of recruitment for the MARI region from the 2021 update and the 2025 update. 16
Figure 8. Retrospective analysis for annual F for the MARI region in absolute numbers (top) and percent difference (bottom). 17
Figure 9. Retrospective analysis for SSB for the MARI region in absolute numbers (top) and percent difference (bottom). 18
Figure 10. Retrospective analysis for recruitment for the MARI region in absolute numbers (top) and percent difference (bottom). 19
Figure 11. Annual SSB plotted with SSB target and threshold (top) and 3-year average F plotted with F target and threshold (bottom) for the MARI region. 20
Figure 12. Status quo harvest projections for the MARI region showing the trajectory of annual F (top) and SSB (bottom) with their target and threshold reference points. 21
Figure 13. Total removals by sector for LIS region. 32
Figure 14. Indices of abundance used for the LIS region. 33
Figure 15. Estimates of the 3-year average F for the 2021 update and the 2025 update for the LIS region. 34
Figure 16. Estimates of spawning stock biomass for the 2021 update and the 2025 update for the LIS region. 35
Figure 17. Estimates of recruitment for the 2021 update and the 2025 update for the LIS region. 36
Figure 18. Retrospective analysis for the 3-year average F in absolute numbers (top) and percent difference (bottom) for the LIS region. 37
Figure 19. Retrospective analysis for annual SSB in absolute numbers (top) and percent difference (bottom) for the LIS region. 38
Figure 20. Retrospective analysis for annual recruitment in absolute numbers (top) and percent difference (bottom) for the LIS region. 39
Figure 21. Annual SSB plotted with SSB target and threshold (top), and 3-year average F plotted with F target and threshold (bottom) for the LIS region. 40

Figure 22. Status quo harvest projections for the LIS region for F (top) and SSB (bottom). 41
Figure 23. Total removals for the NJ-NYB region by sector. 51
Figure 24. Observed CPUE for each index used in the NJ-NYB region. 52
Figure 25. Estimates of the 3-year average of F from the 2025 update compared with the 2021 update for the NJ-NYB region. 53
Figure 26. Estimates of spawning stock biomass from the 2025 update compared to the 2021 update for the NJ-NYB region. 54
Figure 27. Estimates of recruitment for the 2025 update compared to the 2021 update for the NJ-NYB region. 55
Figure 28. Retrospective analysis for the three-year average *F* in absolute numbers (top) and percent difference (bottom) for the NJ-NYB region. 56
Figure 29. Retrospective analysis for SSB in absolute numbers (top) and percent difference (bottom) for the NJ-NYB region. 57
Figure 30. Retrospective analysis for recruitment in absolute numbers (top) and percent difference (bottom) for the NJ-NYB region. 58
Figure 31. Stock status for the NJ-NYB region. 59
Figure 32. Short-term projection results for the NJ-NYB region using the average of the most recent three years of removals for F (top) and SSB (bottom) plotted with the F and SSB reference points. 60
Figure 33. Total removals by sector for the DMV region. 76
Figure 34. Indices of abundance used for the DMV region. 77
Figure 35. Estimates of the annual full F based on the 2016, 2021 and 2025 updates for the DMV region. 78
Figure 36. Estimates of spawning stock biomass for the 2016, 2021 and 2025 updates for the DMV region. 79
Figure 37. Estimates of recruitment for the 2016, 2021 and 2025 updates for the DMV region. 80
Figure 38. Retrospective analysis for annual F in absolute numbers (top) and percent difference (bottom) for the DMV region. 81
Figure 39. Retrospective analysis for SSB in absolute numbers (top) and percent difference (bottom) for the DMV region. 82
Figure 40. Retrospective analysis for recruitment in absolute numbers (top) and percent difference (bottom) for the DMV region. 83
Figure 41. Stock status of tautog in the DMV region. 84
Figure 42. Status quo harvest projections for the DMV region showing the trajectory of annual F (top) and SSB (bottom) with their target and threshold reference points. 85

Tautog Stock Assessment Update
MASSACHUSETTS-RHODE ISLAND REGION
2025

Executive Summary
The 2025 Massachusetts-Rhode Island Region (MARI) stock assessment update used the accepted 2016 benchmark statistical catch-at-age model (ASAP, ASMFC, 2015), adding new years of data since the 2021 stock assessment update. Updated data through 2024 were included for commercial and recreational catch, age and length composition, and fishery-independent indices. No changes to the model occurred during this assessment update and calculations for the biological reference points followed the spawning potential ratio (SPR)-based methods. Model diagnostics showed continued trends in certain residual patterns (e.g., catch and age composition) and a significant retrospective pattern was observed for both three-year averaged fishing mortality rate and spawning stock biomass (Mohn's rho of 0.55 and -0.40, respectively), necessitating an adjustment to the terminal year estimates. The adjusted three-year averaged (2022-2024) fishing mortality rate (F) of 0.26 was below the fishing mortality threshold reference point of 0.46, indicating overfishing is not occurring. The adjusted estimate of spawning stock biomass (SSB) of 9,572 mt was above the threshold of 4,595 mt, indicating that the MARI population is not overfished. Spawning stock biomass has had an increasing trend since 2016, likely due in part to a couple very high recruitment years in 2015-2016. Despite recent lower recruitment likely contributing to a projected decline in SSB from 2025-2027, the three-year projected estimate has a 100% probability of remaining above both the SSB threshold and the SSB target. However, the three-year projection shows fishing mortality continuing to increase through 2027, with a 26% probability of *F* being at or above the *F* threshold in 3 years.

TOR 1. Update fishery-dependent data (landings, discards, catch-at-age, etc.) that were used in the previous peer-reviewed and accepted benchmark stock assessment.
All datasets included in the 2021 Update Assessment (ASMFC, 2021) were updated to include 2021-2024 data.

Total weight of commercial landings from 1982–2024 were sourced from the Atlantic Coastal Cooperative Statistics Program. The total commercial landings were converted into catch at length using the length frequency distribution of the recreational (MRIP) catch as it is assumed the commercial and recreational length distribution of tautog is consistent between the two fisheries due to similar size regulations, seasons, and gear usage. The catch at length was then multiplied by an age-length key populated by biological data (length/age relationship) from fisheries dependent and independent sources from the MARI region for each year.

Recreational landings in weight and numbers of fish and releases in numbers of fish were retrieved from the MRIP estimates. Recreational landings were converted into catch at age using the same methods as the commercial catch such that the length frequency distribution of the MRIP catch was used to generate catch at length. From there, the catch at length was multiplied by annual age-length keys populated by biological data from the region.

While recreational landings are available in both weight and numbers, the recreational releases are only reported by MRIP in numbers of fish. To determine the total weight of the recreational releases, the length frequency data from the combined MRIP headboat discard data (Type 9) and the American Littoral Society (ALS) volunteer angler survey was applied. By including both these data sources, releases due to length limits as well as other factors (out of season, already reached bag limit, etc.) were accounted for and give an overall makeup of discards in this dataset. The combined length frequencies were used to convert the recreational releases at length into releases at age using the annual age-length keys from the region. The discard mortality rate of 2.5% was then used to obtain the total weight of recreational dead discards and dead discard numbers at age. Total recreational removals by weight and by numbers at age were determined by adding together recreational landings and dead discards.

A single fleet for catch is used in the tautog assessment model, therefore, the total recreational removals in weight and the total commercial removals in weight were combined to represent all removals (converted to metric tons). The total removals at age were also combined (commercial, recreational landings, and recreational discards) into a single fleet.

In the MARI region, the tautog fishery is primarily recreational with recreational removals accounting for 93% of the total removals and a series high of 98% in 2023 (Table 2, Figure 3). From 1982–1992, removals were high, but variable averaging roughly 1.5 million fish per year for the region. Removals have decreased significantly since 1993, averaging roughly 425,000 fish from 1993–2013. Amendment 1 to the tautog FMP was passed in 2017, and from 2018–2024 on average just over 1 million fish have been harvested recreationally in the region per year. This increase is due to recent increases in recreational landings for the region, along with increases in recreational releases. From 2018–2020, recreational landings were closer to 1993–2013 levels averaging approximately 550,000 fish per year. From 2021–2024, recreational landings jumped significantly to an average of 1.3 million fish per year.

The commercial fishery follows a similar trend to the recreational fishery. Landings peaked in 1991 at 329 mt before decreasing in the mid/late 1990s (Table 2, Figure 3). Since the late 1990s commercial landings have remained fairly stable. Since the adoption of Amendment 1, landings have averaged 52.8 mt (2018–2024).

A catch-per-unit-effort (CPUE) index of abundance was used following the same species guild approach as the benchmark assessment. A guild including black sea bass, scup, fluke, and winter flounder was used to identify tautog trips and a generalized linear model (GLM) was used to standardize catch-per-trip as an index of abundance. The same factors were used in the standardization model as in previous assessments (Year, Wave, State, Mode, Angler-Hours) with one addition, Area Fished. The index was also updated to include the data from 2021–2024. The MRIP CPUE index was high and somewhat variable at the beginning of the series before declining through the mid-1990s to lower stable levels throughout the 2000s (Figure 4). The index in recent years (2020–2024) is the highest observed since 1996.

TOR 2. Update fishery-independent data (abundance indices, age-length data, etc.) that were used in the previous peer-reviewed and accepted benchmark stock assessment.

There were three fishery-independent indices incorporated in the 2021 Update Assessment that were updated with data from 2021–2024 for this assessment: the Massachusetts Spring Trawl Survey, the Rhode Island Fall Trawl Survey, and the Rhode Island Narragansett Bay Seine Survey (Table 3, Figure 4). The MA and RI trawl survey's age composition information is shown in MARI Appendix 1. The RI seine is a young-of-the-year survey and therefore no age composition is available. Each index was standardized using GLMs to account for factors that may impact the catchability of tautog (such as depth and temperature).

The MA trawl survey uses a stratified random design occurring in the spring and fall of each year, with the exception of 2020 due to COVID-19 restrictions. The 2025 assessment update continued using only the spring survey, similar to previous tautog assessments, for the 2021–2024 data additions. Overall, the survey index peaked in the late 1980s followed by a decline through the 1990s and has since remained at low, relatively stable levels (Figure 4).

The RI trawl survey has operated without interruption since 1979 as a two-season survey (spring and fall) and uses a stratified random design. In 1990, a monthly component was added to the survey that operates year-round under a stratified random design. For this model, only the fall portion of the survey was considered, remaining consistent with the benchmark and 2021 update. Similar to the MA survey, the RI survey index peaked in the mid to late 1980's and then declined to a low level where it has largely remained since (Figure 4).

The RI Narragansett Bay seine survey has operated since 1986 with a consistent standardized methodology since 1988. The survey samples 18 fixed stations throughout Narragansett Bay from June–October annually. The index has been variable over time, increasing through the 2000's before decreasing to a recent low in 2011 of 0.8 fish/seine. The index then increased, hitting a time series high of 16.3 fish/seine in 2022; however, this was followed by a steep decline in 2023 and 2024 (Figure 4).

Age-length data was collected for the MARI region annually in compliance with the tautog FMP. Data collected from 2021–2024 was combined to form annual age-length keys for the region. Samples were collected from both fishery-dependent and fishery-independent sources. This ensures a full sampling of size and age classes as well as provides larger sample sizes for developing the keys. Gaps in the data (i.e., missing length samples) were filled using data from neighboring length bins or using samples from surrounding regions in those missing bins.

TOR 3. 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.

There were no significant changes to the life history information or model structure since the Benchmark Stock Assessment (Table 4).

This update includes data from 1982–2024. For all datasets, all fish greater than age-12 were combined into a 12+ group. Maturity was set to 0 for age 1 and age 2, 0.8 for age 3 fish, and 1 (fully mature) for all fish age 4 and older across the entire time series. Natural mortality was fixed at 0.16 for all ages and across all years. Release mortality for all age classes across the time series was fixed at 2.5%. Size at age (length at age, weight at age) were developed for each year in the time series, accounting for changes in the biomass over time. The existing sensitivity blocks were maintained through this assessment, with the additional years since the 2021 update included in the final sensitivity block.

TOR 4. 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.

The 2025 assessment update used the accepted 2016 benchmark assessment model (Age Structured Assessment Program from NOAA Fisheries Toolbox), adding data through 2024, to obtain updated estimates of fishing mortality, spawning stock biomass, and recruitment. The updated ASAP model ran successfully, without error, though the model struggled to fit to each index time series precisely, particularly in capturing peaks in abundance early in the MA and RI trawl surveys, or the RI seine in its entirety (see MARI Appendix 1). However, the fits generally matched the trends and were similar to those seen in the 2021 assessment update. Some residual patterns were evident in the age composition diagnostic plots for the indices, similar to the 2021 assessment update (see MARI Appendix 1). Additionally, there was a pattern evident in the total catch residuals, where total catch was largely overestimated prior to 2000 and underestimated thereafter. These patterns were not deemed problematic enough to prohibit the use of this model for assessment or management purposes.

Annual fishing mortality was low through the 1980s (time series low in 1985 of 0.07) then increased to a time series high in 1992 (0.63). Following this peak, annual *F* has varied about a mean of approximately 0.24 through 2024 (Table 5, Figure 5). Spawning stock biomass was above 20,000 mt early in the time series but declined fairly rapidly through the early 1990s and remained at a mean of approximately 6,500 mt from 1992–2017 (Table 5, Figure 6). Recently SSB has shown a slight increase, though it has remained less than 10,000 mt. Recruitment estimates remained largely stable throughout the time series until a marked increase in 2015 and 2016 (Table 5, Figure 7). Estimates of recruitment in recent years have been lower than the time series average and reached a time series low in 2024. High recruitment peaking in 2015 likely contributed to the recent bump seen in spawner biomass (see MARI Appendix 1).

A retrospective analysis was completed using a seven-year peel (i.e., 2017–2024) that showed a significant retrospective pattern for the three-year average *F* (Mohn's rho = 0.55), SSB (Mohn's rho = -0.40), and recruitment (Mohn's rho = -0.34). The model runs tended to overestimate *F* and underestimate SSB and recruitment relative to the terminal year run (Figure 8 - Figure 10). The adjusted estimates of *F* and SSB to account for the retrospective pattern fell outside the confidence intervals of the terminal year estimates for these parameters (MARI Appendix 2

Figure A2.1), warranting the adjustment of *F* and SSB for this assessment (ASMFC 2024). The source of the retrospective pattern is unknown; however, there are several sources of uncertainty in this assessment, and a minor retrospective pattern was observed in the 2021 update. The unadjusted estimates for the 3-year average *F* and SSB were 0.40 and 5,725 mt, respectively. Retrospective adjusted estimates were 0.26 and 9,572, respectively.

Sensitivity analyses were run to look at model dependence on the four survey indices (MA trawl survey, RI trawl survey, RI seine survey, and MRIP CPUE). The final ASAP model chosen for this assessment used adjusted catch and index CVs to correct for Root Mean Square Errors (see MARI Appendix 1); therefore, an additional sensitivity run was completed to look at model performance with the unadjusted CVs. No sensitivity run substantially changed the general trends in fishing mortality or SSB over the time series (MARI Appendix 2 Figures A2.2 and A2.3), though removing the MA trawl survey had a larger impact than the other sensitivity runs. The retrospective error for fishing mortality improved slightly for the runs where the RI trawl and MRIP CPUE indices were removed. The retrospective error for SSB improved in the runs where RI trawl and MRIP CPUE were removed as well as when using the original CVs.

TOR 5. Update the biological reference points or trend-based indicators/metrics for the stock. Determine stock status.

The target and threshold levels for fishing mortality (F) were calculated using spawning potential ratio (SPR) reference points. The updated target *F* reference point for 2024, F40%, was 0.27, and the threshold level, F30%, was 0.46, similar values as those estimated for the previous assessment updates (Table 6). The adjusted three-year averaged (i.e., 2022–2024) *F* was estimated to be 0.26 (Table 7). Since the three-year average *F* was below the threshold, the model did not indicate that overfishing was occurring (Figure 11).

Target and threshold spawning stock biomass reference points were calculated by determining equilibrium SSB when assuming fishing at both the target and threshold fishing mortality levels. During these projections, historical recruitment patterns as well as terminal year selectivity, maturity and weight-at-age were assumed. These calculations were conducted using the AgePro program from the NOAA Fisheries Toolbox. The SSB threshold was 6,143 mt and the SSB target was 4,595 mt, similar to the estimates from the 2021 update (Table 6). The adjusted estimated 2024 SSB was 9,572 mt (Table 7). Since the estimated spawner biomass was above both the target and the threshold, the model indicated that the stock was not overfished (Figure 11).

TOR 6. Conduct short term projections when appropriate. Discuss assumptions if different from the benchmark and describe alternate runs.

Short term, three-year projections (2025–2027) were completed to estimate the probability of overfishing or the stock being overfished during the period. Projections were completed using an assumed constant harvest level equal to the average total removals from 2022–2024 (2,134 mt). All other parameters (life history information and selectivity patterns) were assumed to be the same as used in the ASAP model. Recruitment was randomly drawn from the empirical distribution of recruitment estimated by the ASAP model. Short term projections showed a 100% probability of being at or above the SSB threshold in three years and a 0.3% probability the fishing mortality will be at or below target in three years (Table 8, Figure 12).

TOR 7. 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.

Fishery-dependent high priorities from the last benchmark assessment focused on biological sampling. There remains a need for expanded sampling of commercial catch, continuation of collecting age structures, increasing catch and discard lengths from commercial and recreational fisheries, and an increase in MRIP sampling to improve recreational catch estimates.

Since the benchmark, the ageing committee has approved the pelvic spine as an appropriate age structure. Since that recommendation, both MA and RI have moved forward with pelvic spines as the primary ageing structure. As in the previous update, differences were seen between MA and RI length-at-age. Moving forward, the observed differences should be investigated to determine if they are naturally occurring (i.e., there are differences in length-at-age between the two states) or if it is a result of differences in ageing techniques.

While improvements to the MRIP sampling have been ongoing since the last benchmark, additional improvements to sampling should be explored. State-level PSEs have improved for Massachusetts and Rhode Island; however, additional sampling at the mode-level would greatly increase the understanding of the recreational fishery as whole.

Fishery-independent priorities include conducting a workshop and pilot studies to design and implement a standardized multi-state fishery survey to monitor tautog abundance and to develop YOY indices, and to enhance age structure collection for smaller fish.

While MARI has the RI seine survey used as a YOY index for the region to fulfill the need locally; working towards a multi-state fishery survey to improve YOY indices will further increase the understanding of recruitment and decrease a source of uncertainty found in the current assessment.

Additional survey methods should be investigated and considered. Outside of the RI seine survey, the other fishery-independent data sources used in the model were trawl surveys. Trawl nets are known to be a sub-optimal method for sampling tautog, as tautog's preferred habitat is rocky areas and reefs, where trawls cannot tow. Alternative survey types, such as fish pot, should be considered to appropriately sample this species.

Though RI and MA have both begun sampling smaller fish for age/length information, increased sample sizes across the entire size range, including these smaller fish, should continue to be a priority for the region to improve the age-length key.

The last benchmark assessment for tautog was completed in 2016. Given that nearly a decade has passed, a new benchmark assessment should be considered. Some considerations for a new assessment should be: reducing uncertainty, managing/improving retrospective patterns seen in both the current (2025) update and the 2021 update, investigating differences in age-length relationships across the region, and to improve the understanding of recruitment within the region.

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List of Appendices

MARI Appendix 1: ASAP Input and Diagnostic Plots for the Base Run
MARI Appendix 2: Retrospective Adjustment and Sensitivity Runs

Tables

Table 2. Total removals in metric tons by sector for the MARI region.

Year	Recreational Harvest (mt)	Recreational Release Mortalities (mt)	Commercial Harvest (mt)
1982	2,700.6	2.8	70.6
1983	1,714.1	12.4	90.8
1984	1,761.8	21.6	182.7
1985	603.4	6.9	211.6
1986	4,363.9	25.7	239.9
1987	1,834.5	15.1	304.1
1988	2,905.9	26.6	274.9
1989	1,523.2	8.6	257.1
1990	1,792.2	15.1	226.9
1991	2,502.6	23.7	329.3
1992	4,624.0	15.4	295.8
1993	1,109.0	7.9	164.2
1994	579.8	16.4	76.1
1995	507.1	14.8	59.1
1996	771.0	22.3	44.2
1997	441.9	14.9	47.1
1998	415.7	12.4	50.6
1999	1,033.1	35.2	46.1
2000	903.2	14.0	63.4
2001	655.3	20.0	63.7
2002	788.3	40.6	89.8
2003	868.9	30.3	63.9
2004	818.2	20.7	56.6
2005	1,052.1	29.3	64.5
2006	732.2	31.1	88.4
2007	650.6	27.8	72.2
2008	732.8	22.6	55.3
2009	855.3	35.0	47.9
2010	1,106.9	28.1	54.1
2011	513.7	41.2	47.7
2012	868.9	42.7	53.5
2013	1,571.0	67.6	56.1
2014	1,198.2	104.1	52.9
2015	973.6	72.7	49.4
2016	729.1	55.6	49.3
2017	1,580.3	109.1	54.1
2018	623.8	101.1	51.0
2019	965.8	119.3	51.5
2020	701.3	162.0	52.6
2021	2,049.7	167.5	54.0
2022	1,389.9	114.5	55.9
2023	2,455.8	204.7	50.6
2024	1,911.2	164.5	54.2

Table 3. Indices used in the ASAP model for the MARI region.

Index Name	Index Metric	Design	Time of Year	Years	Ages
MRIP CPUE	Total Catch Per Unit Effort	Stratified Random	Mar-Dec	1982-2024	2+
Massachusetts Trawl Survey	Mean number per tow	Stratified Random	Spring and Fall	1982-2019; 2021-2024	2+
Rhode Island Fall Trawl Survey	Mean number per tow	Stratified Random	September - November	1982 - 2024	2+
Rhode Island Narragansett Bay Seine	Mean number per haul	Fixed	June - October	1988-2024	YOY

Table 4. Model structure and life history information used in the MARI stock assessment.

	Value(s)
Years in Model	1982-2024
Age Plus Group	12+
Fleets	1 (Rec and Commercial)
Recreational Release Mortality Rate	2.5%

	Age Group											
	1	2	3	4	5	6	7	8	9	10	11	12+
Proportion mature-at-age	0	0	0.8	1	1	1	1	1	1	1	1	1
Natural mortality	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16

Table 5. Spawning stock biomass, recruitment, annual F, and 3-year average *F* estimated for the MARI region.

Year	Spawning stock biomass (mt)	Recruitment (millions of age-1 fish)	Annual F	3-year Average F
1982	21,294	4.38	0.13	-
1983	21,738	2.86	0.09	-
1984	22,347	2.02	0.09	0.10
1985	22,547	1.74	0.07	0.08
1986	21,276	2.06	0.20	0.12
1987	18,575	2.22	0.20	0.15
1988	16,017	2.46	0.22	0.21
1989	14,118	2.28	0.15	0.19
1990	13,024	1.86	0.16	0.18
1991	11,823	1.86	0.24	0.19
1992	9,292	1.83	0.63	0.34
1993	7,393	1.73	0.27	0.38
1994	7,150	1.64	0.16	0.35
1995	7,141	1.66	0.18	0.20
1996	6,866	1.47	0.27	0.20
1997	6,686	1.57	0.15	0.20
1998	6,827	2.00	0.13	0.18
1999	6,735	2.00	0.26	0.18
2000	6,542	1.72	0.23	0.21
2001	6,544	1.24	0.23	0.24
2002	6,552	1.29	0.23	0.23
2003	6,403	1.44	0.24	0.23
2004	6,177	1.78	0.22	0.23
2005	5,962	1.57	0.23	0.23
2006	5,880	1.39	0.21	0.22
2007	5,906	1.44	0.19	0.21
2008	5,885	1.89	0.22	0.21
2009	5,703	1.80	0.29	0.23
2010	5,538	1.59	0.29	0.27
2011	5,650	1.65	0.17	0.25
2012	5,902	2.09	0.19	0.22
2013	6,003	2.06	0.24	0.20
2014	6,011	2.59	0.30	0.24
2015	6,031	3.58	0.28	0.27
2016	6,349	3.35	0.24	0.27
2017	7,021	2.53	0.29	0.27
2018	7,976	1.85	0.15	0.23
2019	8,952	1.39	0.17	0.20
2020	9,510	1.34	0.14	0.15
2021	9,290	1.30	0.28	0.20
2022	8,588	1.17	0.19	0.20
2023	7,436	1.47	0.45	0.31
2024	5,726	0.57	0.53	0.39
*2024**	*9,572*			*0.26*

**Retrospectively adjusted values*

Table 6. SSB and *F* reference points from 2021 and 2025 updates for the MARI region.

	SSB		F	
	Target	Threshold	Target	Threshold
2021 Update	6,137	4,703	0.28	0.49
2025 Update	6,143	4,595	0.27	0.46

Table 7. Stock status for the MARI region.

	SSB		F	
	Target	Threshold	Target	Threshold
Reference Points	6,143	4,595	0.27	0.46
2024 Estimate	9,572*		0.26*	
2024 Status	Not Overfished		Overfishing is Not Occurring	

*: Retrospectively-adjusted values

Table 8. Short-term projection results for the MARI region under status quo removals.

Landings (mt) for 2025-2027	Probability of being at or above *F* threshold in 3 years	Probability of being at or below SSB threshold in 3 years
Status quo (2022-2024 average)	26%	0%

Figures

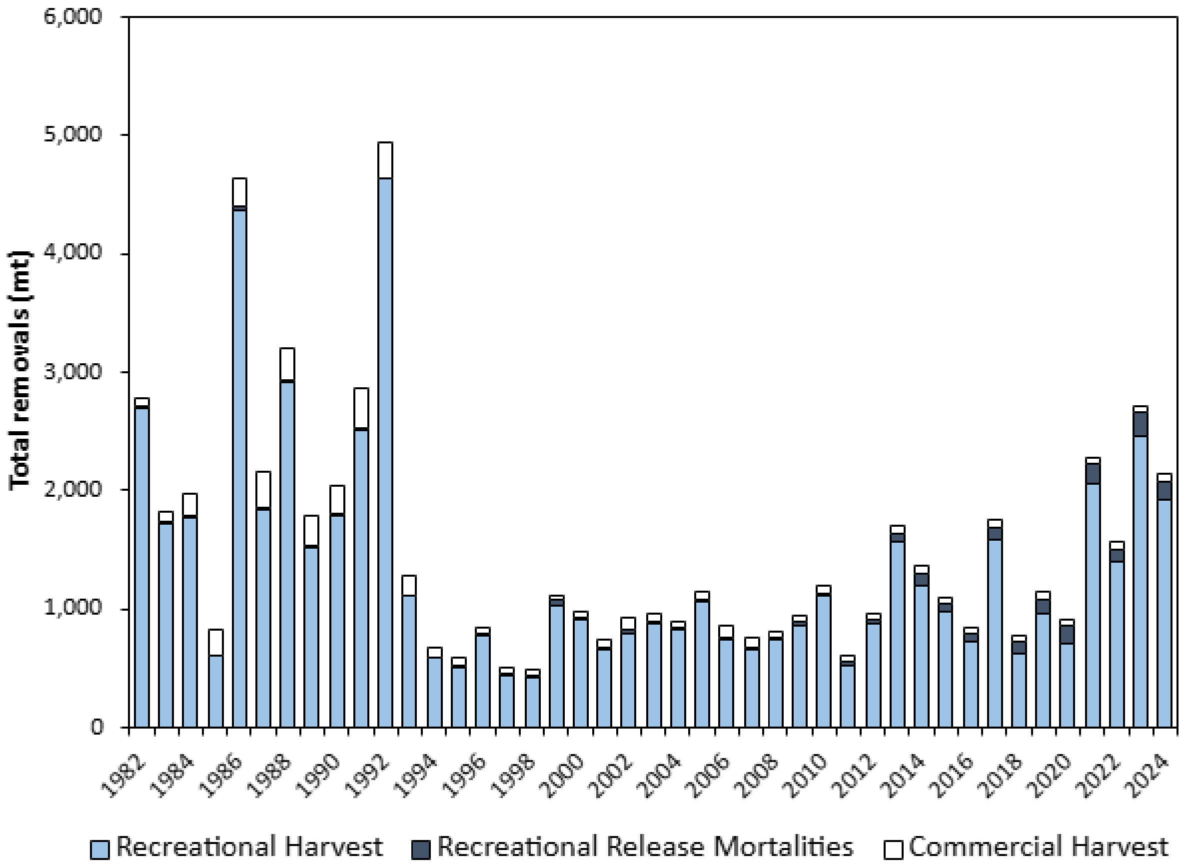


Figure 3. Total removals by sector for the MARI region.

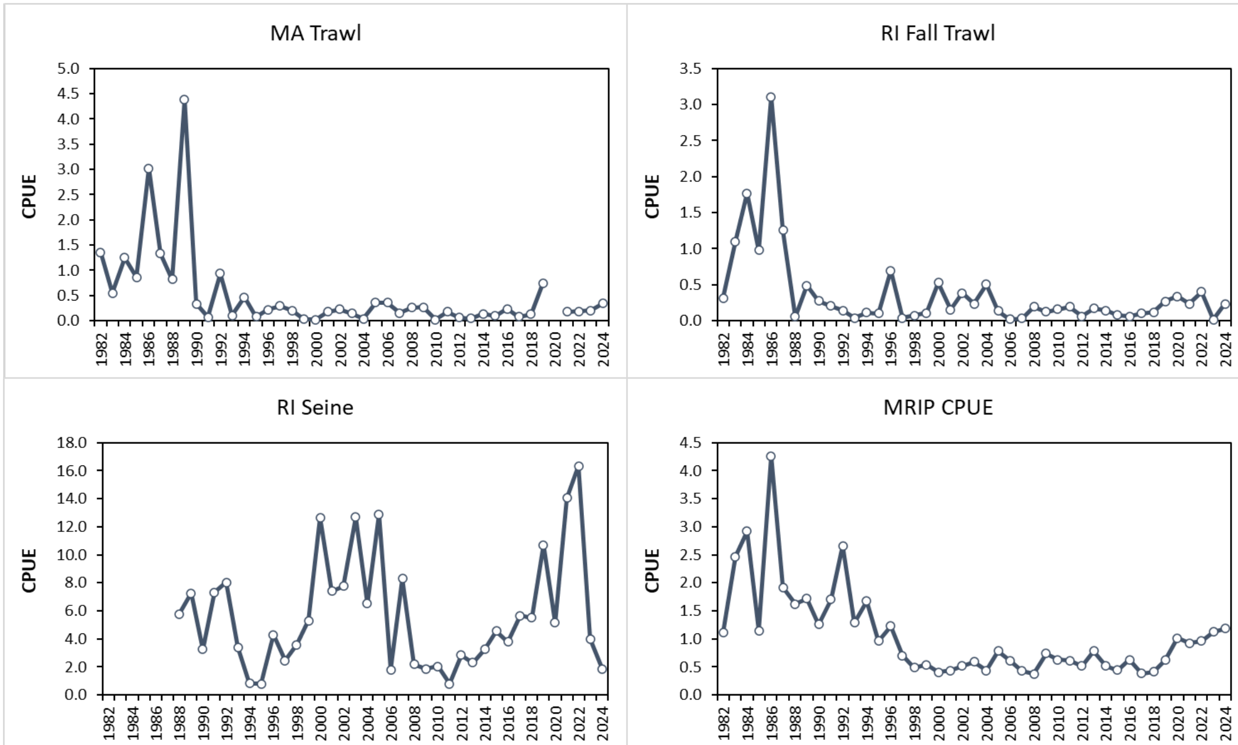


Figure 4. Indices of abundance used in the ASAP model for the MARI region.

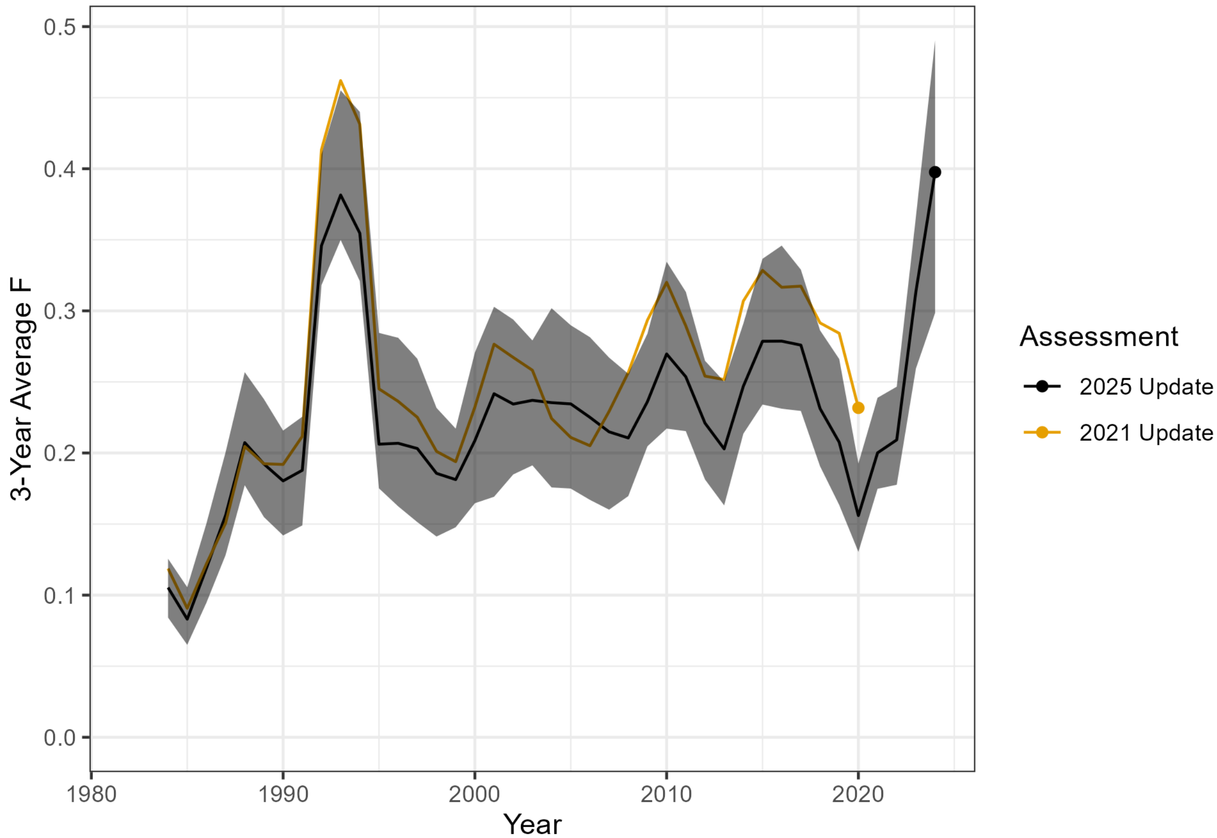


Figure 5. Estimates of the annual full *F* for the MARI region from the 2021 update and the 2025 update.

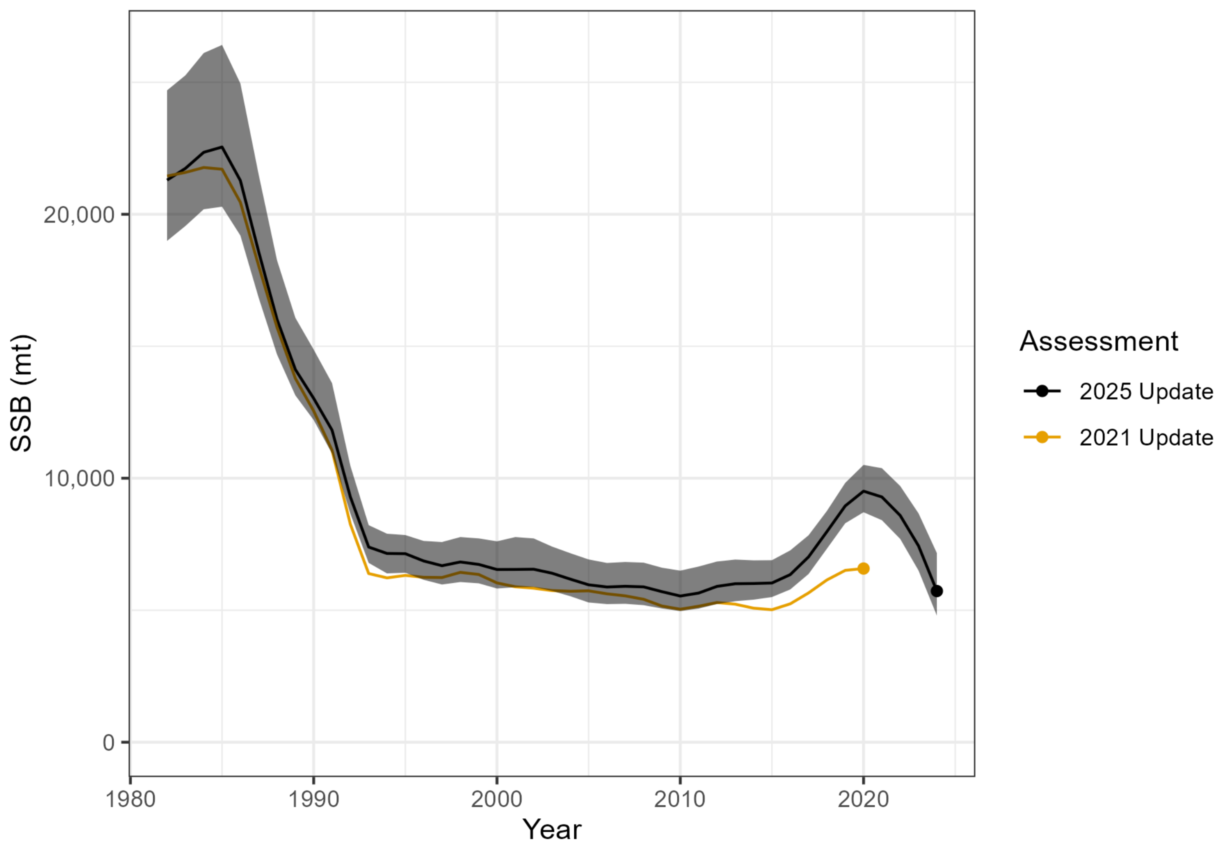


Figure 6. Estimates of spawning stock biomass for the MARI region from the 2021 update and the 2025 update.

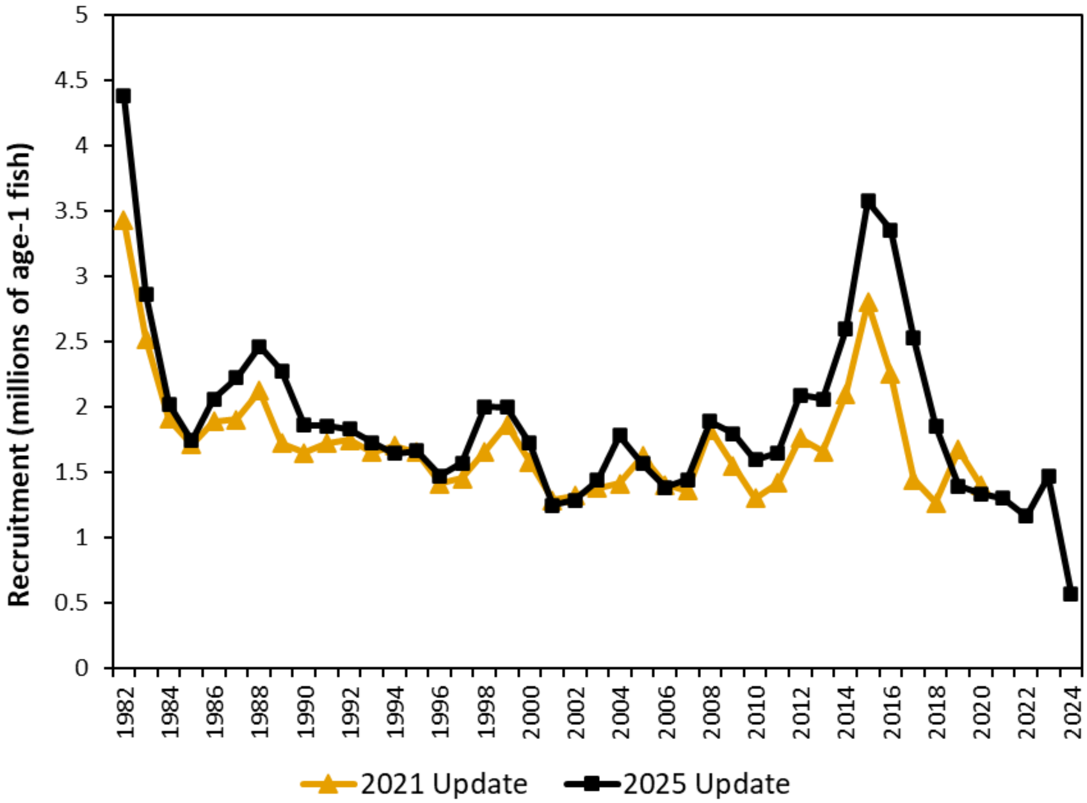


Figure 7. Estimates of recruitment for the MARI region from the 2021 update and the 2025 update.

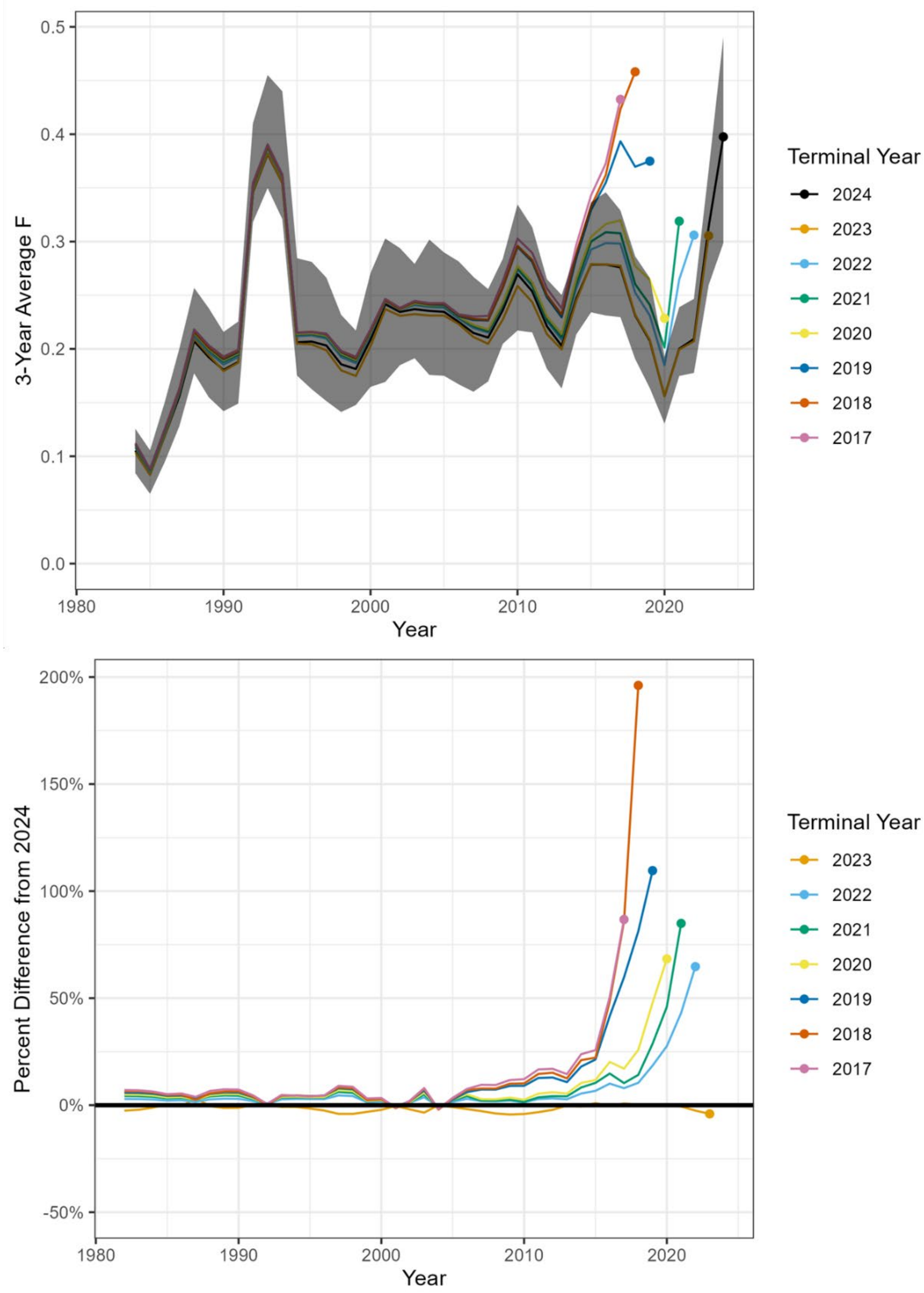
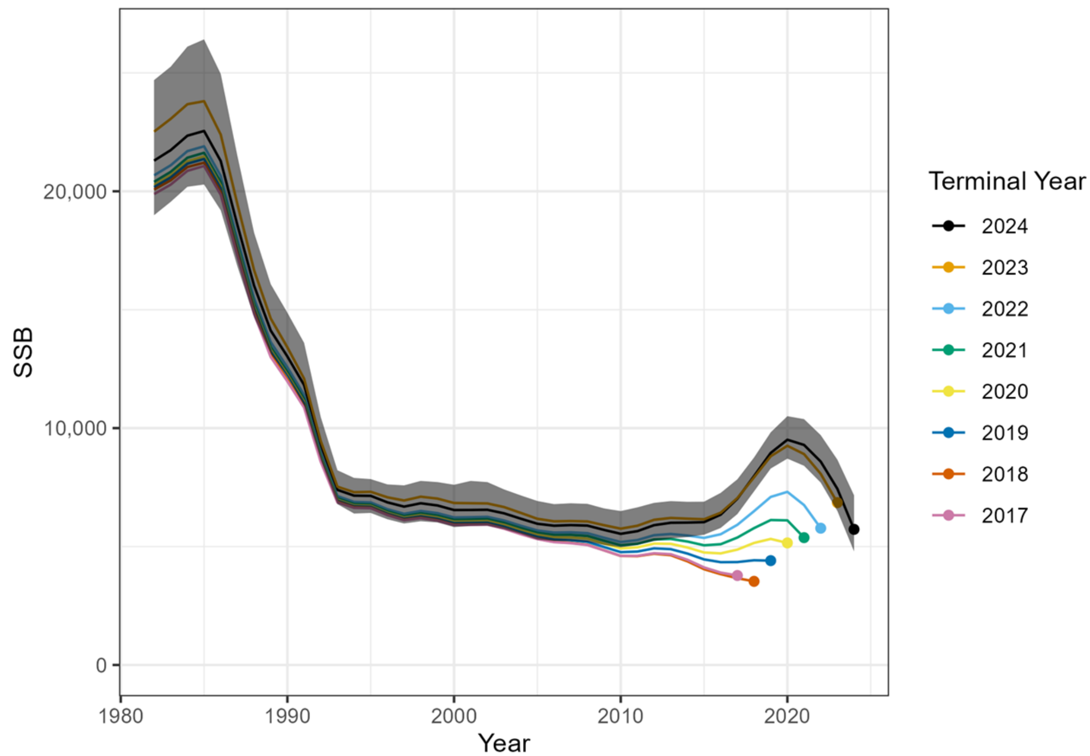


Figure 8. Retrospective analysis for annual *F* for the MARI region in absolute numbers (top) and percent difference (bottom).



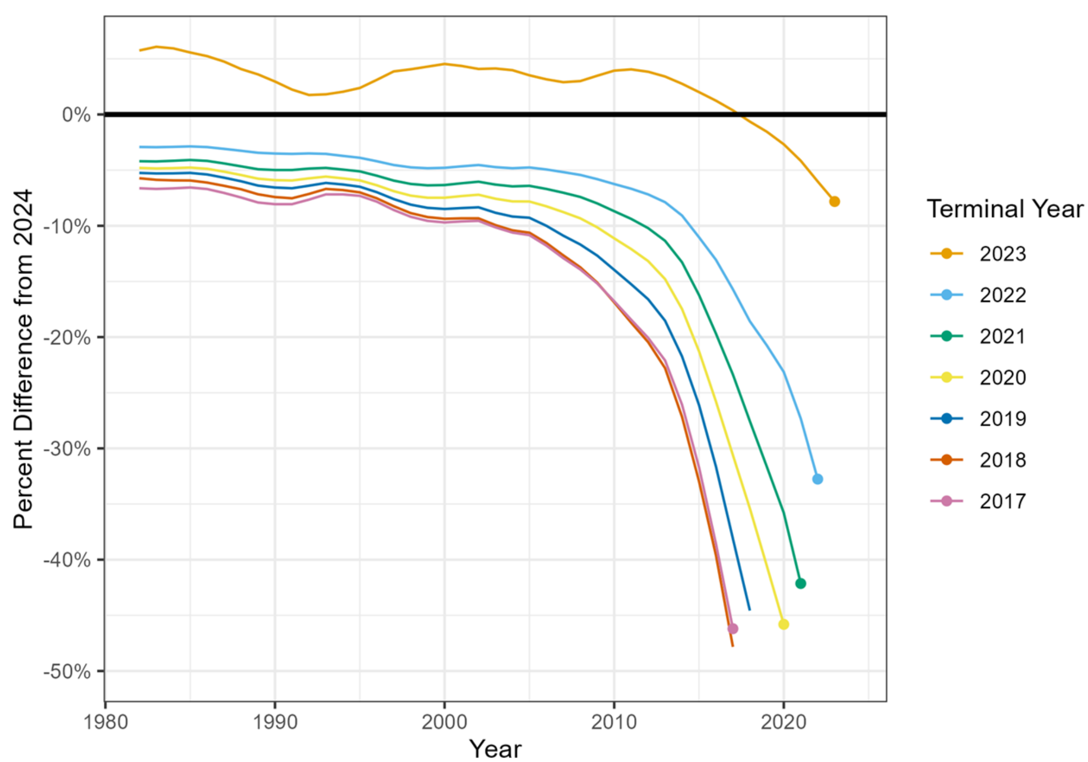


Figure 9. Retrospective analysis for SSB for the MARI region in absolute numbers (top) and percent difference (bottom).

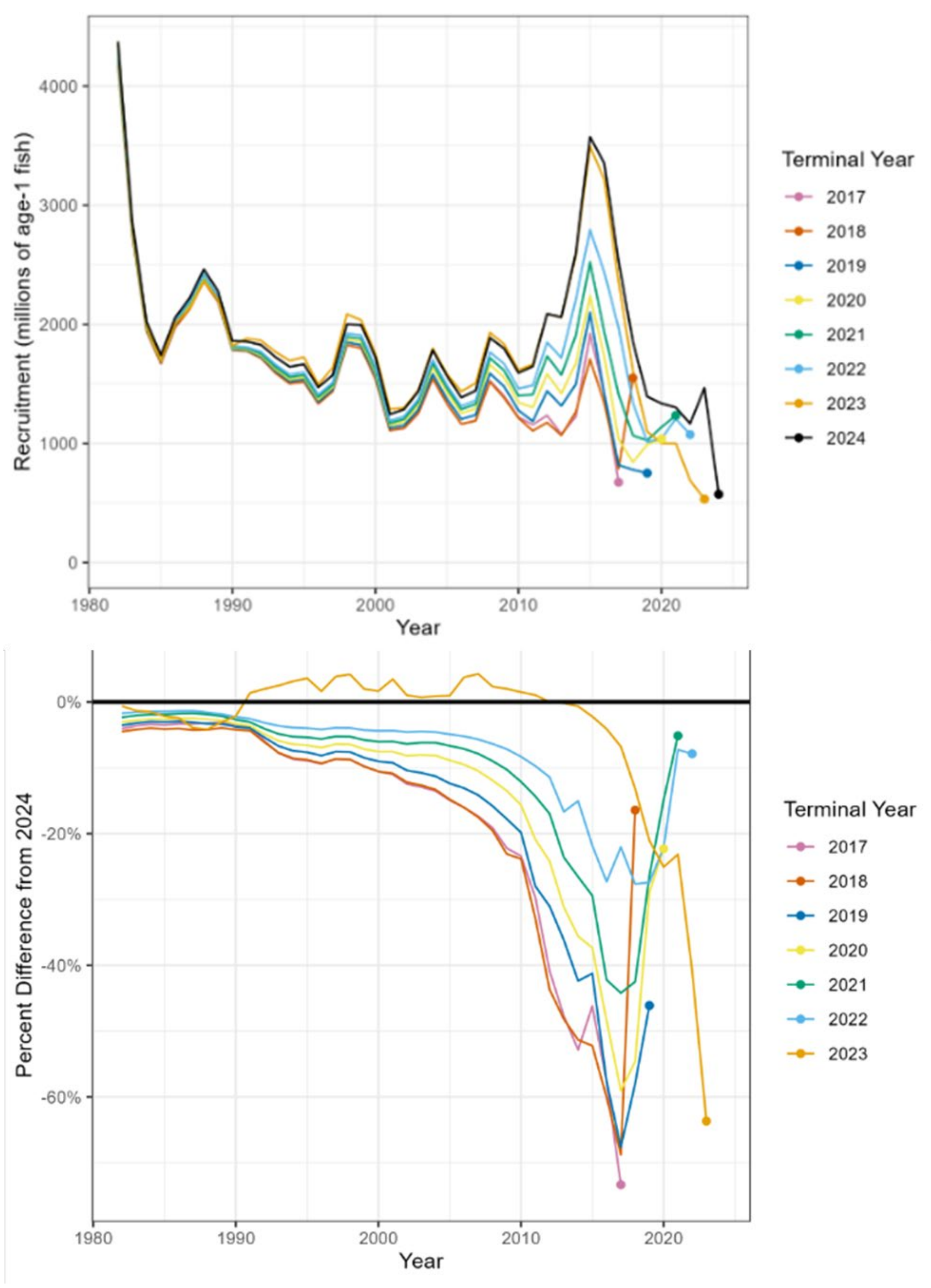


Figure 10. Retrospective analysis for recruitment for the MARI region in absolute numbers (top) and percent difference (bottom).

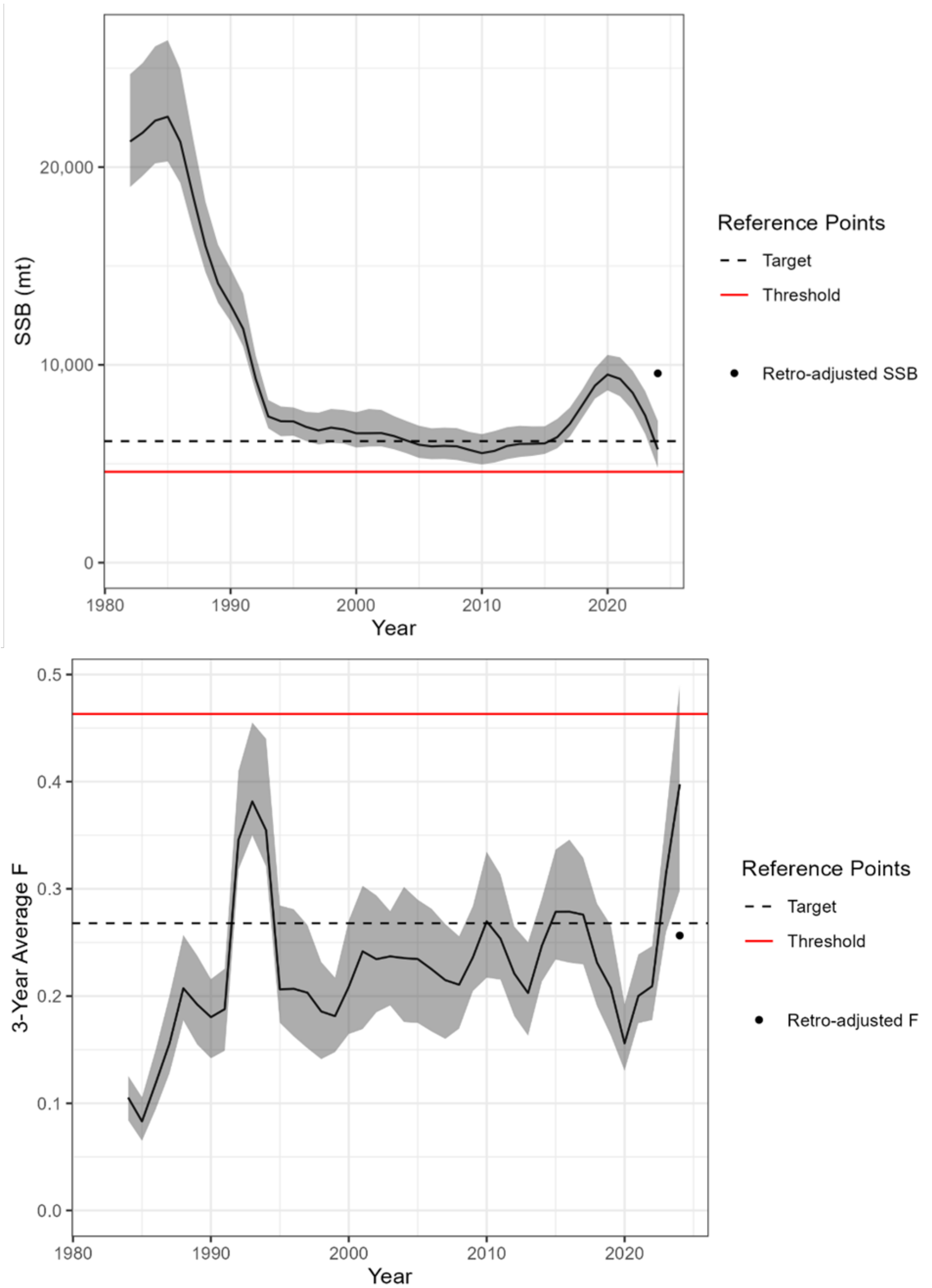
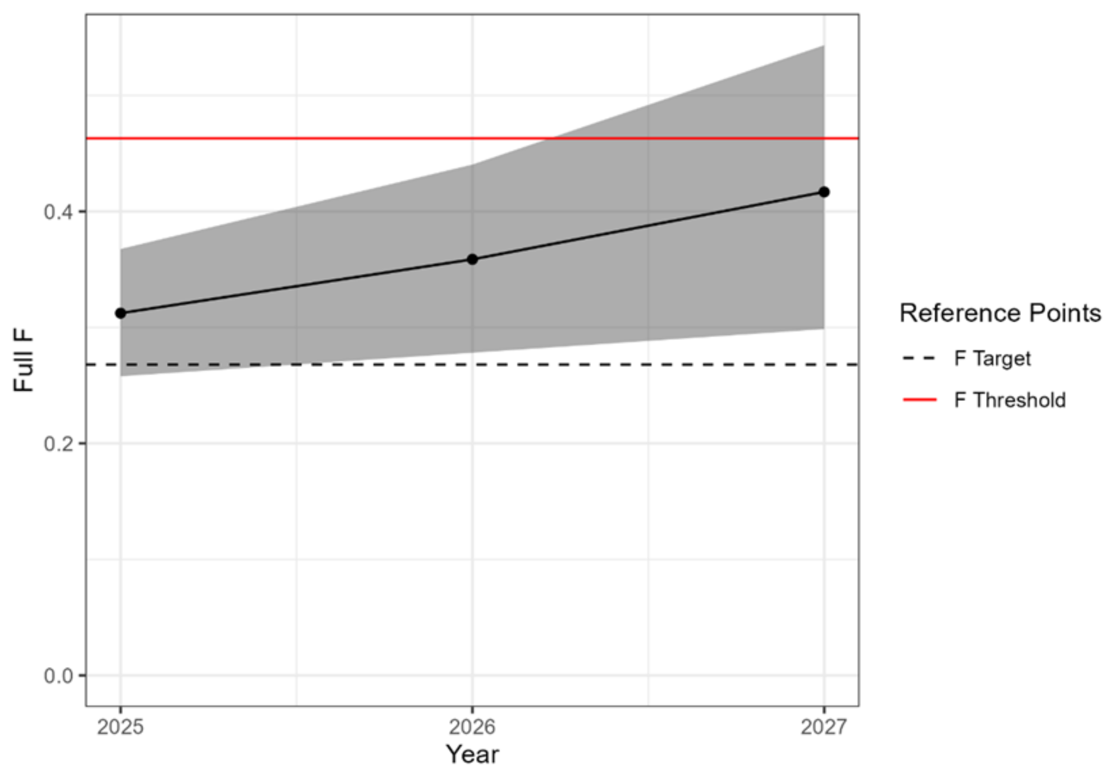


Figure 11. Annual SSB plotted with SSB target and threshold (top) and 3-year average *F* plotted with *F* target and threshold (bottom) for the MARI region.



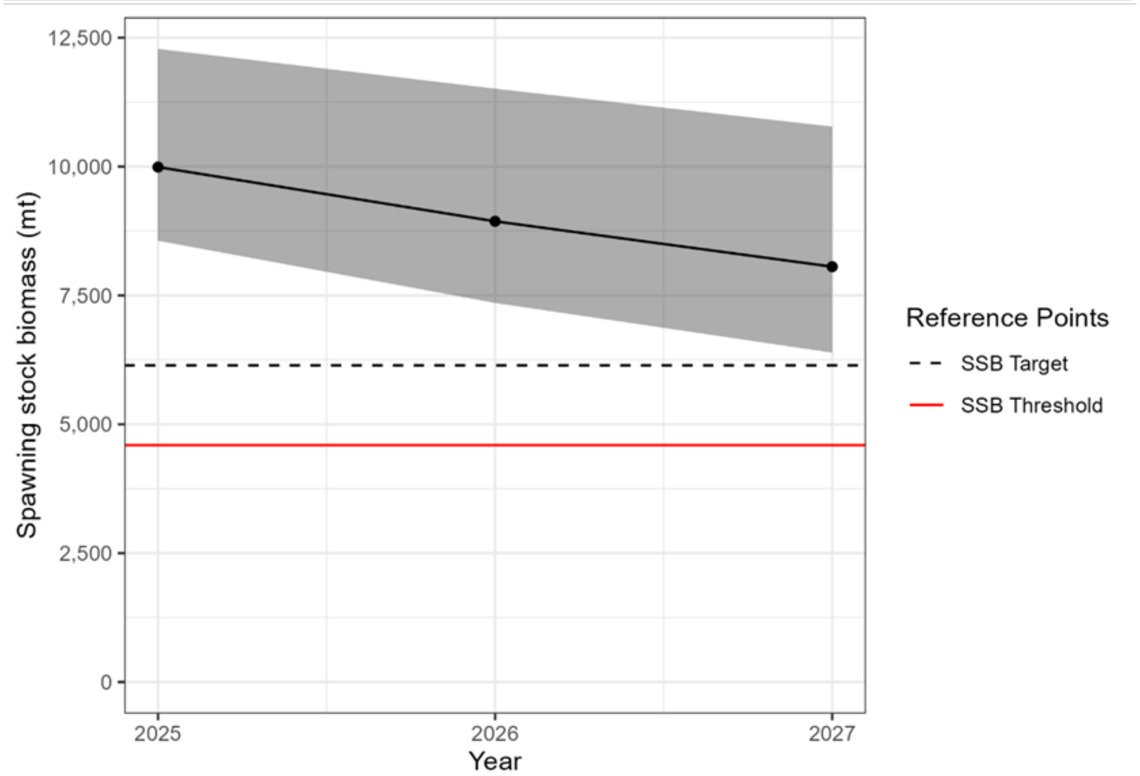


Figure 12. Status quo harvest projections for the MARI region showing the trajectory of annual *F* (top) and SSB (bottom) with their target and threshold reference points.
Shaded areas indicate the 95% confidence intervals of the estimates.

Tautog Stock Assessment Update
LONG ISLAND SOUND REGION
2025

Executive Summary

The 2024 Long Island Sound (LIS) region tautog stock assessment update used the Age Structured Assessment Program (ASAP) version 3.0.17, available through the Northeast Fishery Science Center (NEFSC) National Fishery Toolbox (NFT) which is a "data rich," forward projecting statistical catch at age program to assess tautog populations. The model incorporated annual harvest estimates, adult fishery-independent and fishery-dependent biomass, available age structure, size-at-age, and juvenile abundance indices from 1984-2024. The fishery-independent surveys were re-standardized to account for new data from 2021-2024. The ASAP model assumed a single fleet with four selectivity periods based on management time blocks. The ASAP model had a strong retrospective pattern that required adjustments for both spawning stock biomass and fishing mortality. Adjusted stock status in 2024 was consistent with the previous update. The current update indicated that the stock is not overfished and not experiencing overfishing. Short-term projections (three years) were conducted to evaluate the risk to the stock for maintaining status quo management. There was no risk that the stock will be overfished or experience overfishing in the near future.

TOR 1. Update fishery-dependent data (landings, discards, catch-at-age, etc.) that were used in the previous peer-reviewed and accepted benchmark stock assessment.

The time series for commercial and recreational removals was extended from the previous assessment update (ASMFC 2021) through 2024, along with the associated age compositions from both sources.

The tautog fishery in the LIS region is predominantly recreational (Table 9, Figure 13). Recreational harvest has remained relatively stable since 2007, with years of low harvest in 2011 and 2018 (Table 1, Figure 13). Recreational release mortality has become a higher proportion of total removals since 2021, with 2024 having the highest number of recreational discard mortality.

Commercial harvest remains a small portion of overall mortality (Table 9, Figure 13). Commercial harvest was highest in the 1980s before declining to a series low in 1999. However, commercial harvest has been higher in 2021-2024, including a 4-year high of approximately 109.5 mt in 2022, which is similar to commercial harvest in the 1980s.

The calibrated MRIP length frequencies were used to calculate the age composition of the recreational harvest and were also used as a proxy for the length composition of the commercial harvest. Data from the MRIP at-sea headboat observer program, the Connecticut Volunteer Angler Survey, and the American Littoral Society (ALS) Volunteer tagging program were used to calculate the age composition of the recreational release mortality based on the methods described in the previous benchmark (ASMFC 2016). Ages 5–7 made up the majority of the total removals over the time series (LIS Appendix 1).

The Tautog TC developed a fishery dependent index of abundance from MRIP recreational survey data, using the same "logical species guilds" from the benchmark assessment to identify tautog trips. The MRIP CPUE index was high and somewhat variable at the beginning of the series before declining through the mid-1990s to lower, stable, levels throughout the 2000s. The index increased from 2021 to 2024 (Figure 14).

TOR 2. Update fishery-independent data (abundance indices, age-length data, etc.) that were used in the previous peer-reviewed and accepted benchmark stock assessment.

The fishery-independent indices from the LIS consist of the Connecticut Long Island Sound Trawl Survey (CT LISTS), the New York Peconic Bay Trawl Survey, and the New York YOY Seine Survey (Table 10). Age composition information was available for the CT LISTS survey and is shown in LIS Appendix 1. For all indices, statistical model-based standardization of the survey data was conducted to account for factors that affect Tautog catchability.

The CT LISTS is conducted in the spring and fall utilizing a stratified random design and was used to develop an index of age-1+ abundance for tautog. The survey was not conducted in 2020 due to COVID-19 restrictions. This survey is the source of CT's age and length samples for tautog, so as a result, the age-length key for the LIS region did not include CT data for 2020. The model selected with AIC was a zero-altered negative binomial with year, month, and stratum as the explanatory variables. Only categorical parameters were considered because environmental data was not collected in the early years of the time series. The index was highest at the beginning of the time series and declined through the mid-1990s; it rebounded somewhat during the late 1990s and early 2000s and then remained at low, stable levels until 2010. The index increased from 2010 to 2024, by 2024 the index was similar to the late 1980s (Figure 14).

New York YOY Seine Survey operated from 1984 to the present, with a consistent standardized methodology starting in 1987. It is a fixed site survey that is conducted in three separate embayments on Long Island; the data were subset to bays on the north side of Long Island for the LIS region. A subset of 8 stations that were sampled throughout the full time series were used to create the index of abundance. The New York YOY survey was used to develop a YOY index of recruitment for tautog. The New York YOY Seine Survey was conducted in 2020 but the start was delayed due to COVID-19 restrictions. Years with zero catch were not included in the index standardization, including 1985, 1994, and 2009. The best selected model for index standardization was a negative binomial with year and surface temperature as the explanatory variables. The index was variable with periods of higher recruitment including the early 1990s and the early 2000s; in recent years the index has been lower; however 2022, and 2023 were years with high recruitment (Figure 14).

NYDEC Peconic Bay trawl survey operated from 1987 to the present, with a consistent standardized methodology starting in 1991. Sixteen stations are randomly sampled from May to

October and target age-1 individuals. The survey was not conducted in 2005, 2006, and 2008. The best selected model based on AIC was a zero-altered negative binomial model with year, station, surface temperature, and surface salinity as explanatory variables. The index is highly variable with a few periods of higher recruitment including the late 1980s and the mid-2010s, but the index increased to its highest value in 2024 (Figure 14).

TOR 3. 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.

Life history parameters were the same as used in the peer-reviewed benchmark stock assessment (Table 11; ASMFC 2016).

TOR 4. 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.

The model used in the last stock assessment update (1984-2021; ASMFC 2021) was updated with data through 2024. The indices of abundance for the fishery-independent and MRIP surveys were re-calculated and re-standardized for this update, causing some slight deviations between index values for individual years. No other deviations from the 2021 update were made for the 2025 update.

Estimates from the 2025 update were compared to the 2021 update, but not to the benchmark assessment in 2016 because the benchmark did not include the calibrated MRIP estimates. Estimates of fishing mortality were largely similar between the two assessments except between 2000-2010, where the 2025 estimates were higher than the 2021 assessment estimates and in 2016-2021, where the 2025 estimates were lower than the 2021 assessment estimates (Table 12, Figure 15). Estimates of SSB were higher than the 2021 update after 1993 (Table 12, Figure 16). Recruitment estimates for the 2025 update were higher than the 2021 update for most years in the time series (Table 12, Figure 17).

Due to recruitment and SSB estimates being significantly higher compared to the 2021 update, sensitivity runs were conducted to establish what was driving these changes in the model. Runs without the NY Seine Survey and one without the NY Peconic Bay Survey were conducted (LIS Appendix 2 Figure A2.2). Dropping the NY Seine Survey from the model affected the recruitment and SSB estimates greatly, with both values estimated much lower in recent years compared to other model runs. The NY Seine Survey was thus weighted less than others in the final model to offset the extreme influence and high variability in this index.

A retrospective analysis was run from 2019-2024. While there was a strong retrospective pattern, the bias was generally conservative, with fishing mortality being overestimated in all years (Figure 18) and SSB being underestimated in all years (Figure 19). Recruitment was underestimated in all years (Figure 20). Mohn's rho for *F* (rho=0.56) and SSB (rho=-0.31) were outside the recommended bounds for a long-lived species, and the retrospectively adjusted values for both *F* and SSB were outside of the 90% confidence intervals of the unadjusted values in the terminal year (LIS Appendix 2, Figure A2.1). Therefore, a retrospective adjustment was applied for both metrics (ASMFC 2024).

Fishing mortality has fluctuated throughout the time series, increasing to a high in 1995 before decreasing again through 2001 (Figure 15). In recent years, fishing mortality has declined from 2010 to 2021 but has increased again through 2024. SSB was highest in 1984 but declined to a series low in 1995 (Figure 16). During periods of low F, SSB increased slightly from 1996-2006, before declining again from 2007-2010. SSB increased from 2011-2021 but has declined slightly in the last 3 years, although these years are still some of the highest in the time-series. Recruitment has fluctuated somewhat over time (Figure 17); however, recruitment has generally increased during 2006-2024, with a time-series high recruitment in 2024.

TOR 5. Update the biological reference points or trend-based indicators/metrics for the stock. Determine stock status.

The LIS region uses MSY-based reference points for tautog. The SSB target is SSB_{MSY} and the SSB threshold is 75% of SSB_{MSY}. The *F* target is F_{MSY}, and the *F* threshold is the value of *F* that will allow the population to stabilize at the SSB threshold in the long-term. The updated SSB reference points for the LIS region were higher than the values from the 2021 update, but the *F* reference points were similar (Table 13).

The ASAP model runs indicated overfishing was not occurring in the LIS in 2024 relative to MSY reference points. The adjusted 3-year average value of F_{3yr} = 0.25 was below the *F* threshold value of 0.35 (Table 14, Figure 21).

The ASAP model runs indicated the tautog stock was not overfished in the LIS relative to MSY reference points. SSB in 2024 was 13,718 mt, well above the $SSB_{75\%\ MSY}$ threshold of 7,349 mt and SSB_{MSY} target of 9,799 mt (Table 6, Figure 21).

TOR 6. Conduct short term projections when appropriate. Discuss assumptions if different from the benchmark and describe alternate runs.

Short term, 3-year projections were conducted in AgePro and were used to predict the impact of status quo management on the population. Overall, the stock is not at risk for becoming overfished or for overfishing to occur in the near future. The short-term projection using most recent three-year average of removals indicated there was a 0% probability of being at or above the *F* threshold and less than 10% probability of being at or above the *F* target in 2027 (Table 15, Figure 10). Short term projections showed a 100% probability of being at or above both the SSB threshold and SSB target for 2025-2027 (Table 15, Figure 22).

TOR 7. 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.

Research recommendations from the benchmark assessment included expanding biological sampling of catch and discards and increased MRIP sampling efforts. Age and length samples in the fishery remain limited leading to age-length borrowing between regions and years. Modeling the harvest and discard at length distributions, rather than using the actual harvest and discard length observations, could potentially help to manage the small sample size for such observations. However, increased monitoring of tautog for both the fishery and fishery-independent survey could increase sample size of age-length data in this region.

Additionally, establishing multi-stage fishery-independent surveys with appropriate gears for structure-oriented species was a high priority documented in the benchmark assessment. In Connecticut, the new Nearshore Survey involving non-trawl gears including pots, seines, and light-traps was initiated in 2025, which may be able to capture young-of-the-year tautog and could be included as a data source in future benchmarks.

The benchmark assessment suggested improved genetic analyses and monitoring of illegal harvest. These recommendations remain high priority for this region and future benchmark assessments. Commercial tagging programs have helped reduce illegal harvest in the commercial sector and improve monitoring of harvest. However, fishers have expressed concern with the current type of tag used (strap tag), suggesting the tag caused lesions on fish and did not stay in place. New York State Department of Environmental Conservation (NYDEC) conducted a feasibility study to evaluate alternative tag types (e.g., Peterson disc, strap, and T-Bar) and tagging locations (NYDEC 2024). NYDEC could not find an alternative to the current tag used for commercial tagging. Due to funding constraints and limited alternative gears to test, the NYDEC has halted additional research.

Age data for the LIS was informed by operculum derived ages for both New York and Connecticut. However, New York anticipates transitioning fully to otoliths in the near future and Connecticut has considered transitioning to spines. Early pair-wise comparisons suggest some bias between otolith and operculum ages, where tautog are estimated one-year older with otolith derived ages compared to operculum derived ages. If otolith or spine ages are to be used in the next benchmark assessment, further pairwise analysis should be conducted to understand how this new age information may affect stock assessment output. Additionally, age composition informed by different structures (spines and otolith) could create disagreement in age information. Future research is needed to understand the impacts of using multiple structures to inform age composition.

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List of Appendices

LIS Appendix 1: ASAP plot outputs from the base run.
LIS Appendix 2: Retrospective Adjustment and Sensitivity Runs.

Tables

Table 9. Total removals in metric tons by sector for the LIS region.

	Recreational Harvest (mt)	Recreational Release Mortalities (mt)	Commercial Harvest (mt)
1984	1,413.1	3	
1985	2,389.6	6.3	
1986	2,179.7	3.2	129.4
1987	2,483.9	5.9	159.1
1988	1,779.0	6	116.9
1989	1,794.0	5.7	140.4
1990	1,518.5	7.8	77.9
1991	1,373.1	8.8	76.2
1992	1,195.2	6.3	74.4
1993	1,254.6	5.1	60
1994	837.0	5.9	33.5
1995	472.1	4.4	11.1
1996	252.1	3.3	51.5
1997	262.3	3.5	31.9
1998	381.5	9.7	26
1999	508.0	8	8.9
2000	154.3	2.5	9.1
2001	151.5	4.8	15.6
2002	1,625.2	19.9	20.4
2003	735.5	9.5	31.9
2004	717.9	10.1	40.8
2005	370.7	5.5	33.6
2006	885.2	13.8	39.3
2007	1,695.5	25.9	54.6
2008	1,371.7	15.5	37.5
2009	1,371.2	14.8	21.5
2010	1,003.7	13.7	25.2
2011	340.7	12.2	33.1
2012	1,224.8	67.6	25.4
2013	972.4	55.2	31.8
2014	1,053.6	93.8	39.6
2015	1,356.3	88.3	29.7
2016	1,519.1	85.3	33.3
2017	833	81.5	47.9
2018	303.2	61.1	38.8
2019	1,550.5	99.2	76.3
2020	1,120.4	96.2	58
2021	1,525.5	92.8	81.6
2022	807.2	87.4	109.5
2023	1,434.8	157.9	77.4
2024	1,388.6	132.4	92.7

Table 10. Indices used in the ASAP model for the LIS region.

Index Name	Index Metric	Design	Time of Year	Years	Ages
MRIP CPUE	Total Catch Per Unit Effort	Stratified Random	Mar-Dec	1982-2024	1+
Connecticut LIS Trawl Survey	Mean number per tow	Stratified Random	April-June	1984-2024	1+
NYDEC Peconic Bay Trawl	Mean number per tow	Stratified Random	May-Oct	1987-2024	1
New York YOY Seine Survey	Mean number per haul	Fixed	July-Nov	1984-2024	YOY

Table 11. Model structure and life history information used in the LIS stock assessment.

	Value(s)
Years in Model	1984-2024
Age Plus Group	12+
Fleets	1 (Rec and Commercial)
Recreational Release Mortality Rate	2.5%
Fraction of year before SSB calculation	0.42
Number of selectivity blocks	4
Selectivity periods	1984-1986, 1987-1994, 1995-2011, and 2012-2024
Selectivity type	Logistic

	1	2	3	4	5	6	7	8	9	10	11	12+
Proportion mature-at-age	0	0	0.8	1	1	1	1	1	1	1	1	1
Natural mortality	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15

Table 12. Spawning stock biomass, recruitment, annual F, and 3-year average *F* estimates for the LIS region.

Year	Spawning stock biomass (mt)	Recruitment (millions of age-1 fish)	Annual F	3-year Average F
1984	13,843	2.85	0.18	
1985	13,255	2.27	0.26	
1986	12,096	3.13	0.25	0.23
1987	10,667	2.54	0.34	0.28
1988	9,423	2.59	0.30	0.30
1989	8,441	1.49	0.37	0.34
1990	7,499	1.74	0.38	0.35
1991	6,590	1.79	0.37	0.37
1992	5,799	1.57	0.37	0.37
1993	5,144	1.34	0.39	0.38
1994	4,061	1.41	0.77	0.51
1995	3,301	1.76	0.49	0.55
1996	3,484	1.55	0.22	0.49
1997	4,028	1.77	0.18	0.30
1998	4,555	2.25	0.19	0.20
1999	4,997	2.31	0.23	0.20
2000	5,455	1.98	0.24	0.22
2001	6,119	1.70	0.13	0.20
2002	6,027	1.91	0.66	0.34
2003	5,601	2.16	0.29	0.36
2004	5,826	1.46	0.27	0.41
2005	6,263	1.50	0.15	0.24
2006	6,580	1.44	0.24	0.22
2007	6,125	1.87	0.47	0.29
2008	5,172	2.97	0.55	0.42
2009	4,486	2.53	0.55	0.52
2010	4,490	2.57	0.48	0.53
2011	5,064	2.39	0.27	0.43
2012	5,620	2.24	0.55	0.43
2013	5,908	2.75	0.44	0.42
2014	6,178	2.96	0.42	0.47
2015	6,414	3.09	0.42	0.43
2016	6,647	2.79	0.45	0.43
2017	7,264	2.61	0.22	0.36
2018	8,449	3.27	0.09	0.25
2019	9,287	2.79	0.29	0.20
2020	9,741	2.55	0.21	0.19
2021	9,876	2.70	0.36	0.28
2022	9,785	4.39	0.22	0.26
2023	9,692	4.36	0.36	0.31
2024	9,519	5.21	0.39	0.32
*2024**	*13,718*			*0.25*

**Retrospectively adjusted values.*

Table 13. SSB and *F* reference points from 2021 and 2025 updates for the LIS region.

	SSB		F	
	Target	Threshold	Target	Threshold
2021 Update	6,725	5,044	0.26	0.38
2025 Update	9,799	7,349	0.25	0.35

Table 14. Stock status for the LIS region with adjusted estimates of SSB and F.

	SSB		F	
	Target	Threshold	Target	Threshold
Reference Points	9,799	7,349	0.25	0.35
2024 Estimate	13,718*		0.25*	
2024 Status	Not overfished		Not overfishing	

*: Retrospectively-adjusted value

Table 15. Projection results for the LIS region.

Landings (mt) for 2025-2027	Probability of being at or above the *F* threshold in 3 years	Probability of being at or below SSB threshold in 3 years
Status quo (2021-2024 average)	0%	0%

Figures

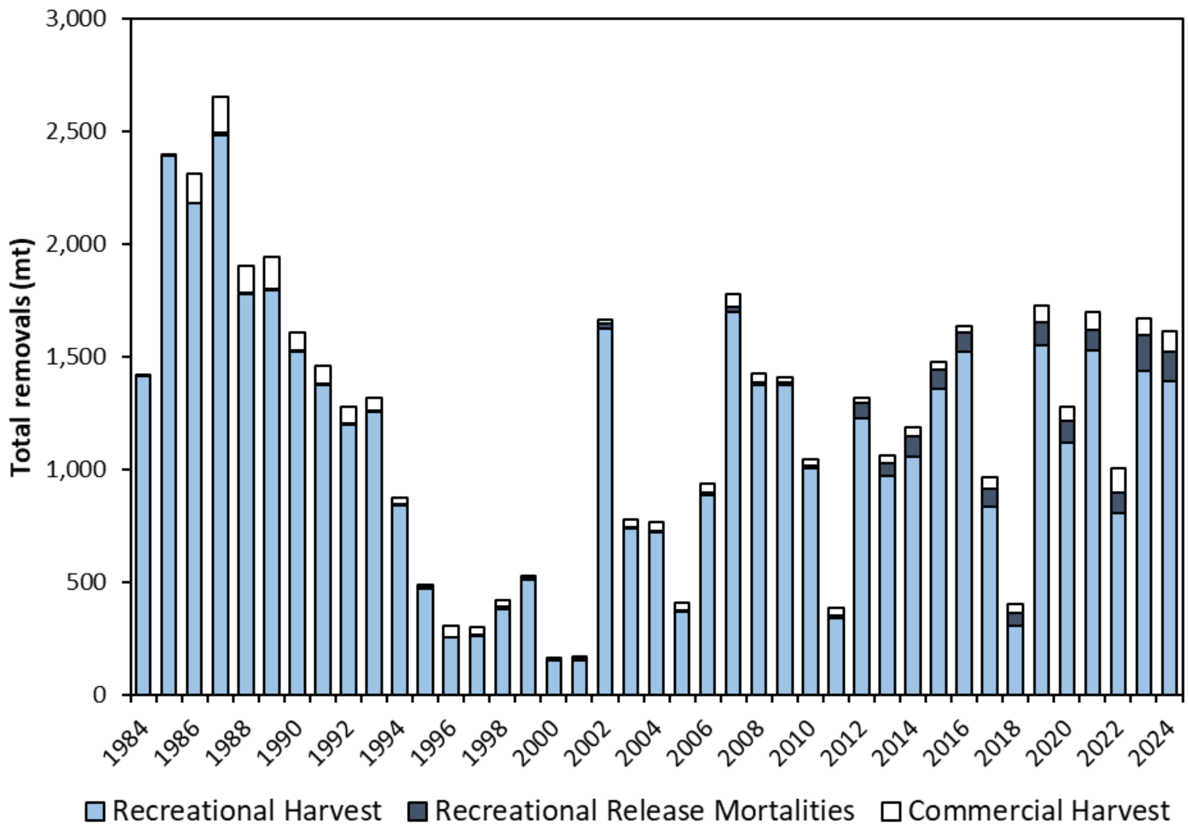


Figure 13. Total removals by sector for LIS region.

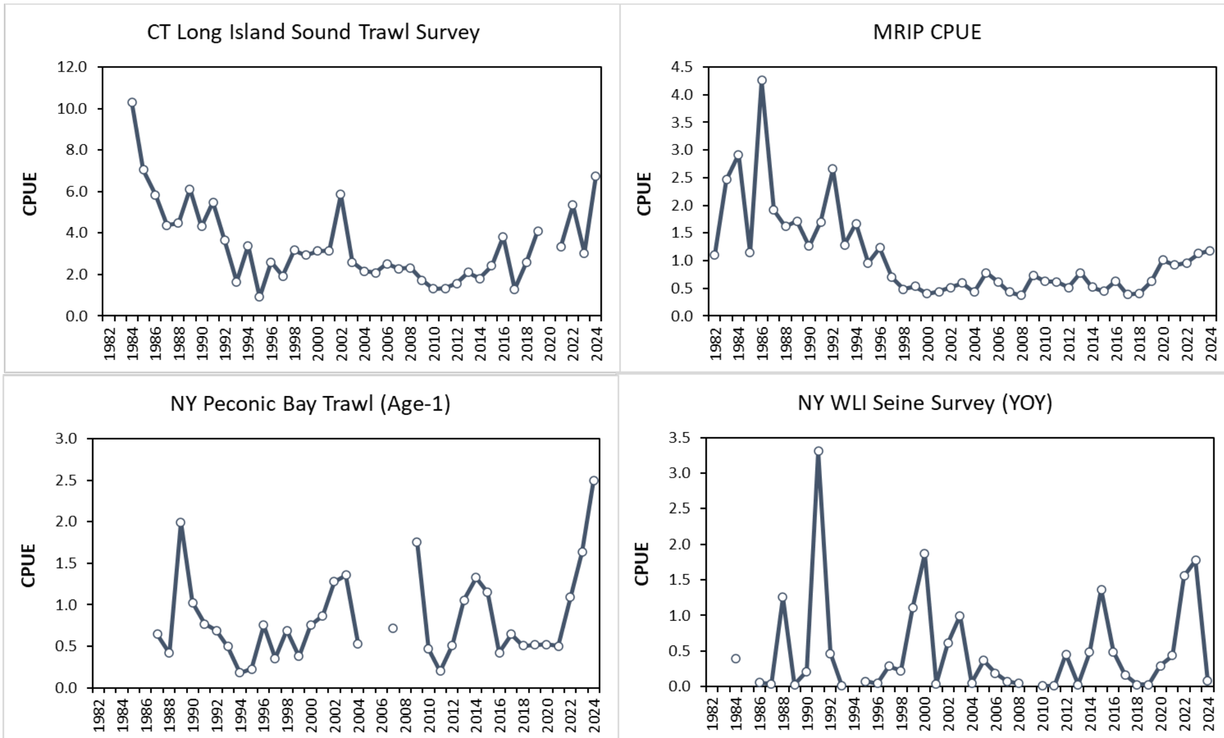


Figure 14. Indices of abundance used for the LIS region.

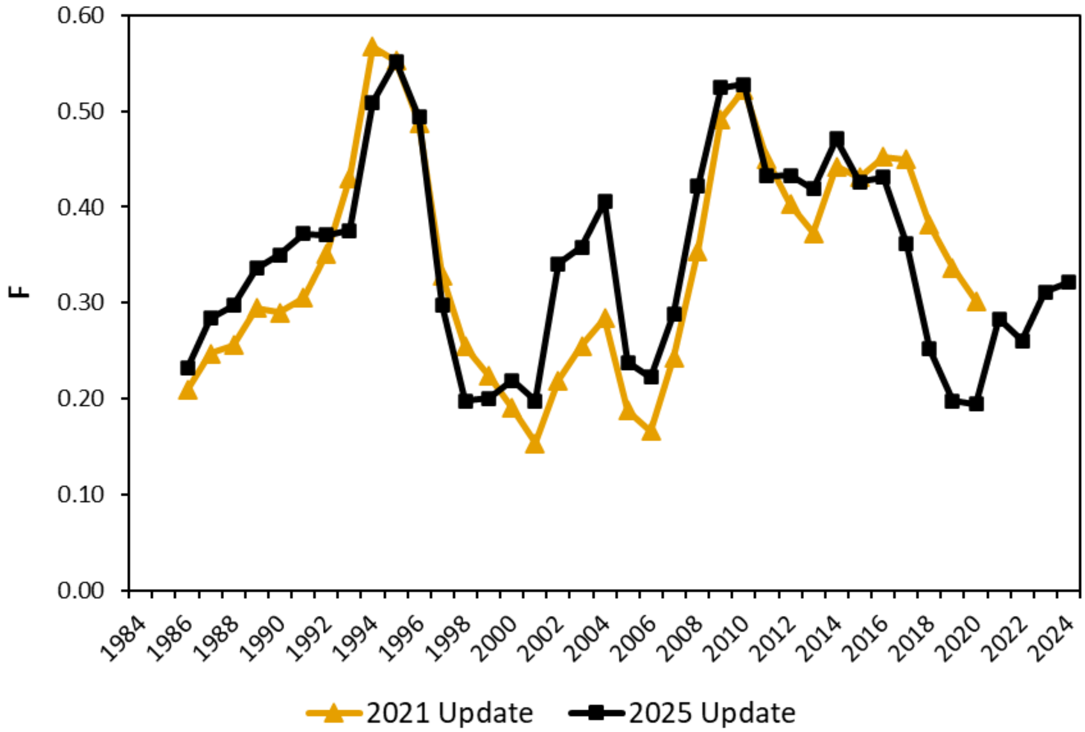


Figure 15. Estimates of the 3-year average *F* for the 2021 update and the 2025 update for the LIS region.

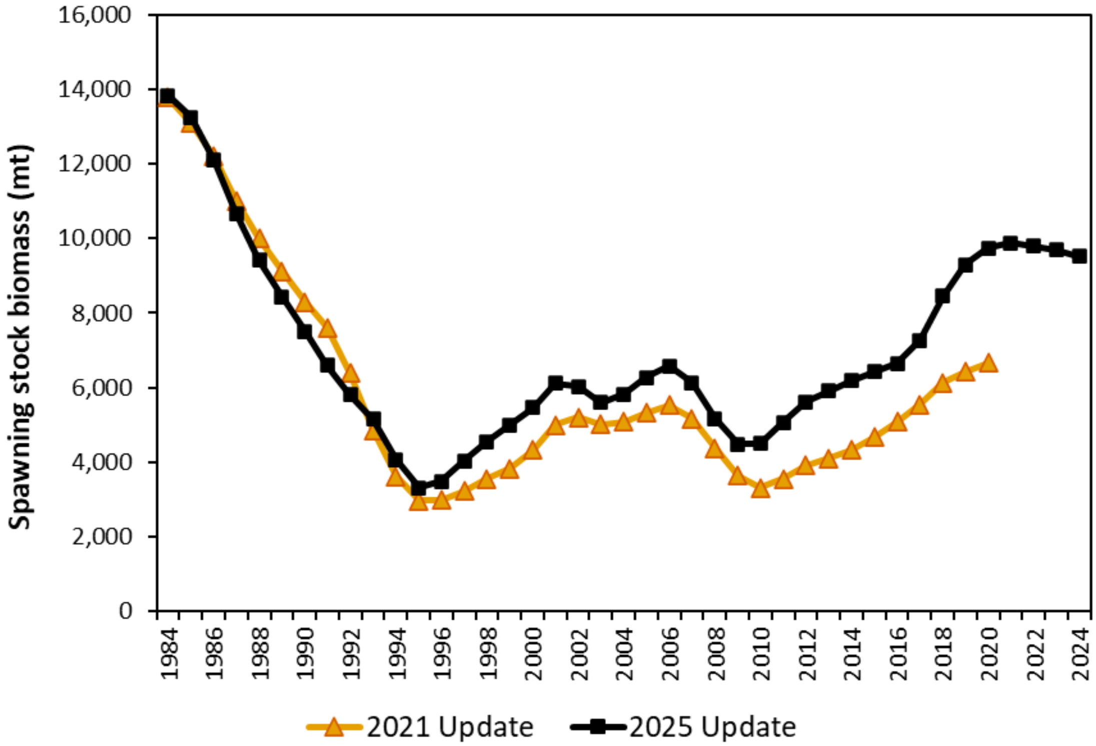


Figure 16. Estimates of spawning stock biomass for the 2021 update and the 2025 update for the LIS region.

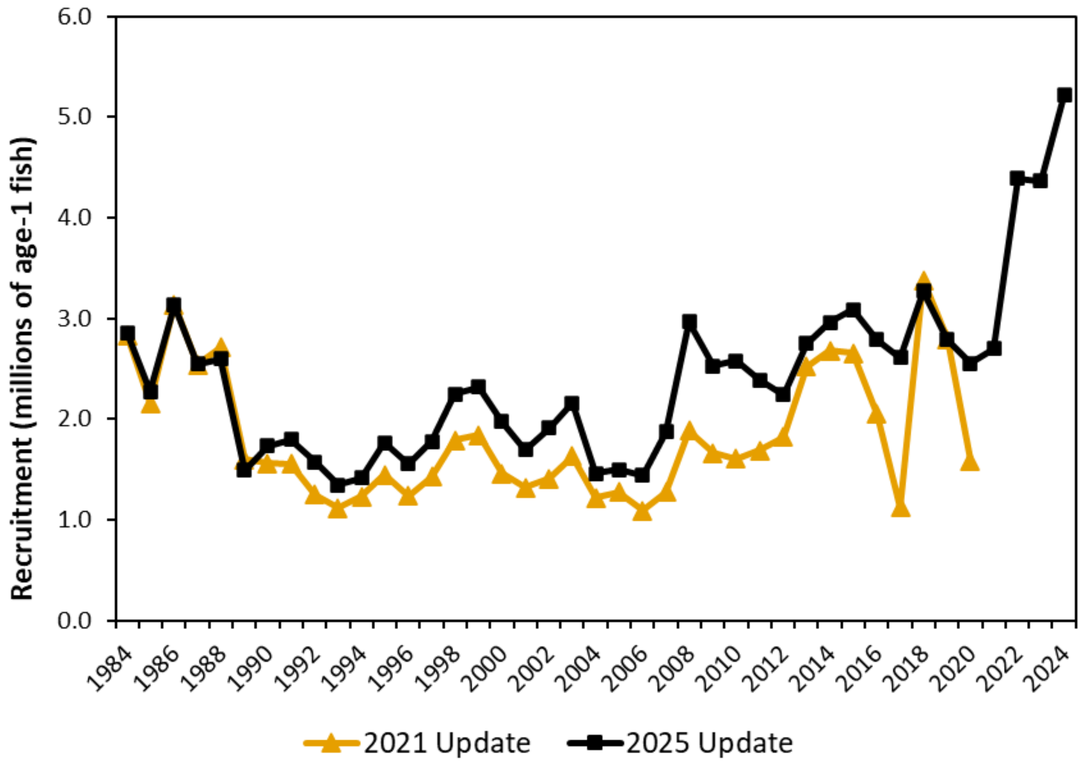


Figure 17. Estimates of recruitment for the 2021 update and the 2025 update for the LIS region.

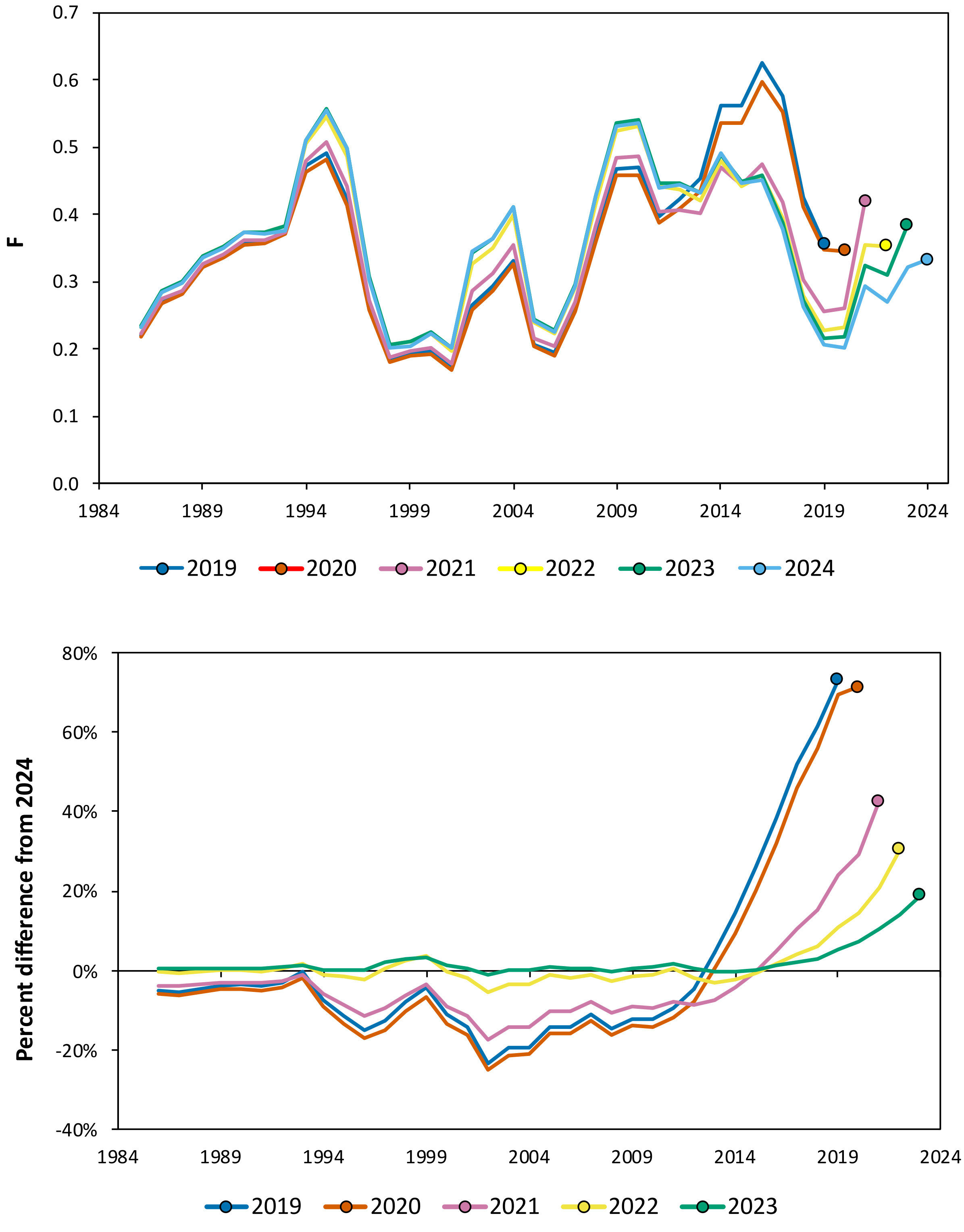
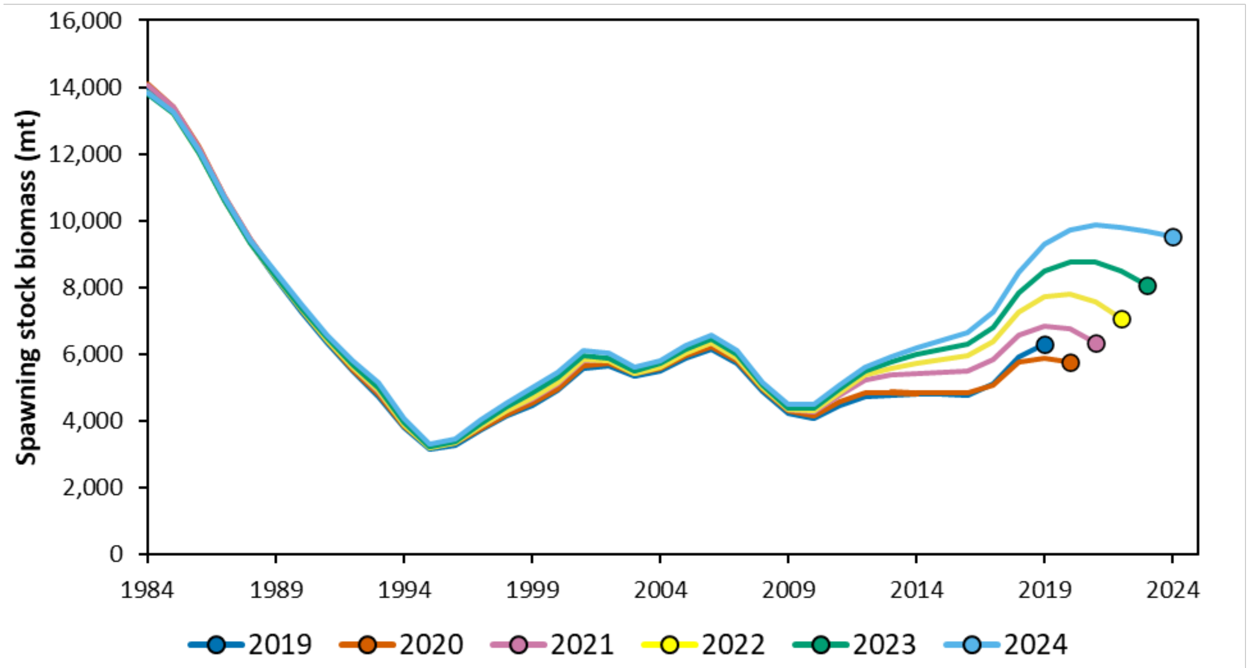


Figure 18. Retrospective analysis for the 3-year average *F* in absolute numbers (top) and percent difference (bottom) for the LIS region.



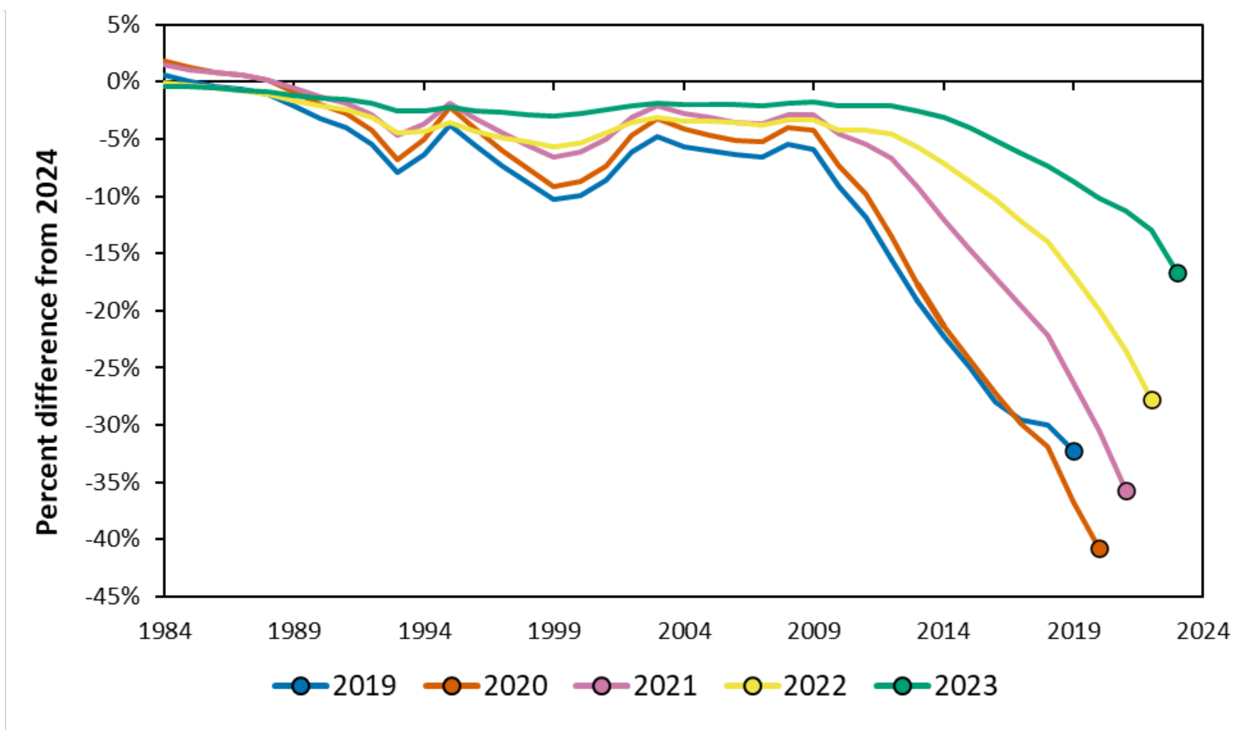


Figure 19. Retrospective analysis for annual SSB in absolute numbers (top) and percent difference (bottom) for the LIS region.

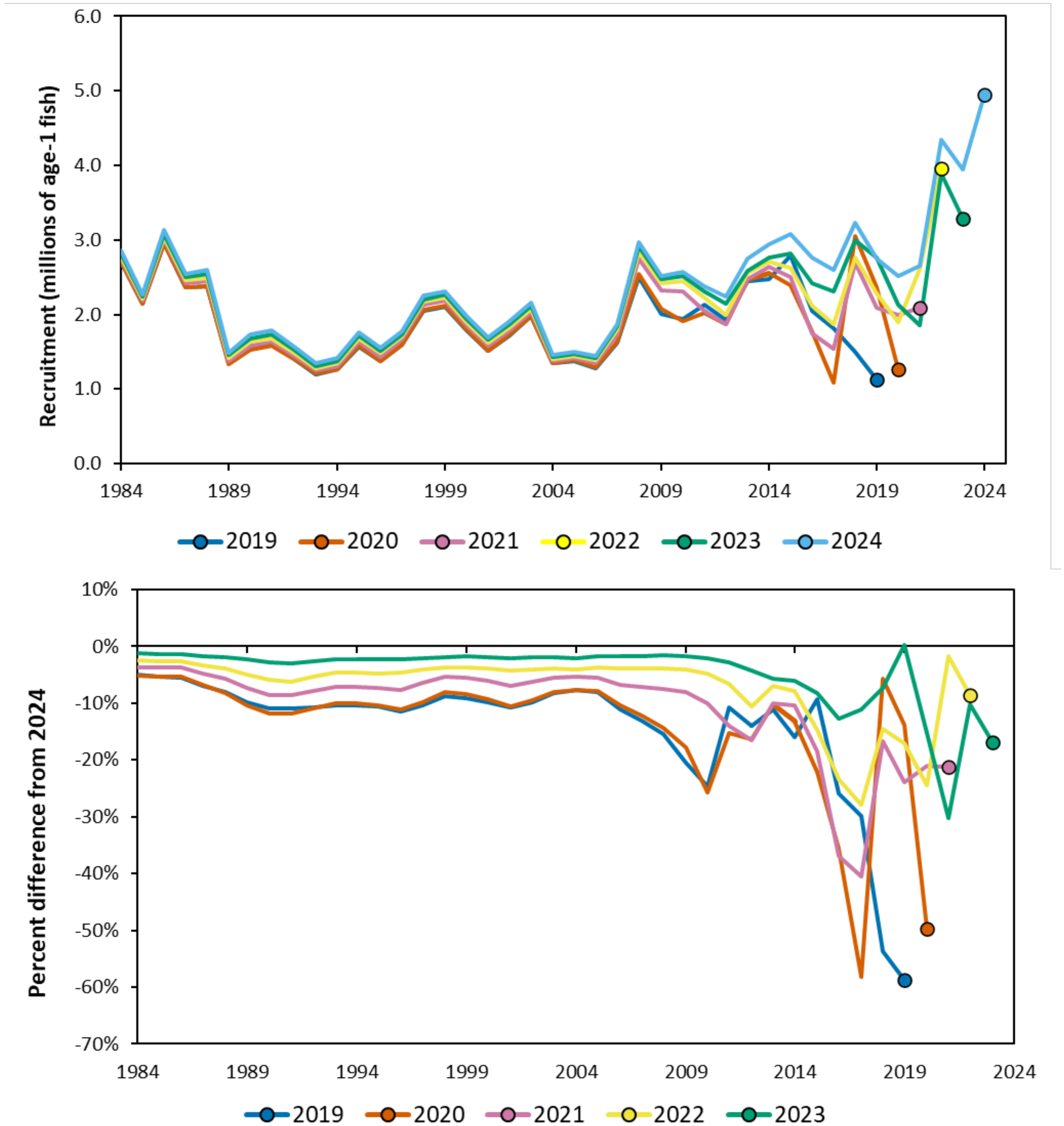
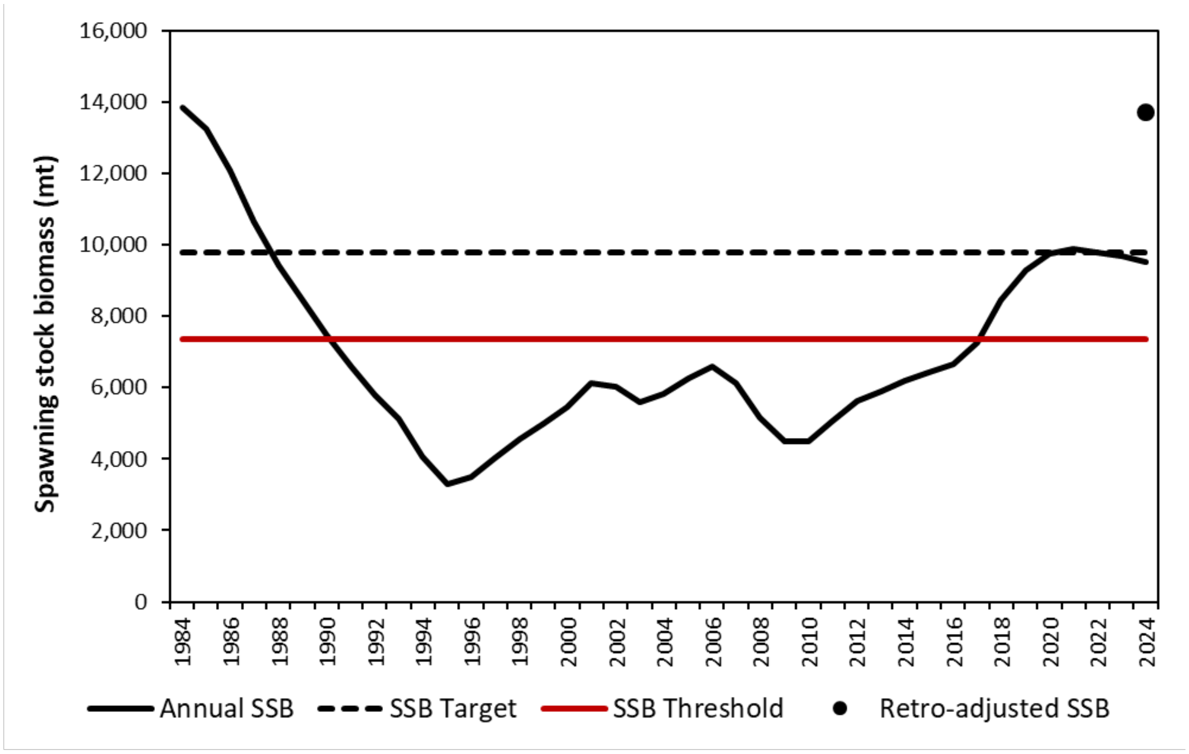


Figure 20. Retrospective analysis for annual recruitment in absolute numbers (top) and percent difference (bottom) for the LIS region.



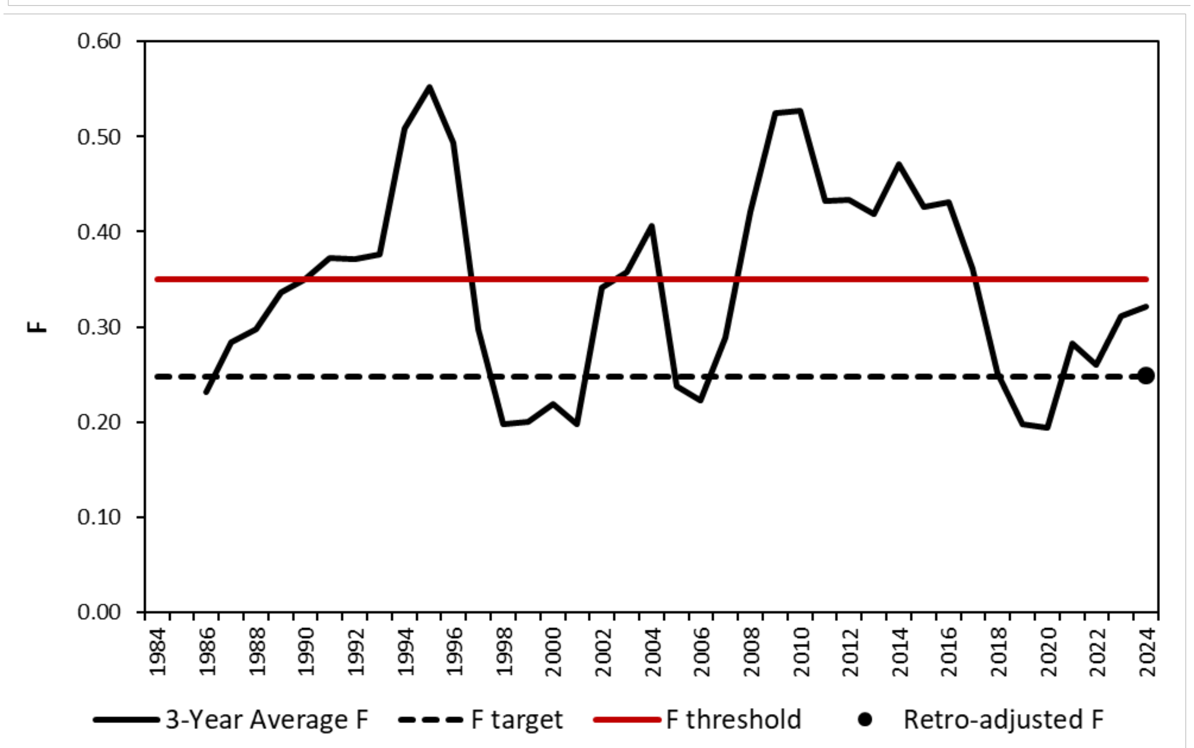


Figure 21. Annual SSB plotted with SSB target and threshold (top), and 3-year average *F* plotted with *F* target and threshold (bottom) for the LIS region.

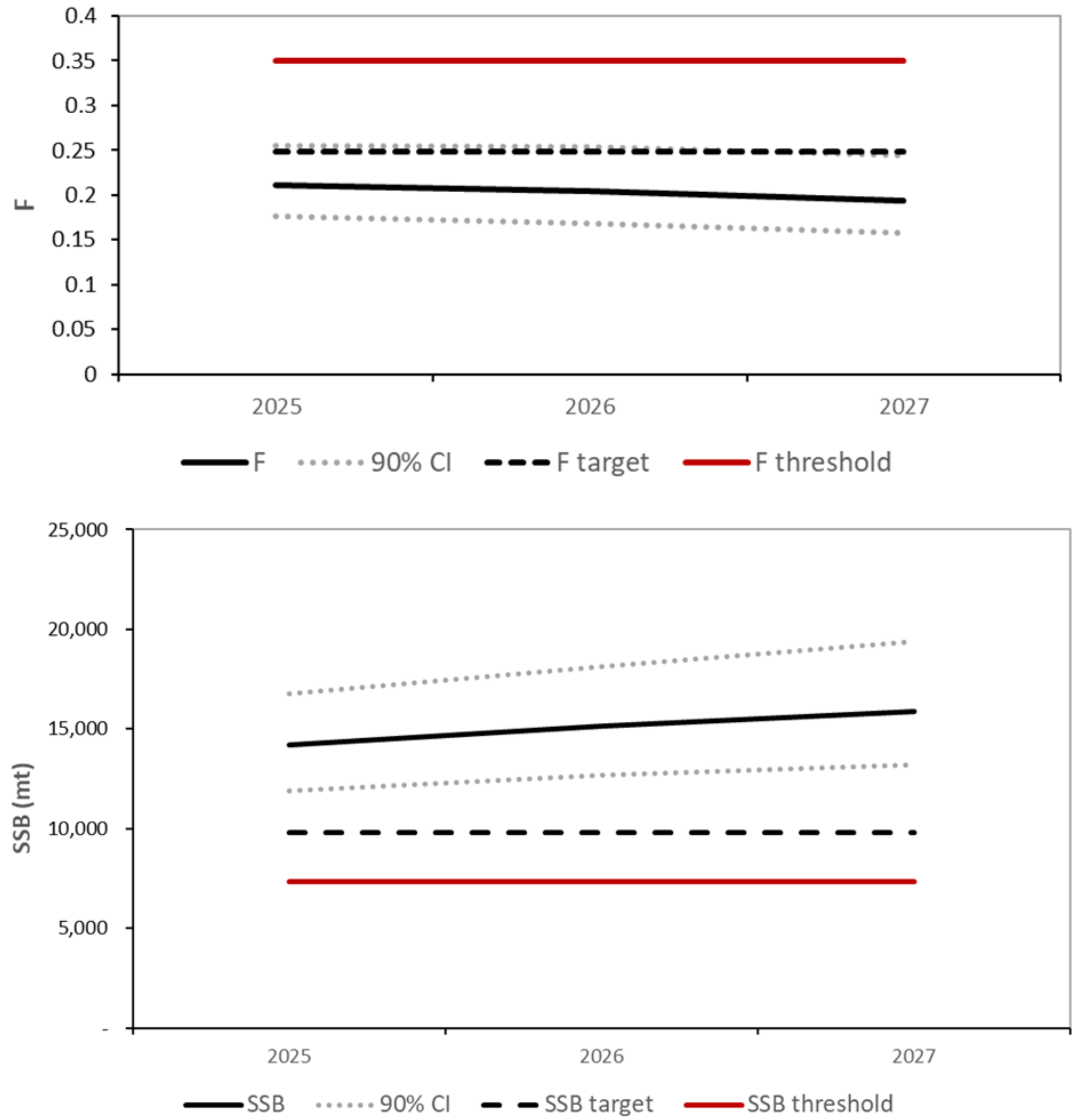


Figure 22. Status quo harvest projections for the LIS region for *F* (top) and SSB (bottom).

Tautog Stock Assessment Update
NEW JERSEY – NEW YORK BIGHT REGION
2025

Executive Summary

This stock assessment is an update to the existing benchmark assessment for tautog (ASMFC 2015, ASMFC 2016); the previous assessment update was completed in 2021 (ASMFC 2021). This assessment updates the accepted statistical catch-at-age model for the New Jersey – New York Bight (NJ-NYB) region with commercial and recreational fishery catch data and indices of relative abundance from fishery-independent and fishery-dependent data sources through the terminal year of 2024.

Total removals have increased since the last assessment, averaging 1,843 mt from 2021-2024 compared to an average of 1,029 mt for 2016-2020. The MRIP CPUE showed an increasing trend since the last update, while the New Jersey Ocean Trawl index showed a declining trend in the most recent years. The NY Seine young-of-the-year index has been highly variable over the time-series, but has shown a number of high values over the most recent years.

Estimates of spawning stock biomass (SSB) from the ASAP model showed that the increasing trend from the 2021 assessment update had been reversed, with SSB declining from a recent high in 2022; the three-year average fishing mortality (*F*) showed the opposite pattern, with *F* increasing since 2021 after a decline from 2016. The model indicated that the stock was not overfished, with SSB being above the threshold and slightly below the target, but overfishing was occurring in 2024. This was a change from the 2016 update, where the stock was overfished, but overfishing was not occurring. Stock status was based on retrospectively adjusted values of SSB and the three-year average *F*, as the 2025 update showed a significant retrospective pattern, with SSB being underestimated and *F* being overestimated.

Short-term projections (2025-2027) based on the 3-year average of recent removals indicated there was a high probability (81%) that the stock would be above the SSB threshold in 2027 but a low probability that *F* would be below the *F* threshold.

It is recommended that the next assessment for this region should be a benchmark assessment, to incorporate a new fishery independent trap survey that should be more appropriate for tautog than the current trawl survey, and to investigate and resolve the worsening retrospective pattern for this region.

TOR 1. Update fishery-dependent data (landings, discards, catch-at-age, etc.) that were used in the previous peer-reviewed and accepted benchmark stock assessment.

The time series for commercial and recreational removals was extended from the previous assessment update (ASMFC 2021) through 2024, along with the associated age compositions from both sources. This assessment update used calibrated estimates of recreational removals from MRIP. The tautog fishery in the NJ-NYB region is predominantly recreational (Table 16, Figure 23). There was a peak in estimated recreational release mortality in 2022, with 2021-2024 overall showing an increased proportion of release mortality to total recreational removal. Commercial landings averaged 69 mt from 2021–2024. Total removals have increased since the last assessment, averaging 1,843 mt from 2021-2024 compared to an average of 1,029 mt for 2016-2020.

The calibrated MRIP length frequencies were used to calculate the age composition of the recreational harvest and used as a proxy for the length composition of the commercial harvest. Data from MRIP and the American Littoral Society (ALS) volunteer tagging program were used to develop the age composition of the recreational release mortality. The MRIP CPUE was updated using the same "logical species guilds" from the benchmark assessment to identify tautog trips. Since the last update, the MRIP CPUE has increased markedly from 2021 onward (Figure 24).

TOR 2. Update fishery-independent data (abundance indices, age-length data, etc.) that were used in the previous peer-reviewed and accepted benchmark stock assessment.

Fishery-independent indices from the NJ-NYB region consisted of the NJ Ocean Trawl Survey and the New York Western Long Island Seine Survey (NY WLI; Table 17, Figure 24). Age composition information was available for the NJ Ocean Trawl survey. For all indices, statistical model-based standardization of the survey data was conducted to account for factors that affect tautog catchability.

The NJ ocean trawl survey, which began in 1989, is conducted 5 times annually from January through October utilizing a stratified random design and is used in the assessment as an index of age-1+ tautog abundance. Each sampling period is termed a cruise. Tautog are most abundant on cruises 4-5 (i.e. Aug-Dec), and thus these survey periods were used for the indices. The survey was not conducted in 2020-2021 due to COVID-19 restrictions. Cruise 5 was not completed in 2024 due to boat repairs needed. Since the previous update, while the ocean trawl index indicated an uptick for tautog in 2022, the following years exhibited a decline (Figure 24). The lack of data from an important survey period in 2024 lends uncertainty to this trend.

The NY WLI seine survey has operated from 1984 to the present, with a consistent standardized methodology starting in 1987. It is a fixed site survey that is conducted in three separate embayments on Long Island; the data were subset to Jamaica Bay on the south side of Long Island for the NJ-NYB region. The WLI seine index captures mainly age- 0 fish, so was lagged forward one year and treated as an age-1 index. It was used to develop a YOY index of recruitment for tautog. The NY WLI seine survey was conducted in 2020 but the start was delayed due to COVID-19 restrictions. Since the most recent stock assessment update, the index exhibited its sharpest increase over the time series, only to return to a declining trend as of 2024.

TOR 3. 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.

Life history data for 2021-2024 was sourced from the New Jersey Ocean Trawl, private charter boats and the Raritan inventory project. The start year was set at 1989 with the terminal year of 2024 which adds 4 additional years of data since the last assessment (Table 18). Natural mortality was set at 0.15 (Table 18). The age plus group included ages 12 and over. The maturity schedule remained the same as the benchmark with 0 for ages 1 and 2, 0.8 for age 3, and 1 for ages 4 through 12 plus. The selectivity blocks remained the same as the last update, as there were no regulatory changes for tautog since the beginning of the most recent block (2018).

TOR 4. 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.

The 2025 assessment update used the accepted 2016 benchmark assessment model (Age Structured Assessment Program from NOAA Fisheries Toolbox), adding data through 2024, to obtain updated estimates of fishing mortality, spawning stock biomass, and recruitment. The catch was generally well fit, with minor patterning in the residuals for total catch and no concerning patterns in the age composition residuals (NJ-NYB Appendix 1). However, the model struggled to fit the NJ Ocean Trawl index in this update and the CV had to be increased compared to the 2021 update in order to have a reasonable RMSE for this index. This was likely due to the change in trend in the NJ Ocean Trawl with the updated standardization, which resulted in a stronger increase in the late 1990s which was not evident in the recruitment index or MRIP CPUE (Figure 24). Some residual patterns were evident in the age composition diagnostic plots for the indices, similar to the 2021 assessment update (see ASMFC 2021, NJ-NYB Appendix 1). These issues were not deemed problematic enough to reject the model.

The three-year average of fishing mortality has been highly variable with no trend over time and has been increasing from a recent low in 2020 to near a time-series high in 2024 (Table 19, Figure 25). The *F* estimates from the 2025 update were similar to the estimates from the 2021 update, and the 2021 *F* estimates were generally within the confidence interval of the 2025 update estimates (Figure 25). SSB peaked at the beginning of the time-series at 9,242 mt and declined through the 1990s, reaching a time-series low in 2003 at 3,539 mt (Table 19, Figure 26). SSB was relatively stable until 2015 before increasing to 6,962 mt in 2021, driven by an increase in recruitment (Table 19, Figure 27) and a decrease in *F* over that time period (Table 19, Figure 25). SSB has declined somewhat since 2021. Estimates of SSB from the 2025 update were generally higher than the estimates from the 2021 update, with most of the 2021 estimates, including the last years of the 2021 update, being outside the confidence intervals of the 2025 update (Figure 26). Recruitment estimates showed a similar trend to SSB, with a period of high recruitment at the beginning of the time-series, a decline to low levels through the late 1990s followed by an increase in the mid-2010s to the mid-2020s (Table 19, Figure 27). Generally, recruitment estimates since the mid-2010s have been the highest since the early 1990s. Estimates of recruitment from the 2025 update were similar to the estimates from the 2021 update for the early part of the time-series, but have been higher than the 2021 update for the last ten years (Figure 27)

A retrospective analysis was completed using a six-year peel (i.e., 2018–2024) to avoid crossing a selectivity block. A significant retrospective pattern for the three-year average *F* (Mohn's rho =

0.18) and SSB (Mohn's rho = -0.26); the pattern for recruitment was minor (Mohn's rho = 0.06). The model runs tended to overestimate *F* (Figure 28) and underestimate SSB (Figure 29) relative to the terminal year run; there was no consistent pattern for recruitment (Figure 30). The retrospectively adjusted estimates of *F* and SSB were outside the 90% confidence intervals of the terminal year estimates (NJ-NYB Appendix 2 Figure A2.1) and the rho estimates were outside the acceptable limits for a long-lived species (-0.15 < rho < 0.2), warranting the adjustment of *F* and SSB for this assessment (ASMFC 2024). The unadjusted estimates for the 3-year average *F* and SSB were 0.52 and 5,870 mt, respectively. Retrospective adjusted estimates were 0.44 and 7,900 mt, respectively (Table 19).

Sensitivity analyses were run to look at model dependence on the three survey indices (NJ ocean trawl survey, NY seine survey, and MRIP CPUE). The final ASAP model chosen for this assessment used adjusted catch and index CVs to bring the RMSE bounds closer to 1.0; therefore, an additional sensitivity run was completed to look at model performance with the unadjusted CVs. No sensitivity run substantially changed the general trends in fishing mortality or SSB over the time series, or the overall scale of the assessment, although removing the MRIP CPUE resulted in a significantly higher estimate of *F* in the last few years of the time-series and using the original CVs resulted in a significantly higher estimate of SSB and recruitment at the end of the time-series (NJ-NYB Appendix 2 Figures A2.2 and A2.3).

TOR 5. Update the biological reference points or trend-based indicators/metrics for the stock. Determine stock status.

The target and threshold levels for fishing mortality were calculated using spawning potential ratio (SPR) reference points. The updated target *F* reference point, $F_{40\%SPR}$, was 0.20, and the threshold level, $F_{30\%SPR}$, was 0.33, similar to those estimated for the previous assessment updates (Table 20). The retrospectively adjusted three-year average (i.e., 2022–2024) *F* was estimated to be 0.44, above both the target and the threshold, indicating overfishing was occurring (Table 6, Figure 31).

Target and threshold spawning stock biomass reference points were calculated by determining equilibrium SSB when assuming fishing at both the target and threshold fishing mortality levels. The projections drew from the empirical distribution of observed recruitment for the full time-series and used the most recent five-year average for selectivity and life history parameters like weight-at-age. These calculations were conducted using the AgePro program from the NOAA Fisheries Toolbox. The SSB threshold was 5,929 mt and the SSB target was 7,910 mt, somewhat higher than 2021 assessment update (Table 20). This was due to the increase in recruitment in recent years which increased the time-series median recruitment. The adjusted estimated 2024 SSB was 7,900 mt, above the threshold and slightly below the target, indicating that the stock was not overfished (Table 21, Figure 31). The retrospective adjustment changed stock status for spawning stock biomass, moving the stock from below the SSB threshold to close to the SSB target. Fishing mortality remained above the *F* threshold after the retrospective adjustment.

TOR 6. Conduct short term projections when appropriate. Discuss assumptions if different from the benchmark and describe alternate runs.

Short term, three-year projections (2025–2027) were completed to estimate the probability of overfishing or the stock being overfished during the period. Projections were completed using an assumed constant harvest level equal to the average total removals from 2022–2024 (1,843 mt). All other parameters (life history information and selectivity patterns) used the most recent five-year average. Recruitment was drawn from the empirical distribution of the full time-series recruitment estimated by the ASAP model. SSB remained relatively constant over the projections, with a 19% probability of being at or below the SSB threshold in three years (Table 22, Figure 32). Although *F* declines slightly over the projections, there was an 88% probability that fishing mortality would be at or above the threshold in three years (Table 22, Figure 32).

TOR 7. 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.

In 2016, New Jersey began conducting a ventless trap survey within and around 3 artificial reef sites off the central New Jersey coast. The trap gear is more appropriate for structure-oriented species such as tautog, and the data from this survey may potentially be useful for the next benchmark assessment when the time-series meets the minimum requirement of 10 years.

The retrospective pattern for this region has worsened since the last assessment update, and although the direction is conservative from a management perspective (underestimating SSB and overestimating *F*), this is something that should be investigated during the next benchmark.

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List of Appendices

NJ-NYB Appendix 1: ASAP Input and Diagnostic Plots for the Base Run
NJ-NYB Appendix 2: Retrospective Adjustment and Sensitivity Runs

Tables

Table 16. Annual removals by sector (in metric tons) for the NJ-NYB region.

Year	Recreational Harvest	Recreational Release Mortalities	Commercial Harvest
1982	1,162.4	6.8	67.2
1983	1,579.3	13.3	45.6
1984	1,581.0	4.7	58.8
1985	2,798.7	16.7	56.9
1986	2,550.7	10.7	54.8
1987	3,404.6	39.0	58.4
1988	1,895.5	24.1	89.6
1989	1,826.0	19.9	57.9
1990	1,895.6	23.1	86.6
1991	2,767.4	66.5	93.2
1992	2,932.7	53.7	84.8
1993	1,481.2	43.3	89.2
1994	439.9	18.0	92.2
1995	1,616.0	30.3	64.1
1996	1,322.2	37.0	50.7
1997	871.9	39.1	30.9
1998	64.5	14.3	31.5
1999	769.5	77.1	26.5
2000	1,978.2	42.2	30.9
2001	1,313.3	32.6	50.3
2002	1,552.1	71.0	35.9
2003	534.4	30.2	49.5
2004	412.1	27.1	49.5
2005	170.3	10.6	47.4
2006	847.3	28.7	52.2
2007	1,087.5	62.3	58.0
2008	814.7	43.7	57.3
2009	1,241.1	48.6	34.6
2010	1,172.3	53.5	57.4
2011	762.4	49.0	66.8
2012	370.3	18.1	39.9
2013	1,277.8	134.0	52.8
2014	2,609.5	64.3	46.4
2015	820.4	75.2	47.7
2016	1,352.4	189.3	66.2
2017	868.5	82.7	64.1
2018	578.7	17.6	50.0
2019	900.9	84.6	66.3
2020	643.4	147.0	32.1
2021	1,225.2	134.1	59.5
2022	1,587.8	302.2	85.7
2023	1,721.4	257.6	59.6
2024	1,234.8	205.9	72.5

Table 17. Indices used in the ASAP model for the NJ-NYB region.

Index Name	Index Metric	Design	Time of Year	Years	Ages
NY DEC Western Long Island Seine Survey	Mean number per haul	Fixed	May-Oct	1984-2024	YOY
NJ DEP Ocean Trawl Survey	Mean number per tow	Stratified Random	Jan-Oct	1989-2024	1+
MRIP CPUE	Total catch per angler-trip	Stratified Random	Mar-Dec	1981-2024	1+

Table 18. Model structure and life history information used in the NJ-NYB stock assessment.

	Value(s)
Years in Model	1989-2024
Age Plus Group	12+
Fleets	1 (Rec and Commercial)
Recreational Release Mortality Rate	2.5%
Fraction of year before SSB calculation	0.42
Number of selectivity blocks	5
Selectivity periods	1989 - 1996, 1997 - 2006, 2007 - 2011, 2012 - 2017, 2018 - 2024
Selectivity type	Single logistic

	Age Group											
	1	2	3	4	5	6	7	8	9	10	11	12+
Proportion mature-at-age	0	0	0.8	1	1	1	1	1	1	1	1	1
Natural mortality	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15

Table 19. Spawning stock biomass, recruitment, annual F, and 3-year average *F* estimates for the NJ-NYB region.

Year	Spawning stock biomass (mt)	Recruitment (millions of age-1 fish)	Annual F	3-year Average F
1989	8,759	4.04	0.31	
1990	9,242	3.50	0.30	
1991	8,717	3.71	0.47	0.36
1992	7,153	2.72	0.60	0.46
1993	6,329	2.38	0.36	0.48
1994	6,554	1.96	0.12	0.36
1995	6,629	1.64	0.33	0.27
1996	5,982	1.56	0.30	0.25
1997	5,564	1.56	0.20	0.28
1998	5,732	1.83	0.03	0.18
1999	5,974	1.55	0.23	0.15
2000	5,323	1.47	0.52	0.26
2001	4,507	1.52	0.41	0.38
2002	3,850	1.36	0.62	0.51
2003	3,539	1.45	0.26	0.43
2004	3,722	1.99	0.15	0.34
2005	4,076	2.04	0.07	0.16
2006	4,453	2.00	0.25	0.16
2007	4,412	2.03	0.37	0.23
2008	4,359	2.07	0.27	0.29
2009	4,263	1.73	0.44	0.36
2010	4,055	2.02	0.38	0.36
2011	4,013	1.80	0.27	0.36
2012	4,384	2.41	0.13	0.26
2013	4,554	2.32	0.40	0.27
2014	4,061	2.76	0.78	0.44
2015	3,924	2.91	0.31	0.50
2016	4,299	3.26	0.50	0.53
2017	4,732	2.69	0.30	0.37
2018	5,622	2.52	0.22	0.34
2019	6,359	1.74	0.28	0.27
2020	6,874	2.36	0.20	0.23
2021	6,962	3.32	0.28	0.25
2022	6,518	3.04	0.47	0.32
2023	6,044	2.79	0.59	0.45
2024	5,870	3.10	0.50	0.52
*2024**	*7,900*			*0.44*

**Retrospectively adjusted values*

Table 20. SSB and *F* reference points from the 2021 update and the 2025 update for the NJ-NYB region.

	SSB (mt)		F	
	Target	Threshold	Target	Threshold
2021 Update	6,552	4,890	0.19	0.30
2025 Update	7,910	5,929	0.20	0.33

Table 21. Stock status for the NJ-NYB region.

	SSB (mt)		F	
	Target	Threshold	Target	Threshold
Reference Points	7,910	5,929	0.20	0.33
2024 Estimate	7,900*		0.44*	
2024 Status	Not overfished		Overfishing	

*: Retrospectively-adjusted value

Table 22. Short-term projection results for the NJ-NYB region.

Landings (mt) for 2025-2027	Probability of being at or above the *F* threshold in 3 years	Probability of being at or below SSB threshold in 3 years
Status quo (2021-2024 average)	88%	19%

Figures

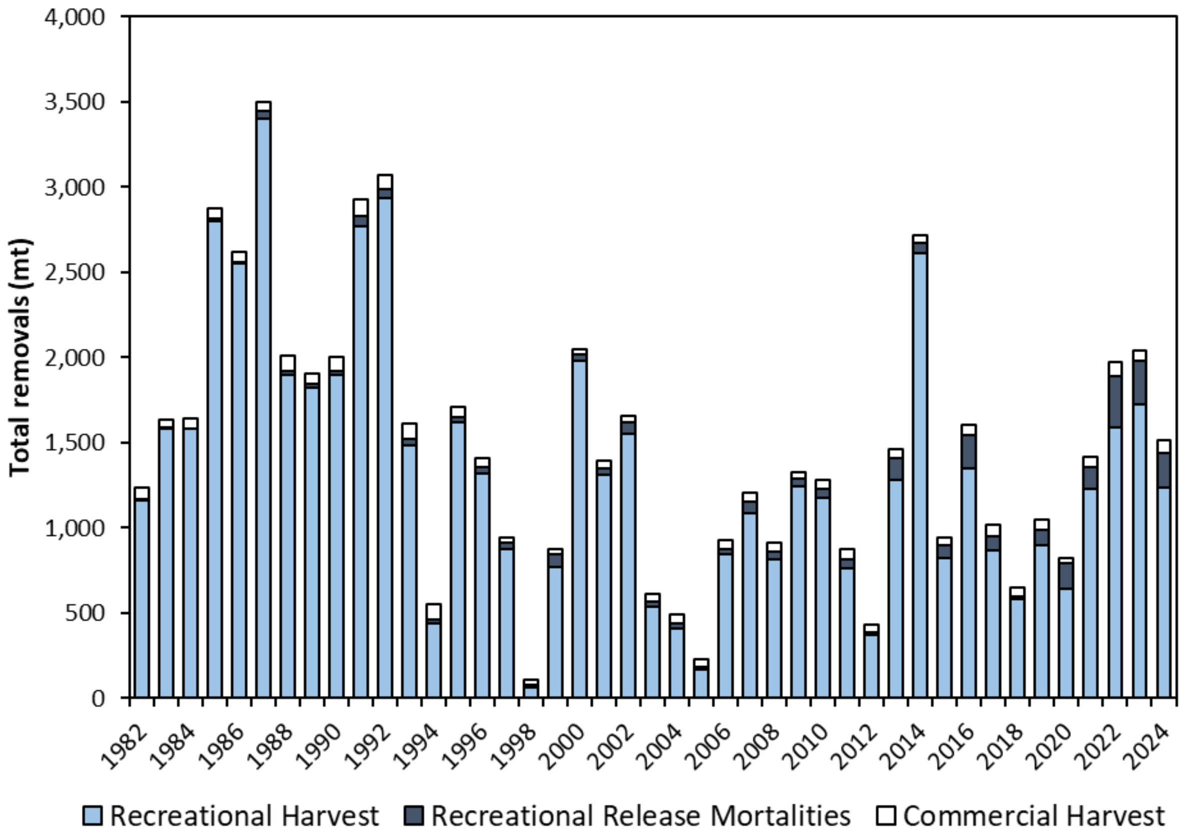

Figure 23. Total removals for the NJ-NYB region by sector.

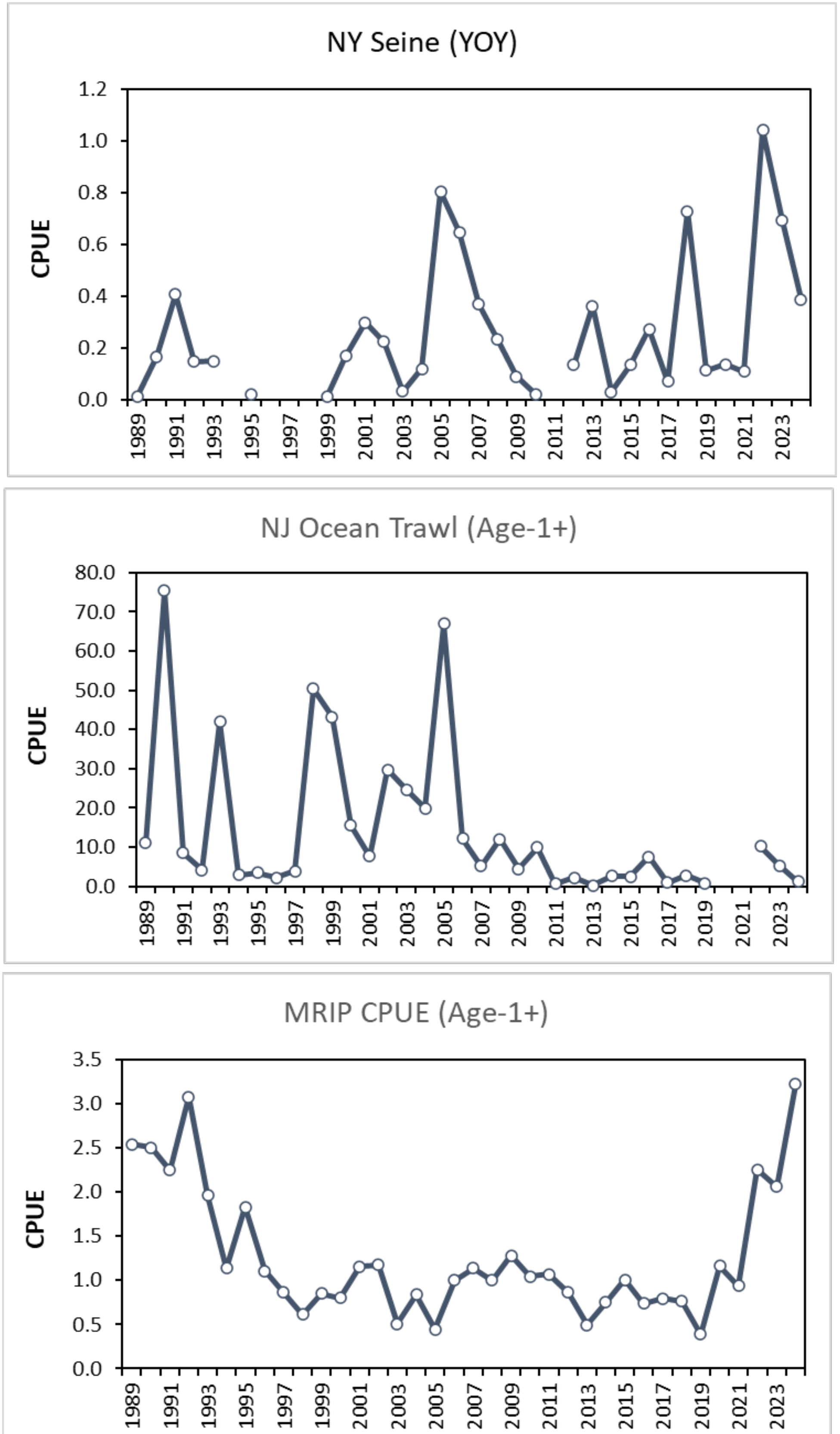

Figure 24. Observed CPUE for each index used in the NJ-NYB region.

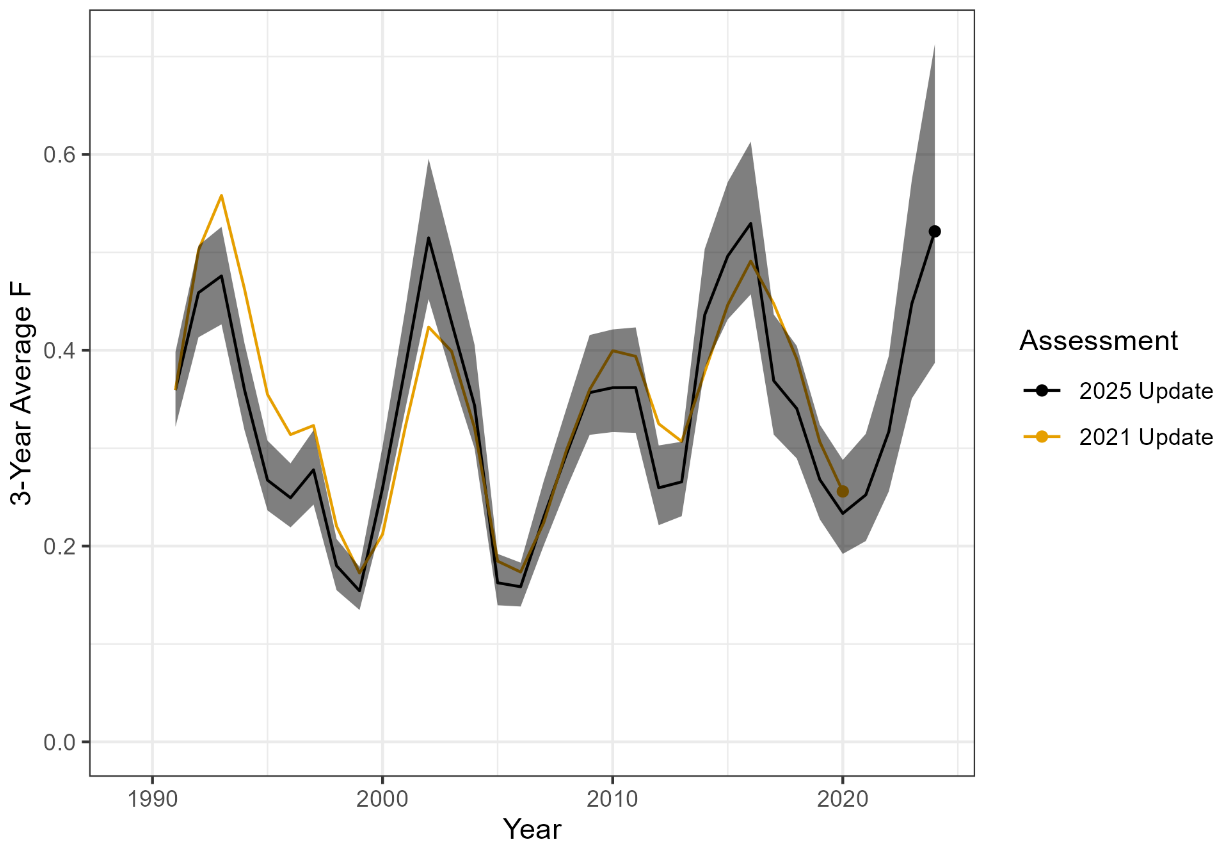

Figure 25. Estimates of the 3-year average of *F* from the 2025 update compared with the 2021 update for the NJ-NYB region. Shaded area indicates the 90% confidence interval of the 2025 update estimates.

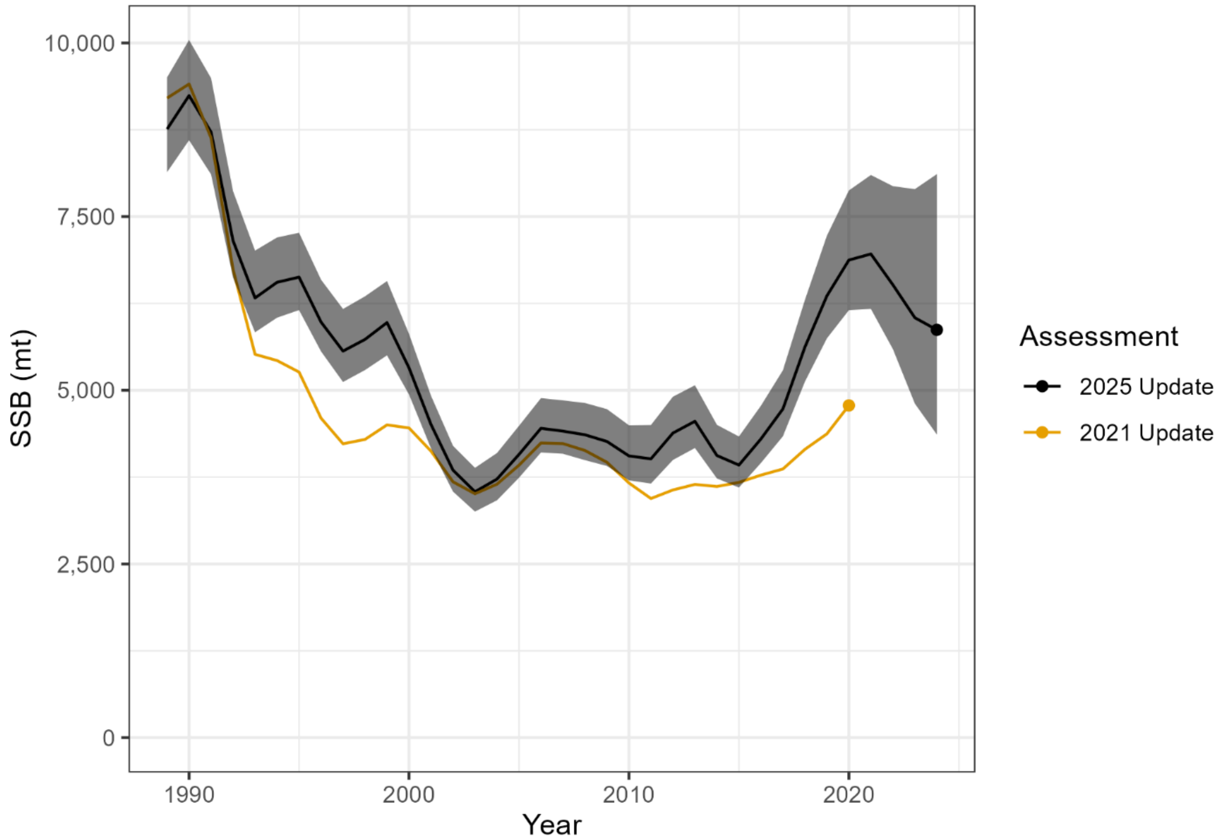

Figure 26. Estimates of spawning stock biomass from the 2025 update compared to the 2021 update for the NJ-NYB region. Shaded area indicates the 90% confidence interval of the 2025 update estimates.

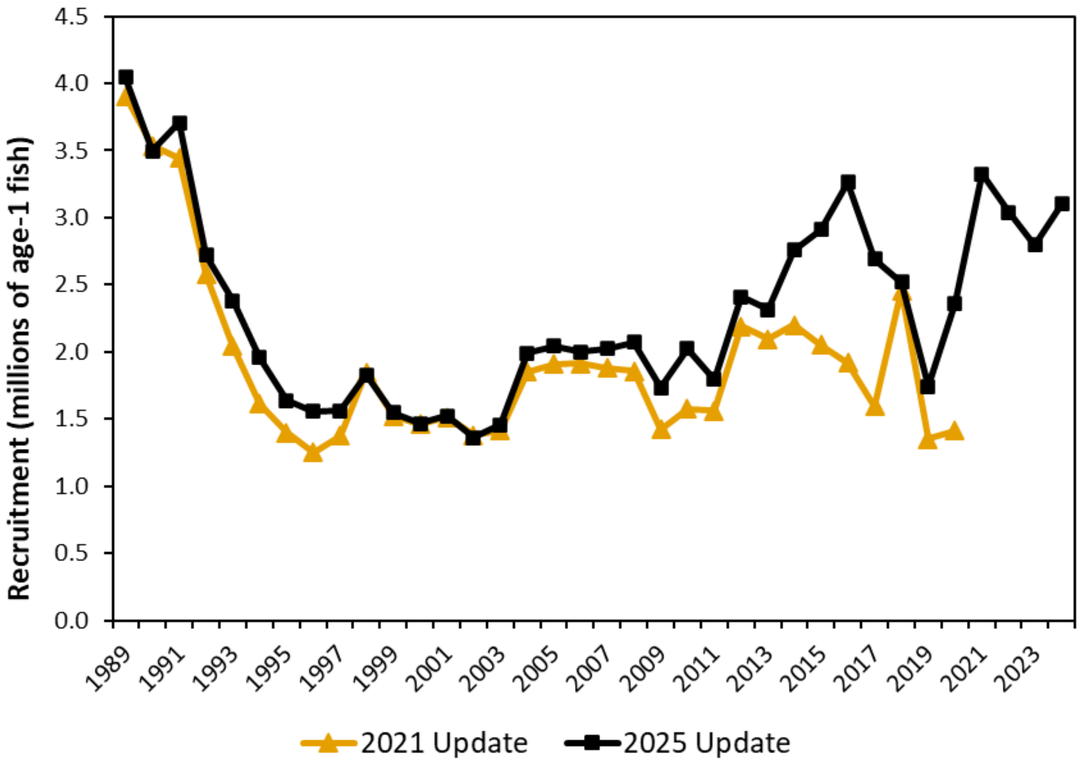

Figure 27. Estimates of recruitment for the 2025 update compared to the 2021 update for the NJ-NYB region.

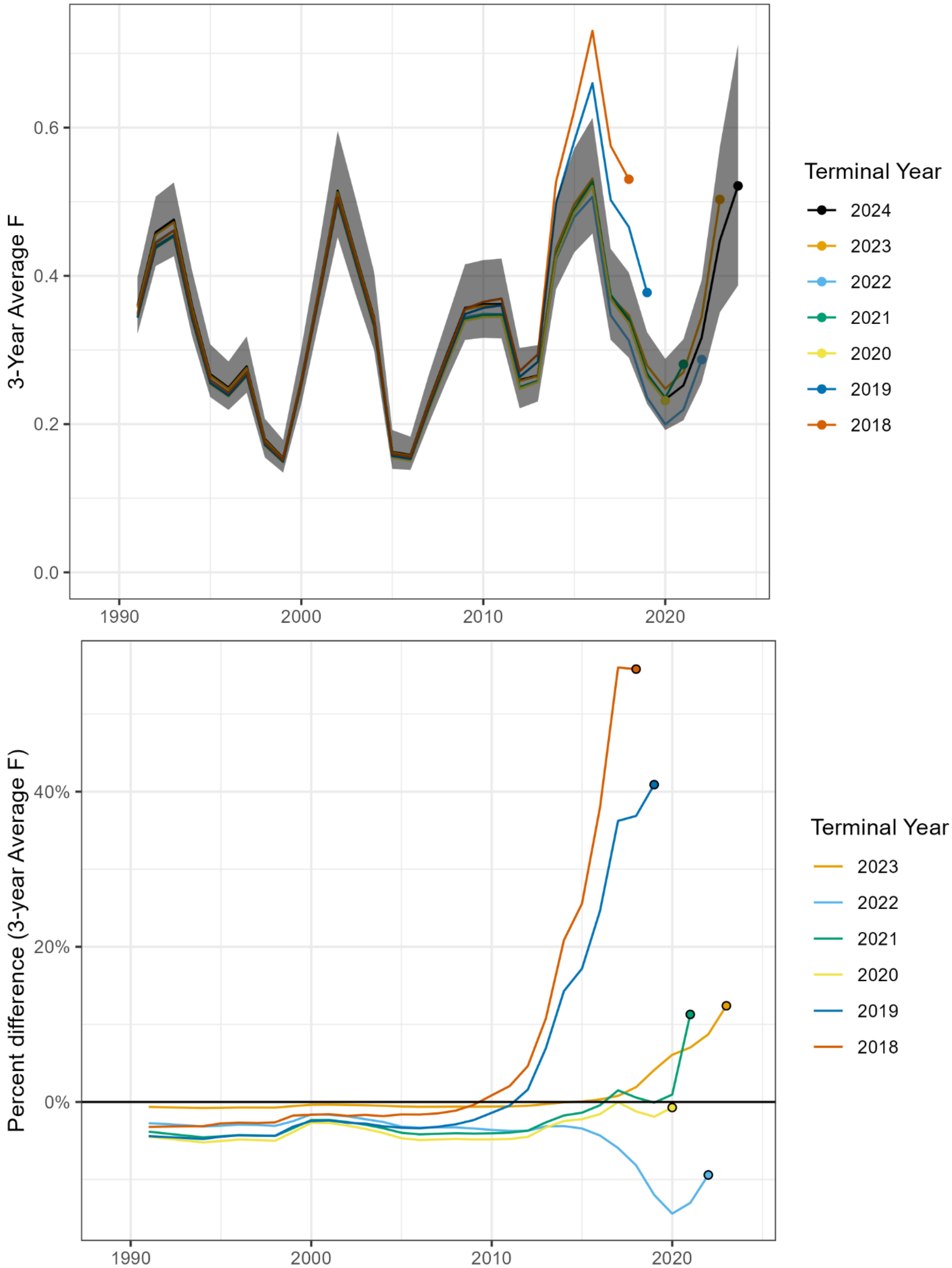

Figure 28. Retrospective analysis for the three-year average *F* in absolute numbers (top) and percent difference (bottom) for the NJ-NYB region. Shaded area indicates 90% confidence interval of base run.

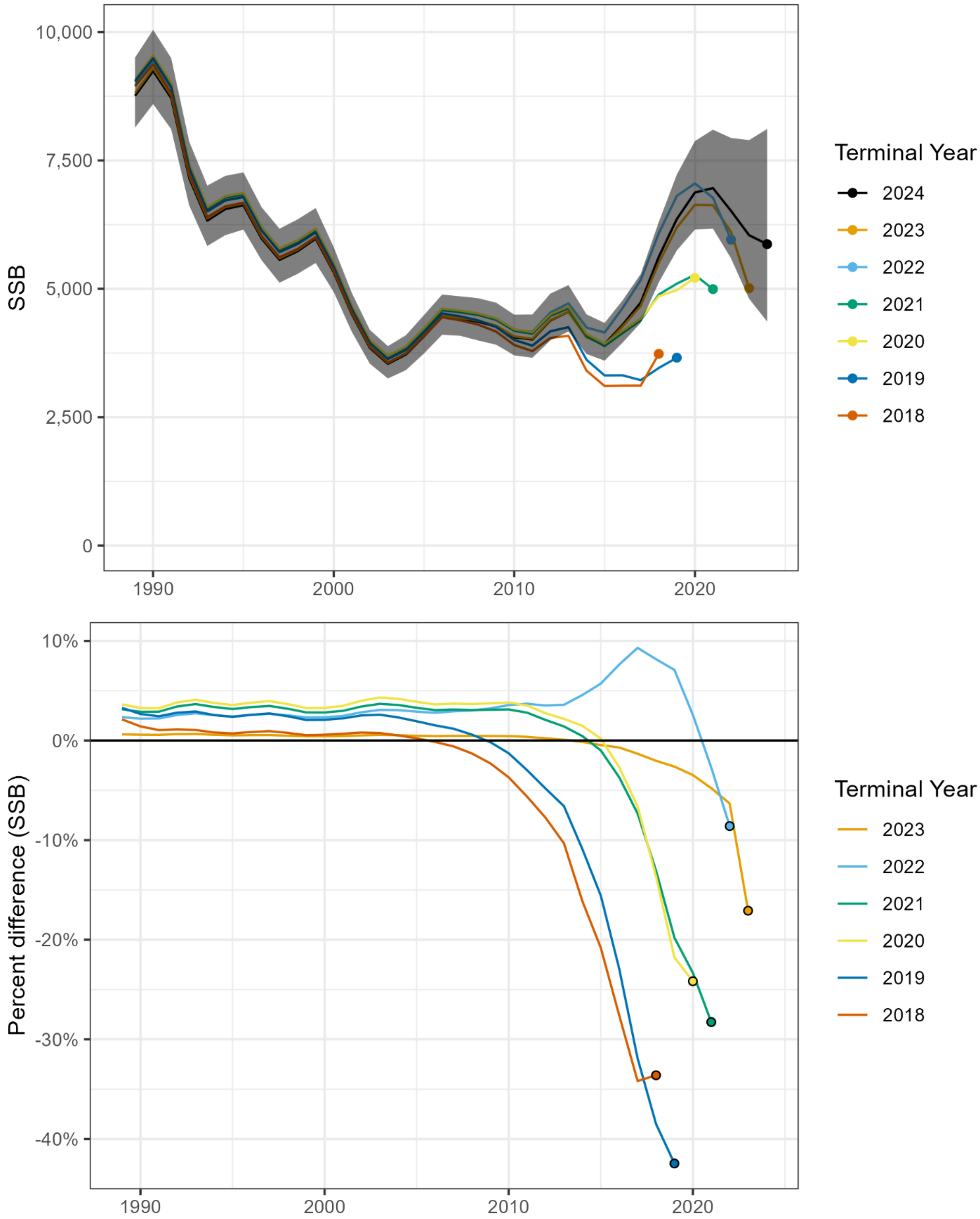

Figure 29. Retrospective analysis for SSB in absolute numbers (top) and percent difference (bottom) for the NJ-NYB region. Shaded area indicates 90% confidence interval of the base run.

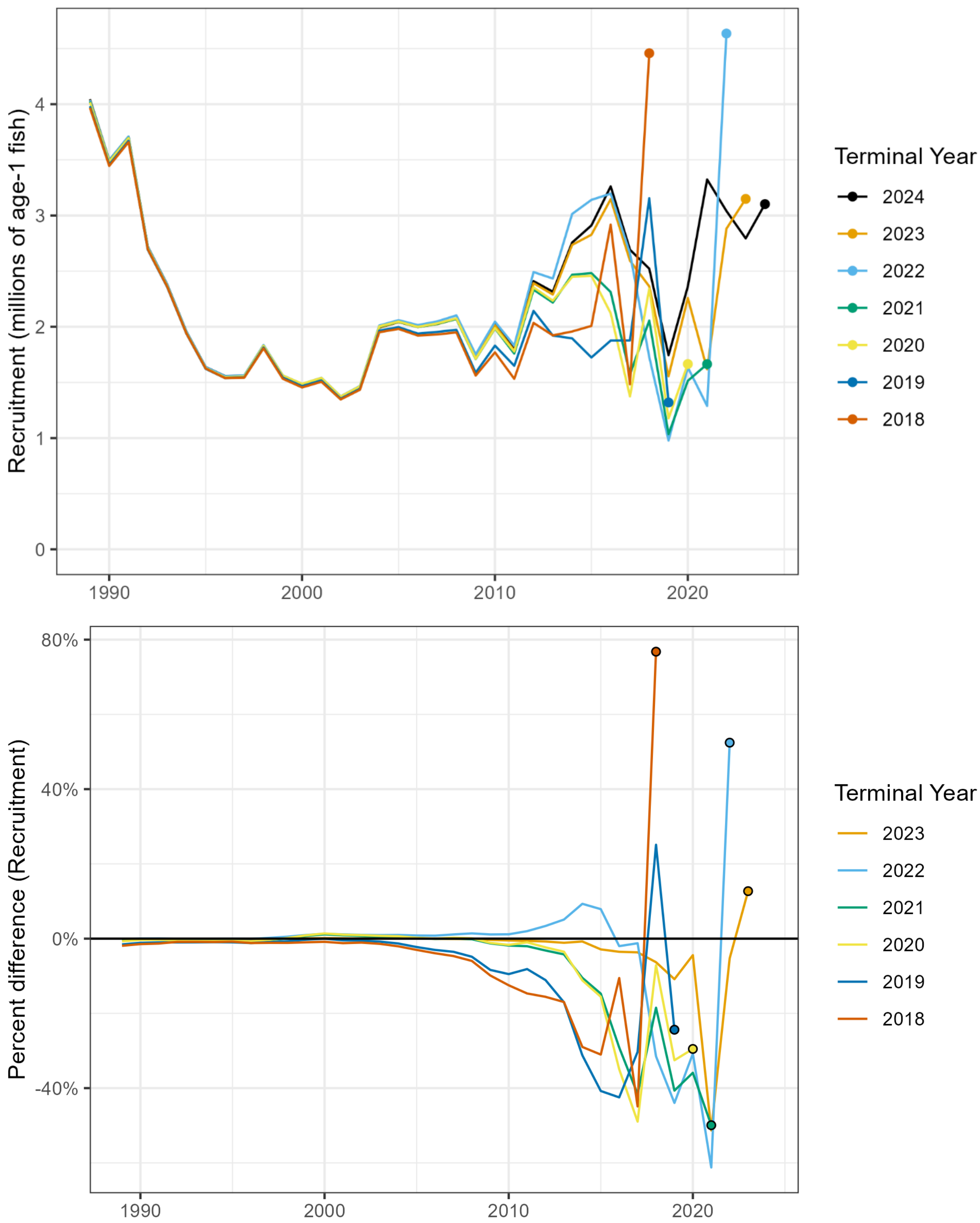

Figure 30. Retrospective analysis for recruitment in absolute numbers (top) and percent difference (bottom) for the NJ-NYB region.

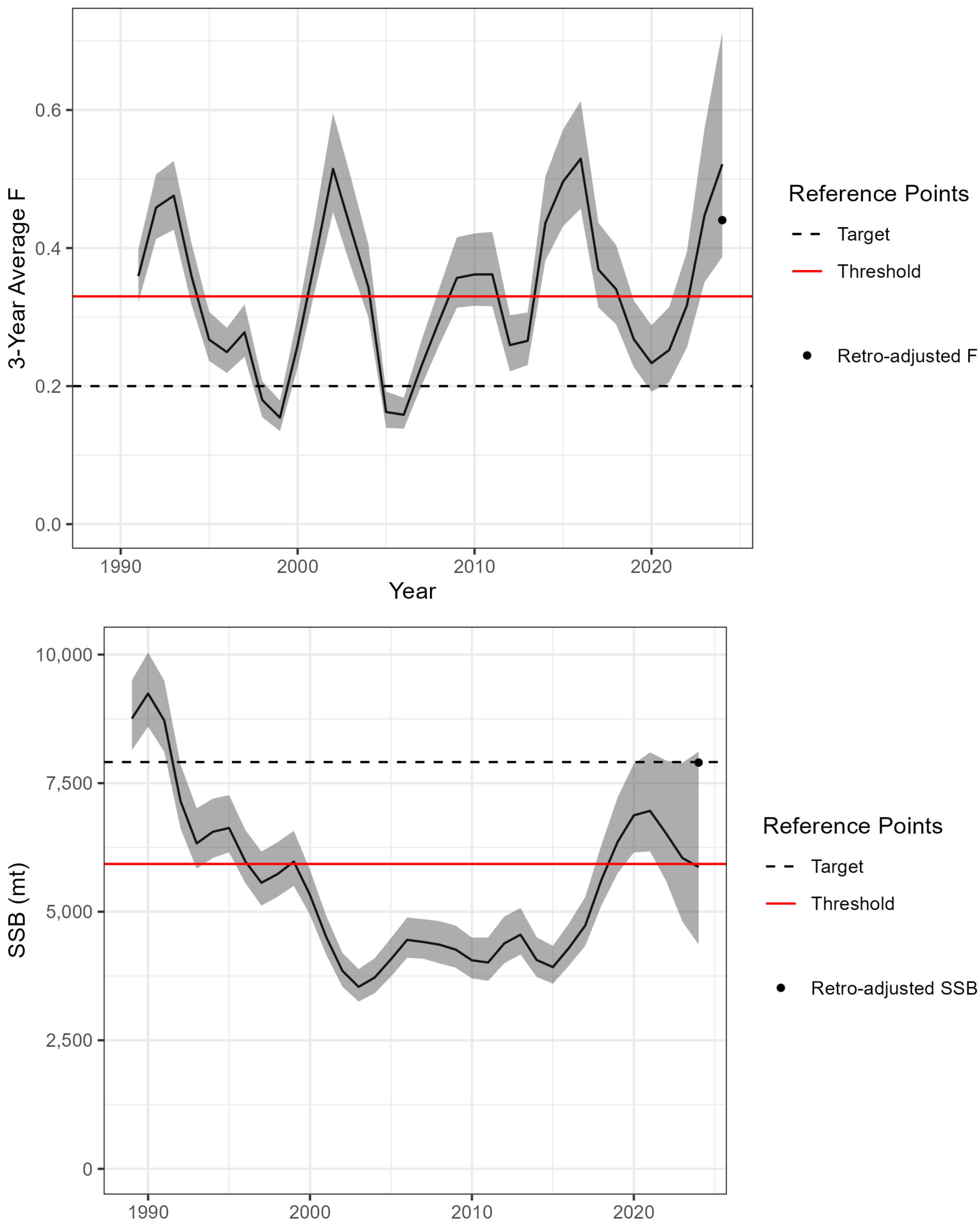

Figure 31. Stock status for the NJ-NYB region. Shaded area indicates the 90% confidence interval of the base run without a retrospective adjustment.

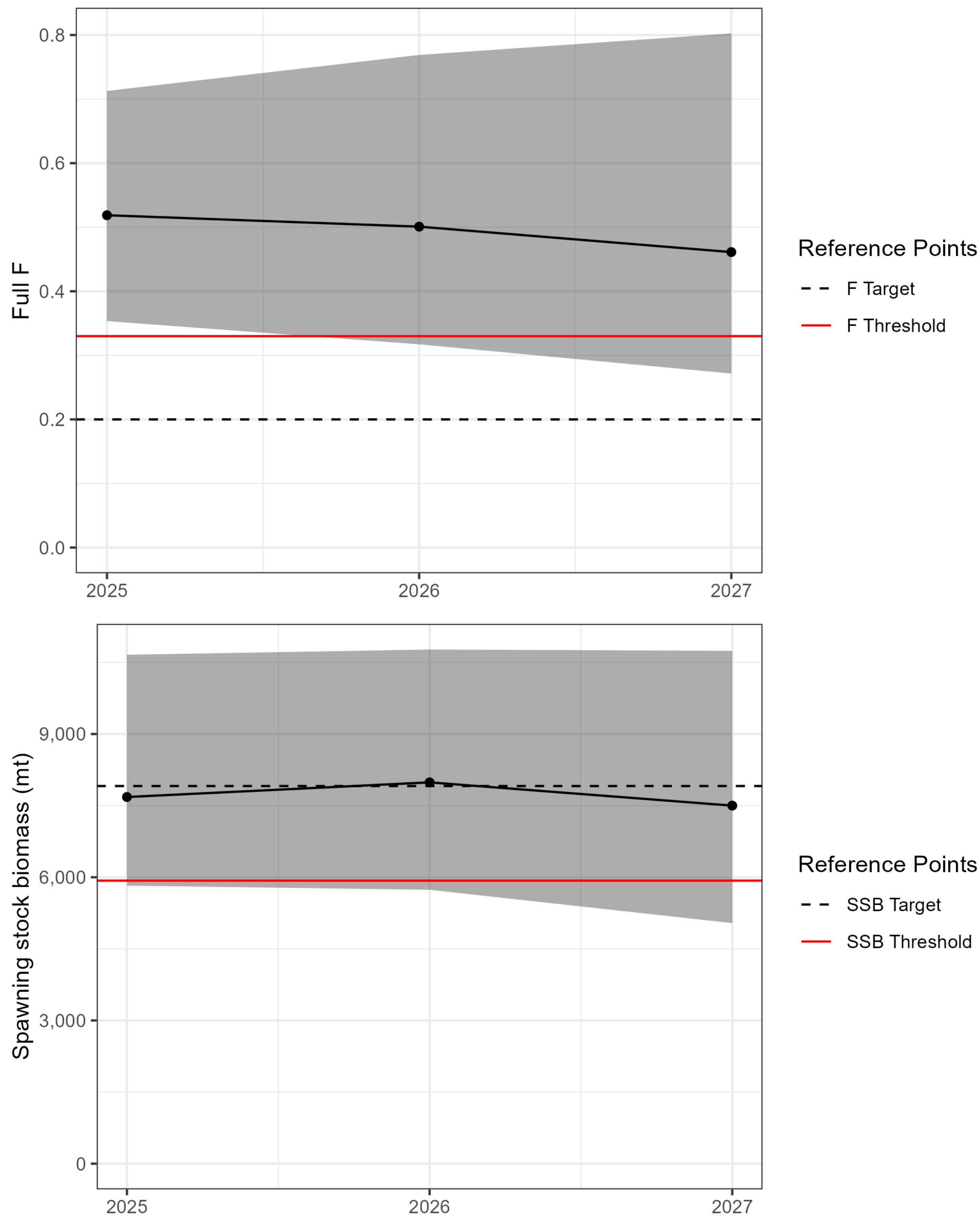

Figure 32. Short-term projection results for the NJ-NYB region using the average of the most recent three years of removals for *F* (top) and SSB (bottom) plotted with the *F* and SSB reference points.

Tautog Stock Assessment Update
DELAWARE-MARYLAND-VIRGINIA REGION
2025

Executive Summary

This stock assessment is an update to the existing benchmark assessment for tautog for the Delaware-Maryland-Virginia (DMV) region (ASMFC 2015, ASMFC 2016); the previous assessment update was completed in 2021 (ASMFC 2021). This assessment updates the accepted statistical catch-at-age model ASAP with commercial and recreational fishery catch data and indices of relative abundance from fishery-independent and fishery-dependent data sources through the terminal year of 2024.

Stock status has changed in this region since the last assessment update. In 2021, the stock for the DMV region was not overfished or experiencing overfishing. The 2025 update of the assessment model initially resulted in a similar conclusion. However, the model shows a strong retrospective pattern, underestimating fishing mortality and overestimating spawning stock biomass in recent years. Based on the observed retrospective pattern and applying ASMFC standardized approach for retrospective correction, the 2024 SSB was adjusted downwards, while fishing mortality was adjusted upwards. As a result of the retrospective adjustment, the 2024 SSB was below the SSB threshold and the fishing mortality was above the *F* threshold, hence the stock status was redefined as overfished and overfishing was occurring.

Short term projections based on the retrospectively adjusted starting values of numbers at age using the average landings from the last three years found that both *F* and SSB will slightly decline by 2027. The probability of the fully-recruited *F* being at or above the *F* threshold is expected to be 22% by 2027, while the probability of SSB being at or below the SSB threshold by the end of the projection is 97%.

TOR 1. Update fishery-dependent data (landings, discards, catch-at-age, etc.) that were used in the previous peer-reviewed and accepted benchmark stock assessment.

Recreational harvest (A+B1) of tautog for DMV region in 1982 - 2024 varied between 0.35 million and 1.1 million fish, with the overall declining trend through time (Table 23, Figure 33). There was an overall declining trend in recreational harvest, most likely a reflection of the protective regulatory measures (minimum size increase, bag size reduction and seasonal closures) instituted to reduce fishing mortality. Average recreational harvest for the most recent four-year period (2021-2024) was 149,500 fish.

Estimated recreational releases have varied from 15,600 fish in 1984 to 3.59 million fish in 2023. Assuming 2.5% release mortality rate, dead releases varied from 3,910 fish to 898,080 fish (Table 23, Figure 33). There was a general increasing trend for recreational releases through time, with the average for the last four years being 2.58 million fish compared to 0.74 million fish from 1982 to 2020. However, release mortality losses generally were very small relative to the harvest, thus the total recreational losses (A+B1+B2) are only slightly above the recreational harvest (A+B1) as reflected in Figure 33.

Due to low number of intercepted fishing trips that had caught tautog in the most recent decade, annual estimates of recreational landings and discards in MD and VA had low precision. In Virginia Proportional Standard Error (PSE) values exceeded 50% in 5 out of 10 of the most recent years for landings and 4 out of the 10 most recent years for discards. In Maryland, PSE exceeded 50% in 6 out of the 10 most recent years for landings and 4 out of the 10 most recent years for discards. PSEs were all below 50% in Delaware. DMV Regionwide PSE were all below 50%, but in the last 10 years, PSEs of harvest estimates have exceeded 30% five times, and PSEs of live release estimates (B2) have exceeded 30% four times.

Commercial landings reported by each state (DE, MD, and VA) were updated through 2024 and combined to derive region specific landings. Historically, commercial landings peaked at 31,400 pounds (14.2 mt) in 1997 and have declined since (Table 23, Figure 33). Average commercial landings for 2021 - 2024 were 3,953 pounds (1.79 mt). Data on commercial discards were not available, but discards were believed to be minimal. Therefore, estimates of dead discards were not generated.

Biological sampling for tautog is conducted by each state on annual basis with the goal of collecting at least 200 samples per year for each state. Samples for length, weight, sex and age are taken mostly by intercepting the catch of recreational fishermen. However, some samples were taken from commercial fishery as well. Annual age length keys were constructed by combining paired length - age samples from all three states. Age length keys were constructed for years 2021 - 2024 to update age information since 2021 assessment update that had a 2020 terminal year. In instances where there were gaps (i.e., missing length samples) in the data they were filled using either neighboring lengths, adjacent years or using samples in those bins from surrounding regions. On average, 584 samples of age and size samples per year were used to construct annual ALKs for 2021 - 2024, covering 22 - 78 cm size range and ages 1 - 28.

Length frequency of the recreational harvest was characterized using length frequency of the data collected by MRIP combined for all states. MRIP annual harvest estimates were applied to corresponding length frequency of the recreational harvest (A+B1) to obtain harvest in numbers by size. Size frequency of discards (B2) was characterized by combining the raw MRIP Type 9 data and the American Littoral Society (ALS) volunteer tagging data on the size of released fish to obtain regional estimate of discards. Discard lengths were poorly sampled in 2024: sample size =15 as compared to 758, 583, and 158 in 2021-2023, respectively. So instead of using raw length distribution for 2024, we used the average of proportions-at-length from 2021-2024 for the 2024 length frequency.

Due to low or absent commercial fishery size sampling, size frequency of recreational harvest was used to describe commercial catch at size. Recreational harvest, dead releases, and commercial harvest in numbers of fish by size were combined into a total regional estimate and converted into catch at age using regional year-specific age-length keys.

TOR 2. Update fishery-independent data (abundance indices, age-length data, etc.) that were used in the previous peer-reviewed and accepted benchmark stock assessment.

There are no fishery-independent indices available for the DMV region. The only index of relative abundance used in the 2015 benchmark assessment and 2016 and 2021 assessment updates was catch per trip derived from MRIP data (Table 24). Total catch per trip was modeled with GLM method using a suite of potentially important covariates (year, state, wave, and mode) with an effort offset based on angler hours for the trip. The MRIP based index was updated through 2024. The MRIP index in 2021-2024 showed a substantial increase compared to the variable but lower average in prior years (Table 25, Figure 34).

TOR 3. 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.

All regions used ASAP (Age Structured Assessment Program which is included in the NOAA Fisheries Toolbox) as the base model (https://www.fisheries.noaa.gov/resource/tool-app/noaa-fisheries-integrated-toolbox). ASAP is a forward-projecting, statistical catch-at-age model that uses a maximum likelihood framework to estimate annual fishing mortality, recruitment, population abundance and biomass, and other parameters from catch-at-age data and indices of abundance. ASAP provides estimates of the asymptotic standard error for estimated and calculated parameters from the Hessian. In addition, MCMC calculations provide more robust characterization of uncertainty for F, SSB, biomass, and reference points.

Model structure and life history parameters used in the assessment for DMV region are presented in Table 26. Natural mortality was assumed to be a constant value for all years and ages (M=0.16), as estimated in the 2015 benchmark assessment. Tautog were considered to be immature through age 2, 78% mature at age 3, 97% mature at age 4 and 100% mature at age 5. Sex ratio was assumed to be 50:50 and no sexual dimorphism in growth was considered.

The ASAP model was run from 1990 to 2024 based on the catch at age and MRIP index data representing ages 1 - 12, where age 12 was treated as a plus group. Removals were modeled as a single fleet that included total removals in weight and numbers-at-age from recreational harvest, recreational release mortality, and commercial catch. Selectivity of the fleet was described by a single logistic curve. Four selectivity blocks were used: 1982-1996, 1997-2006, 2007-2011 and 2012-2024. The number of selectivity blocks and their definition was similar to the 2021 assessment update, except that the fourth block was extended through 2024 following no change in fishery regulations that could have affected the selectivity parameters. Breaks were chosen based on implementation of fishery regulations. MRIP recreational catch index was split into age specific indices using the recreational catch age structure and the model was fit to index-at-age data assuming a single logistic selectivity curve and constant catchability. No YOY indices are available for DMV region.

All likelihood components weights (lambda values) were similar to the 2021 assessment update. Annual CVs on total catch were set equal to the weighted mean of state specific MRIP PSE values, while index CVs were based on the GLM-standardized CVs and adjusted upwards to CV=0.6 (constant for all years) to bring the RMSE values for the catch and the index close to one. The input effective sample size (ESS) was set equal to the number of trips intercepted by the MRIP where tautog were measured. ESS values were further adjusted during second model run using ASAP's estimates of stage 2 multipliers for multinomials.

TOR 4. 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.

The previous assessment update completed in 2021 was based on the ASAP model run from 1990 to 2020. The 2025 update included four more years of data on catch, age structure and index of abundance, but otherwise model structure and estimation process have not been modified. Updated fishing mortality estimates were similar to the 2021 assessment update for most of the historic time series, but in the more recent period appear to be substantially higher, suggesting a presence of retrospective pattern resulting in model underestimation of *F* in most recent years (Figure 35). However, the overall trend of *F* in both cases was very similar (Figure 35).

As in the 2021 assessment update, there was a high peak in fishing mortality in 2010-2012 caused by high recreational harvest estimates for these years (Figure 35). Fishing mortality was in a lower range after 2012 but experienced a recent peak in 2021 (F=0.46) followed by a decline thereafter. The terminal year (2024) *F* was estimated at 0.07, while the three-year average for 2022 – 2024 was estimated as 0.25.

Spawning stock biomass went through two stages of decline during 1990-2010 (Figure 36). The 2025 assessment update indicated SSB was stable between 2010 - 2021, varying within a narrow range of 1,200-1,500 mt (Figure 36). Estimates of SSB from the 2025 update were lower than the estimates of SSB from the 2021 update from about 2000 onwards and did not show the strong increasing trend the 2021 update showed for 2015-2020 (Figure 36). The 2025 update model suggested a strong increase in SSB in 2022-2024 to approximately 4,500 mt. This increase was likely driven by the increase in the MRIP index of tautog abundance (Figure 34). However, this increase is likely to be overestimated as described below in the retrospective section of the report.

Except for the single spike at the beginning of the time series, recruitment appears to have been slowly declining during 1990-2020, varying within the range of 0.3 - 2.1 million fish with an average near 1 million fish (Figure 37). No outstanding year classes were noted aside from the 1990 year-class (age 1 in 1991 on Figure 37). However, the model suggested a striking increase in recruitment in 2022-2023, most likely driven by the trend in the MRIP abundance index because there are no other sources of information on recruitment strength in the most recent years of the assessment (i.e., because those year-classes are not very vulnerable to the fishery, there was very little information on them in the catch-at-age data to date for this region).

Retrospective analyses were performed by shortening ("peeling") the data time series by one year at a time and comparing the results to the output of the model with full time series (1990-2024). The analysis was completed for time series ending in 2017 (a seven-year peel).

As in the benchmark assessment and 2016 and 2021 assessment updates, the DMV region showed a strong retrospective pattern, consistently underestimating *F* (Figure 38) and overestimating SSB (Figure 39), except for the 2021 time series. Bias in recruitment was not unidirectional, both over and underestimation have occurred (Figure 40). The level of bias ranged from -78 to +90% for *F* (Figure 38), -33 to +10% for SSB (Figure 39) and -83 to +55% for recruitment (Figure 40). The estimates of R, F, and SSB produced by different runs converged more when going back in time.

The decision on whether a retrospective pattern adjustment was needed was based on the procedure developed by the ASFMC Assessment Science Committee (ASMFC 2024).

For long-lived species such as tautog, an adjustment is recommended when the value of Mohn's rho is outside the recommended bounds (-0.15 – +0.2 for a long-lived species like tautog) and the retrospectively-adjusted values fall outside the uncertainty bounds of the base model estimates for terminal year. For DMV tautog, there was a major retrospective pattern in SSB, where Mohn's rho = 0.67 exceeded the recommended bounds, and the adjusted value of SSB was outside the 90% confidence interval (DMV Appendix 2 Figure A2.1). Therefore, a retrospective adjustment was applied to SSB.

In case of F, Mohn's rho (-0.32) was outside of the recommended bounds, while the adjusted value of *F* was still within the 90% confidence interval (DMV Appendix 2 Figure A2.1). However, three out of the last five peels were outside of the confidence interval for the base run (DMV Appendix 2 Figure A2.2), and the terminal year of the previous assessment estimated a 3-year average *F* of 0.06, which was also outside the confidence interval in this year's assessment. Therefore, a retrospective adjustment was applied to F.

Based on the formal criteria outlined in ASMFC 2023, the terminal year SSB and 3-year average *F* were adjusted using the Mohn's rho values reported in ASAP for a seven-year peel. The adjusted value of SSB was 2,687 metric tons. The adjusted value of the 3-year average *F* in the terminal year was 0.36.

A limited number of sensitivity runs were conducted to examine the effects of input data and model configuration on model performance and results. The base model results were insensitive to changes in starting values of model parameters (initial numbers at age, steepness, selectivity, catchability, etc.). The model was converging on the same parameters estimates, within a range of initial starting values, indicating stability of model solution.

There is only one index available for the region (MRIP CPUE), therefore removal of the index to investigate its effect was not possible. At the same time, the MRIP index shows a significant increase in abundance in 2022-2024, which has a substantial effect on the model results. An exploratory run was completed by adding a NJ trawl index, assuming there is natural connectivity between DMV and NJ-NYB stocks. However, there was no notable effect of the inclusion of the NJ index on trends or scale of estimated SSB and F. Additionally, the benchmark assessment used only the DMV index for the DMV assessment, hence only DMV MRIP index was kept in the base model run. MRIP survey operations for the DMV region were not significantly affected by COVID pandemic in 2020-2023. Consequently, MRIP index calculated using imputed data was nearly identical to the one that used only non-imputed information.

The most influential parameters to the model were coefficients of variation (CVs) of the index of abundance and catch. Smaller values of CV force the model to fit predicted values of index or total catch closer to the observed and vice versa. To investigate the role of the precision of the estimate of index (MRIP CV), the model was run with the range of estimates of CVs beginning with the original estimates and following with the CVs increased two-fold. Results indicated that overall model fit (objective function value) improves with the increase in CV index, but the RMSE value was still well above 1. The index CVs were then systematically increased with a step of 0.1 and the model was run with the CV ranging from 0.5. to 1.1 (Table A.2.1). High levels of index CV resulted in RMSE values below 1 but at the expense of the modeled index poorly fitting the observed data for both the MRIP Index and Total Catch. For the final run an intermediate CV level of 0.6 for the index was chosen as a balanced value that resulted in RMSE being close to 1 for both catch and an index, and the trend in the modeled index following the observed data reasonably well.

To better characterize the uncertainty in estimates of *F* and SSB, an MCMC procedure was run with the 1000 sampling events and thinning factor of 1000. Results of the MCMC analysis were used to describe the uncertainty in estimates of *F* and SSB as probability density distribution for *F* and SSB for each year of the modeling and in the bootstrapping when doing the short-term projections of the stock using the AgePro software. MCMC results are used to plot the 95% confidence intervals for the time series of *F* and SSB as a measure of the uncertainty (Figure 41).

TOR 5. Update the biological reference points or trend-based indicators/metrics for the stock. Determine stock status.

For the DMV stock, SPR-based reference points are used for the stock status determination. Specifically, $F_{40\%SPR}$ was selected as a target reference point and $F_{30\%SPR}$ as a threshold. To calculate corresponding target and threshold level of SSB, the projection model AGEPRO was used to project the population forward in time 100 years under constant fishing mortality ($F_{30\%SPR}$ and $F_{40\%SPR}$) with recruitment drawn from the model-estimated time-series of observed recruitment to develop an estimate of the long-term equilibrium SSB associated with those fishing mortality reference points.

The current (2025) update resulted in similar values for the *F* target ($F_{40\%SPR}$ = 0.18) and *F* threshold ($F_{30\%SPR}$= 0.29) as compared to the 2021 update (Table 28). These slight changes are a result of re-estimation of age specific selectivity for the latest selectivity block (2012-2024).

The SSB target was estimated at 4,400 mt, and the SSB threshold was estimated at 3,236 mt, very close to those obtained from the 2021 update (Table 28).

Based on the formal criteria outlined in ASMFC (2024), the terminal year SSB and 3-year average *F* were adjusted using Mohn's rho values reported in ASAP for a seven-year peel for the determination of stock status. The adjusted value of SSB is 2,687 metric tons, which is less than the SSB threshold of 3,236 metric tons (Table 29, Figure 41). The adjusted value of the 3-year average *F* in the terminal year is 0.36, which is higher than the *F* threshold of 0.29 (Table 29, Figure 41). Therefore, the determination was made that the DMV stock was overfished and that overfishing was occurring in 2024.

Although the formal criteria for a retrospective adjustment are met, the appropriateness of this adjustment is not certain for a number of reasons. Several additional factors are worth considering when discussing the effect of retrospective bias adjustment on determining the stock status in the DMV region. Importantly, the source of the retrospective bias is unknown and future trends in retrospective pattern might change. Indeed, in one year (2021) the direction of the retrospective pattern was reversed with SSB lower and *F* higher than the base model (Figure 38-Figure 39). The direction of the retrospective pattern is a cause for concern because the model tends to underestimate *F* and overestimate SSB and the history of stock status, as the stock was determined to be not overfished and overfishing was not occurring in 2020. The fishery is considered to be stable in terms of regulations (no change). Effective fishing effort may be less stable as an apparent increase in the use of advanced trolling motors with spot lock technology may allow anglers to hold beneficial locations for longer periods of time and fish for tautog more efficiently. Recruitment over the past two decades appears to be stable, while in recent years it has increased significantly according to the model. An increasing trend in recruitment is supported by the MD DNR YOY tautog index for coastal bays seine survey. Since there are no fishery-independent surveys for the DMV region, both the index and the catch data are composed primarily of MRIP data, with its associated uncertainty (see TOR 1). The appropriateness of bias correction therefore can be verified only when additional years of data with the information on catch and the index are accumulated and the assessment model is rerun.

TOR 6. Conduct short term projections when appropriate. Discuss assumptions if different from the benchmark and describe alternate runs.

A short term, three-year (2025-2027) projection to determine status of the stock and trends in SSB and *F* was completed using AgePro (v. 4.2, NOAA Fisheries Toolbox) model. The projections assumed a constant harvest level equal to the recent three-year average (2022-2024). Biological parameters (maturity, M, weights at age) for the projection model were the same used in the ASAP population model, with the exception that projection catch weights at age were set equal to the average catch weight at age in the most recent selectivity block. Recruitment for the projected years was drawn from the vector of recruitment values estimated by ASAP model in 2021 assessment update. Fishery selectivity at age was set equal to the one estimated by ASAP for the most recent selectivity period. Starting values for the numbers at age were the estimates of number at age calculated for the terminal year of the ASAP model, adjusted for the retrospective bias using the age specific Mohn's rho estimates from the 7-year peel. Harvest for the projected period was assumed equal to the most recent three-year average removals.

If the constant catch of 155.5 mt is maintained during 2025-2027 (status quo scenario), the probability of the fully recruited *F* being at or above the *F* threshold by 2027 is estimated at 22% (Table 30). The probability of SSB being at or above SSB threshold is only 3% (Table 30, Figure 42). Fishing mortality is projected to decline to the *F* target, while SSB is projected to decline slightly by 2027 and remain below the SSB threshold (Figure 42).

TOR 7. 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.

Developing a fishery independent index for tautog in the DMV is a high priority research recommendation. Since the last benchmark two have been started: MD DNR has started a seagrass survey that has the potential to serve as a YOY index for tautog and DE DFW has started a ventless trap survey that catches fish from a wide size range, which has the potential to serve as an additional index of abundance. The SAS recommends that these surveys be continued and considered for use in the next benchmark.

There is a need to improve the precision of the recreational harvest. Recreational harvest estimates for tautog in the DMV area often have high PSE estimates, which indicates the need for higher sampling rates to intercept more trips that have tautog in the harvest. Winter months are poorly sampled due to the lack of sampling in wave 1 and low sampling effort in waves 2 and 6. For hire trips sampling should be also a high priority during those waves.

There is either no sampling of commercial catch, or very low sampling. There is a need to improve the data on size structure of the commercial catch and the level of discards.

There is a need to update the basic biological information tautog and investigate alternative model structures. Understanding sources of retrospective pattern and eliminating the retrospective is a priority for further model development.

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List of Appendices

DMV Appendix 1: ASAP Input and Diagnostic Plots for the Base Run
DMV Appendix 2: Retrospective Adjustment and Sensitivity Runs

Tables

Table 23. Total removals in metric tons by sector for the DMV region.

	Recreational Harvest	Recreational Release Mortalities	Commercial Harvest
1982	1,110.8	0.8	
1983	1,266.9	4.5	
1984	1,158.6	0.4	
1985	927.9	9.5	3.0
1986	1,093.1	3.6	2.3
1987	1,068.5	3.5	3.4
1988	665.1	3.4	4.3
1989	1,758.8	7.5	5.5
1990	532.1	9.5	4.3
1991	1,126.8	14.5	4.3
1992	652.9	13.5	4.3
1993	1,429.3	21.5	3.1
1994	1,249.3	16.5	6.1
1995	1,662.0	21.1	14.1
1996	1,373.5	10.9	13.8
1997	717.8	13.1	14.2
1998	771.9	24.7	10.0
1999	677.5	27.0	12.5
2000	496.7	27.4	8.5
2001	261.9	17.2	8.4
2002	669.1	22.8	12.7
2003	449.8	20.3	8.4
2004	1,010.9	36.7	9.7
2005	539.4	29.2	5.5
2006	709.2	30.8	7.0
2007	676.7	30.6	6.6
2008	709.8	43.4	7.3
2009	999.9	39.1	6.8
2010	1,193.9	47.1	4.2
2011	532.7	18.7	8.1
2012	297.2	7.3	7.4
2013	226.3	16.1	6.8
2014	387.6	23.2	5.0
2015	111.4	23.0	4.6
2016	138.8	15.9	3.6
2017	113.9	29.7	2.7
2018	50.0	15.8	1.0
2019	85.3	13.2	1.2
2020	244.2	10.7	1.3
2021	321.2	100.3	1.2
2022	273.1	62.5	2.3
2023	211.5	119.9	1.6
2024	63.2	31.5	2.0

Table 24. Indices used in the ASAP model for the DMV region.

Index Name	Index Metric	Design	Time of Year	Years	Ages
MRIP CPUE	Total catch per angler-trip	Stratified Random	Mar-Dec	1982-2024	1+

Table 25. Time series of the MRIP index for the DMV region.

Year	CPUE	SE	CV	ESS
1982	1.6263	0.3147	0.1935	17
1983	0.7023	0.0942	0.1342	13
1984	0.9112	0.1501	0.1647	21
1985	0.4262	0.0531	0.1245	18
1986	5.8549	0.5697	0.0973	78
1987	2.1571	0.2897	0.1343	32
1988	1.8500	0.2431	0.1314	33
1989	3.1492	0.3241	0.1029	81
1990	1.3320	0.1623	0.1219	49
1991	1.0838	0.1253	0.1156	54
1992	1.3648	0.1497	0.1097	78
1993	2.6623	0.2925	0.1099	84
1994	2.7895	0.2705	0.0970	75
1995	2.6275	0.2672	0.1017	68
1996	2.5909	0.2737	0.1056	59
1997	1.1610	0.1197	0.1031	40
1998	0.4783	0.0517	0.1081	57
1999	0.8145	0.0898	0.1102	40
2000	0.8409	0.0881	0.1048	27
2001	0.9758	0.0948	0.0972	48
2002	2.0039	0.1836	0.0916	78
2003	1.4193	0.1345	0.0948	99
2004	1.8000	0.1731	0.0961	132
2005	1.8614	0.1740	0.0935	148
2006	2.1948	0.2144	0.0977	174
2007	1.5501	0.1434	0.0925	127
2008	2.6032	0.2275	0.0874	200
2009	1.4090	0.1326	0.0941	157
2010	2.0422	0.1906	0.0933	170
2011	1.7398	0.1812	0.1041	138
2012	1.2304	0.1407	0.1143	93
2013	1.0853	0.1100	0.1014	112
2014	0.8721	0.0940	0.1078	81
2015	0.5923	0.0687	0.1160	51
2016	1.4155	0.1450	0.1024	127
2017	1.4079	0.1428	0.1014	54
2018	1.4719	0.1450	0.0985	60
2019	0.8216	0.0844	0.1027	50
2020	1.3646	0.1582	0.1159	111
2021	2.2522	0.2180	0.0968	104
2022	5.4958	0.5854	0.1065	108
2023	3.4047	0.3506	0.1030	66
2024	3.3876	0.3368	0.0994	21

Table 26. Model structure and life history information used in the stock assessment.

	Value(s)
Years in Model	1990-2024
Age Plus Group	12+
Fleets	1 (Rec and Commercial)
Recreational Release Mortality Rate	2.5%
Fraction of year before SSB calculation	0.42
Number of selectivity blocks	4
selectivity periods	1990-1996, 1997- 2006, 2007-2011 and 2013-2024
Selectivity type	Single logistic

	Age Group											
	1	2	3	4	5	6	7	8	9	10	11	12+
Proportion mature-at-age	0	0	0.8	1	1	1	1	1	1	1	1	1
Natural mortality	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16

Table 27. Spawning stock biomass in metric tons, recruitment (millions of age-1 fish), annual fishing mortality (*F*), and 3-year average *F* estimates for the DMV region.

Year	Spawning stock biomass (mt)	Recruitment (millions of age-1 fish)	Annual F	3-year Average F
1990	5,273	1.82	0.27	
1991	5,588	2.10	0.26	
1992	5,785	1.71	0.21	0.25
1993	5,885	1.29	0.32	0.26
1994	5,729	0.93	0.25	0.26
1995	5,268	0.88	0.39	0.32
1996	4,444	0.94	0.37	0.34
1997	3,887	0.96	0.29	0.35
1998	3,607	1.30	0.30	0.32
1999	3,380	1.12	0.32	0.30
2000	3,454	1.06	0.21	0.28
2001	3,713	1.06	0.14	0.23
2002	3,883	0.93	0.24	0.20
2003	3,907	0.81	0.21	0.20
2004	3,748	0.96	0.33	0.26
2005	3,538	1.07	0.19	0.24
2006	3,485	0.85	0.27	0.27
2007	3,406	0.80	0.26	0.24
2008	3,164	0.83	0.35	0.29
2009	2,408	0.69	0.85	0.48
2010	1,750	0.84	0.68	0.62
2011	1,477	0.46	0.62	0.71
2012	1,341	0.38	0.83	0.71
2013	1,267	0.29	0.32	0.59
2014	1,270	0.39	0.33	0.49
2015	1,214	0.46	0.25	0.30
2016	1,188	0.65	0.33	0.30
2017	1,203	0.46	0.26	0.28
2018	1,390	0.53	0.14	0.24
2019	1,502	0.69	0.27	0.22
2020	1,511	1.55	0.33	0.25
2021	1,510	2.06	0.46	0.36
2022	1,899	3.81	0.38	0.39
2023	2,696	5.66	0.29	0.38
2024	4,489	0.92	0.07	0.25
*2024**	*2,687*			*0.36*

**Retrospectively adjusted values*

Table 28. SSB and *F* reference points from 2021 and 2025 assessment updates for the DMV region.

	SSB		F	
	Target	Threshold	Target	Threshold
2021 Update	4,488	3,355	0.17	0.27
2025 Update	4,400	3,236	0.182	0.288

Table 29. Stock status for the DMV region.

	SSB		F	
	Target	Threshold	Target	Threshold
Reference Points	4,400	3,236	0.18	0.29
2025 retro adjusted	2,687*		0.36*	
2025 Status	Overfished		Overfishing	

**Retrospectively-adjusted value*

Table 30. Projection results for the DMV region.

Landings (mt) for 2022-2024	Probability of being at or above *F* threshold in 3 years	Probability of being at or below SSB threshold in 3 years
Status quo (2022-2024 average)	22%	97%

Figures

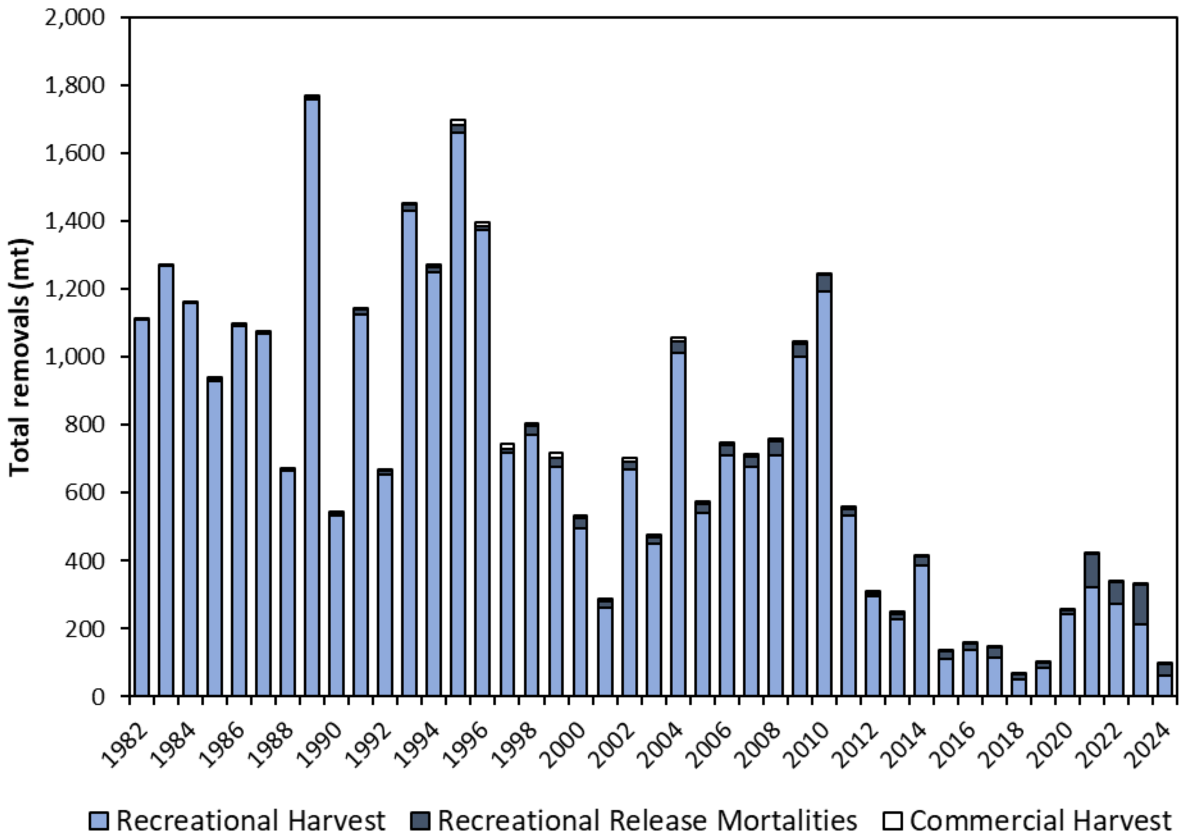

Figure 33. Total removals by sector for the DMV region.

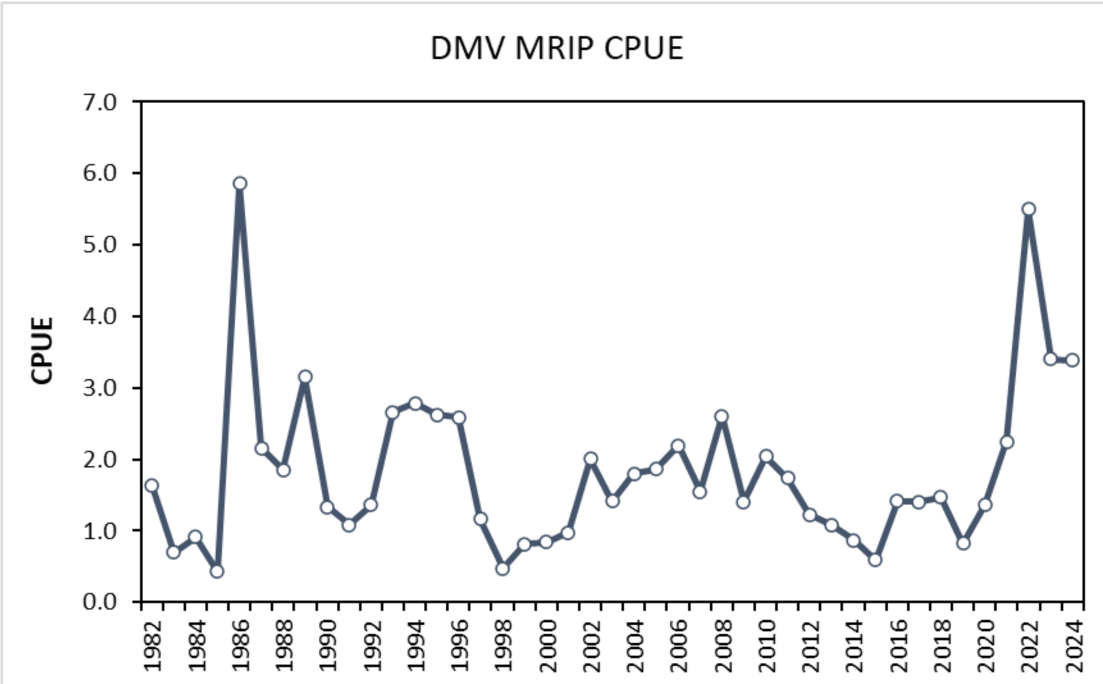

Figure 34. Indices of abundance used for the DMV region.

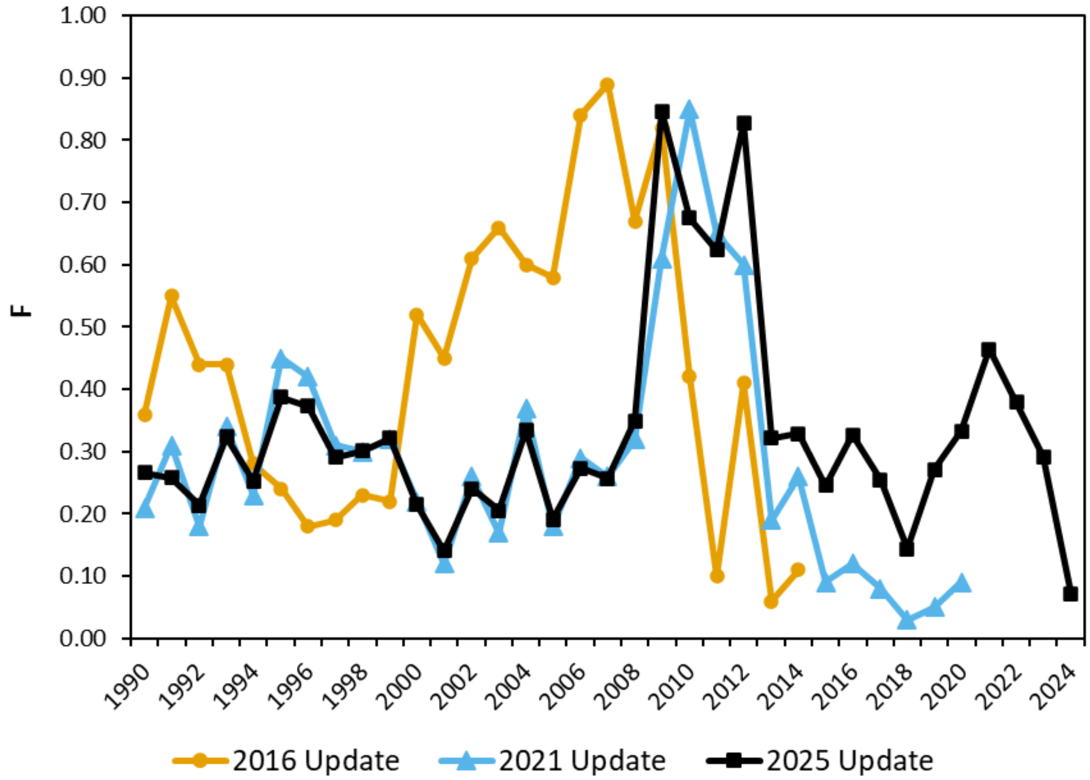

Figure 35. Estimates of the annual full *F* based on the 2016, 2021 and 2025 updates for the DMV region. The estimates from the 2016 update are not directly comparable to the 2021 and 2025 estimates because they are based on the uncalibrated MRIP estimates prior to the transition to the mail-based effort survey.

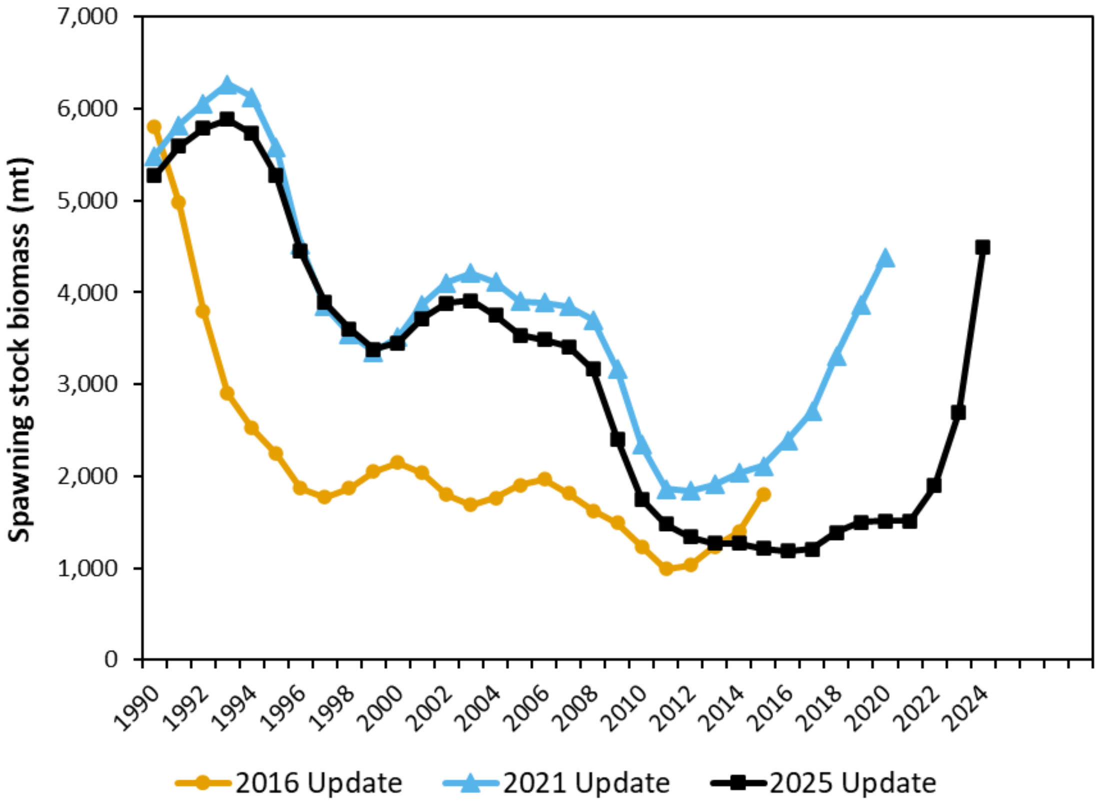

Figure 36. Estimates of spawning stock biomass for the 2016, 2021 and 2025 updates for the DMV region. The estimates from the 2016 update are not directly comparable to the 2021 and 2025 estimates because they are based on the uncalibrated MRIP estimates prior to the transition to the mail-based effort survey.

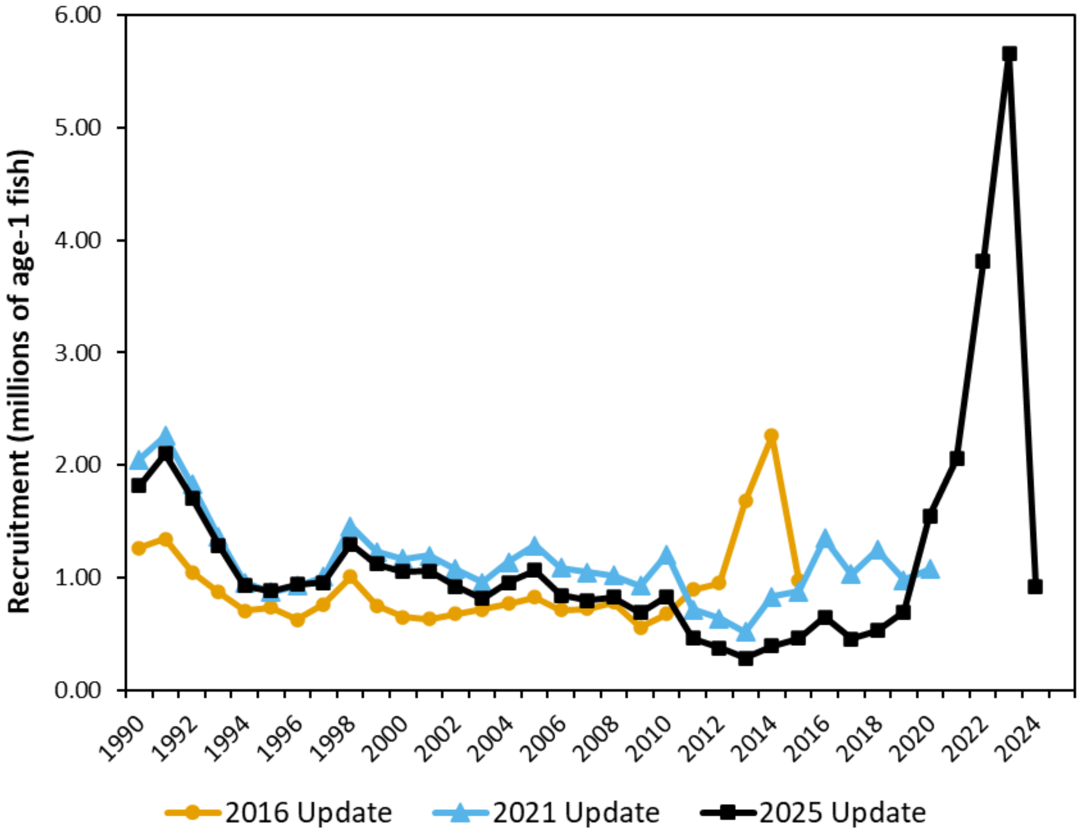

Figure 37. Estimates of recruitment for the 2016, 2021 and 2025 updates for the DMV region. The estimates from the 2016 update are not directly comparable to the 2021 and 2025 estimates because they are based on the uncalibrated MRIP estimates prior to the transition to the mail-based effort survey.

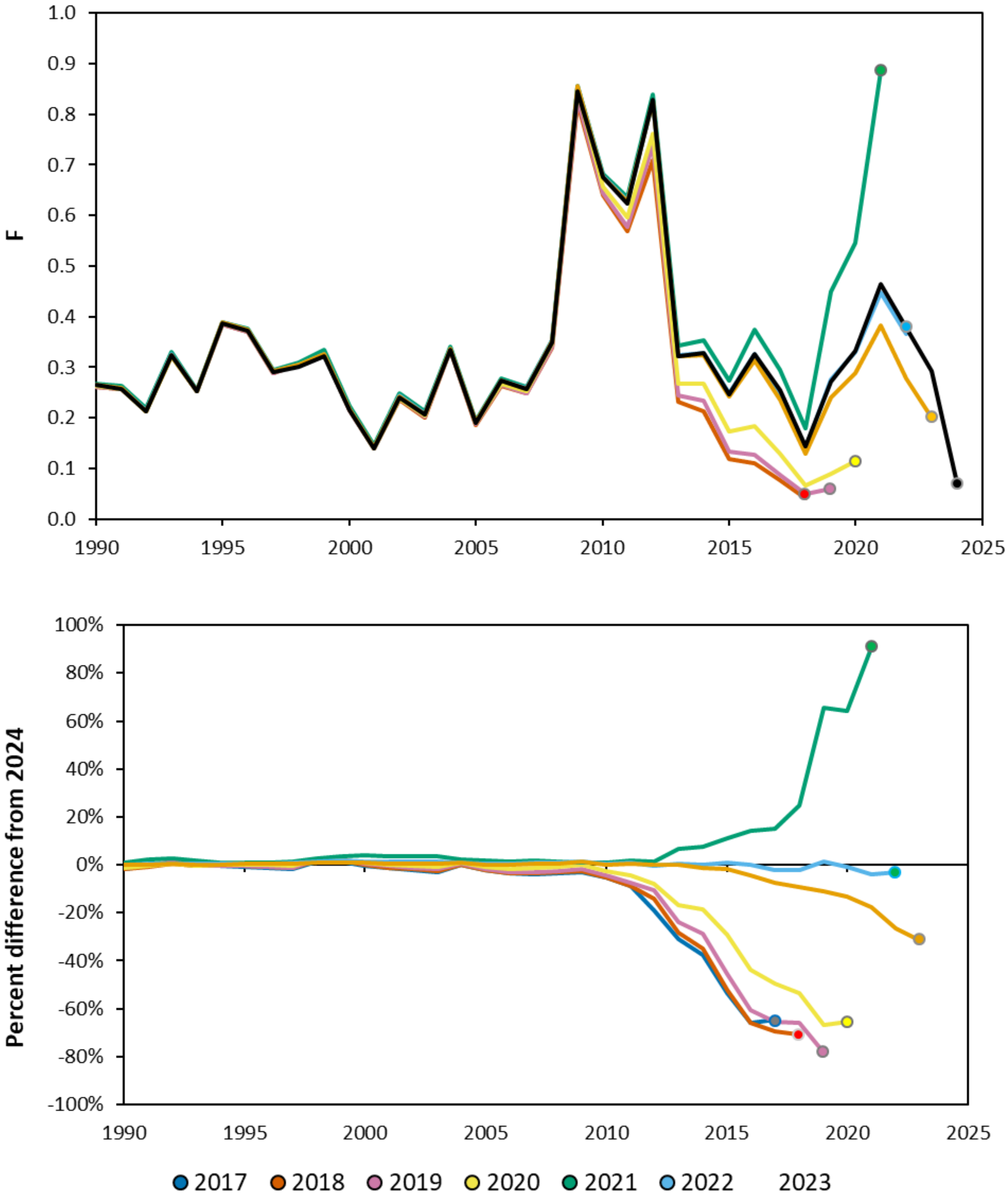

Figure 38. Retrospective analysis for annual *F* in absolute numbers (top) and percent difference (bottom) for the DMV region.

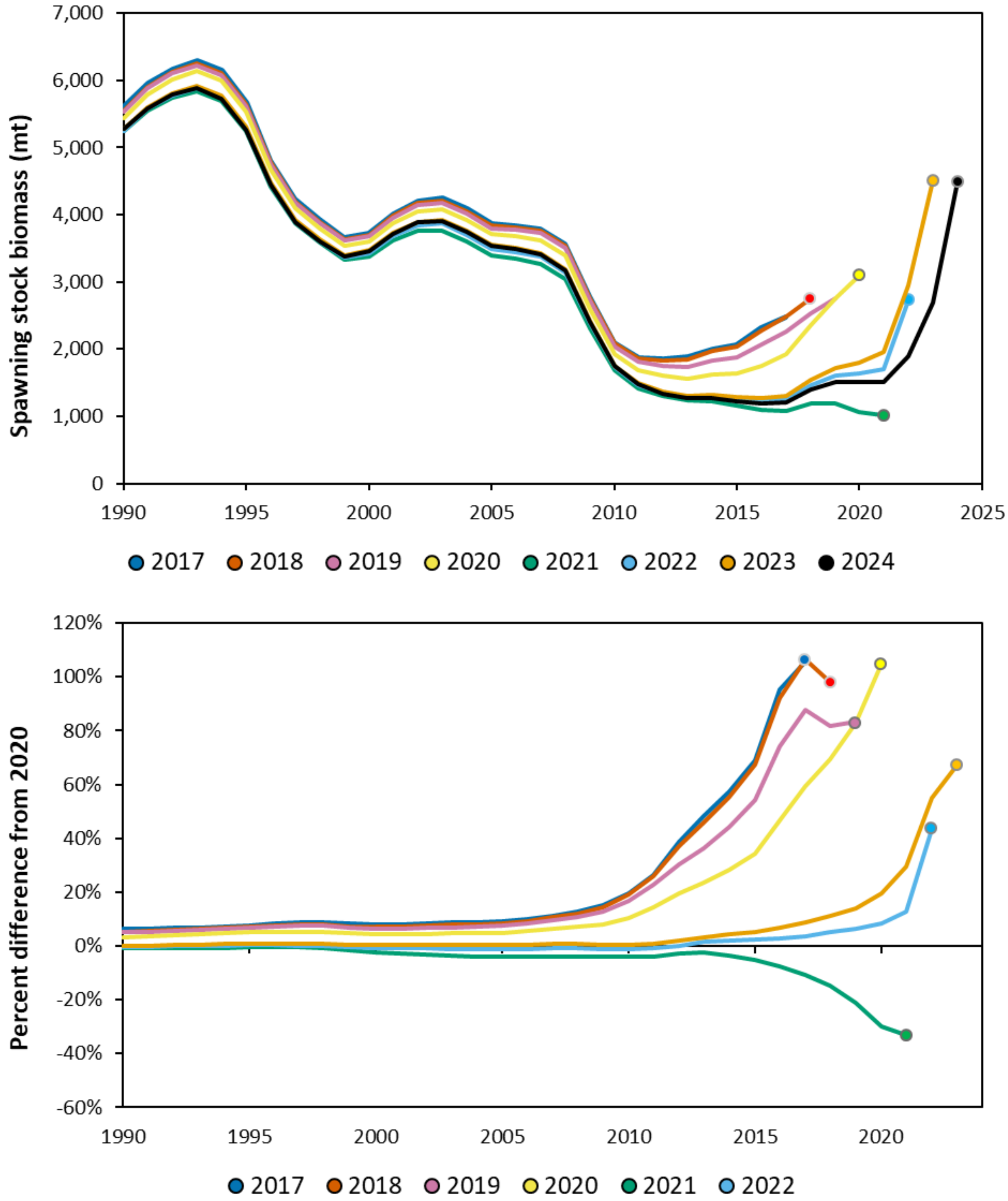

Figure 39. Retrospective analysis for SSB in absolute numbers (top) and percent difference (bottom) for the DMV region.

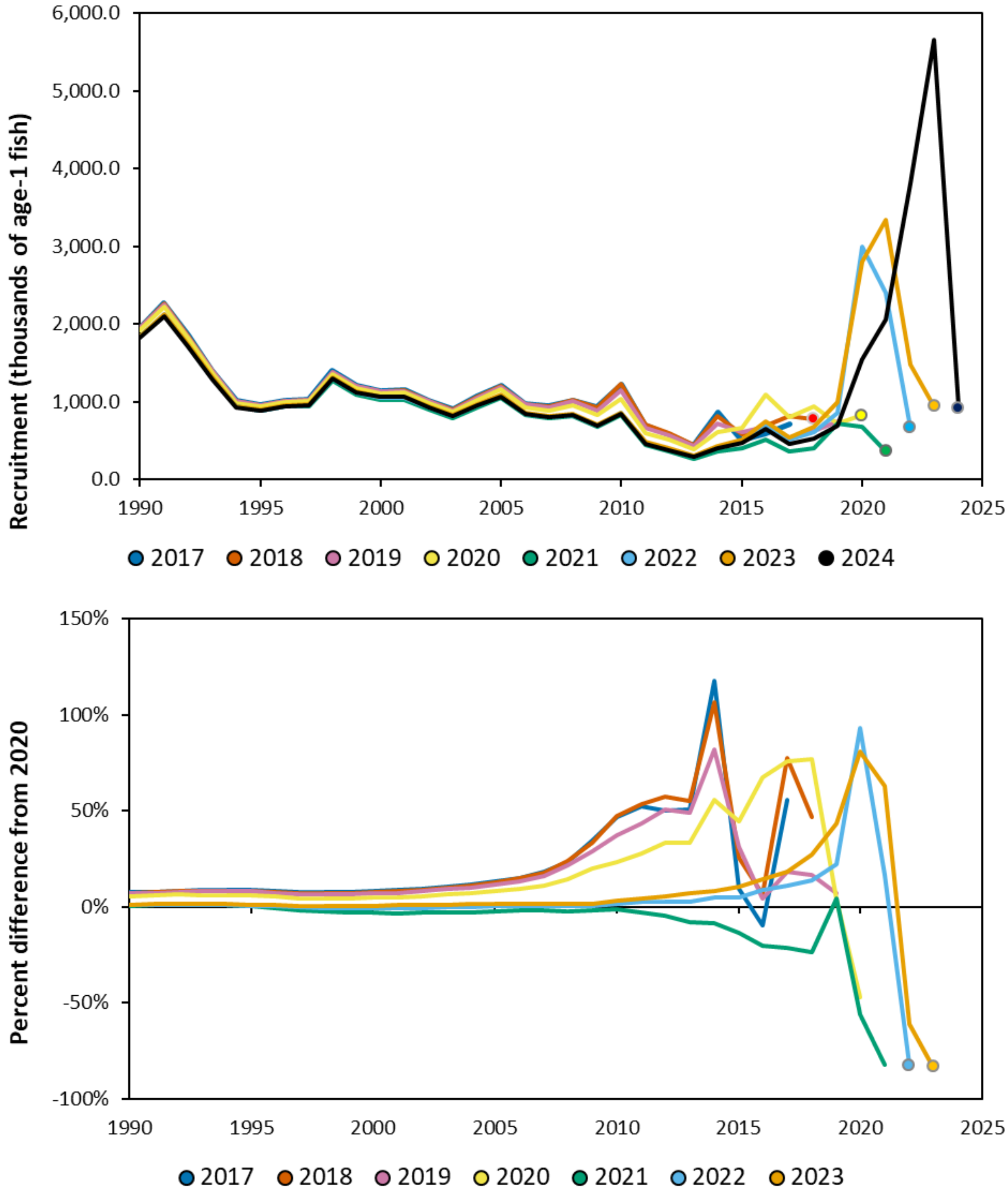

Figure 40. Retrospective analysis for recruitment in absolute numbers (top) and percent difference (bottom) for the DMV region.

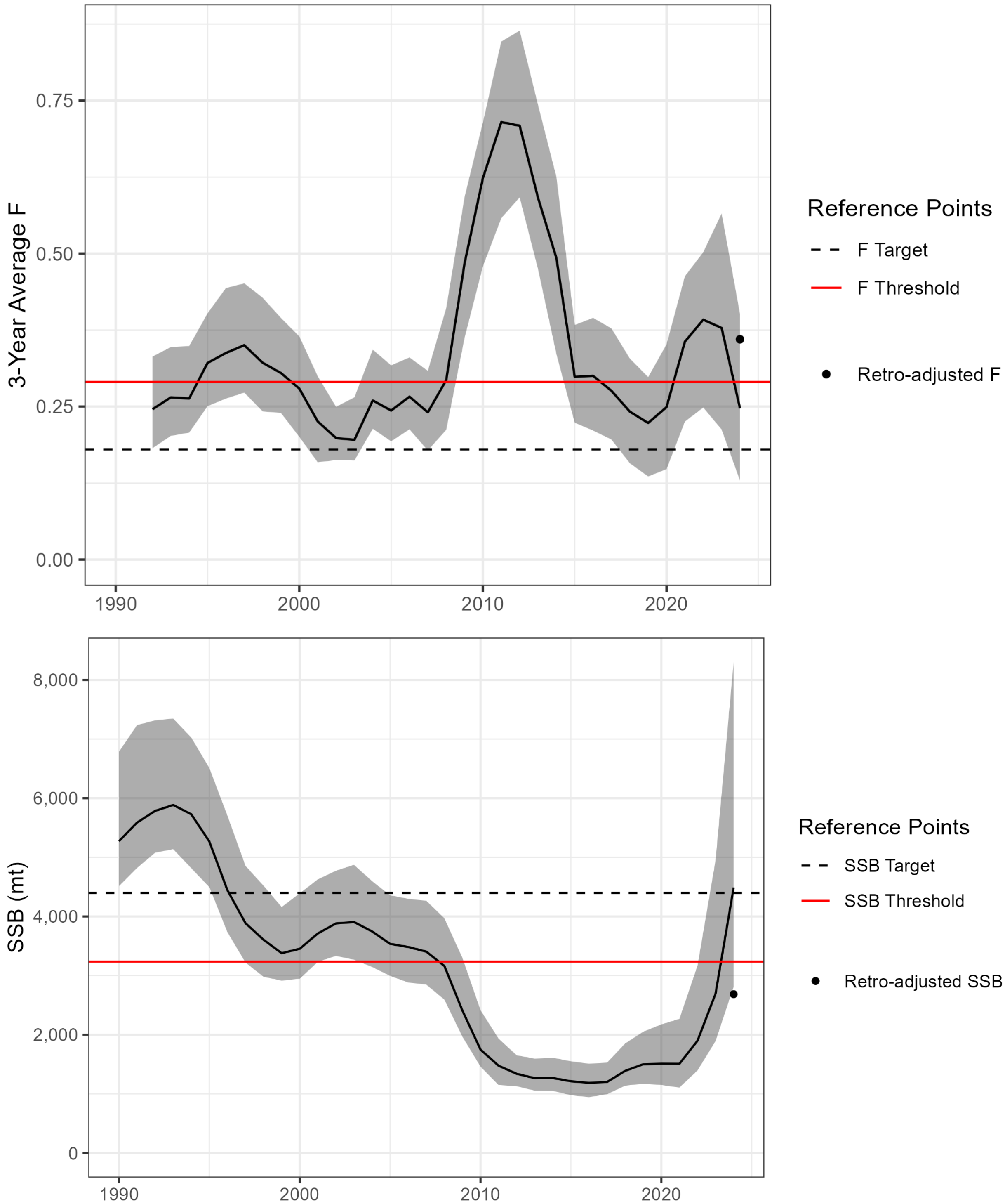

Figure 41. Stock status of tautog in the DMV region. Shaded areas indicate the 95% confidence interval of the estimates. The retrospectively adjusted values were used to assess overfished status in 2024.

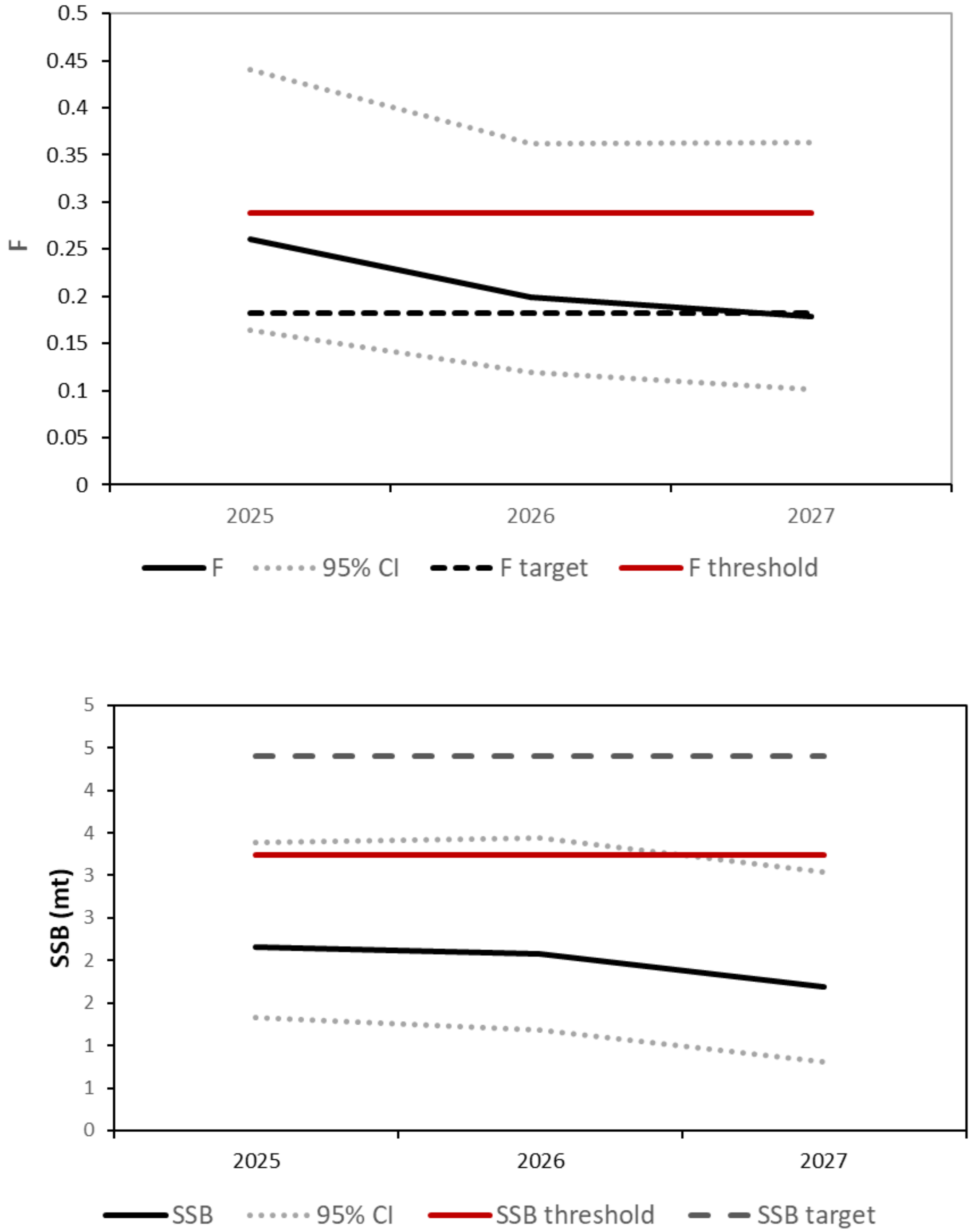

Figure 42. Status quo harvest projections for the DMV region showing the trajectory of annual *F* (top) and SSB (bottom) with their target and threshold reference points. Dotted grey lines indicate the 95% confidence intervals of the estimates.

Atlantic States Marine Fisheries Commission

Tautog Regional Stock Assessment Update 2025

REGIONAL APPENDICES

MARI Appendix 1: ASAP Input and Diagnostic Plots for the Base Run

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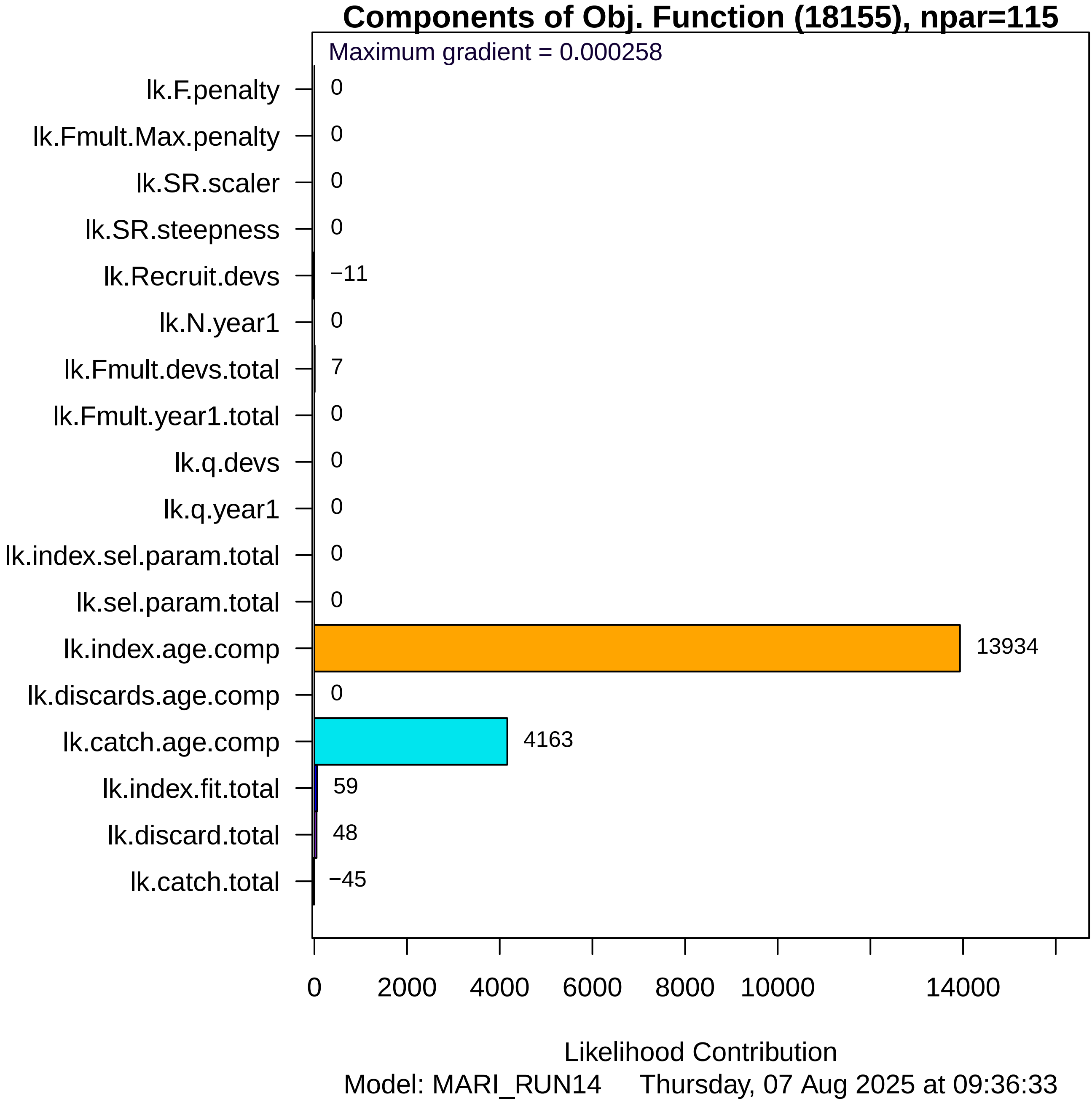
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lk.q.devs
lk.q.year1
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lk.sel.param.total
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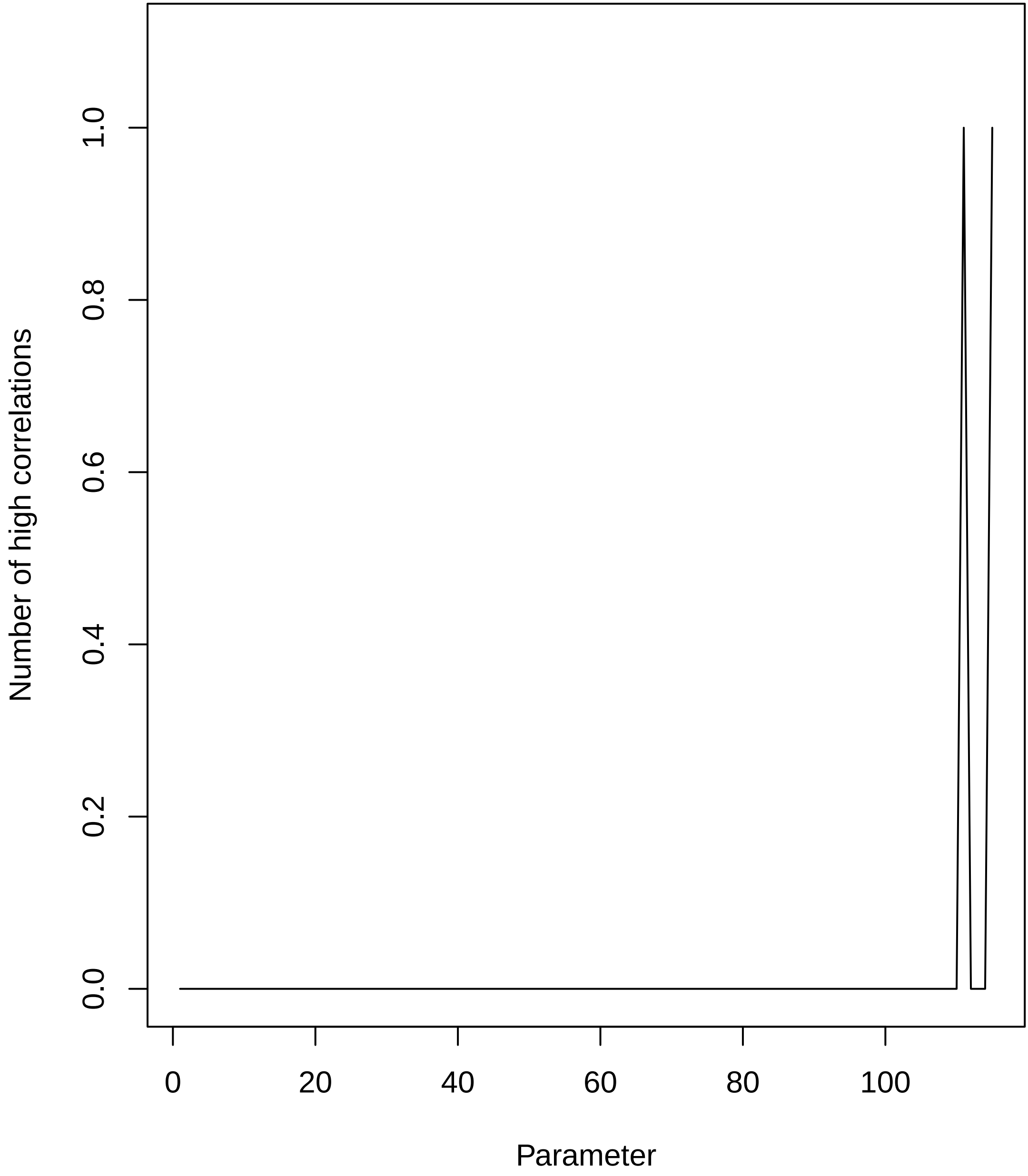
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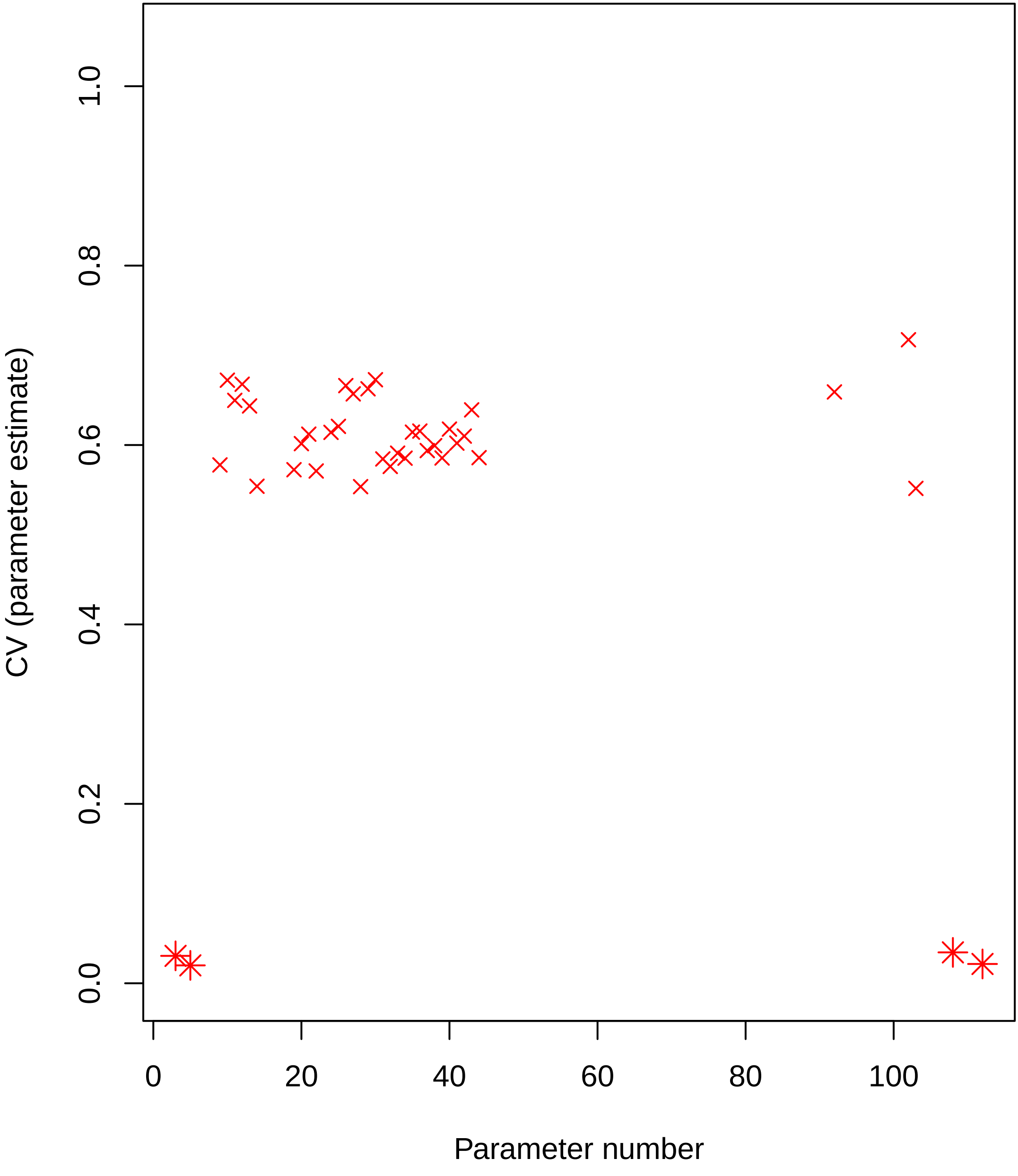
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0
20
40
60
80
100
Parameter number

Root Mean Square Error computed from Standardized Residuals

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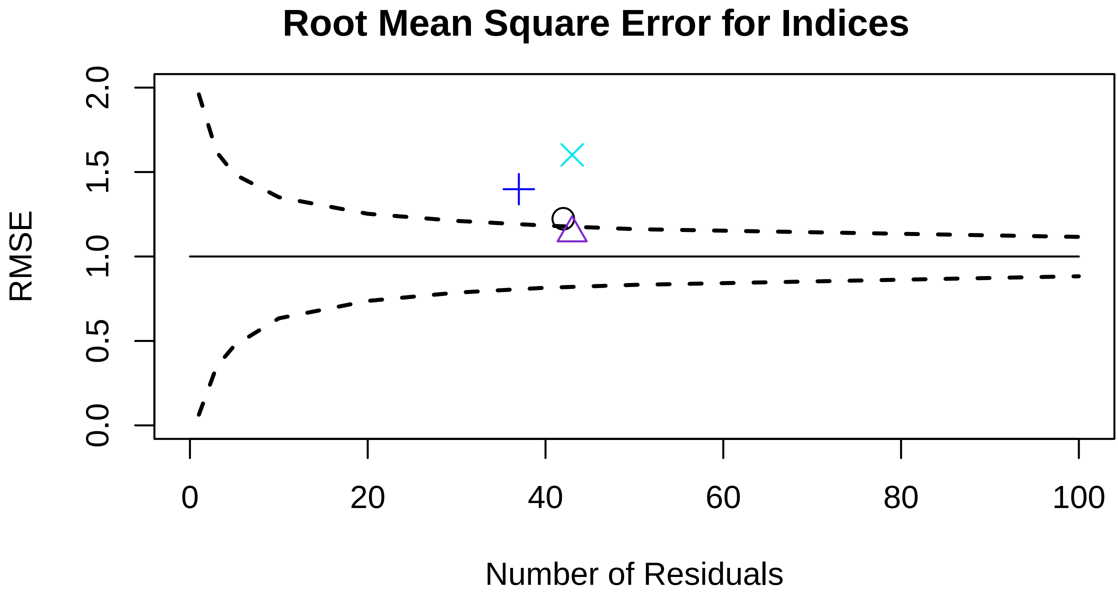
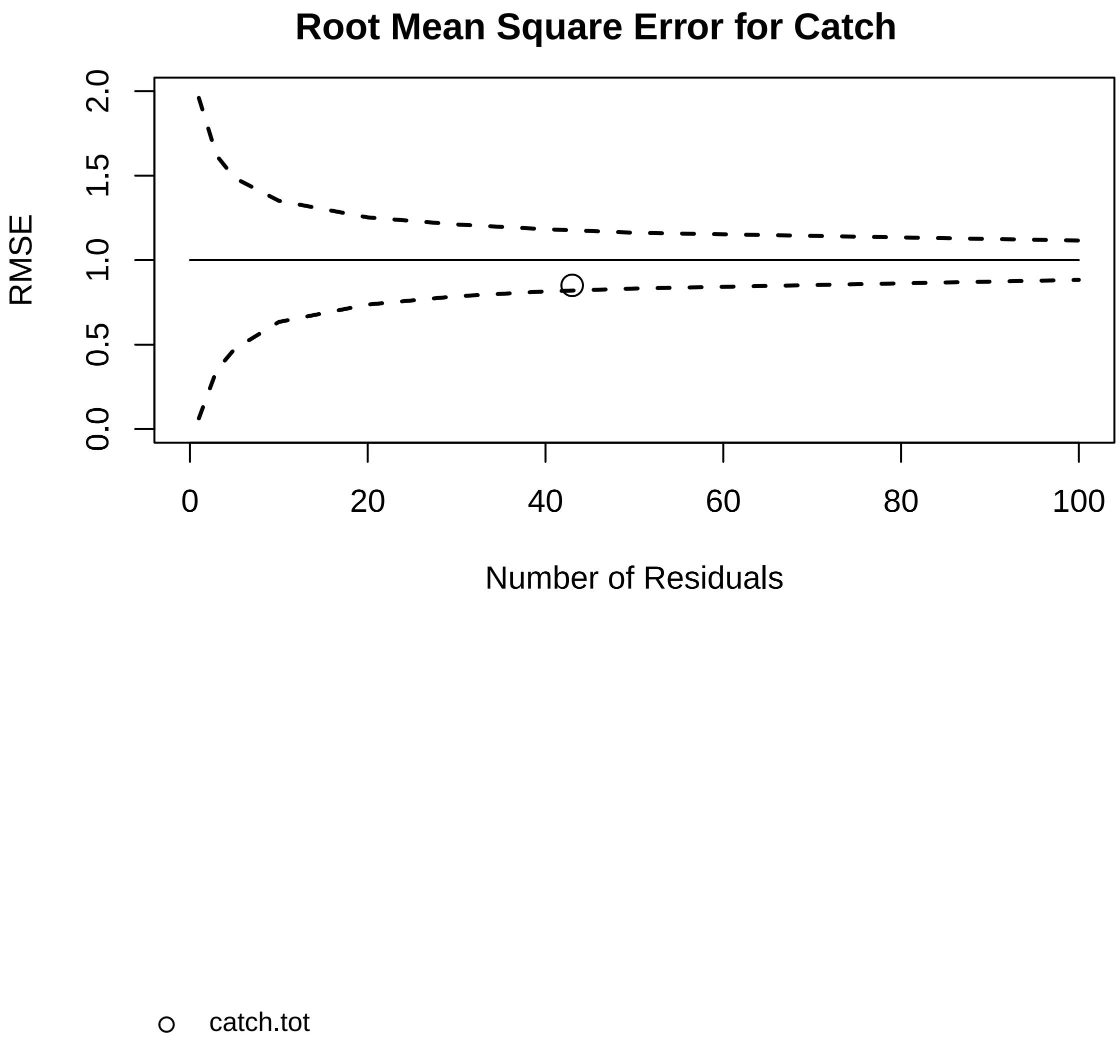
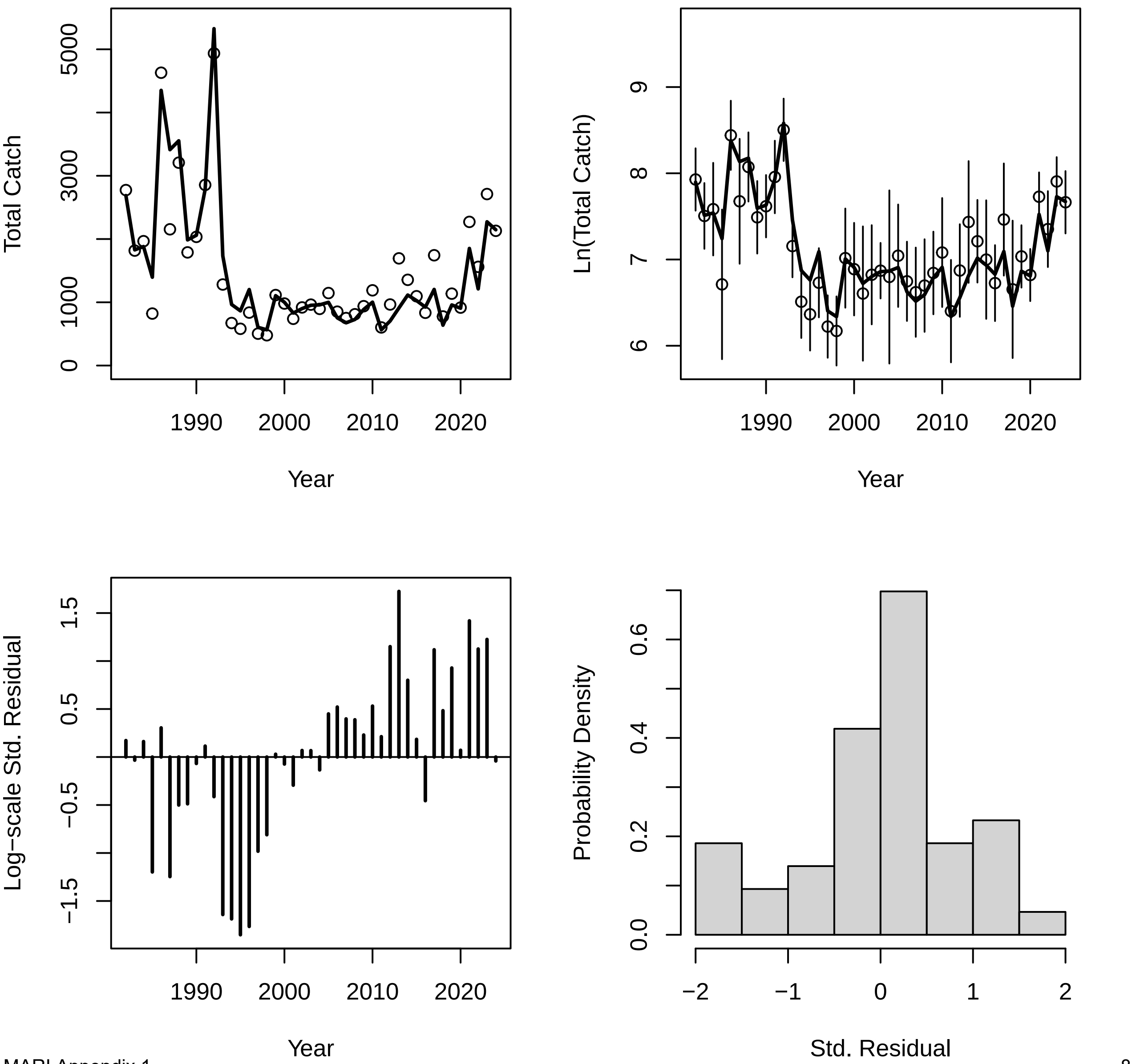
discard.tot	0	0
ind01	42	1.22
ind02	43	1.14
ind03	37	1.4
ind04	43	1.6
ind.total	165	1.35
N.year1	0	0
Fmult.year1	0	0
Fmult.devs.total	42	0.85
recruit.devs	43	0.683
fleet.sel.params	0	0
index.sel.params	0	0
q.year1	0	0
q.devs	0	0
SR.steepness	0	0
SR.scaler	0	0

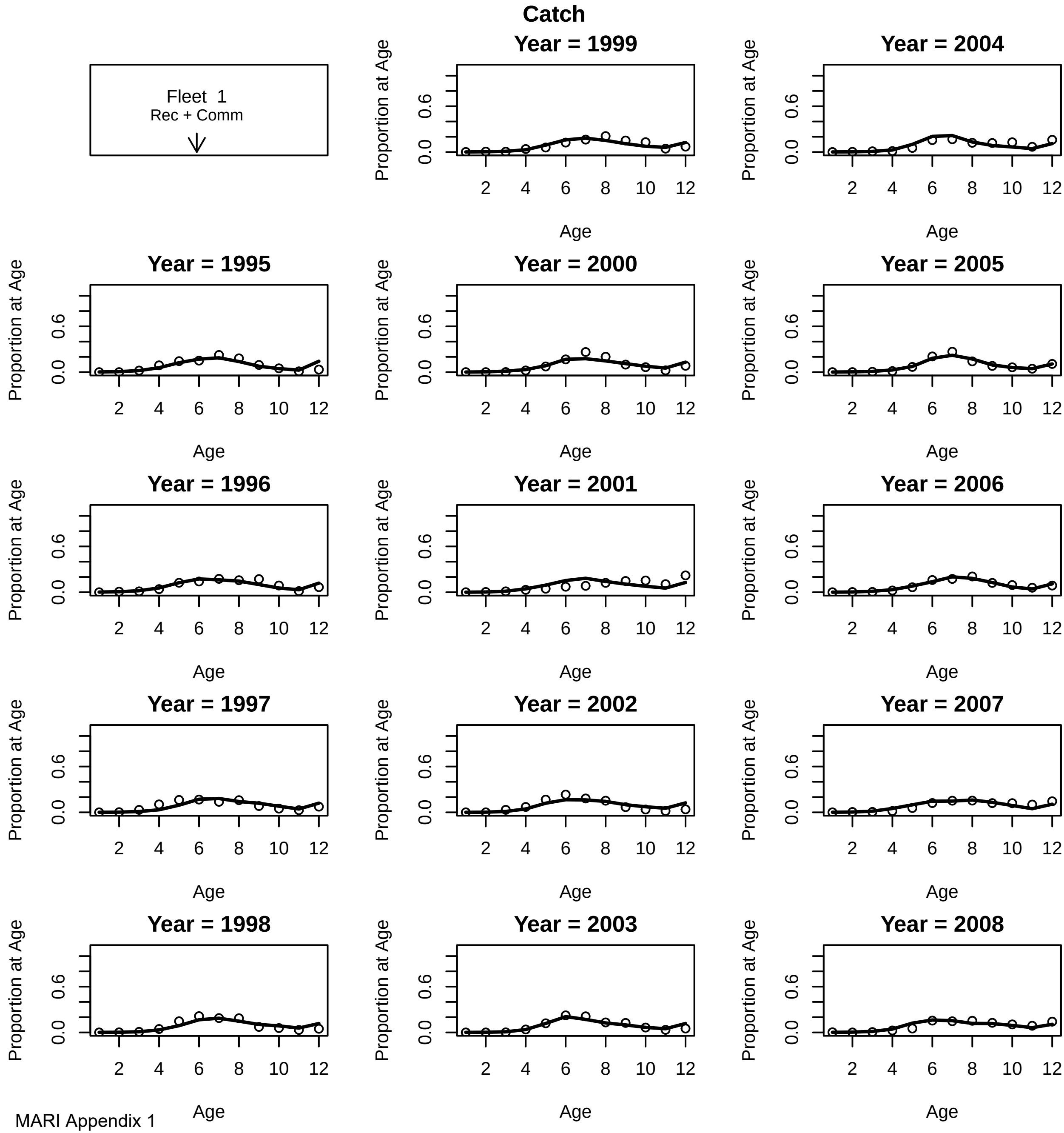

Root Mean Square Error for Indices
RMSE
0.0
0.5
1.0
1.5
2.0
0
20
40
60
80
100
Number of Residuals

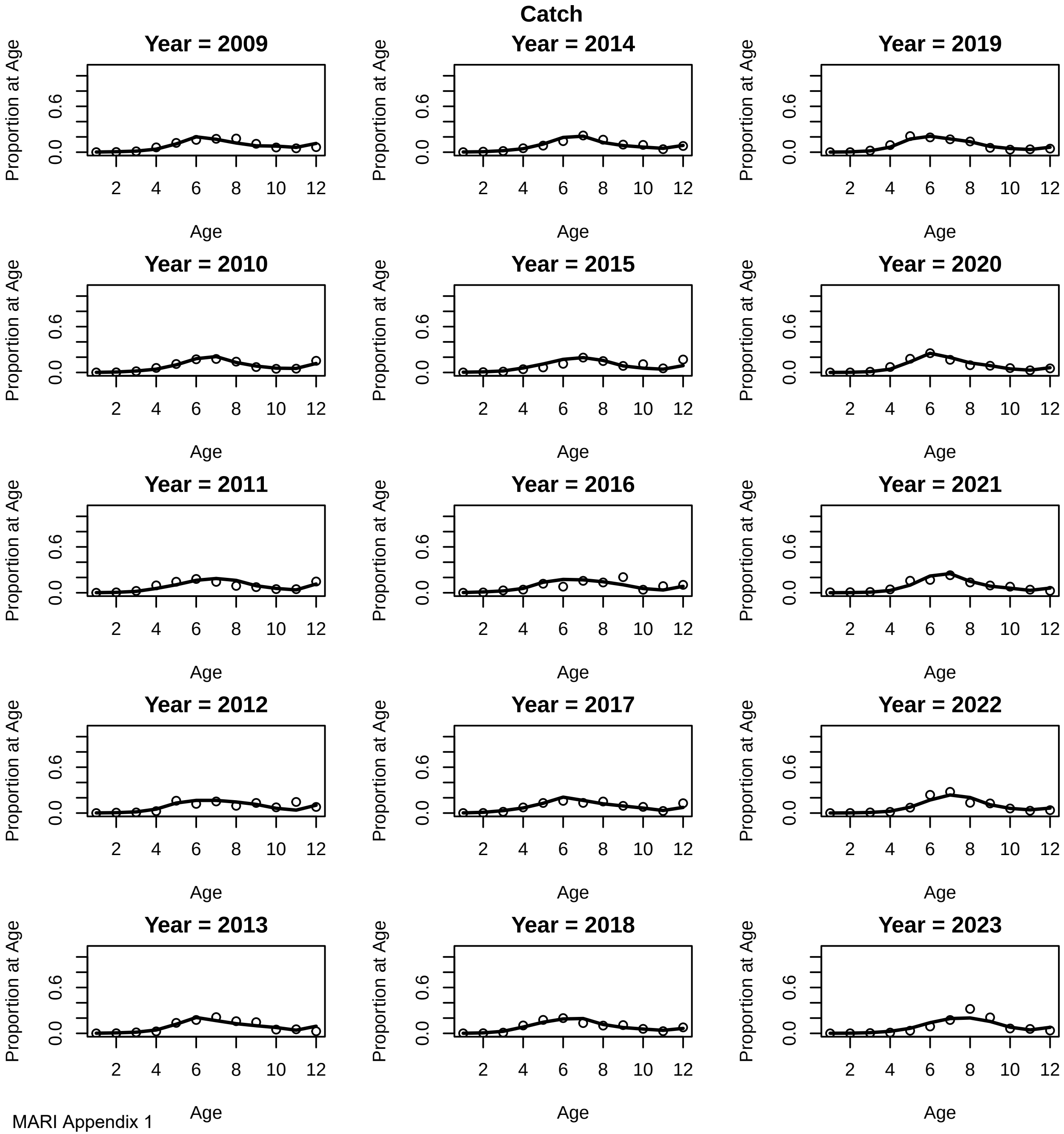

ind.total
MRIP.CPUE
RI Seine
RI Fall Trawl
MA Trawl


Root Mean Square Error for Catch
RMSE
0.0
0.5
1.0
1.5
2.0
0
20
40
60
80
100
Number of Residuals
catch.tot

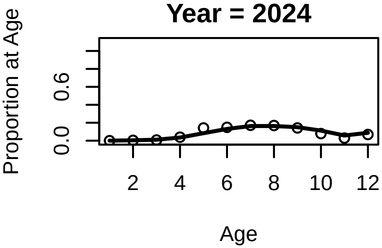
Fleet 1 Catch (Rec + Comm)

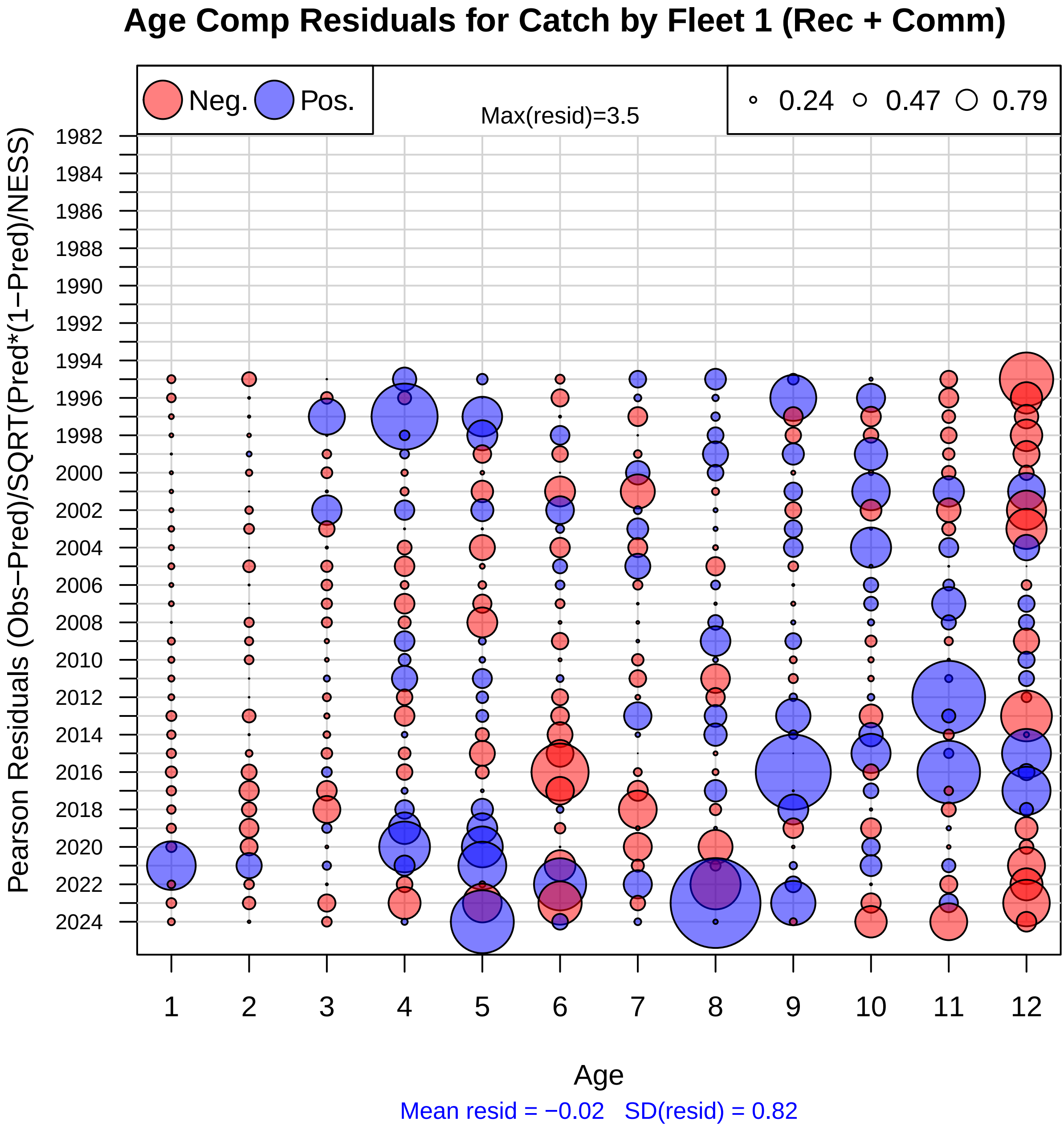



Catch
Fleet 1
Rec + Comm
Year = 1995
Year = 1996
Year = 1997
Year = 1998
Year = 1999
Year = 2000
Year = 2001
Year = 2002
Year = 2003
Year = 2004
Year = 2005
Year = 2006
Year = 2007
Year = 2008
Proportion at Age
Age
0.0
0.6
2
4
6
8
10
12

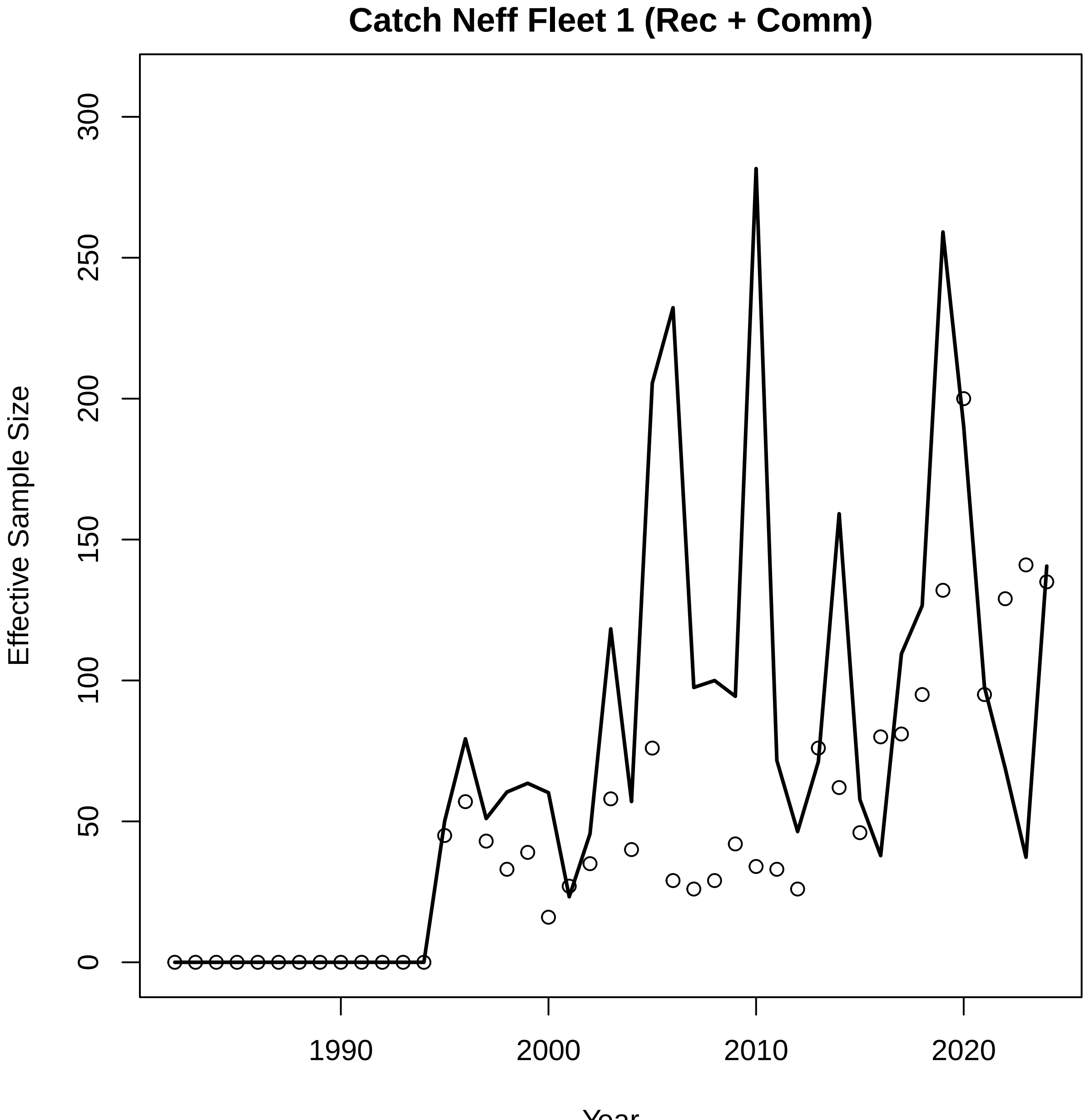

Catch
Year = 2009
Year = 2014
Year = 2019
Year = 2010
Year = 2015
Year = 2020
Year = 2011
Year = 2016
Year = 2021
Year = 2012
Year = 2017
Year = 2022
Year = 2013
Year = 2018
Year = 2023
Proportion at Age
Age
0.0
0.6
2
4
6
8
10
12

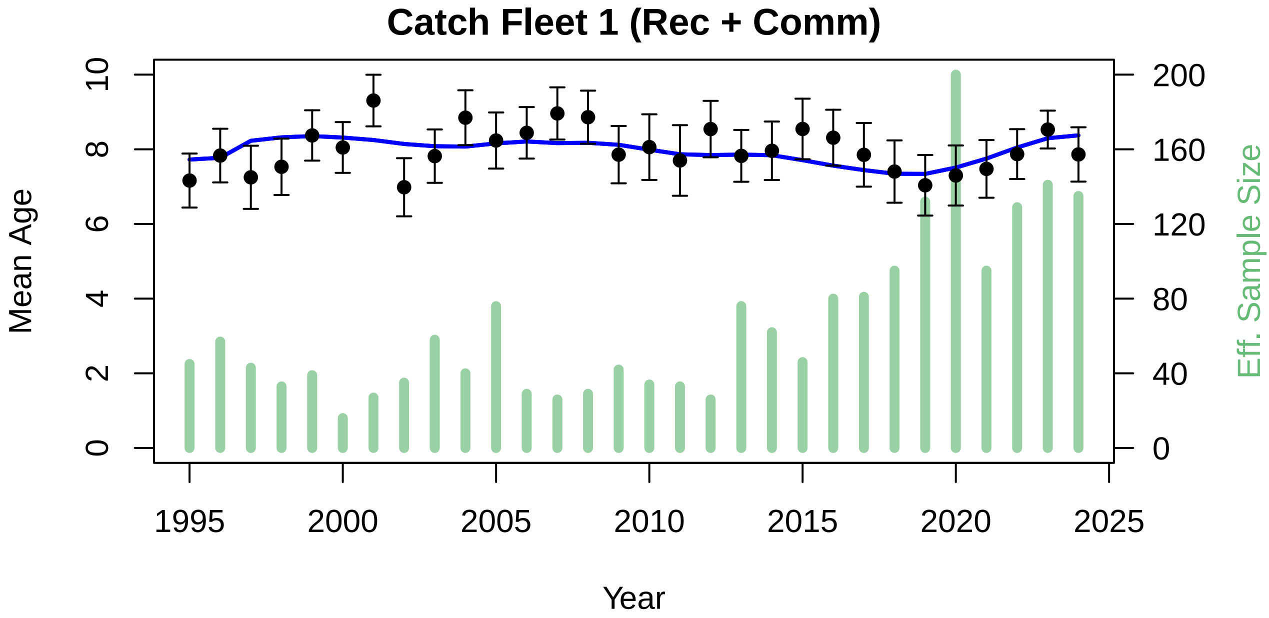
Catch



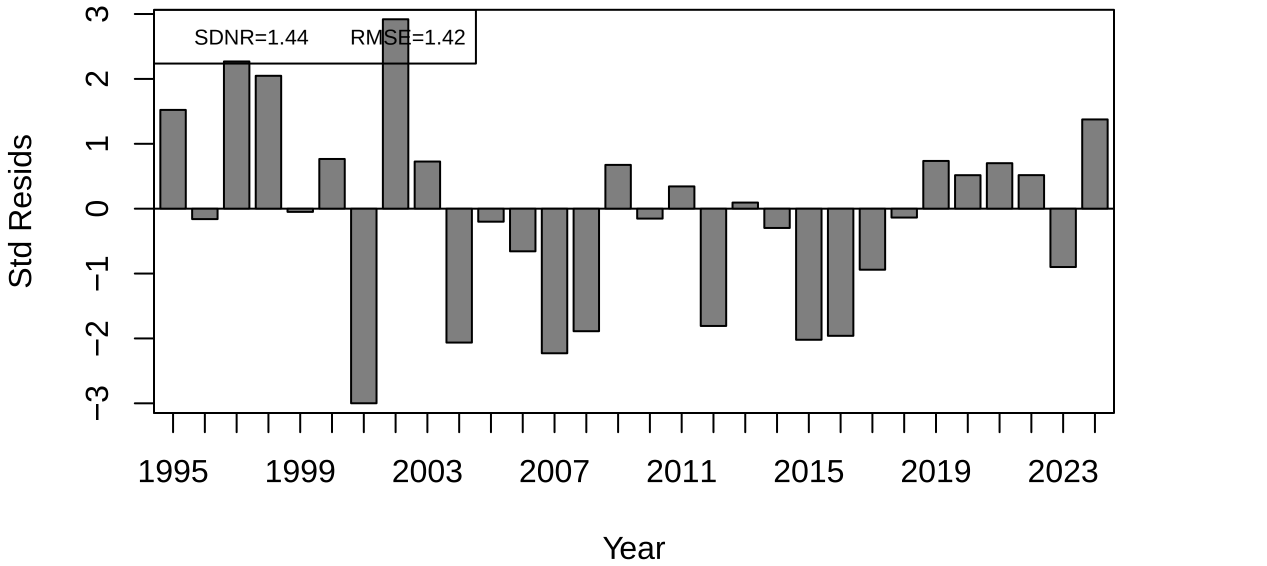


Age Comp Residuals for Catch by Fleet 1 (Rec + Comm)
Neg.
Pos.
Max(resid)=3.5
0.24
0.47
0.79
Pearson Residuals (Obs−Pred)/SQRT(Pred*(1−Pred)/NESS)
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
1
2
3
4
5
6
7
8
9
10
11
12
Age
Mean resid = −0.02 SD(resid) = 0.82

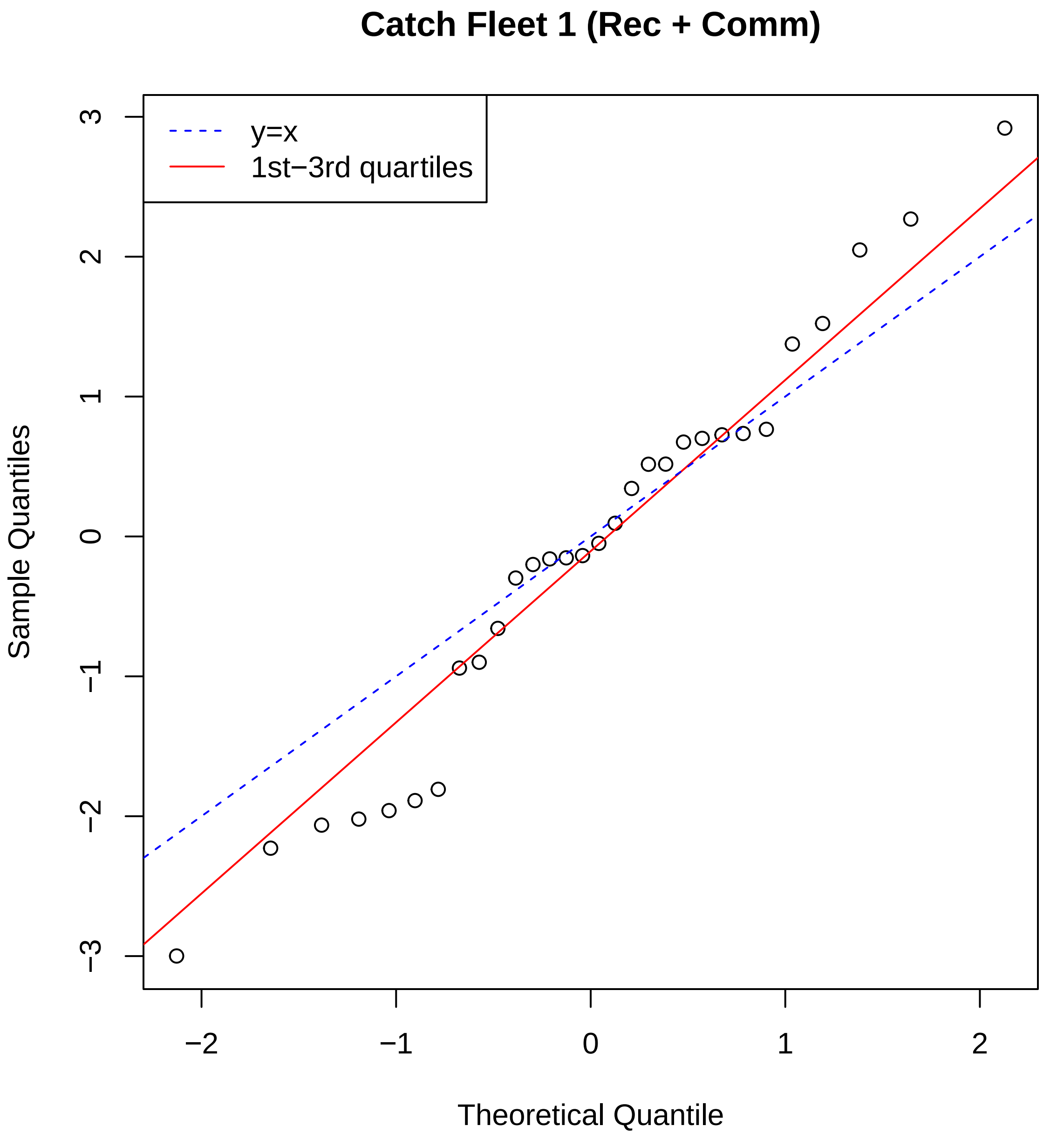

Catch Neff Fleet 1 (Rec + Comm)
Effective Sample Size
0
50
100
150
200
250
300
1990
2000
2010
2020
Year



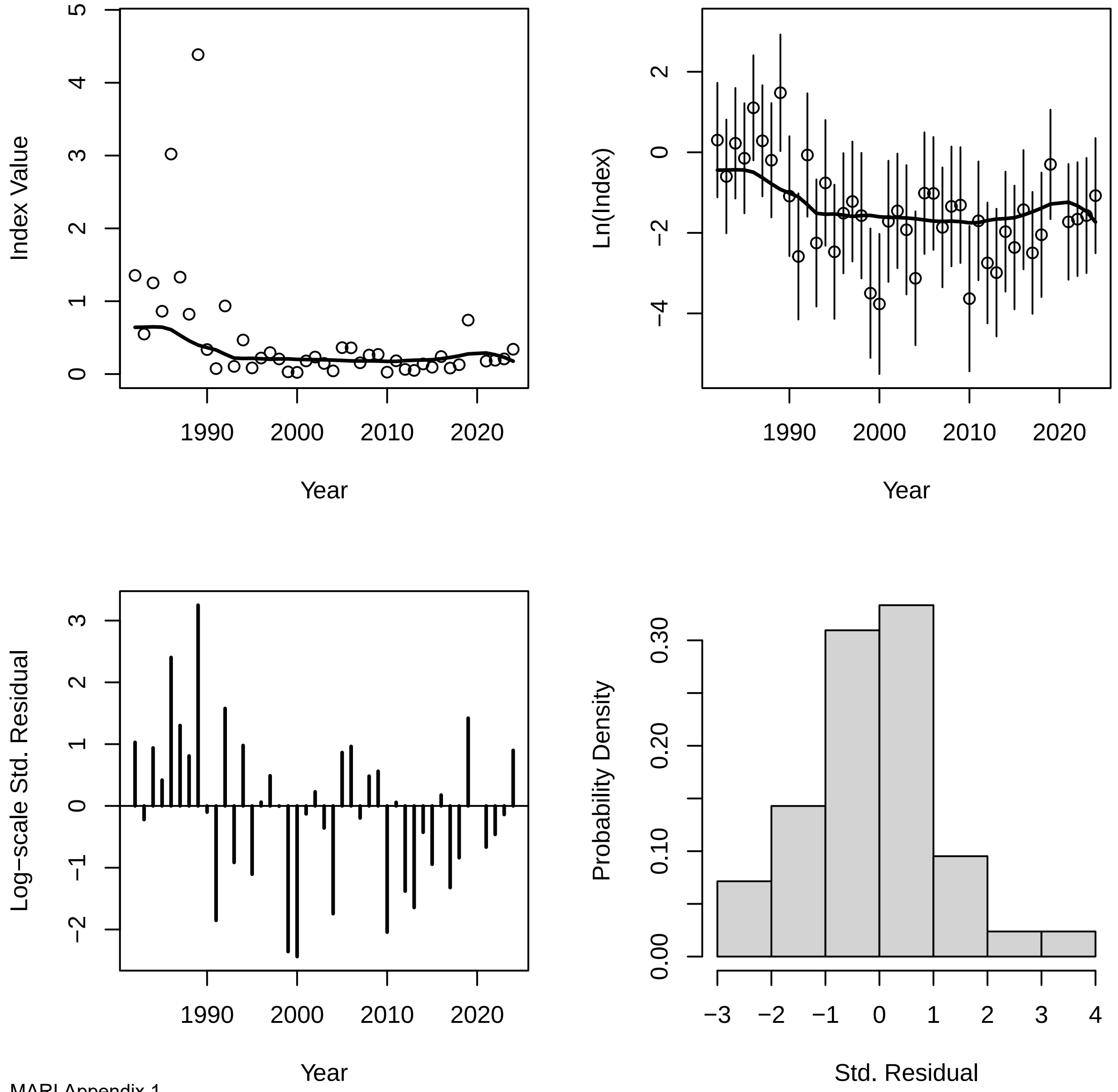
Catch Fleet 1 (Rec + Comm)
Mean Age
Eff. Sample Size
Year



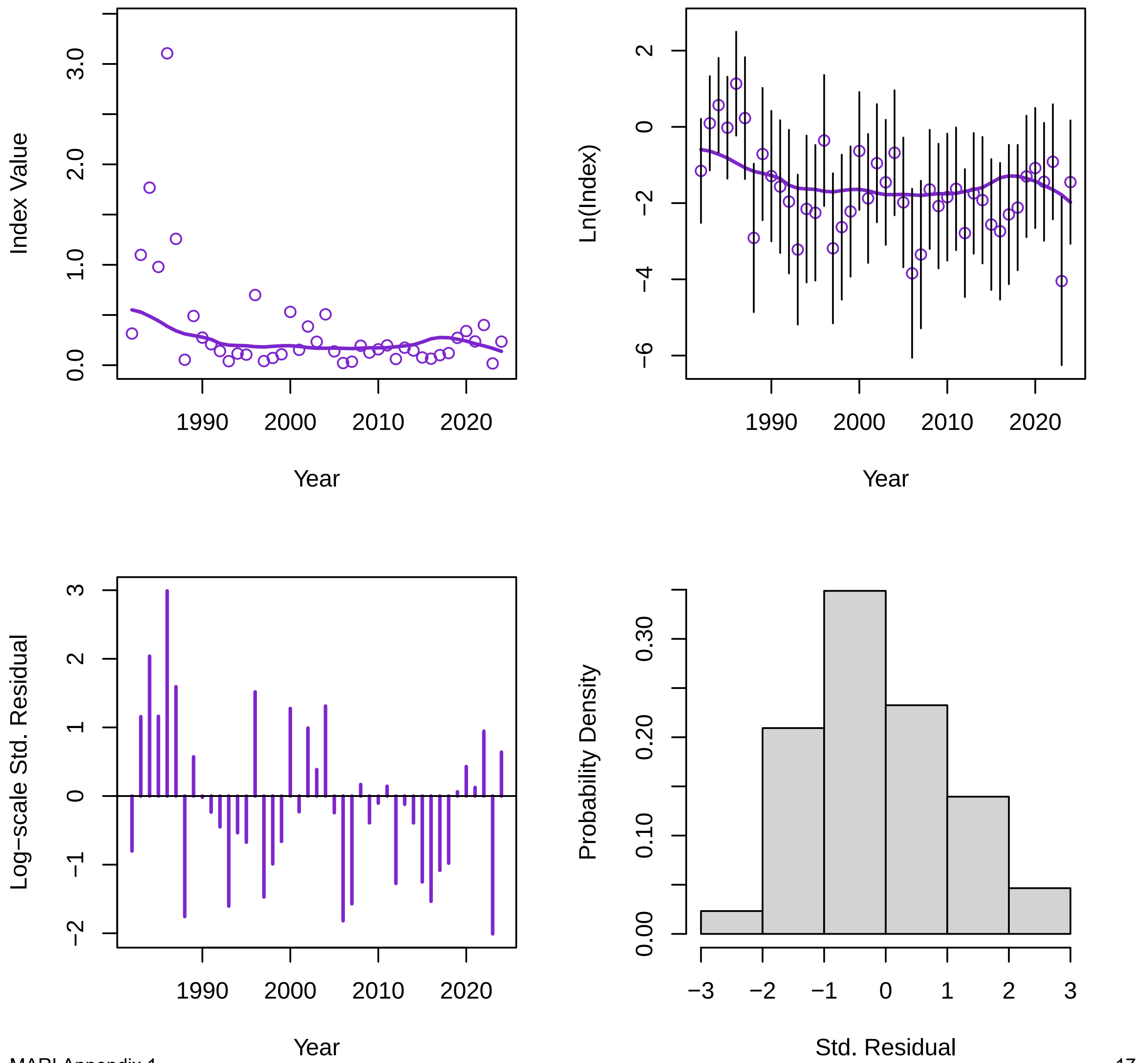
SDNR=1.44
RMSE=1.42
Std Resids
Year


Catch Fleet 1 (Rec + Comm)
y=x
1st−3rd quartiles
Sample Quantiles
Theoretical Quantile
3
2
1
0
−1
−2
−3
−2
−1
0
1
2

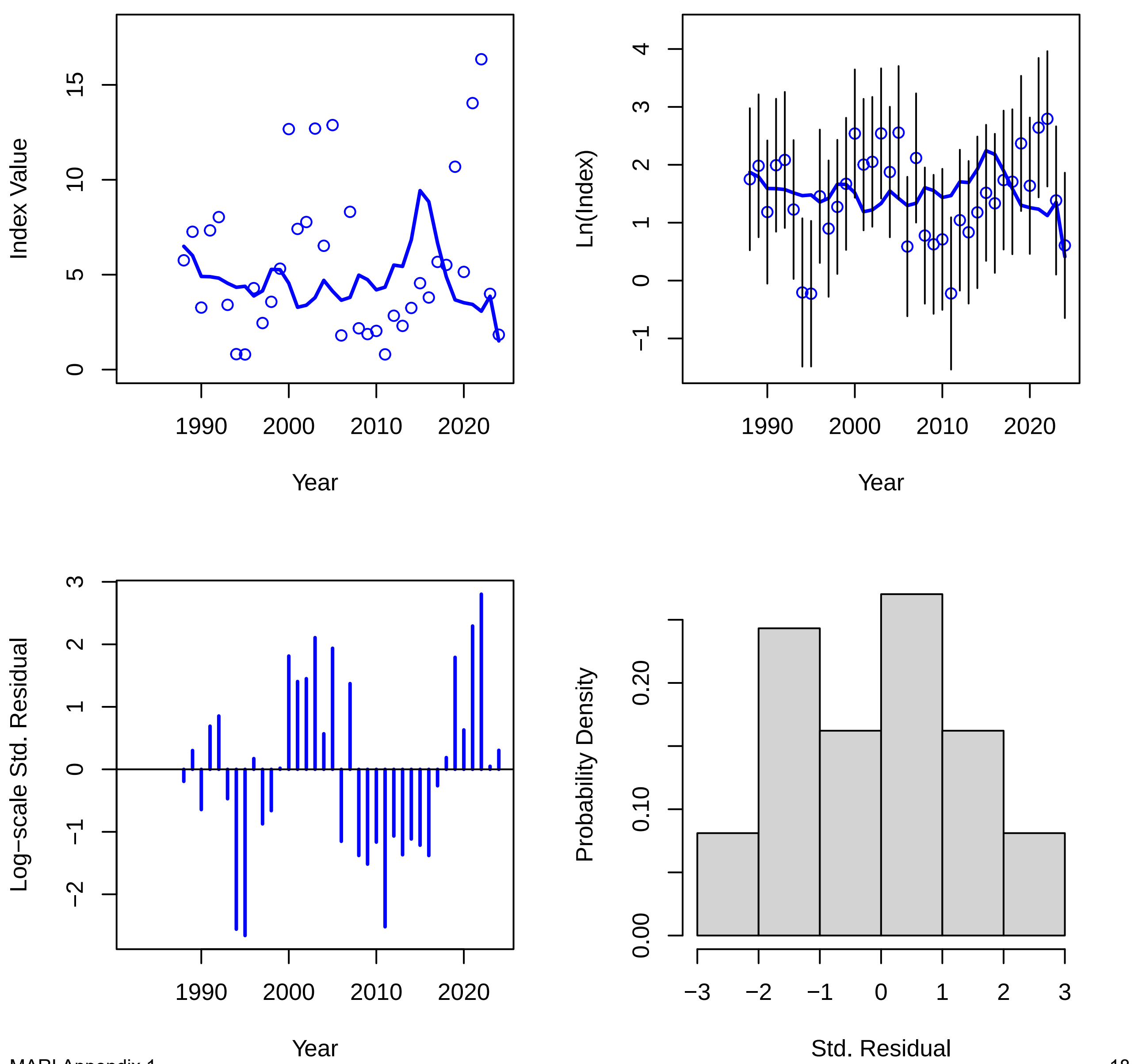
Index 1 (MA Trawl)



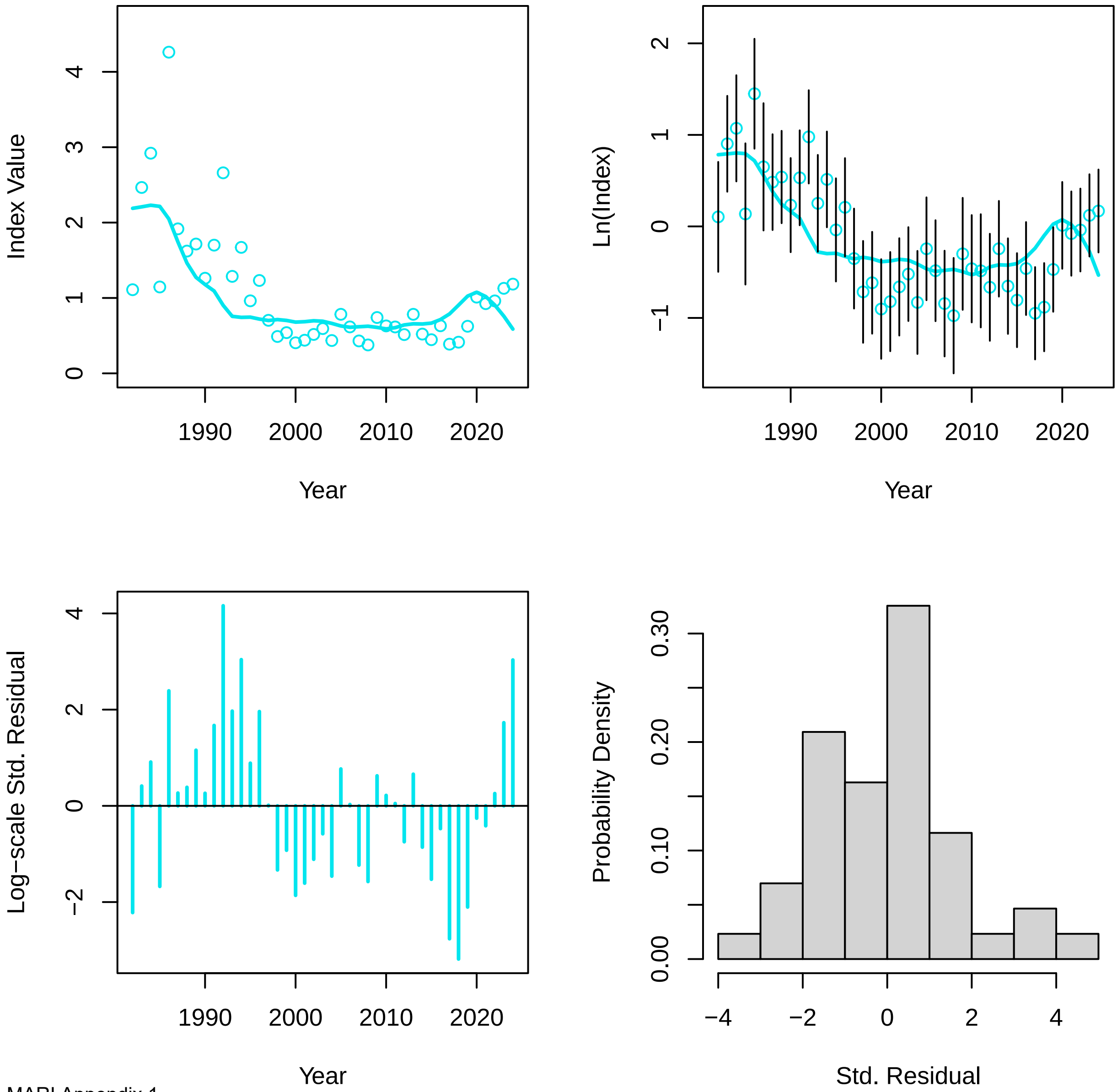
Index 2 (RI Fall Trawl)



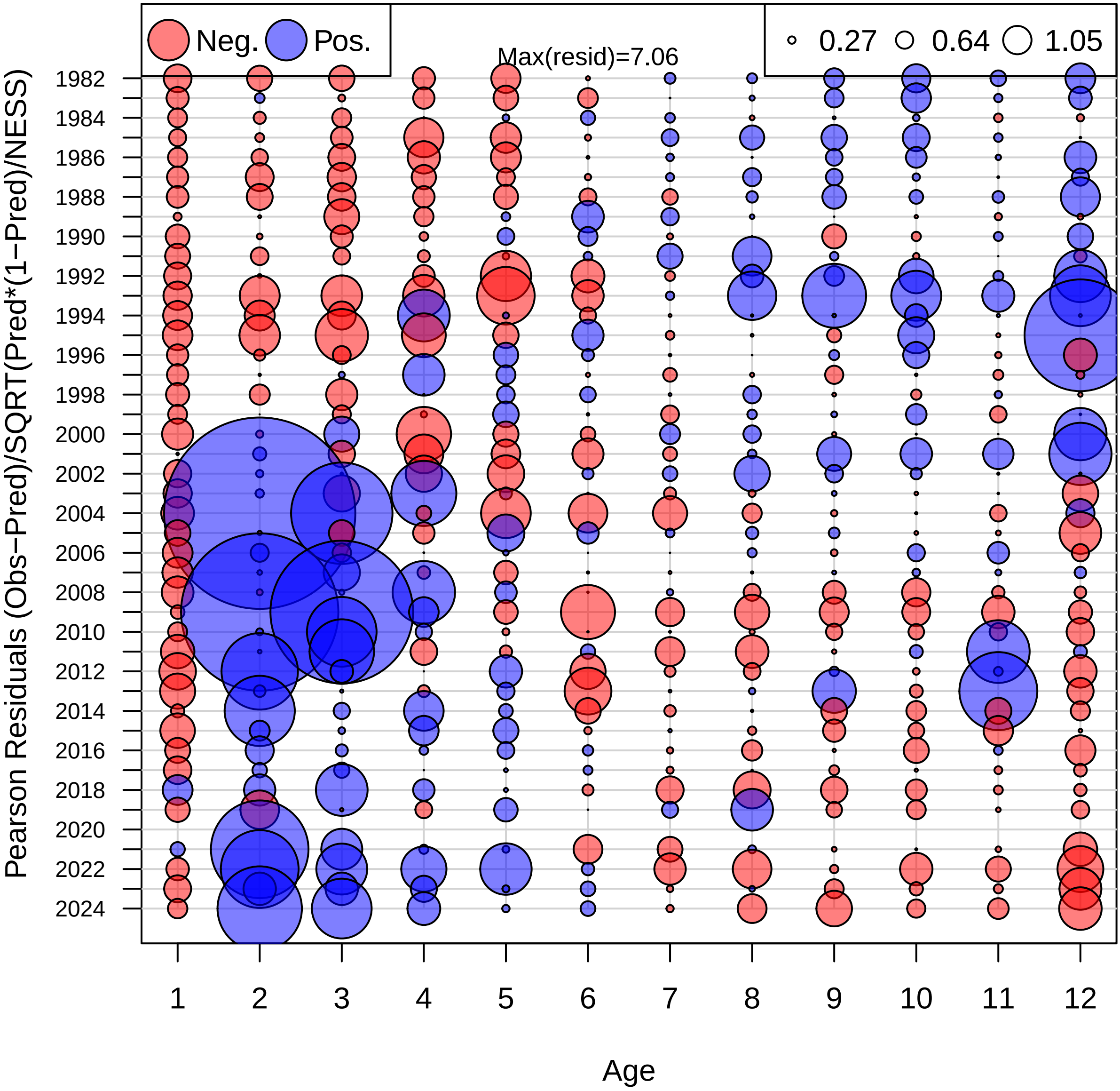
Index 3 (RI Seine)



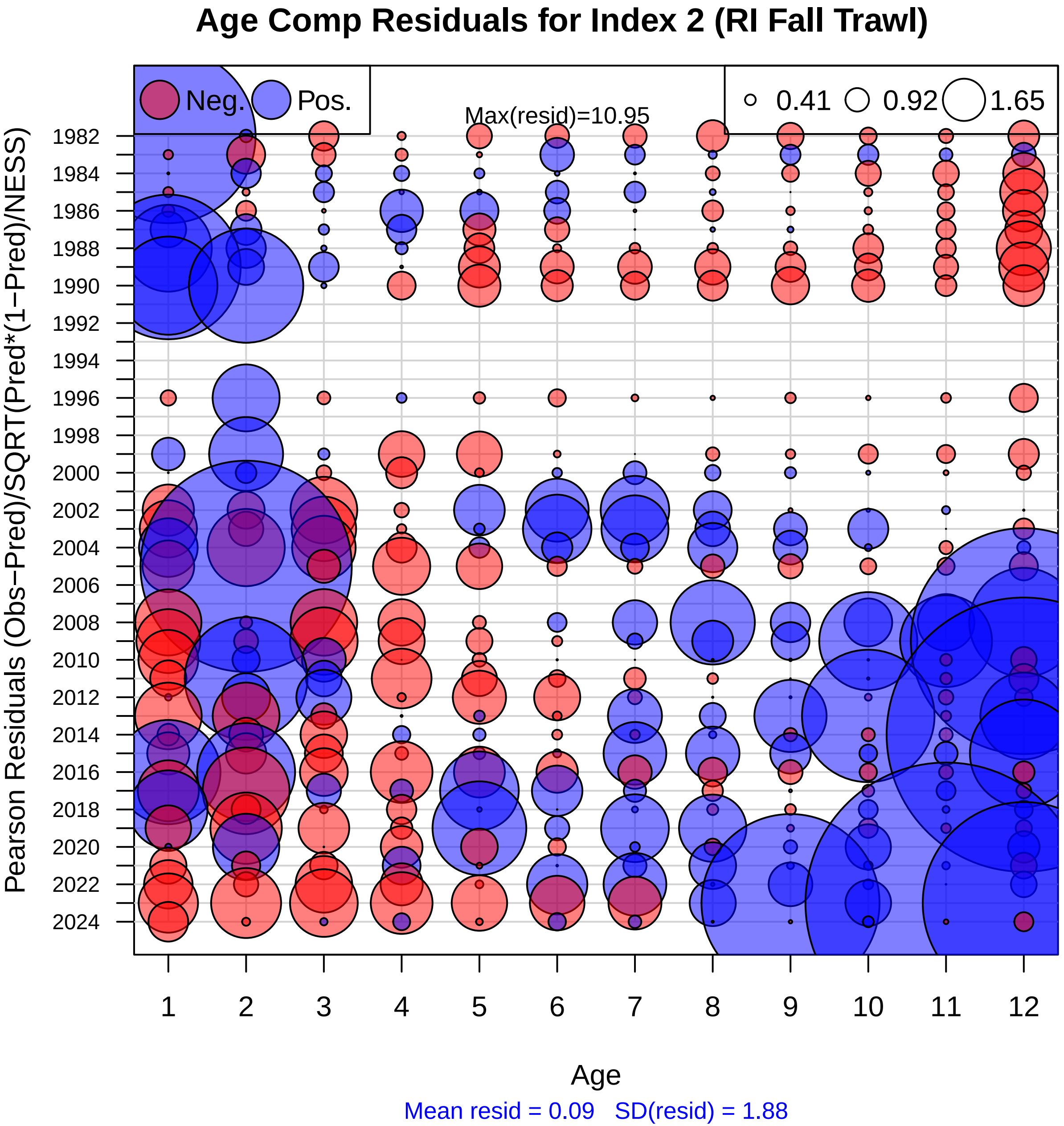
Index 4 (MRIP CPUE)



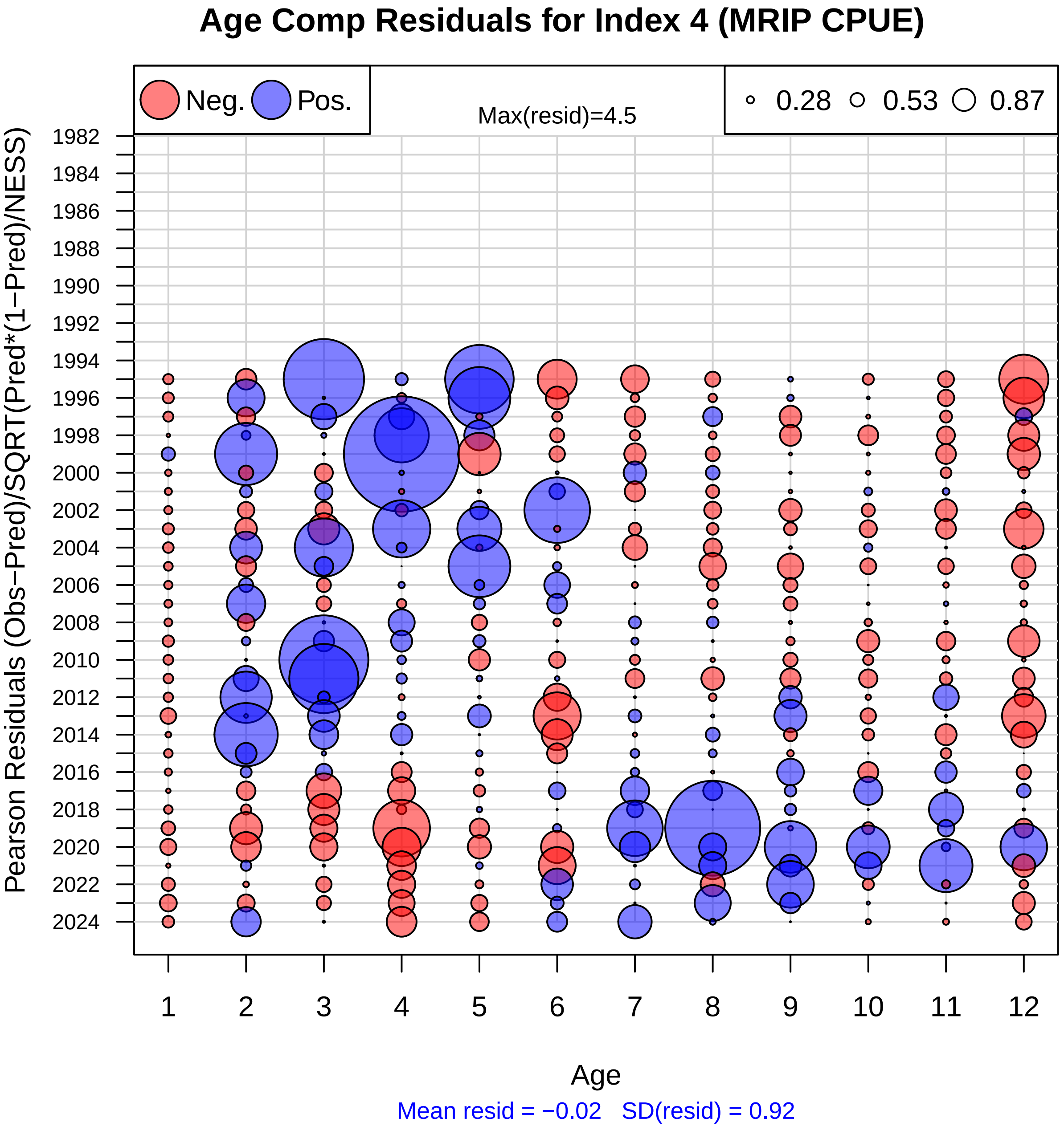
Age Comp Residuals for Index 1 (MA Trawl)

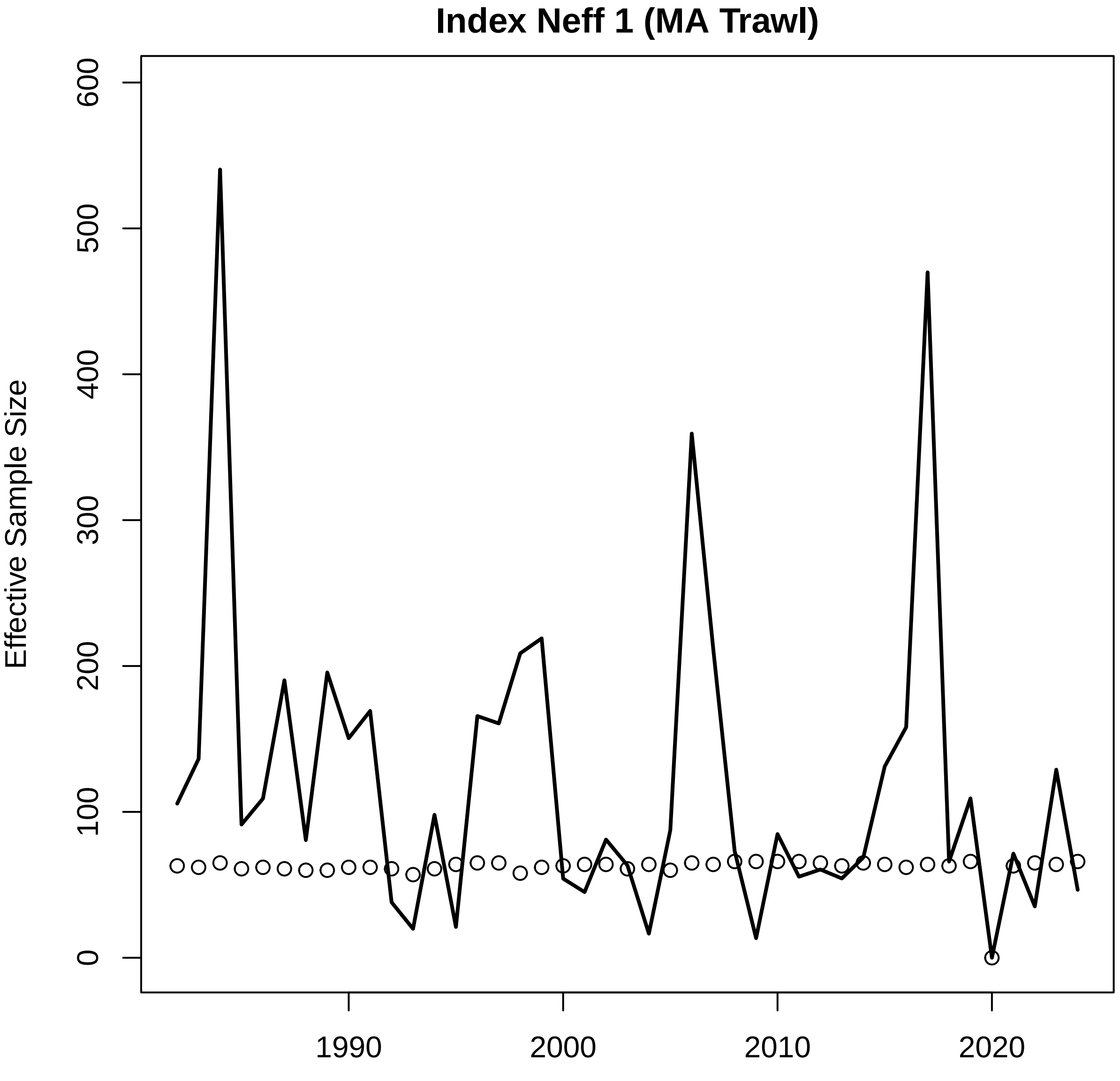


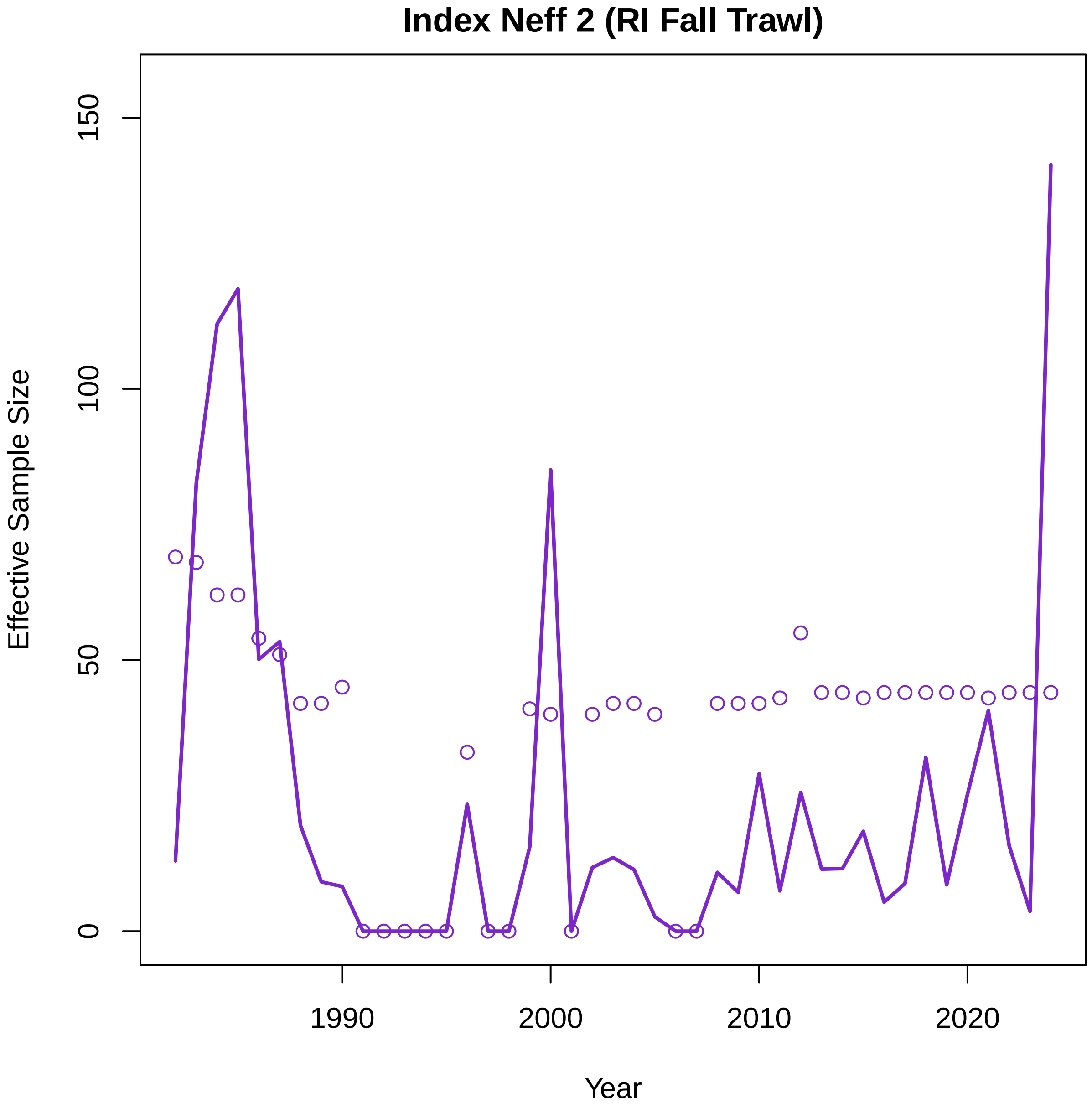
Mean resid = −0.02   SD(resid) = 1.06



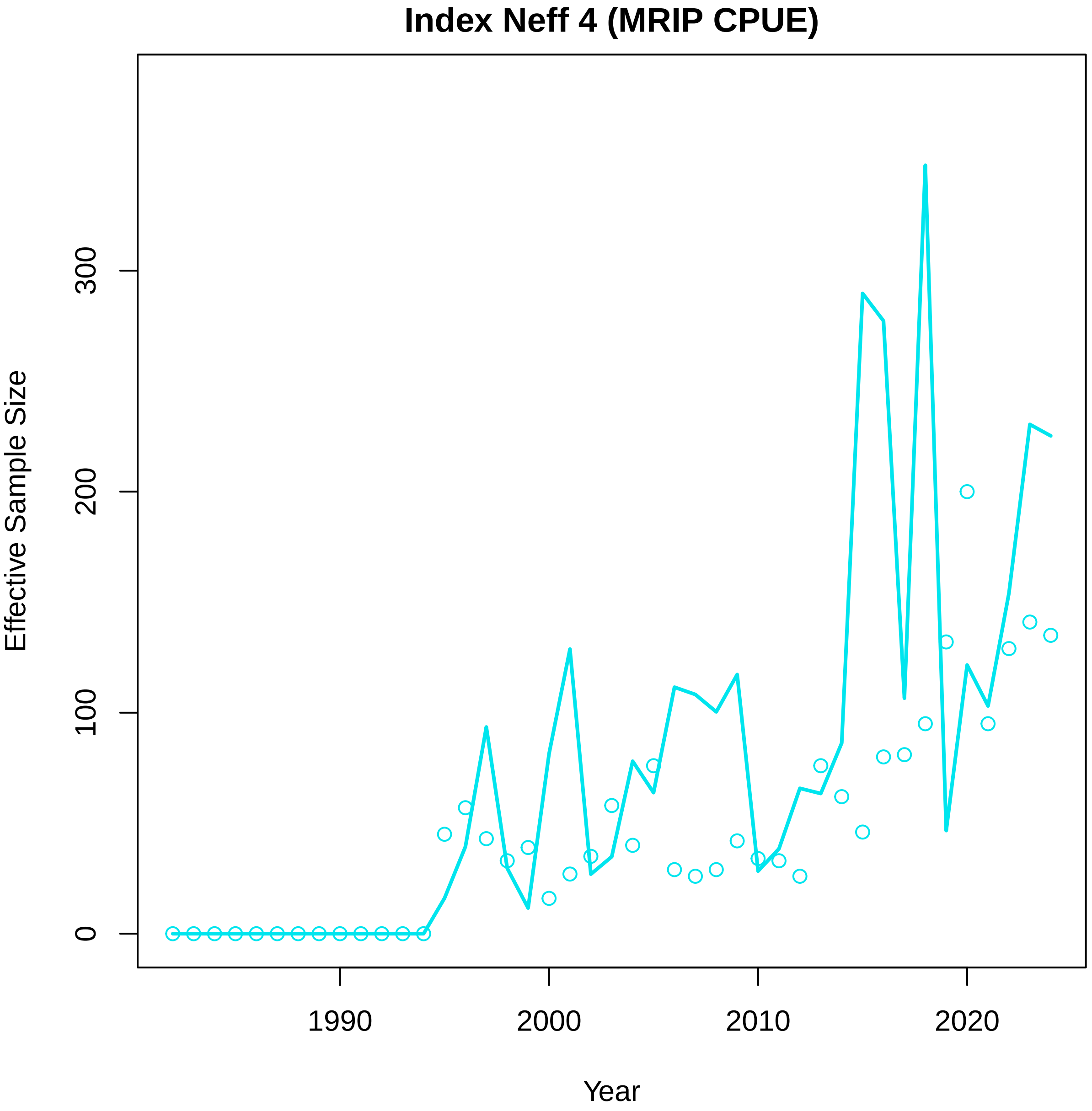
Age Comp Residuals for Index 2 (RI Fall Trawl)
Neg.
Pos.
0.41
0.92
1.65
Max(resid)=10.95
Pearson Residuals (Obs−Pred)/SQRT(Pred*(1−Pred)/NESS)
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
1
2
3
4
5
6
7
8
9
10
11
12
Age
Mean resid = 0.09 SD(resid) = 1.88

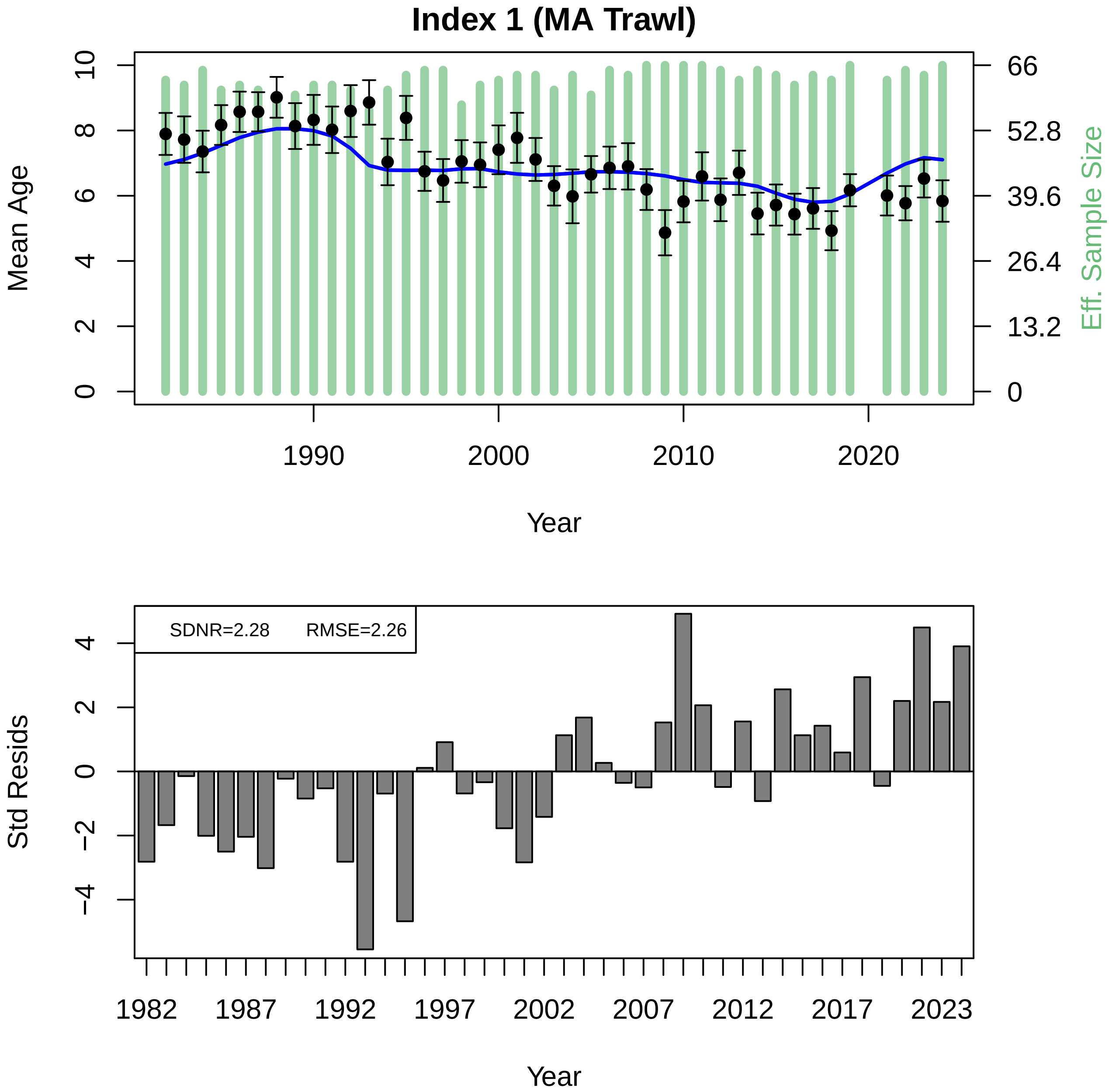

Age Comp Residuals for Index 4 (MRIP CPUE)
Neg.
Pos.
Max(resid)=4.5
0.28
0.53
0.87
Pearson Residuals (Obs−Pred)/SQRT(Pred*(1−Pred)/NESS)
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
1
2
3
4
5
6
7
8
9
10
11
12
Age
Mean resid = −0.02 SD(resid) = 0.92


Index Neff 1 (MA Trawl)
Effective Sample Size
0
100
200
300
400
500
600
1990
2000
2010
2020
Year

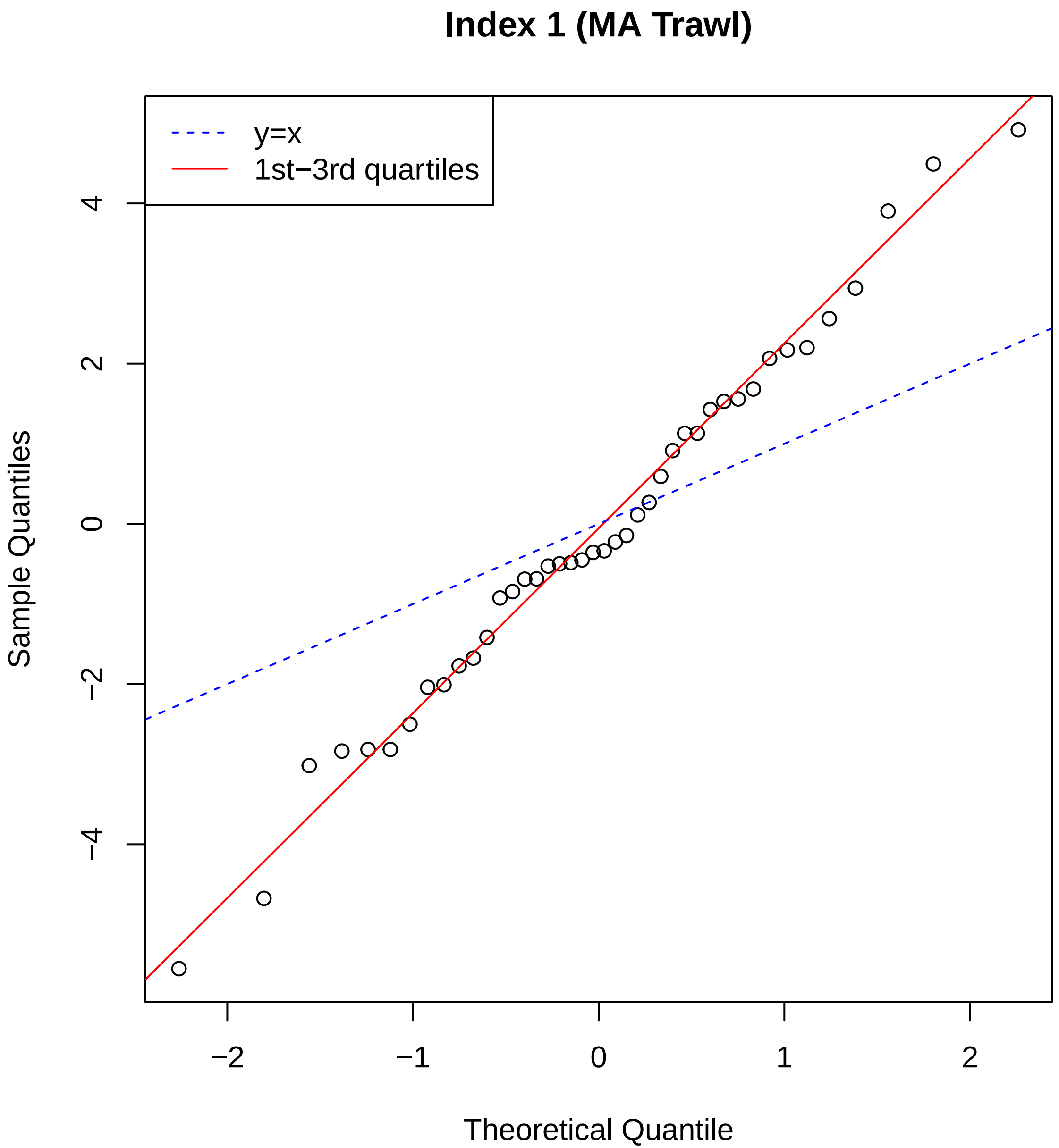


Index Neff 2 (RI Fall Trawl)
Effective Sample Size
0
50
100
150
1990
2000
2010
2020
Year

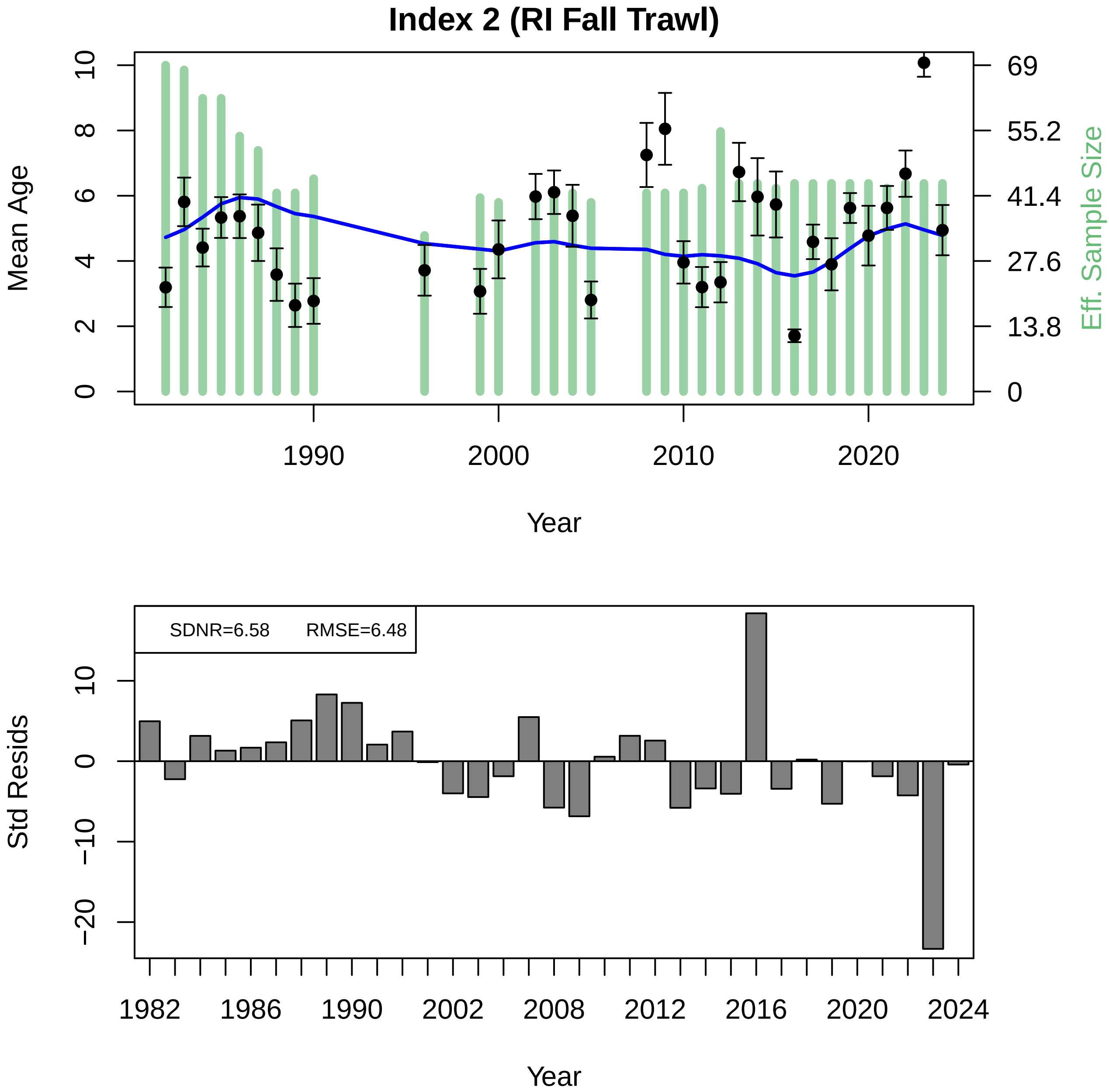

Index Neff 4 (MRIP CPUE)
Effective Sample Size
0
100
200
300
1990
2000
2010
2020
Year



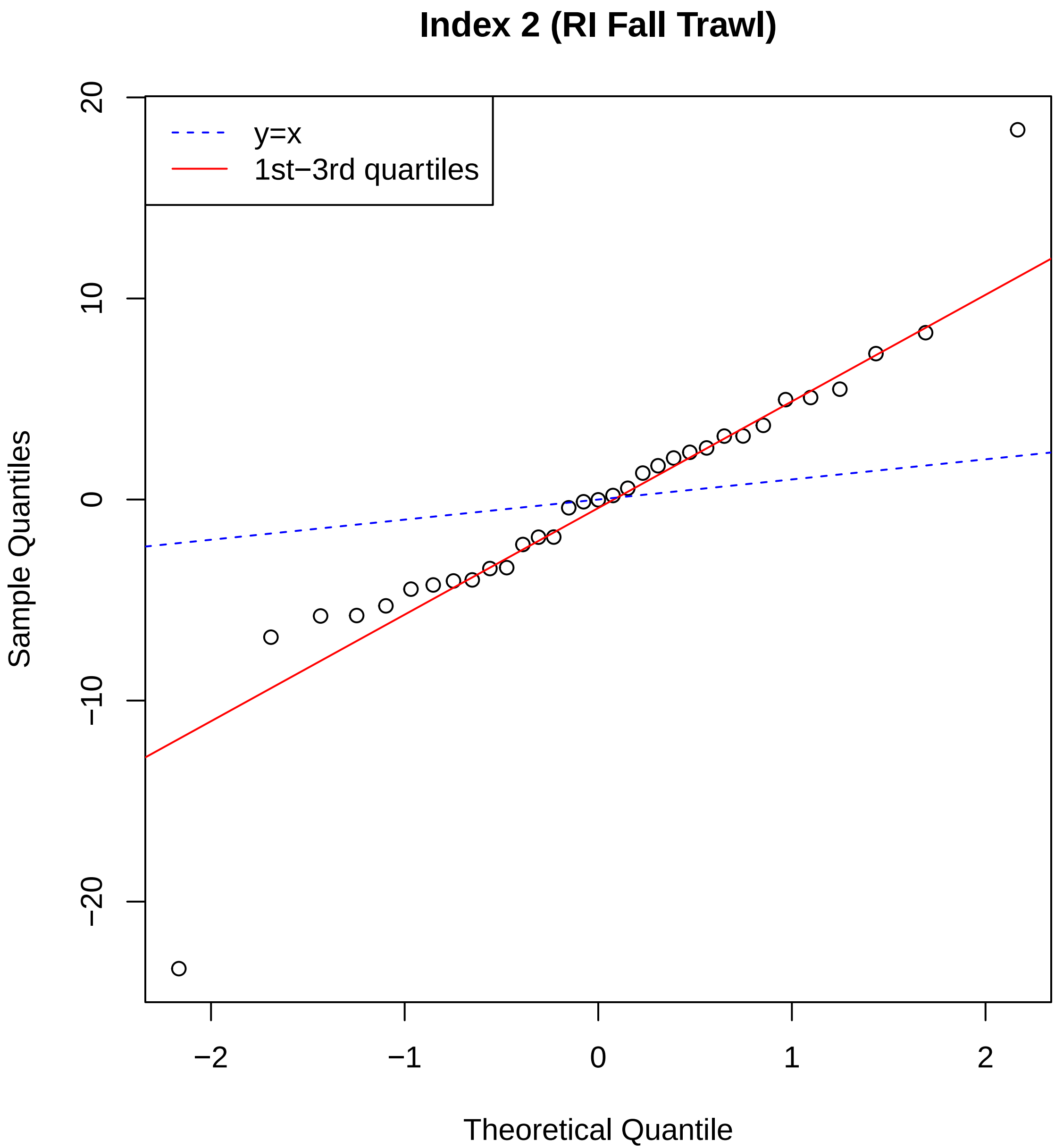
Index 1 (MA Trawl)
Mean Age
Eff. Sample Size
Year
SDNR=2.28
RMSE=2.26
Std Resids
Year

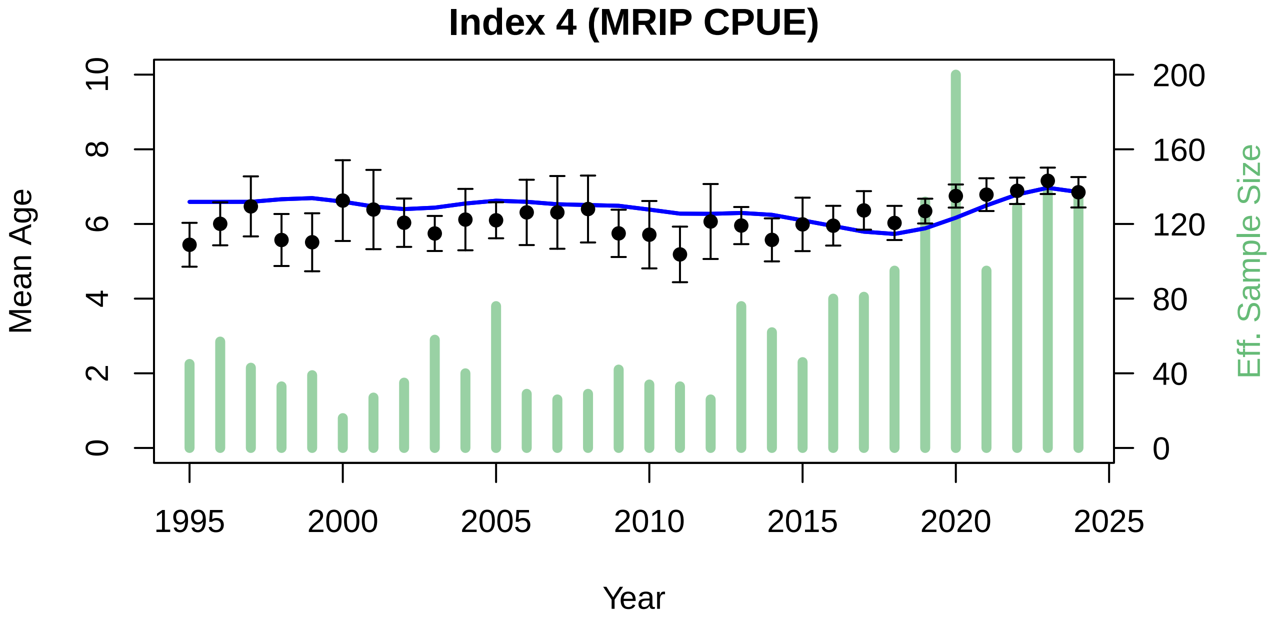


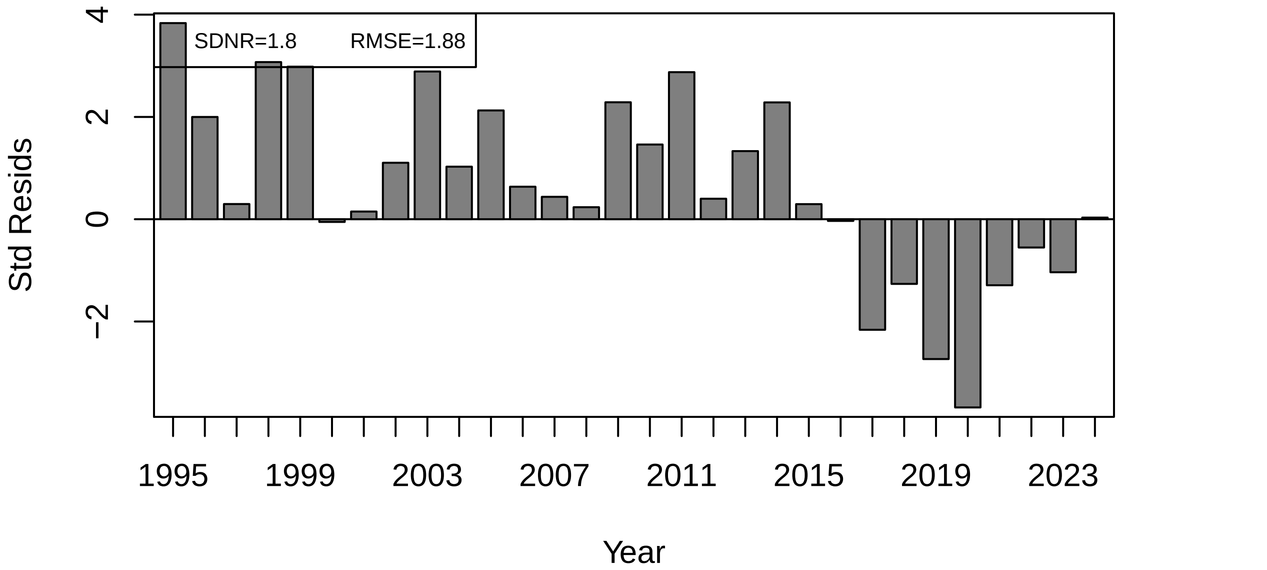
Index 1 (MA Trawl)
y=x
1st−3rd quartiles
Sample Quantiles
−4
−2
0
2
4
−2
−1
0
1
2
Theoretical Quantile

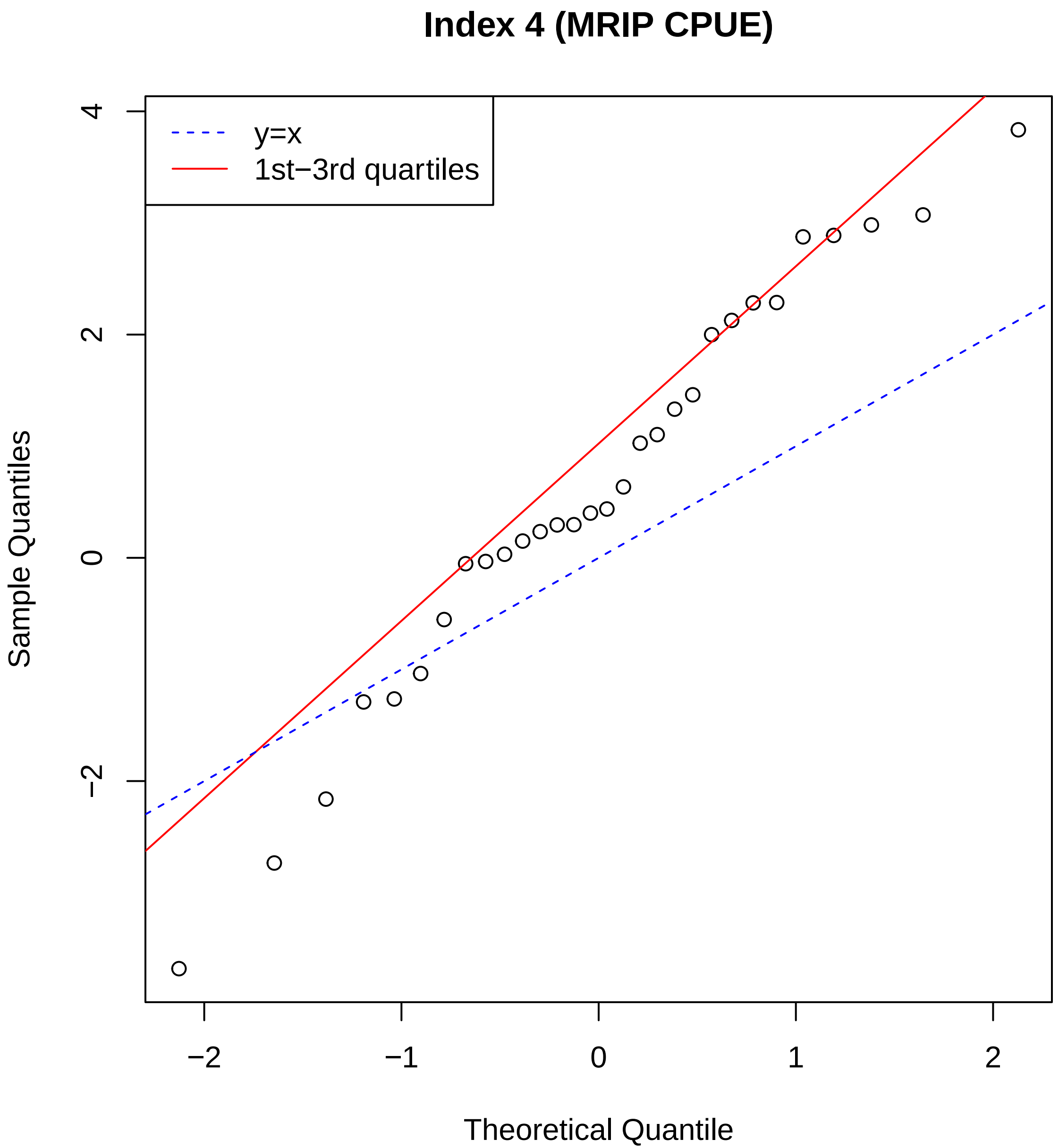


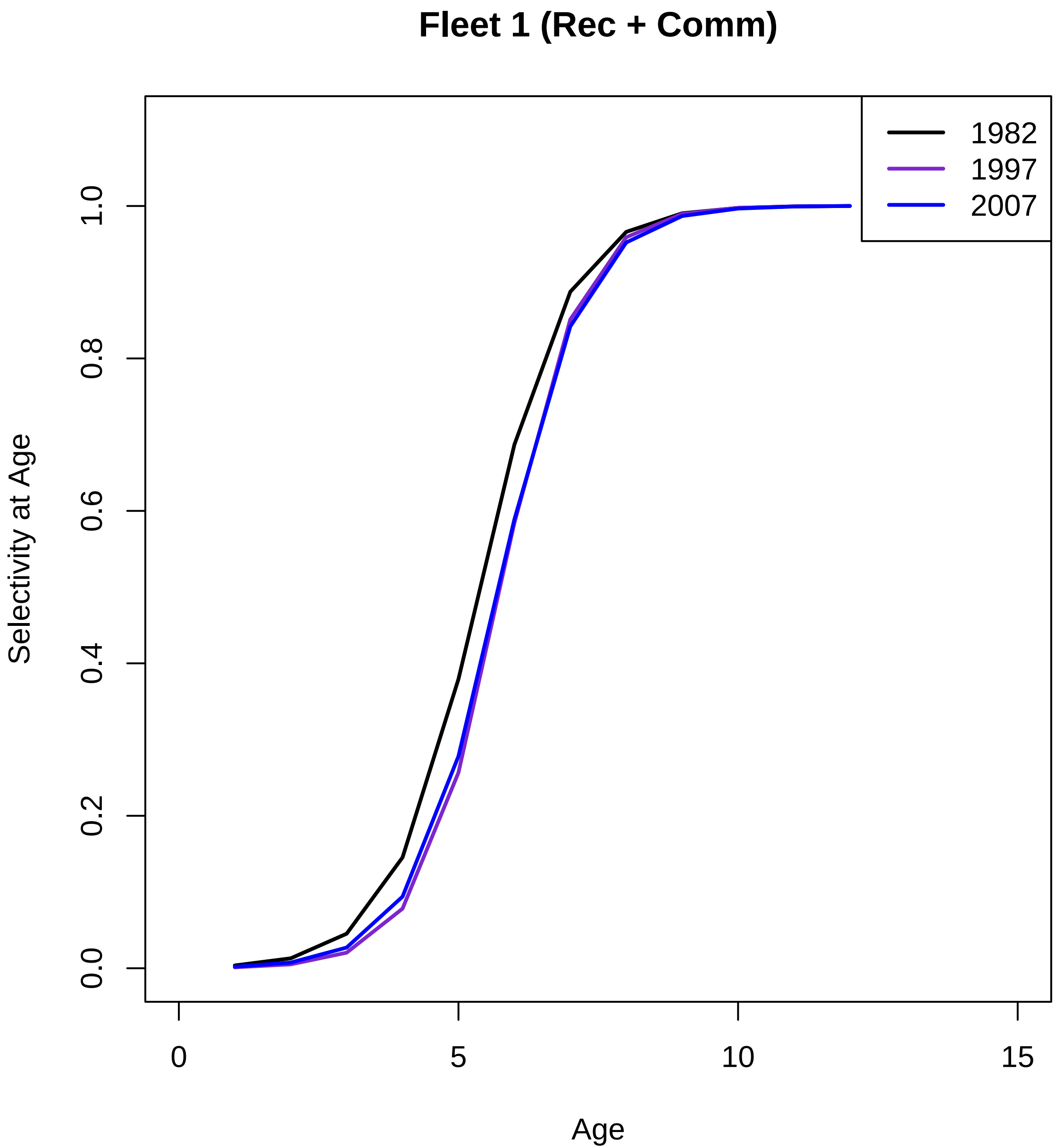
Index 2 (RI Fall Trawl)
Mean Age
Eff. Sample Size
0
2
4
6
8
10
69
55.2
41.4
27.6
13.8
0
1990
2000
2010
2020
Year
SDNR=6.58
RMSE=6.48
Std Resids
10
0
−10
−20
1982
1986
1990
2002
2008
2012
2016
2020
2024
Year

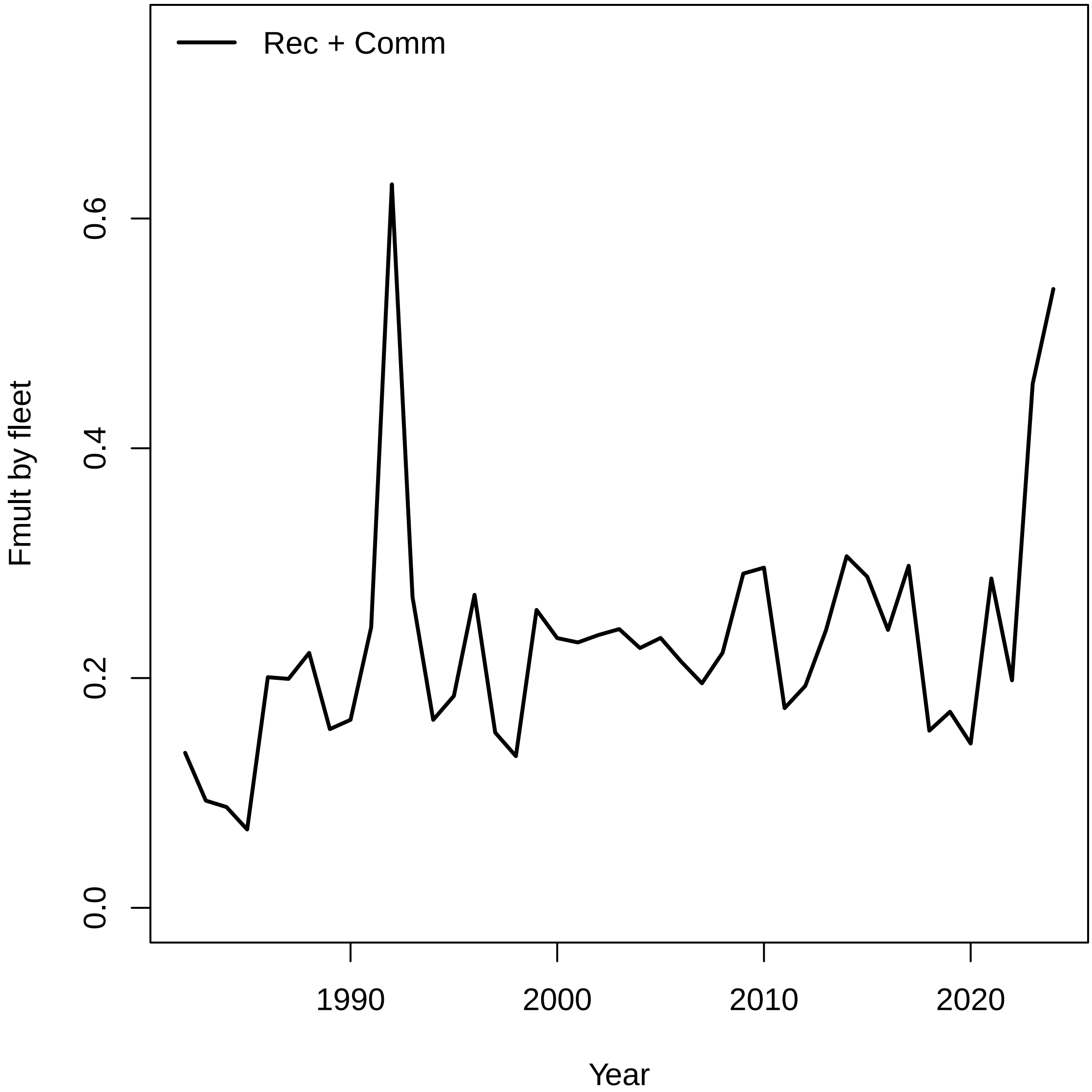

Index 2 (RI Fall Trawl)
y=x
1st−3rd quartiles
Sample Quantiles
Theoretical Quantile
20
10
0
−10
−20
−2
−1
0
1
2

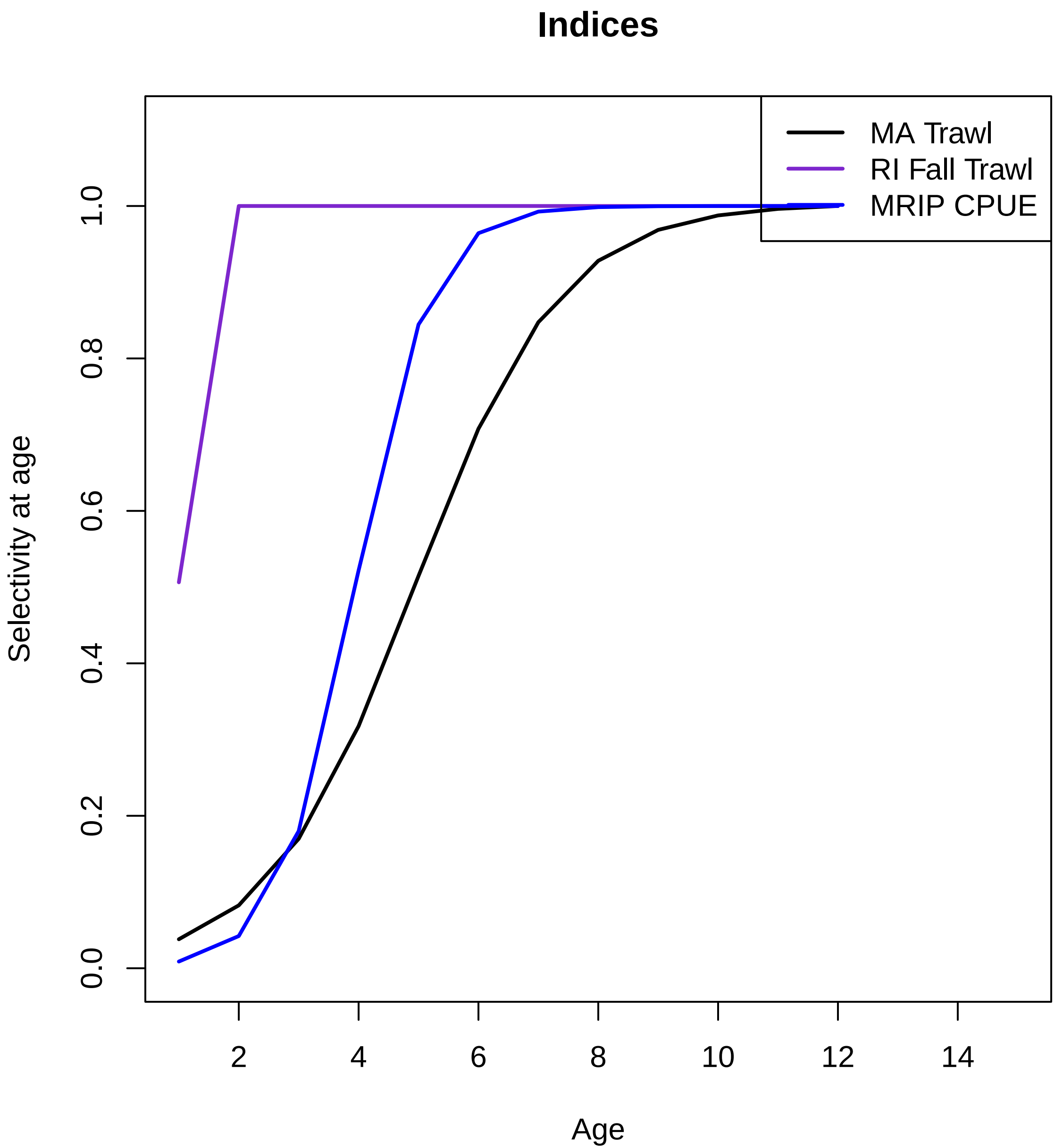

Index 4 (MRIP CPUE)
Mean Age
Eff. Sample Size
Year
0
2
4
6
8
10
0
40
80
120
160
200
1995
2000
2005
2010
2015
2020
2025

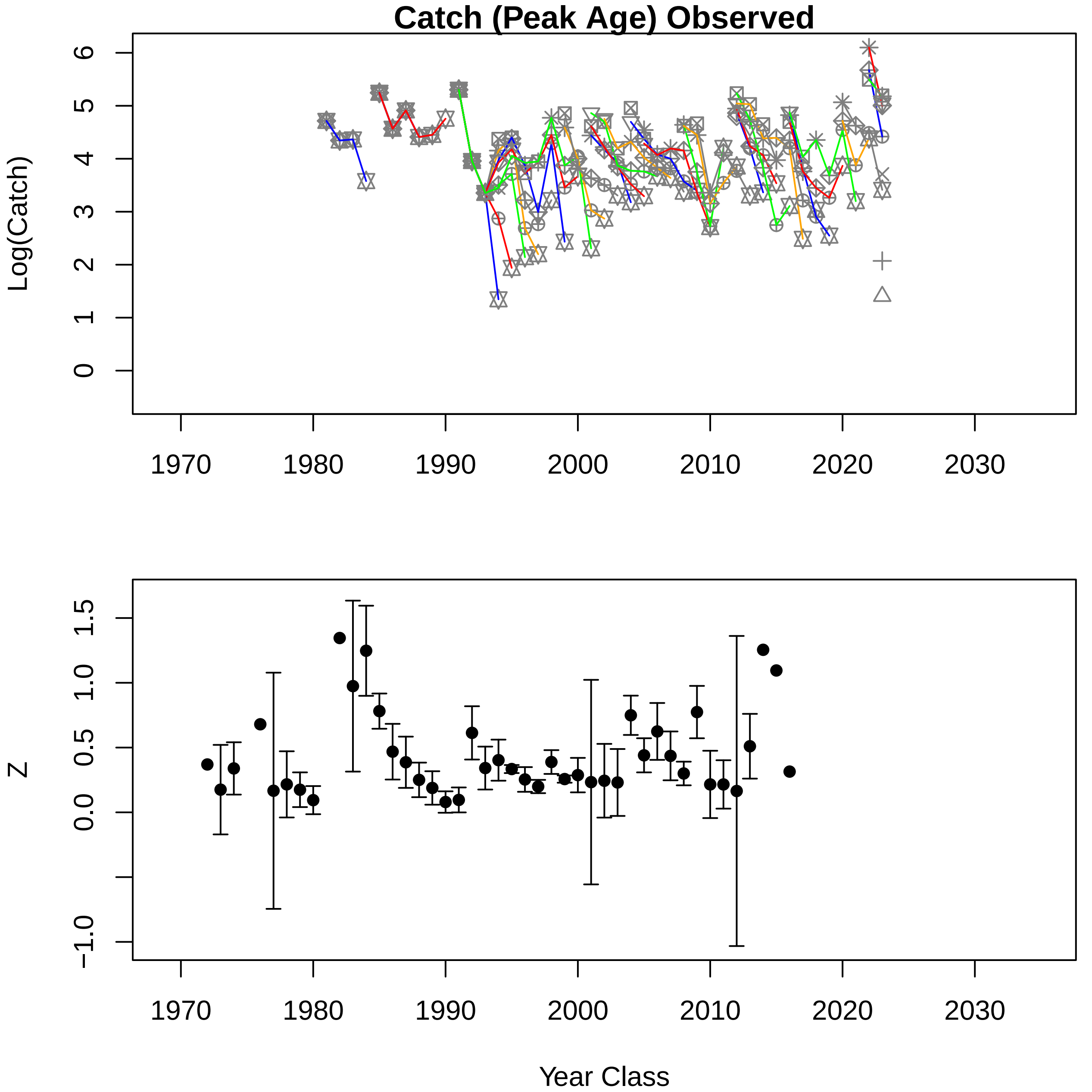

SDNR=1.8
RMSE=1.88
Std Resids
Year
4
2
0
−2
1995
1999
2003
2007
2011
2015
2019
2023


Index 4 (MRIP CPUE)
y=x
1st−3rd quartiles
Sample Quantiles
4
2
0
−2
−2
−1
0
1
2
Theoretical Quantile

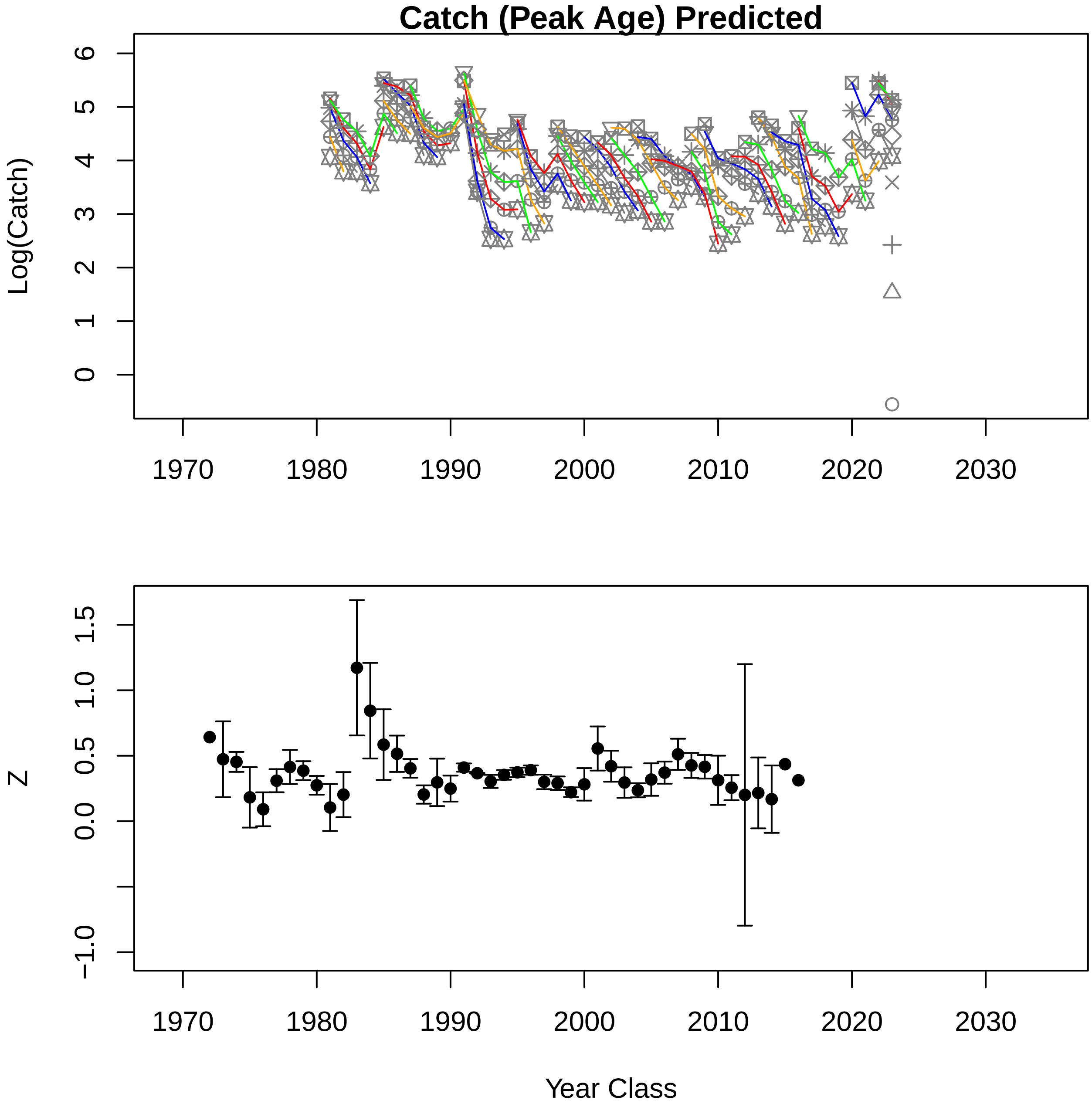

Fleet 1 (Rec + Comm)
1982
1997
2007
Selectivity at Age
0.0
0.2
0.4
0.6
0.8
1.0
0
5
10
15
Age

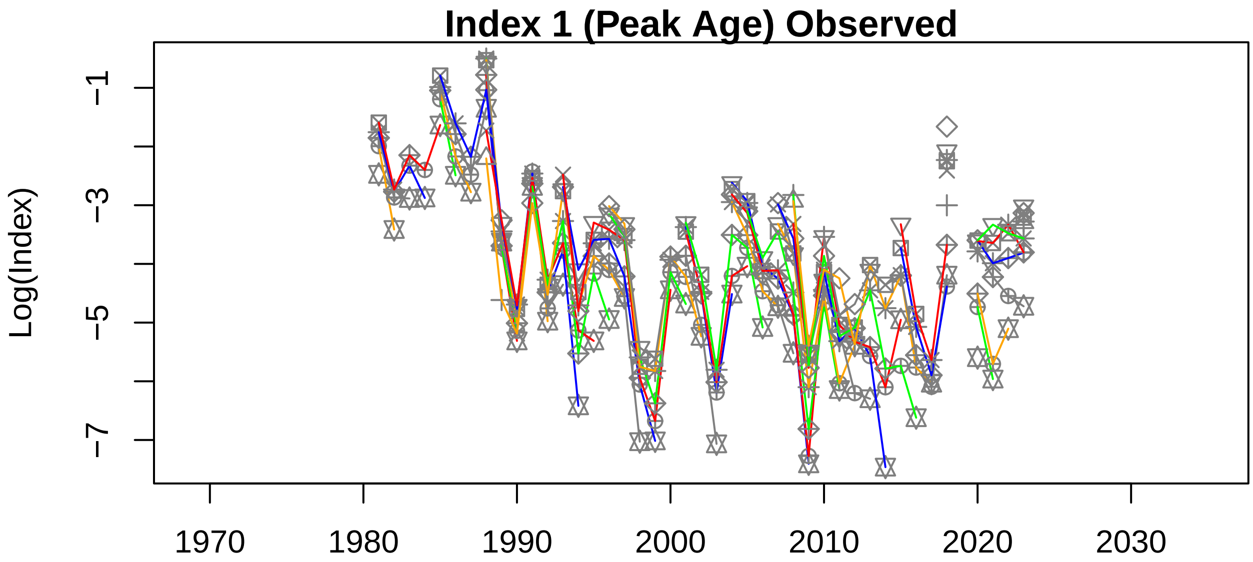

Rec + Comm
Fmult by fleet
0.0
0.2
0.4
0.6
1990
2000
2010
2020
Year

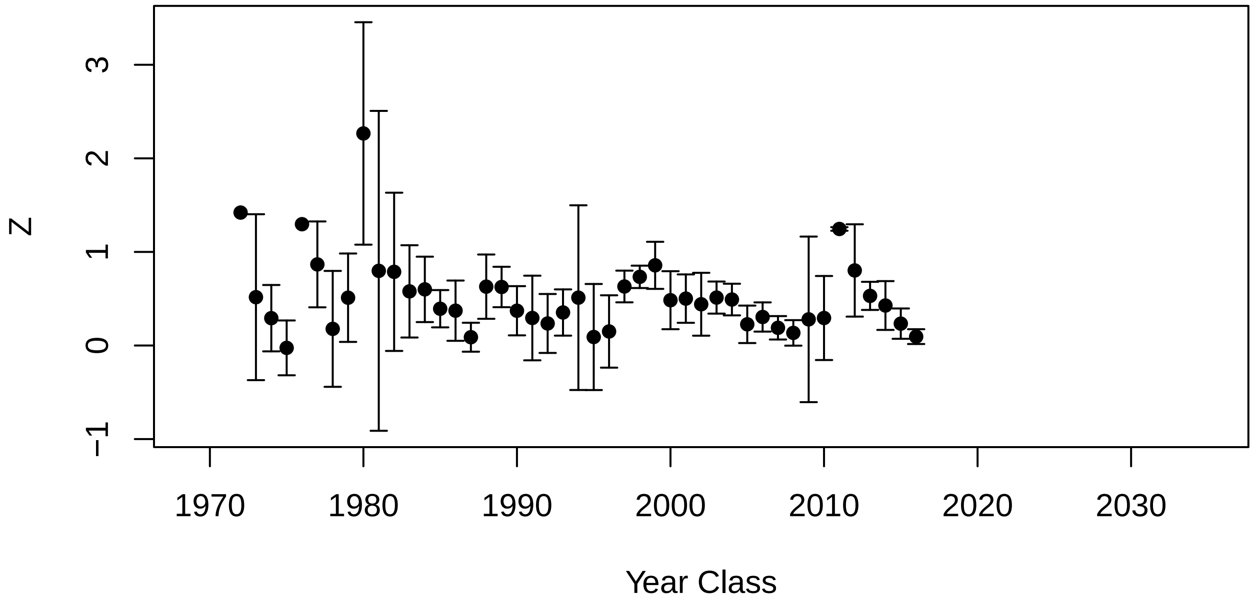

Indices
MA Trawl
RI Fall Trawl
MRIP CPUE
Selectivity at age
0.0
0.2
0.4
0.6
0.8
1.0
2
4
6
8
10
12
14
Age

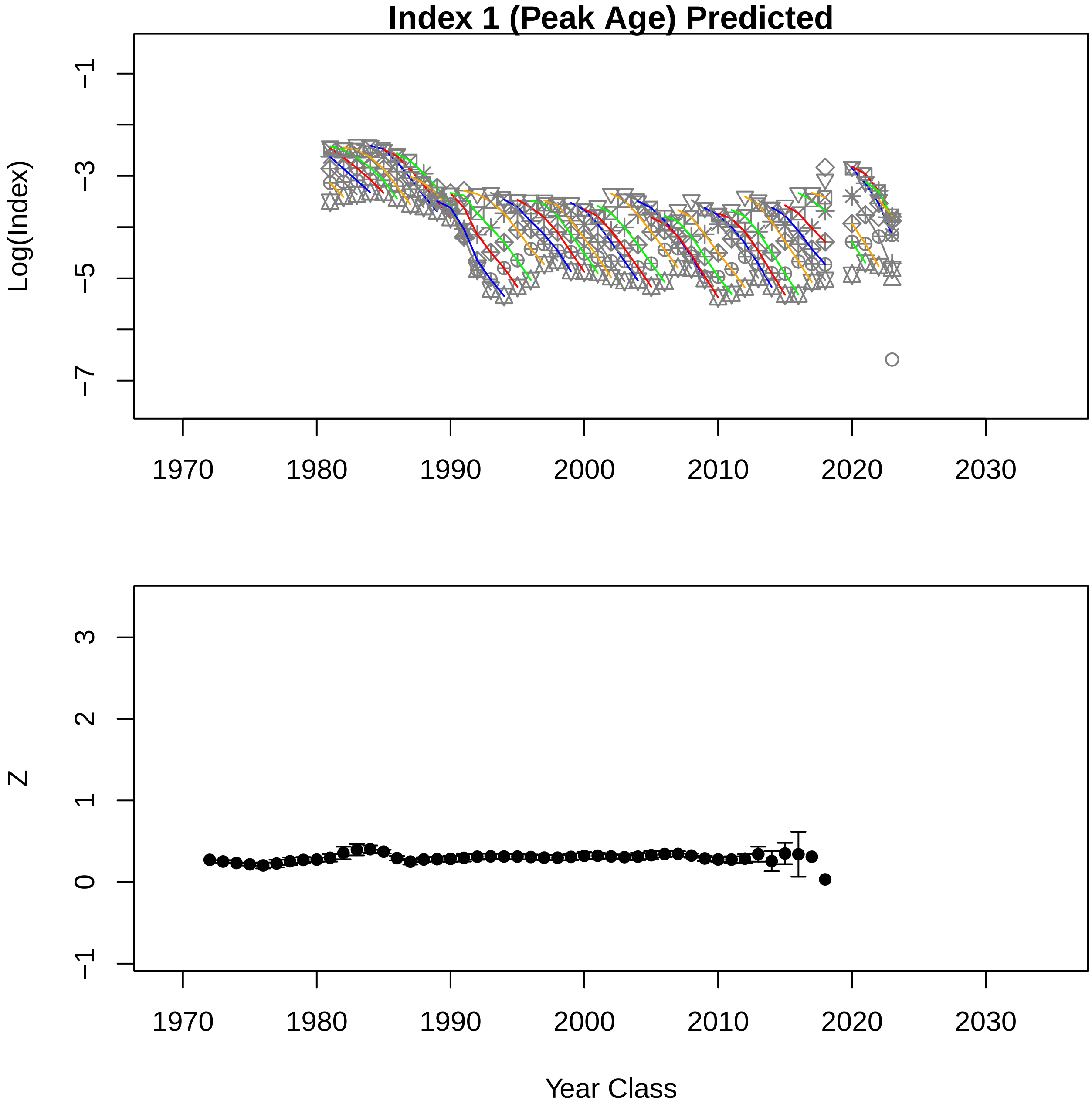


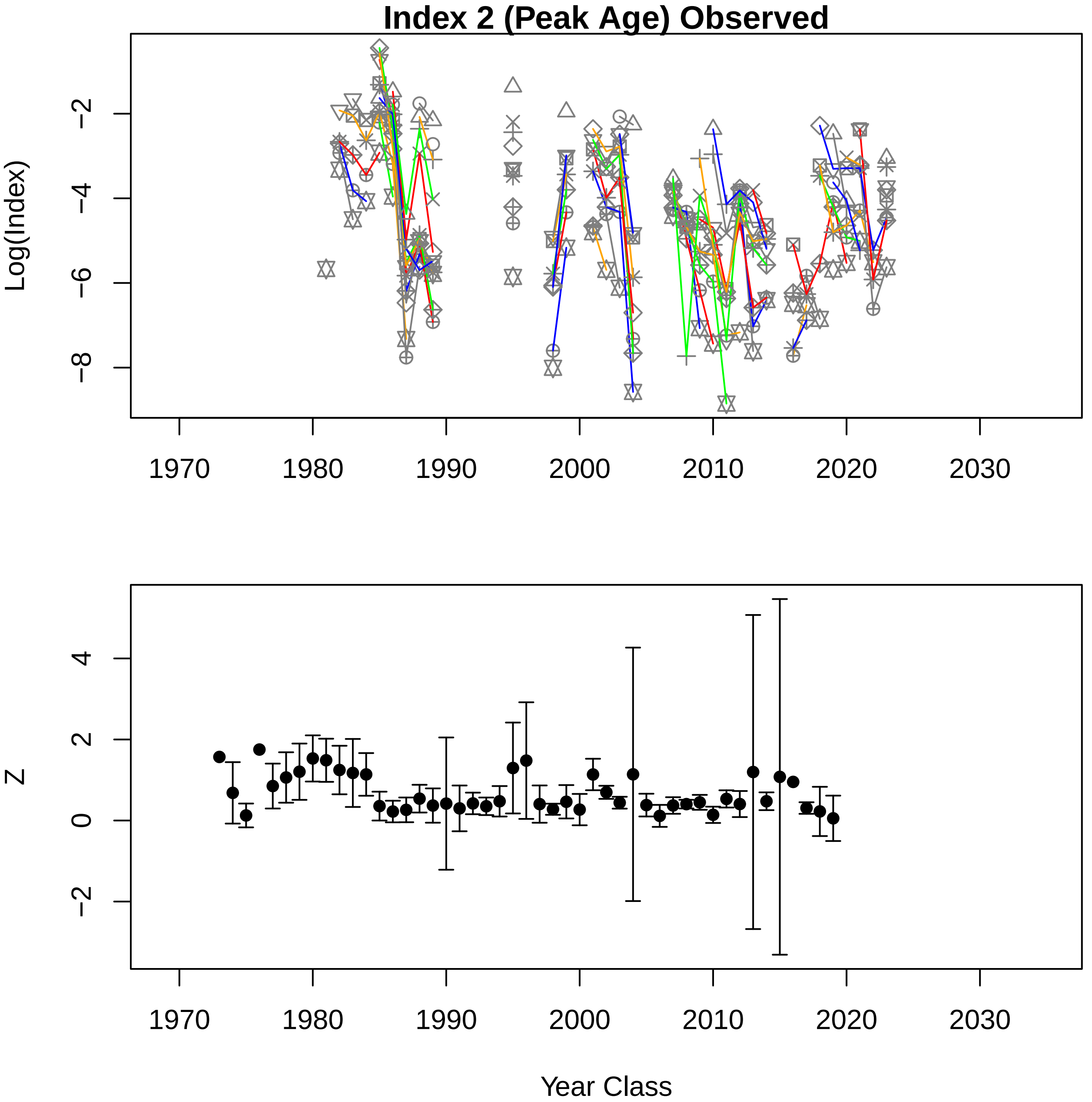
Catch (Peak Age) Observed
Log(Catch)
0
1
2
3
4
5
6
1970
1980
1990
2000
2010
2020
2030
Z
−1.0
0.0
0.5
1.0
1.5
1970
1980
1990
2000
2010
2020
2030
Year Class

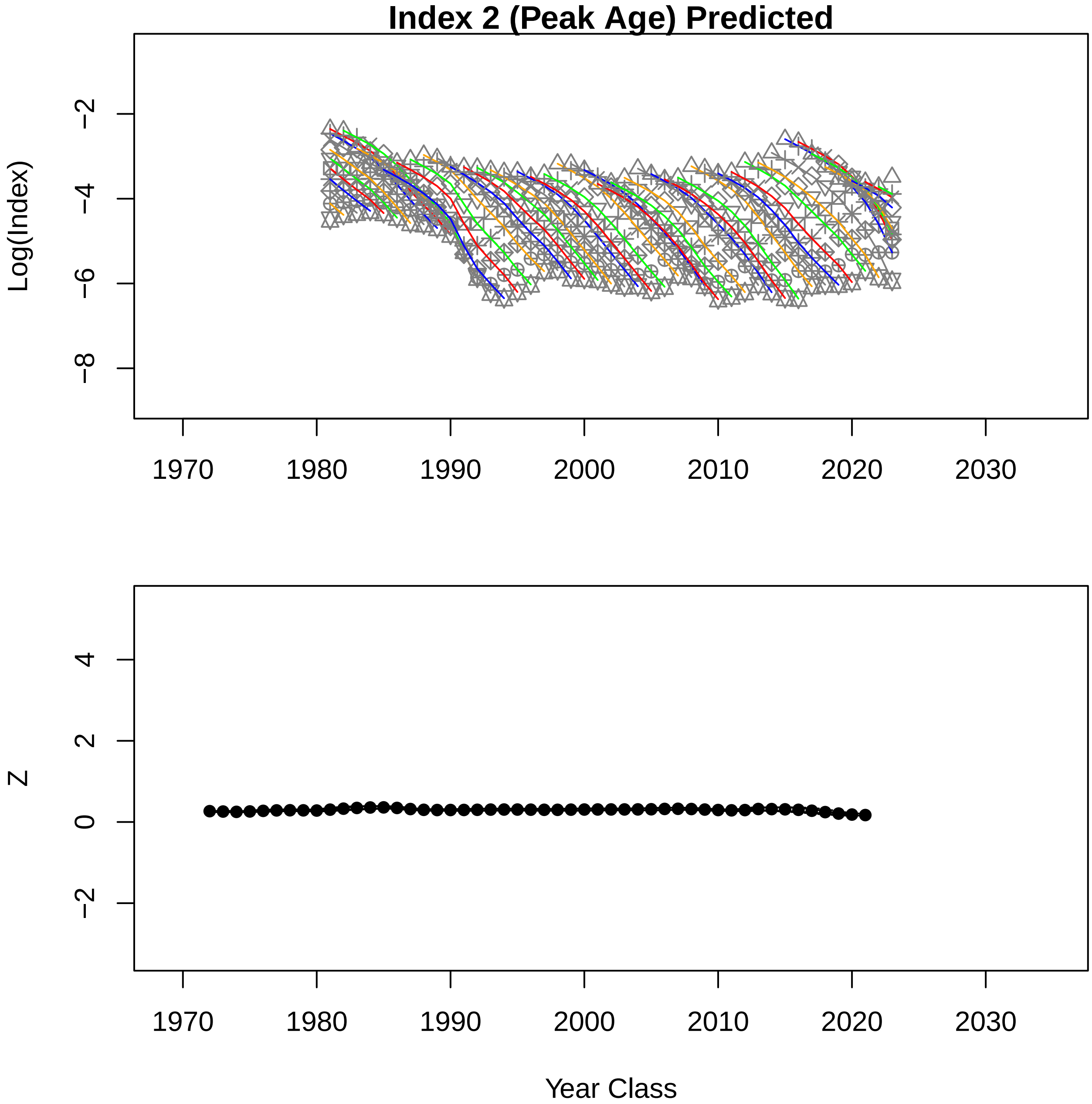

Catch (Peak Age) Predicted
Log(Catch)
0
1
2
3
4
5
6
1970
1980
1990
2000
2010
2020
2030
Z
−1.0
0.0
0.5
1.0
1.5
1970
1980
1990
2000
2010
2020
2030
Year Class

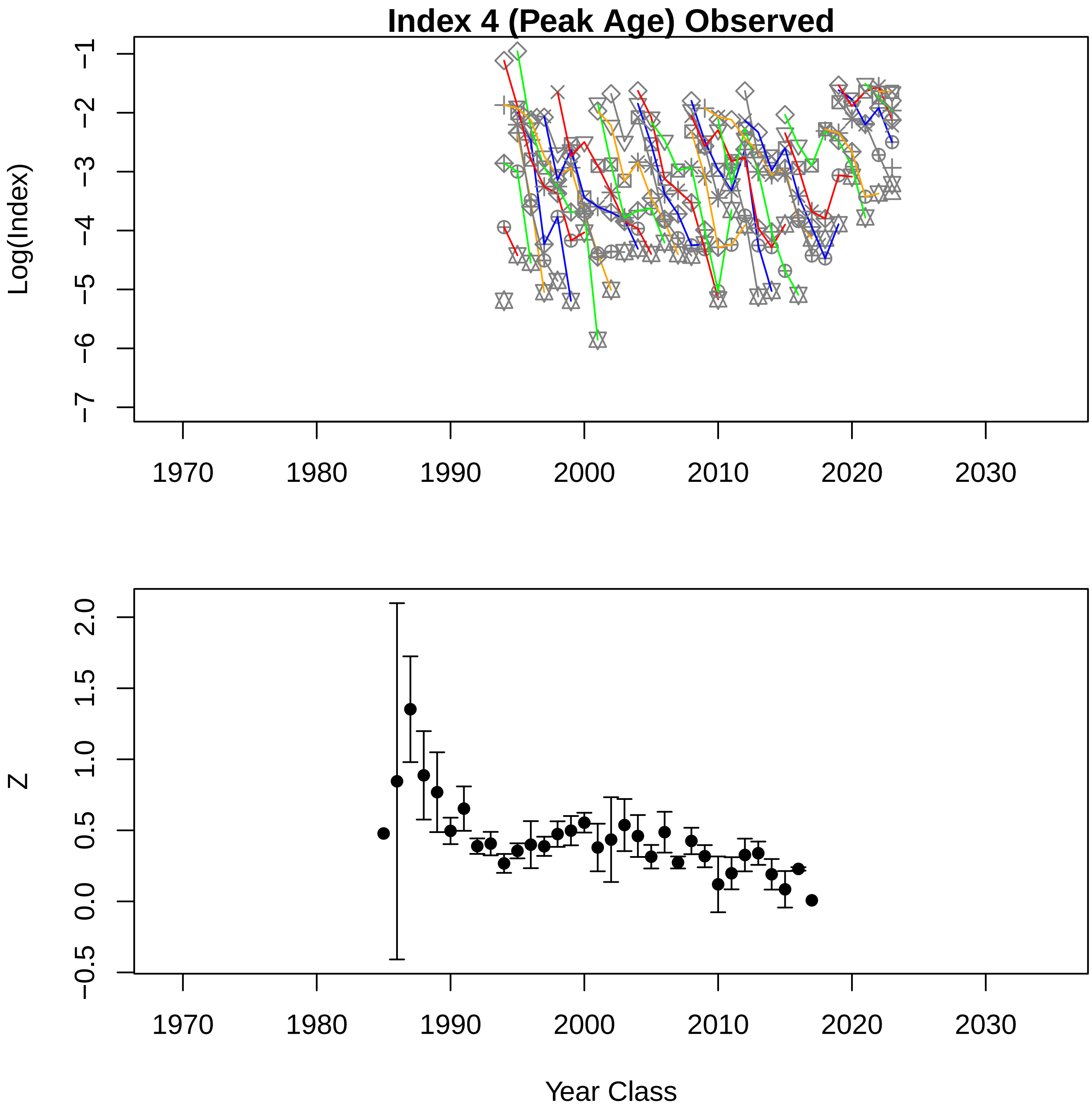

Index 1 (Peak Age) Observed
Log(Index)
−1
−3
−5
−7
1970
1980
1990
2000
2010
2020
2030

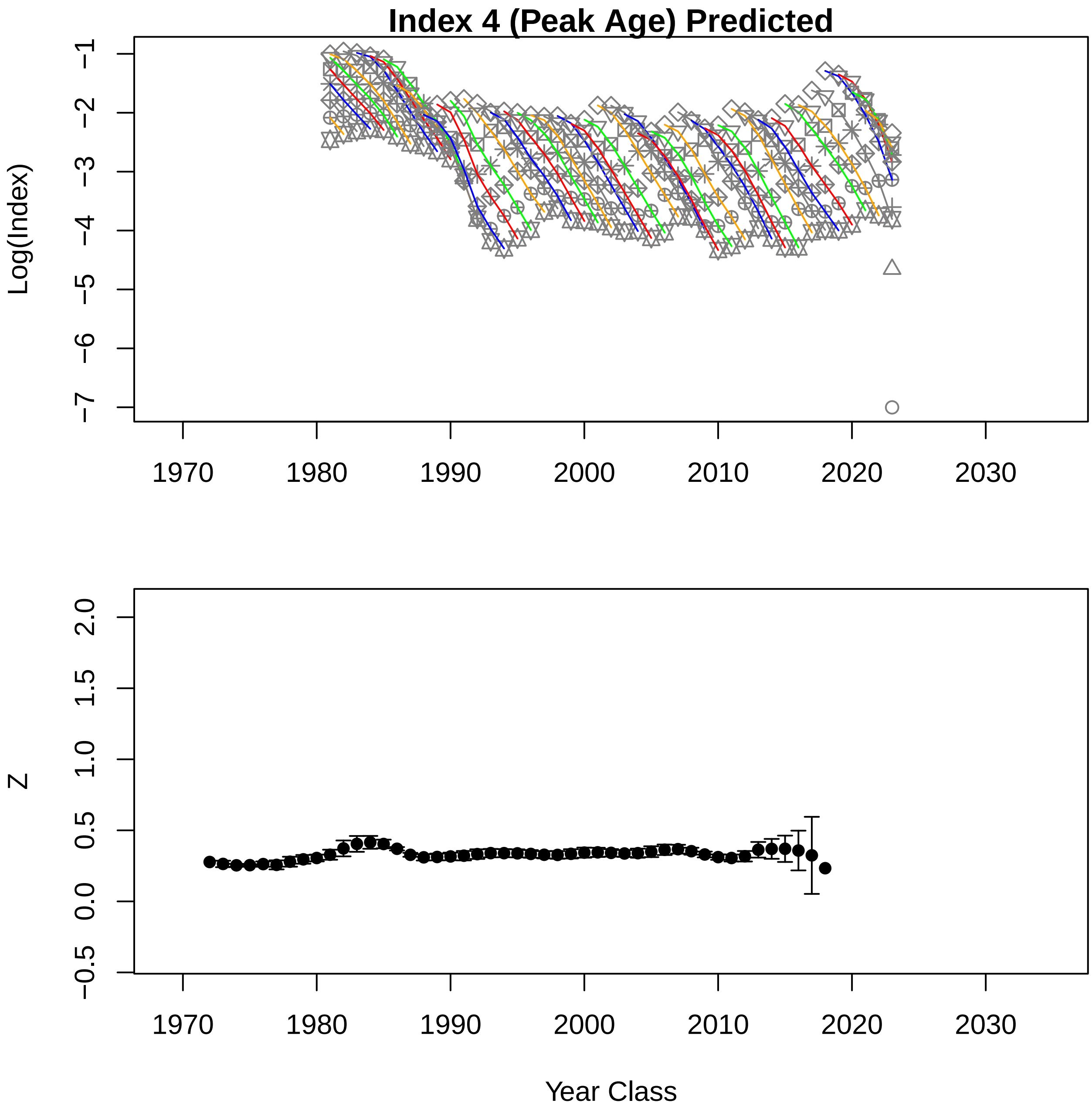

Z
3
2
1
0
−1
1970
1980
1990
2000
2010
2020
2030
Year Class


Index 1 (Peak Age) Predicted
Log(Index)
−1
−3
−5
−7
1970
1980
1990
2000
2010
2020
2030
Z
3
2
1
0
−1
Year Class

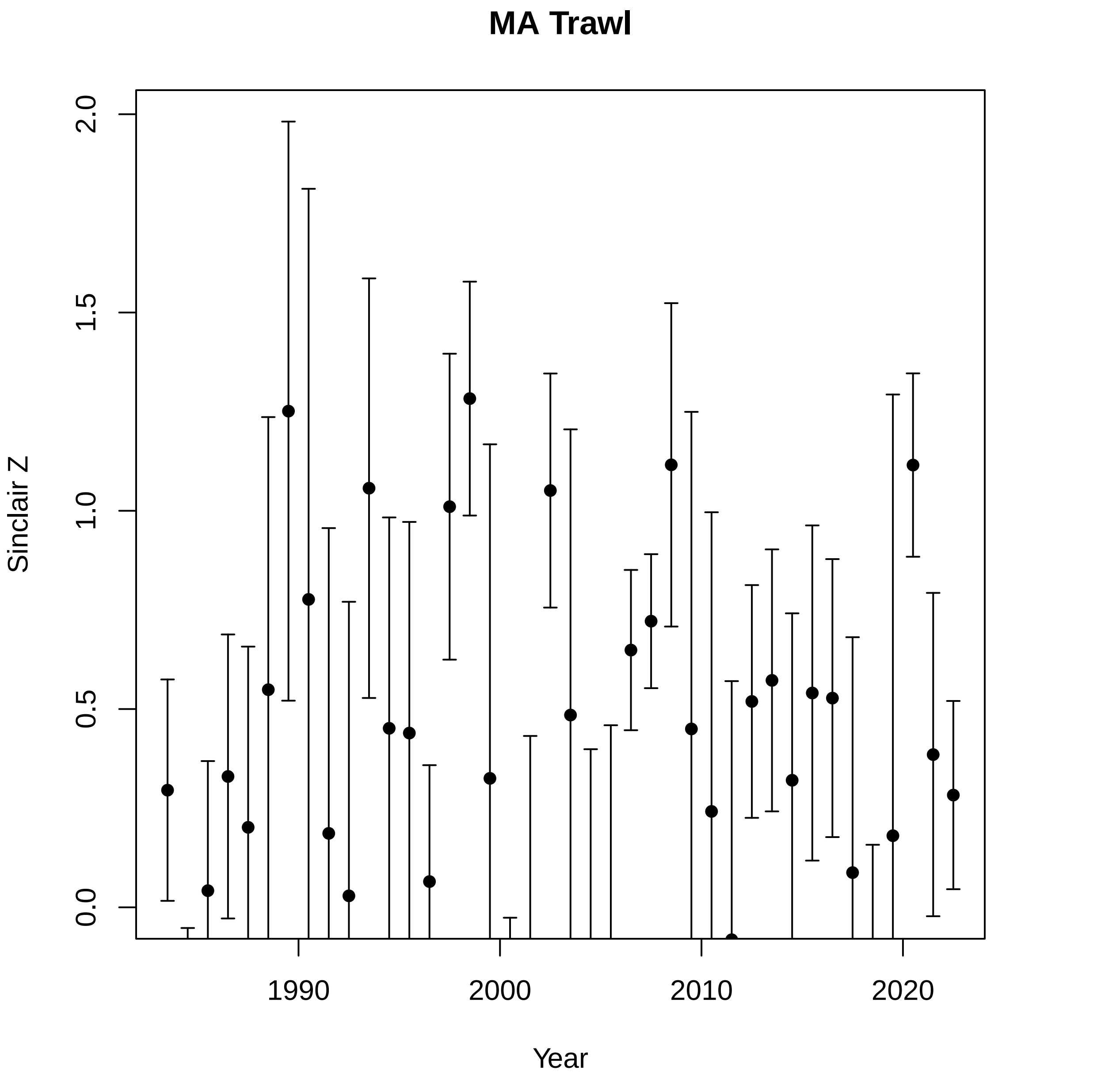

Index 2 (Peak Age) Observed
Log(Index)
−2
−4
−6
−8
1970
1980
1990
2000
2010
2020
2030
Z
4
2
0
−2
Year Class

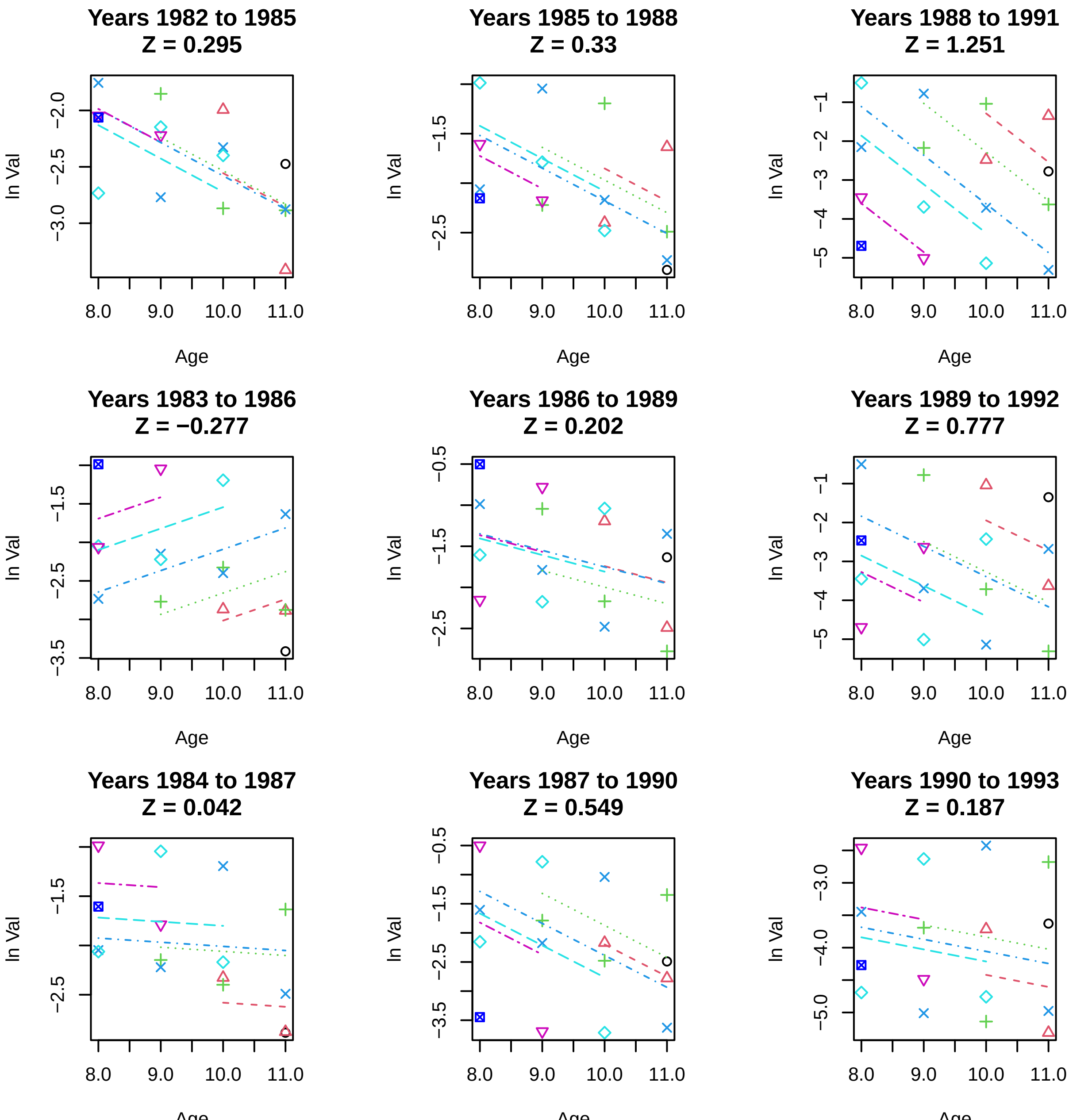

Index 2 (Peak Age) Predicted
Log(Index)
−2
−4
−6
−8
1970
1980
1990
2000
2010
2020
2030
Z
4
2
0
−2
Year Class

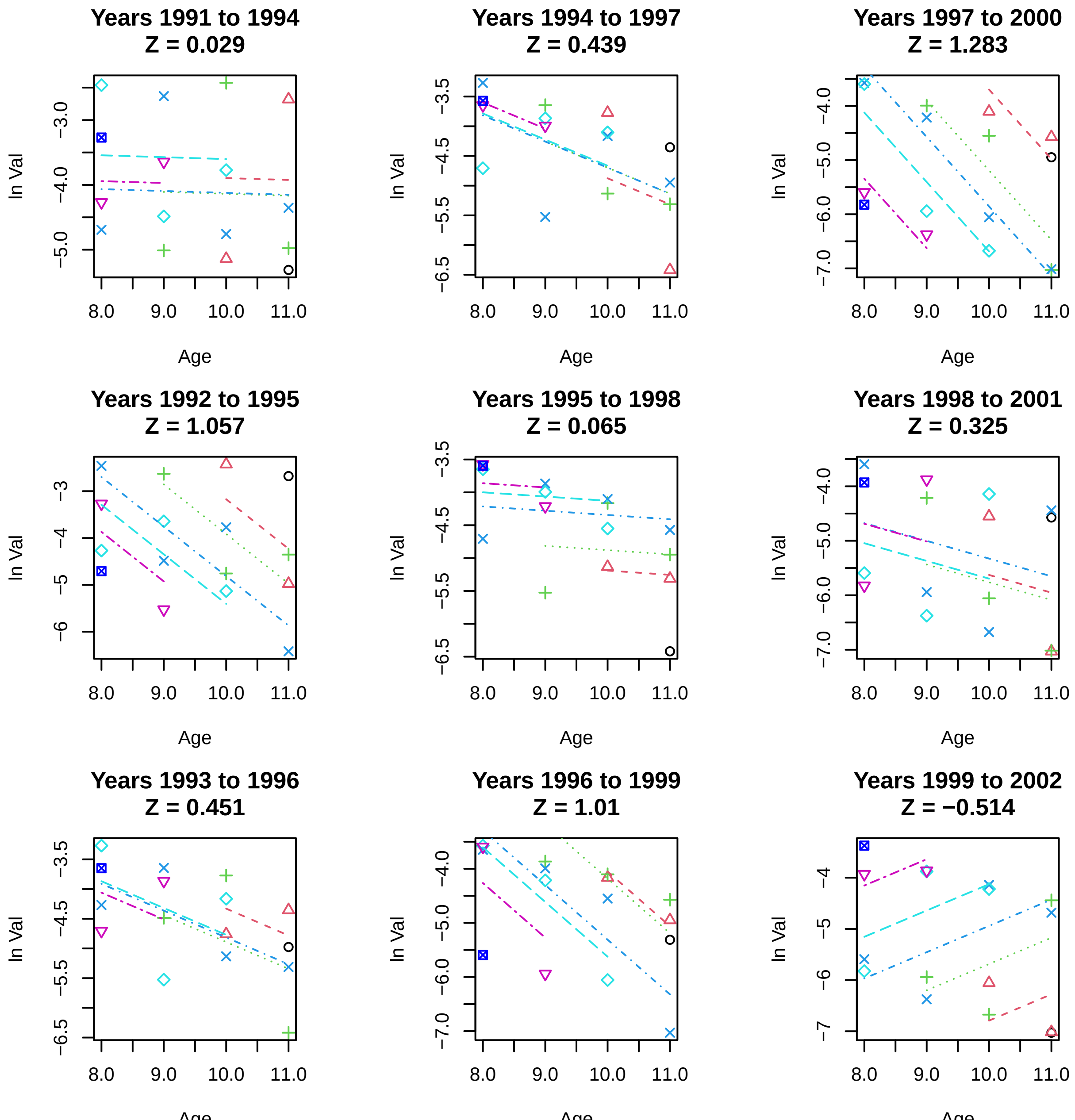

Index 4 (Peak Age) Observed
Log(Index)
−1
−2
−3
−4
−5
−6
−7
1970
1980
1990
2000
2010
2020
2030
Z
2.0
1.5
1.0
0.5
0.0
−0.5
Year Class

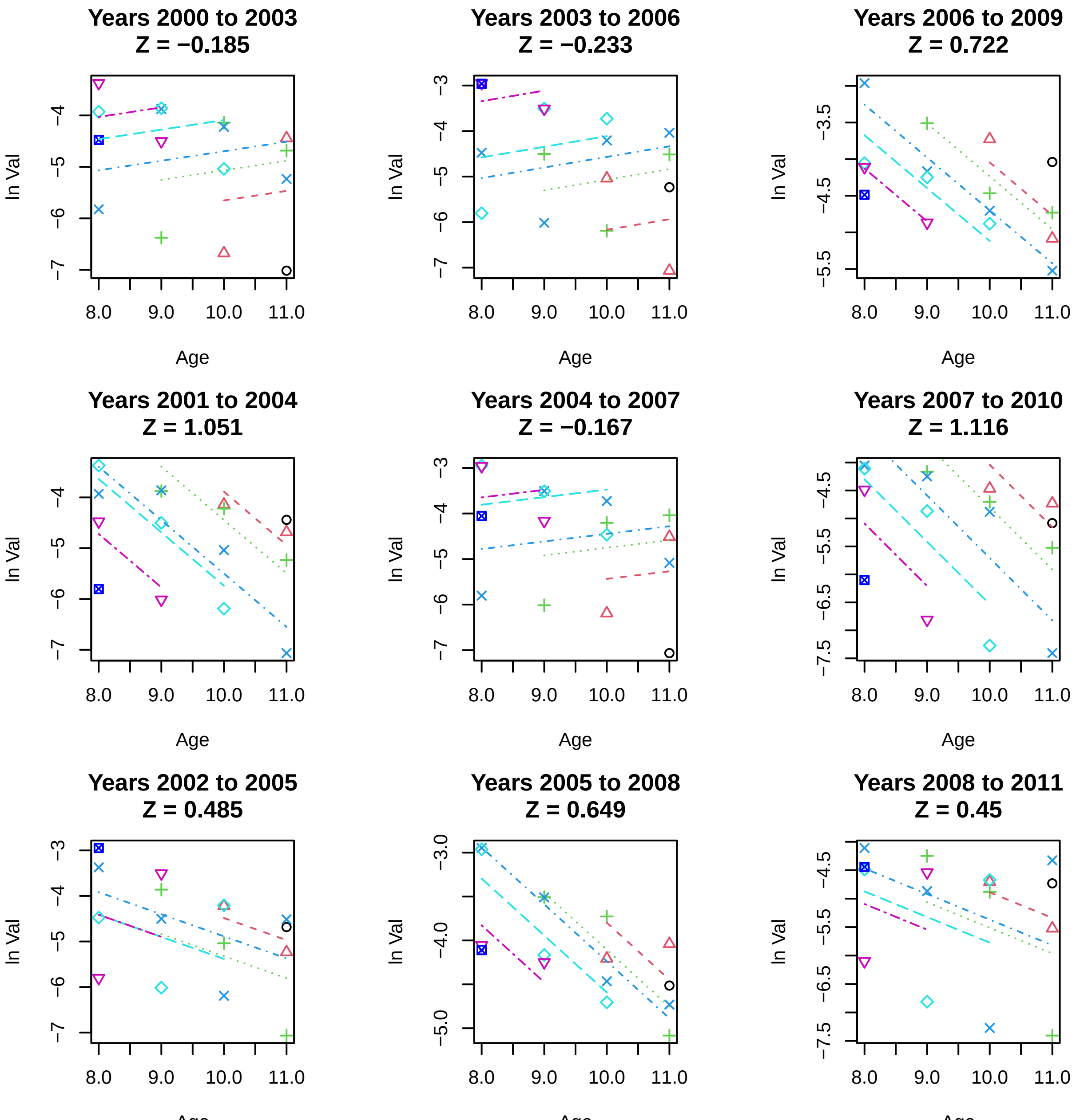


Index 4 (Peak Age) Predicted
Log(Index)
−1
−2
−3
−4
−5
−6
−7
1970
1980
1990
2000
2010
2020
2030
Z
2.0
1.5
1.0
0.5
0.0
−0.5
1970
1980
1990
2000
2010
2020
2030
Year Class

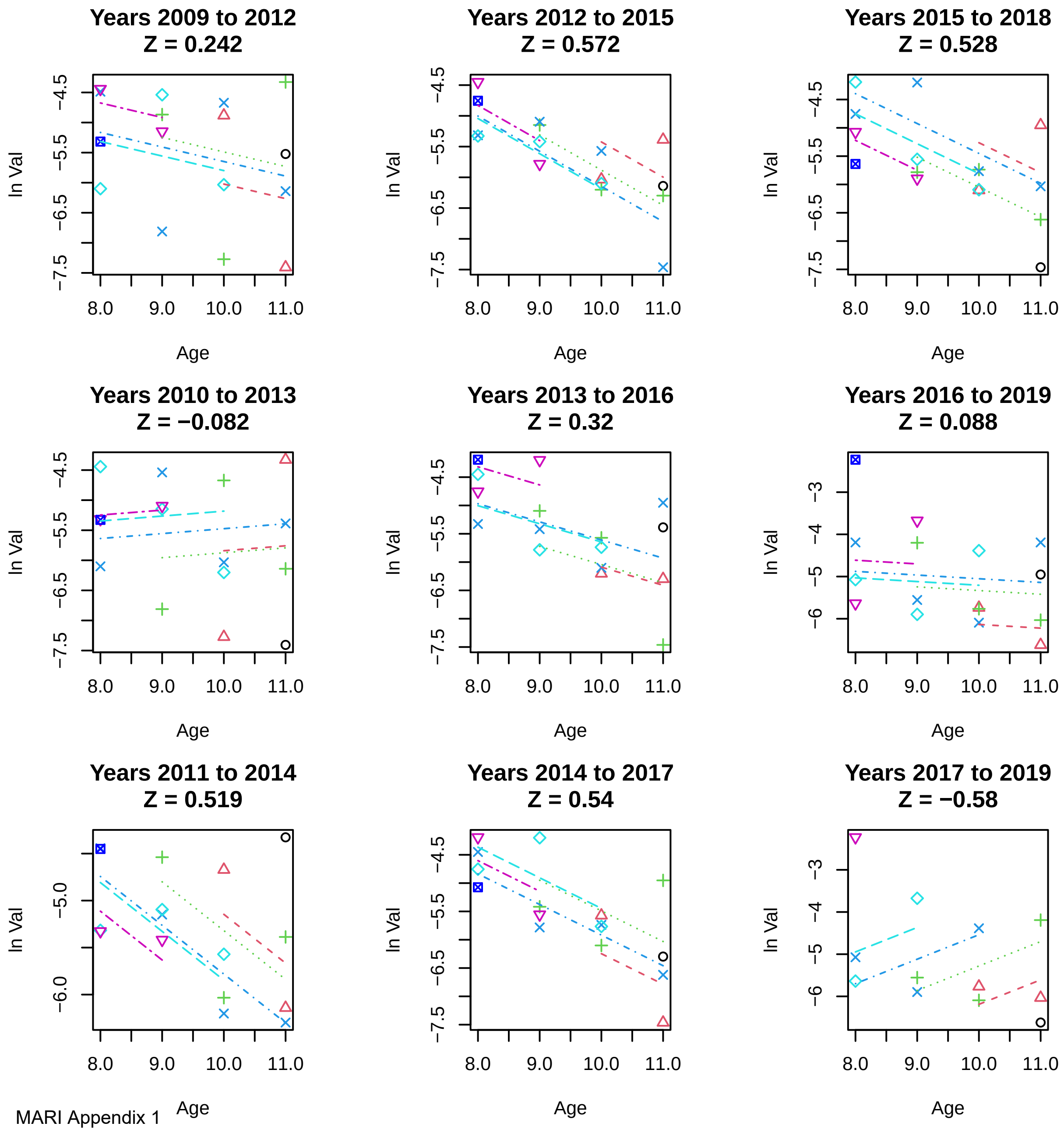

MA Trawl
Sinclair Z
2.0
1.5
1.0
0.5
0.0
1990
2000
2010
2020
Year

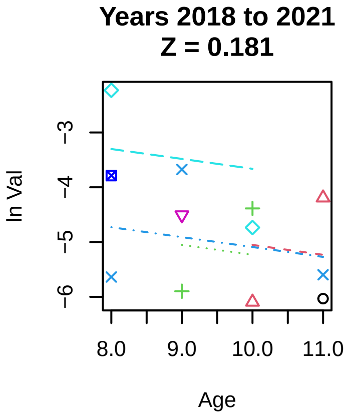

Years 1982 to 1985
Z = 0.295
Years 1985 to 1988
Z = 0.33
Years 1988 to 1991
Z = 1.251
Years 1983 to 1986
Z = −0.277
Years 1986 to 1989
Z = 0.202
Years 1989 to 1992
Z = 0.777
Years 1984 to 1987
Z = 0.042
Years 1987 to 1990
Z = 0.549
Years 1990 to 1993
Z = 0.187
ln Val
Age
8.0
9.0
10.0
11.0


Years 1991 to 1994
Z = 0.029
Years 1994 to 1997
Z = 0.439
Years 1997 to 2000
Z = 1.283
Years 1992 to 1995
Z = 1.057
Years 1995 to 1998
Z = 0.065
Years 1998 to 2001
Z = 0.325
Years 1993 to 1996
Z = 0.451
Years 1996 to 1999
Z = 1.01
Years 1999 to 2002
Z = −0.514
ln Val
Age
8.0
9.0
10.0
11.0

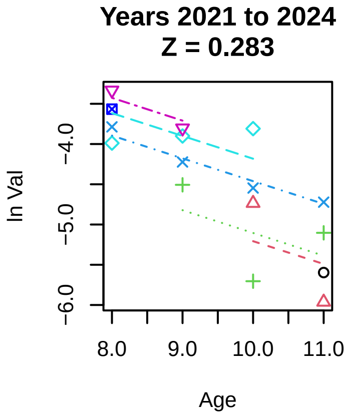


Years 2000 to 2003
Z = −0.185
Years 2003 to 2006
Z = −0.233
Years 2006 to 2009
Z = 0.722
Years 2001 to 2004
Z = 1.051
Years 2004 to 2007
Z = −0.167
Years 2007 to 2010
Z = 1.116
Years 2002 to 2005
Z = 0.485
Years 2005 to 2008
Z = 0.649
Years 2008 to 2011
Z = 0.45
ln Val
Age
8.0
9.0
10.0
11.0

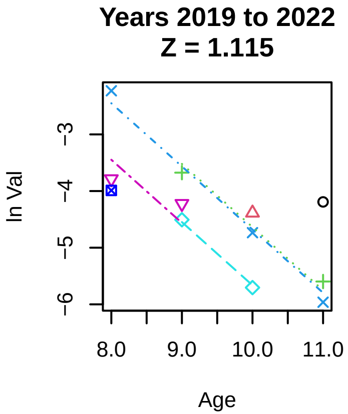

Years 2009 to 2012
Z = 0.242
Years 2012 to 2015
Z = 0.572
Years 2015 to 2018
Z = 0.528
Years 2010 to 2013
Z = −0.082
Years 2013 to 2016
Z = 0.32
Years 2016 to 2019
Z = 0.088
Years 2011 to 2014
Z = 0.519
Years 2014 to 2017
Z = 0.54
Years 2017 to 2019
Z = −0.58
ln Val
Age
8.0
9.0
10.0
11.0



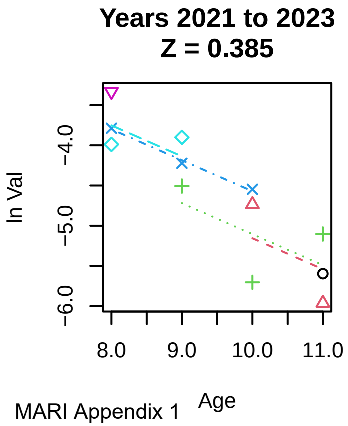
Years 2018 to 2021
Z = 0.181
ln Val
−3
−4
−5
−6
8.0
9.0
10.0
11.0
Age



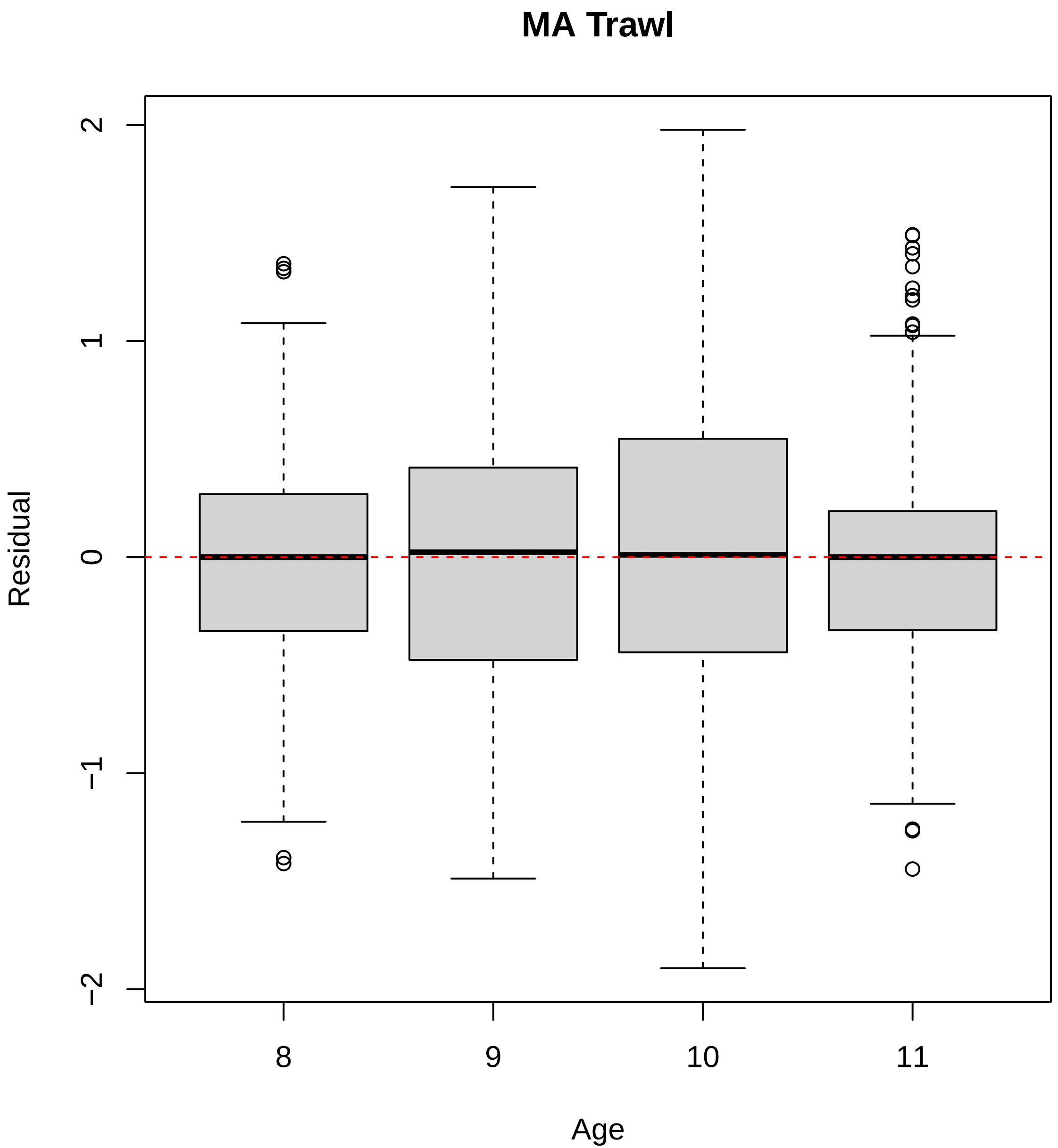
Years 2021 to 2024
Z = 0.283
ln Val
−4.0
−5.0
−6.0
8.0
9.0
10.0
11.0
Age

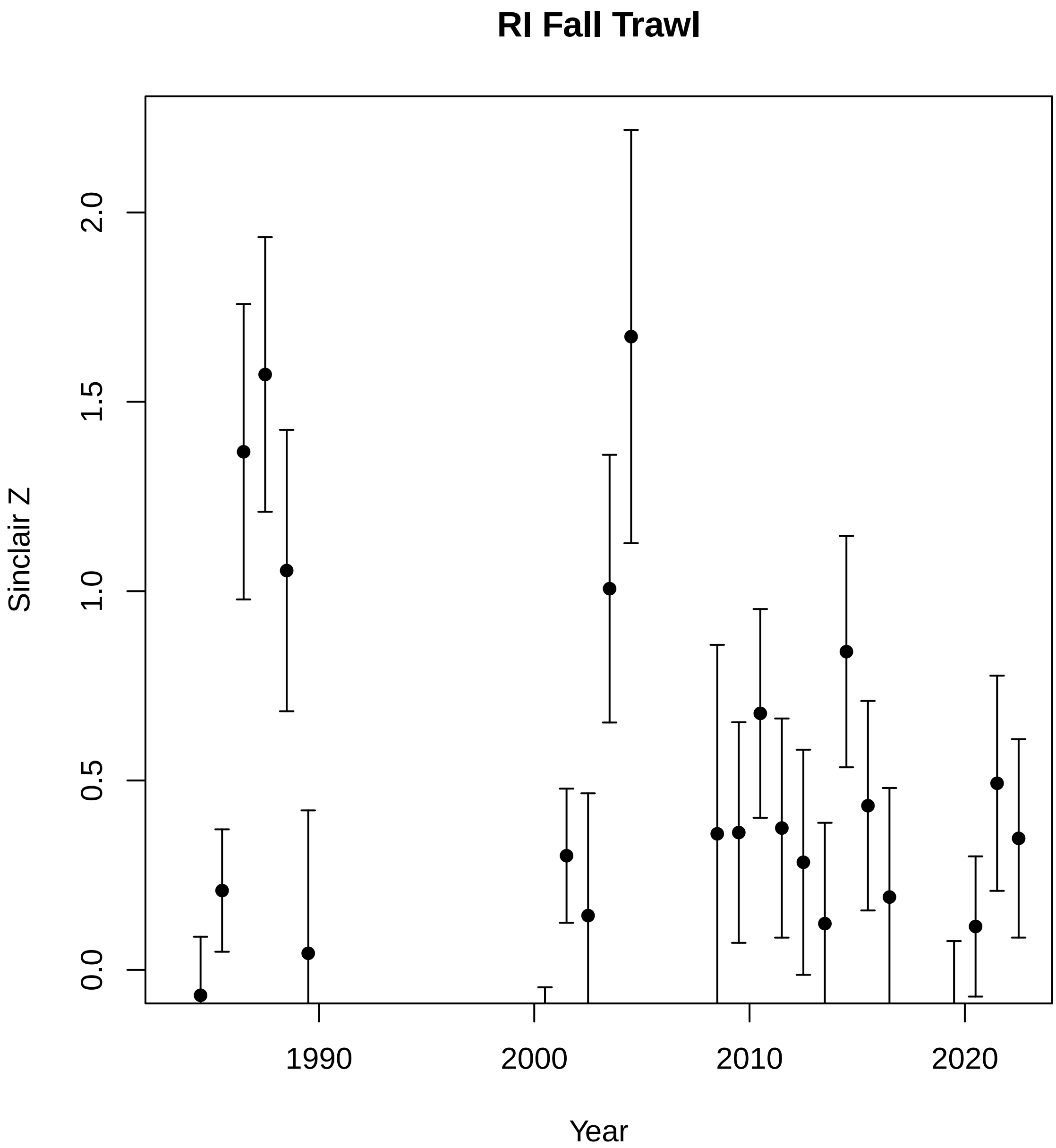


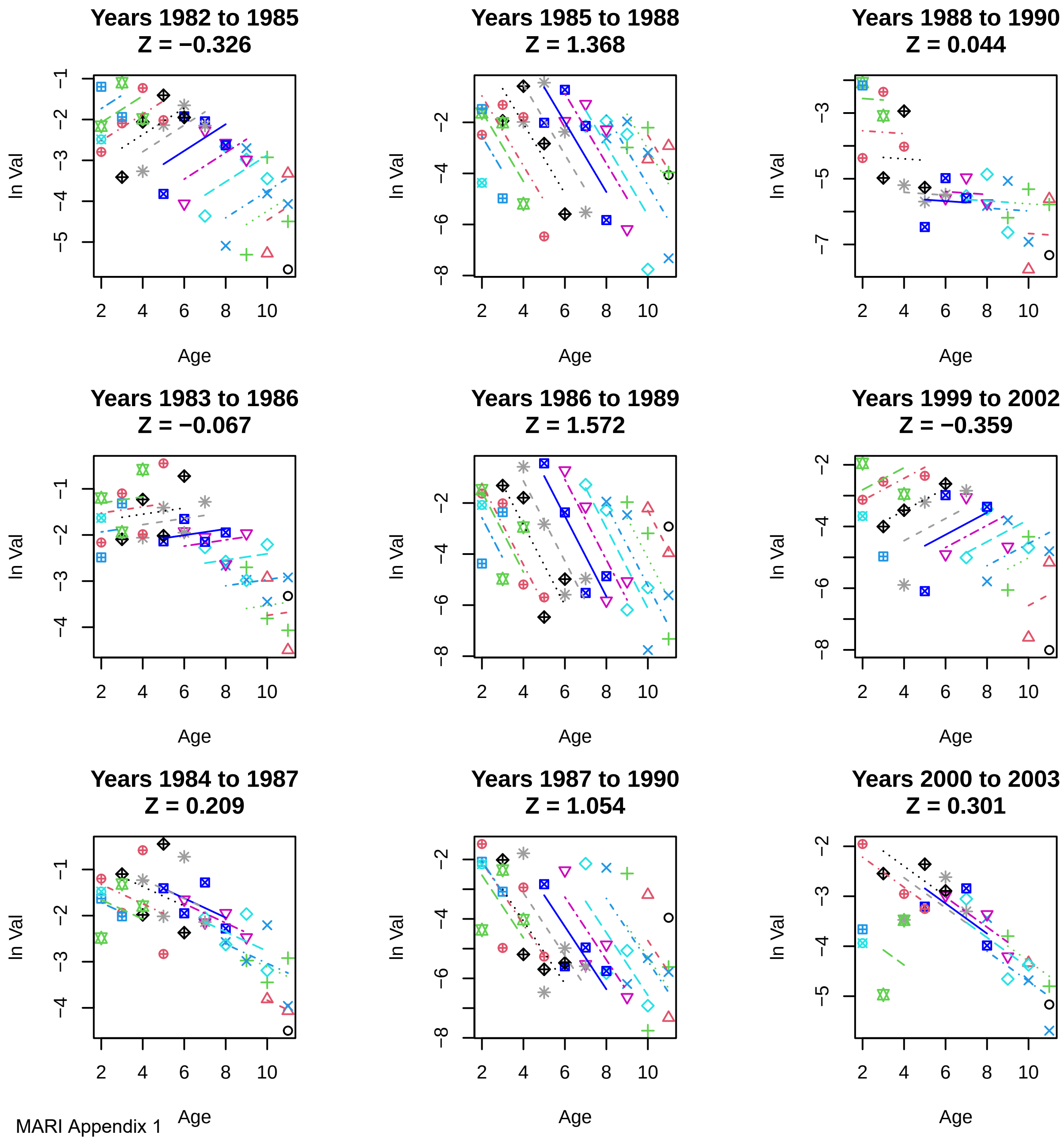
Years 2019 to 2022
Z = 1.115
ln Val
−3
−4
−5
−6
8.0
9.0
10.0
11.0
Age

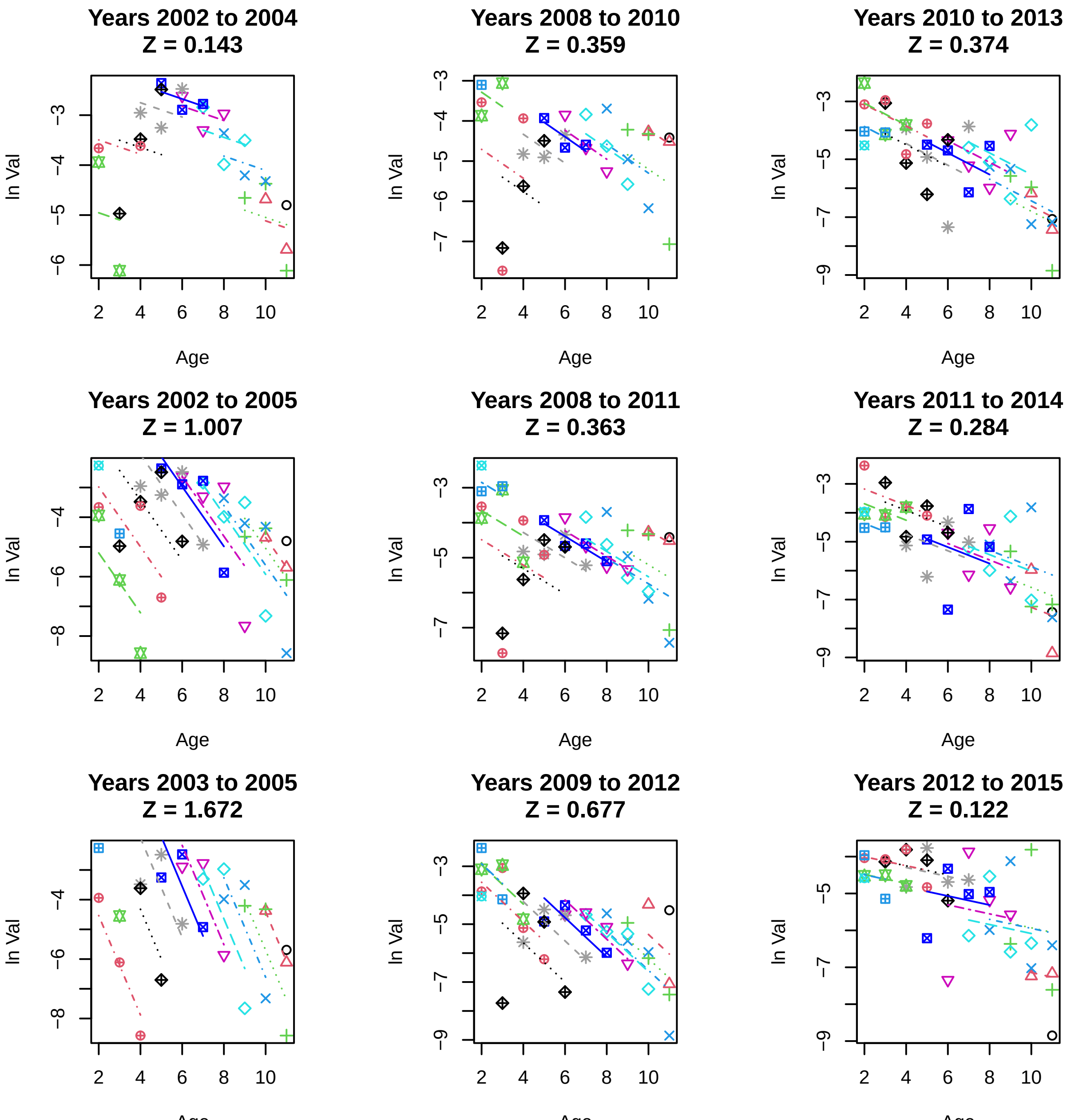


Years 2021 to 2023
Z = 0.385
ln Val
−4.0
−5.0
−6.0
8.0
9.0
10.0
11.0
Age

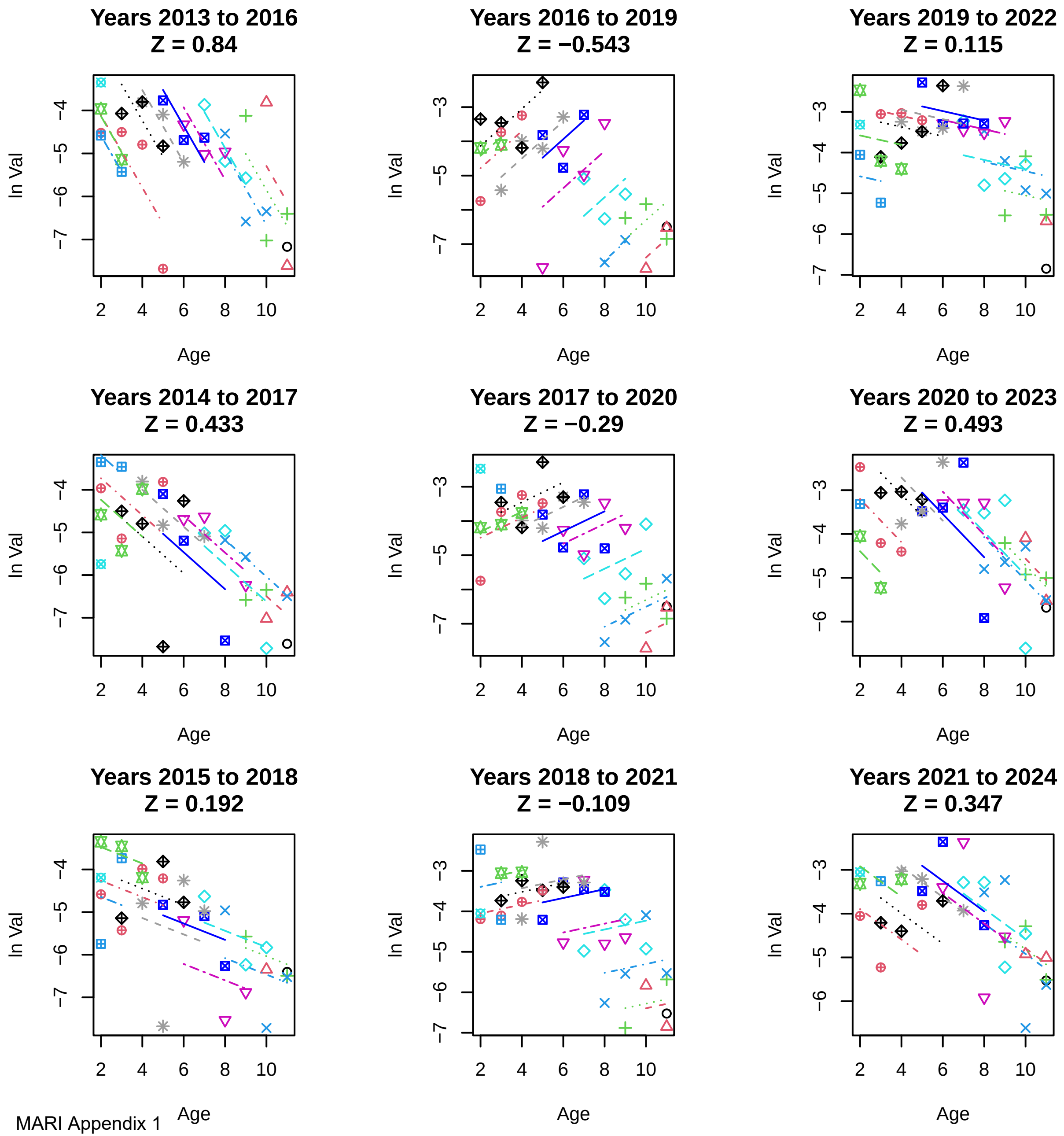

MA Trawl
Residual
2
1
0
−1
−2
8
9
10
11
Age

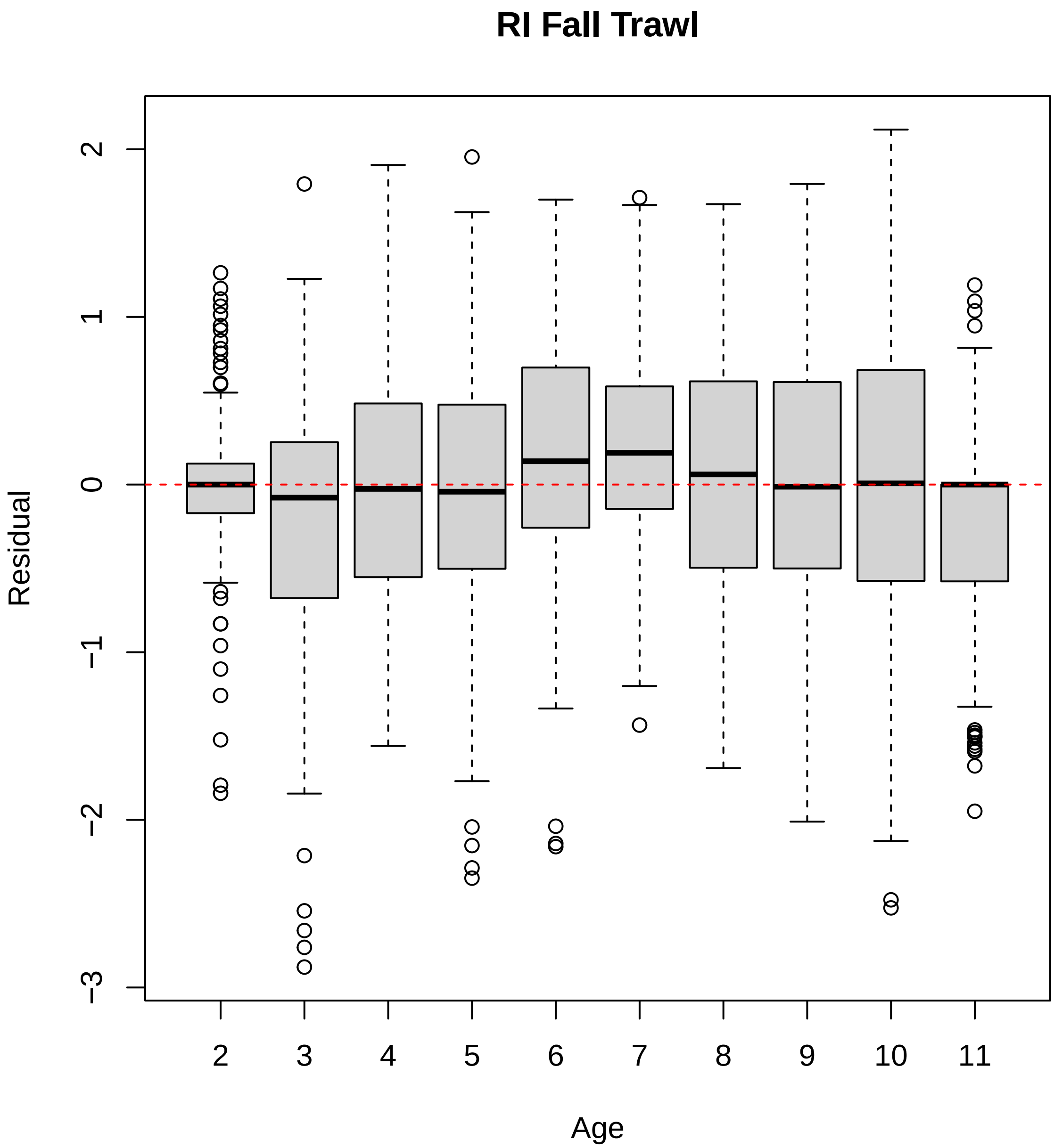

RI Fall Trawl
Sinclair Z
0.0
0.5
1.0
1.5
2.0
1990
2000
2010
2020
Year

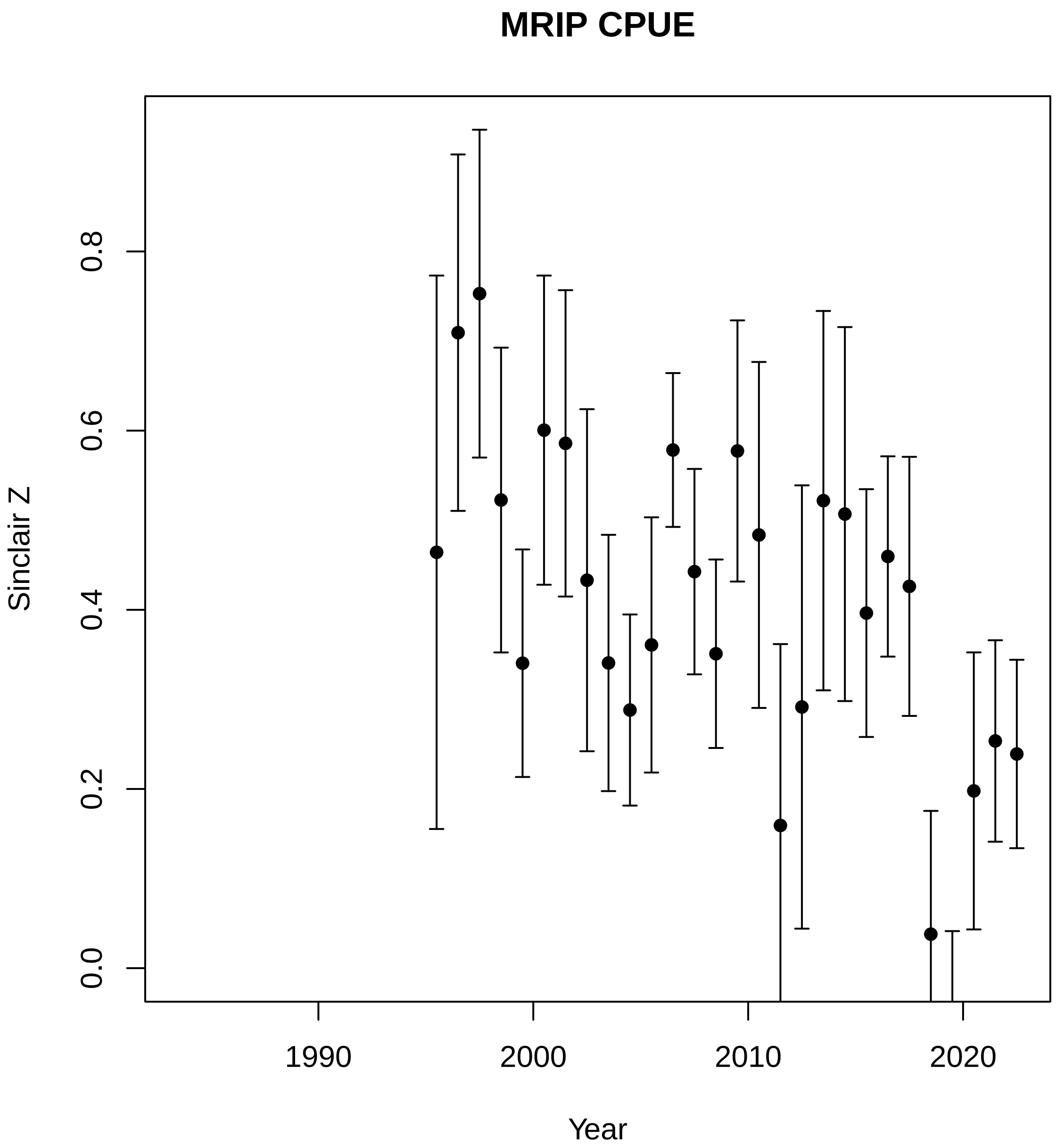

Years 1982 to 1985
Z = −0.326
Years 1985 to 1988
Z = 1.368
Years 1988 to 1990
Z = 0.044
Years 1983 to 1986
Z = −0.067
Years 1986 to 1989
Z = 1.572
Years 1999 to 2002
Z = −0.359
Years 1984 to 1987
Z = 0.209
Years 1987 to 1990
Z = 1.054
Years 2000 to 2003
Z = 0.301
ln Val
Age

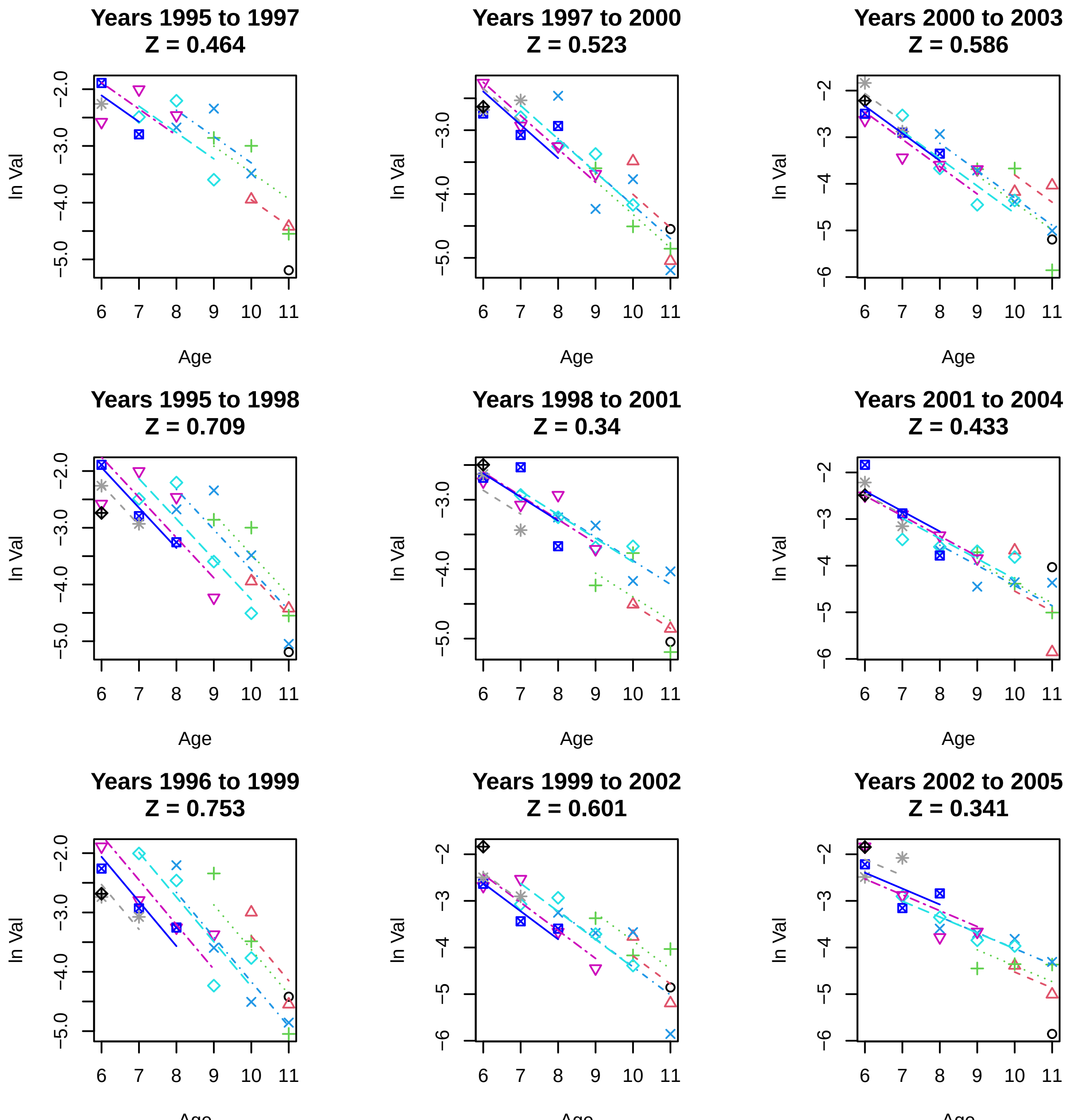


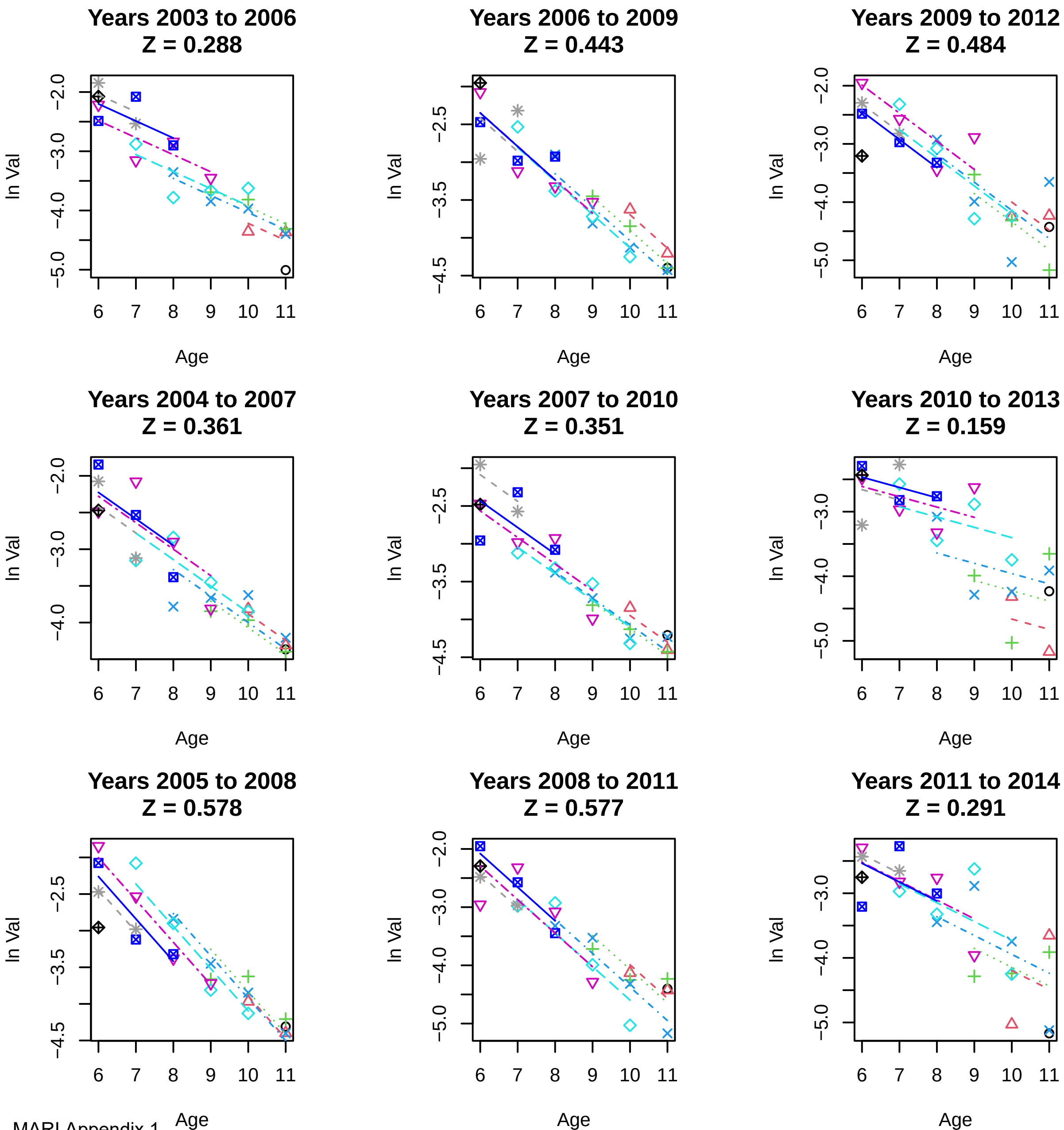
Years 2002 to 2004
Z = 0.143
Years 2008 to 2010
Z = 0.359
Years 2010 to 2013
Z = 0.374
Years 2002 to 2005
Z = 1.007
Years 2008 to 2011
Z = 0.363
Years 2011 to 2014
Z = 0.284
Years 2003 to 2005
Z = 1.672
Years 2009 to 2012
Z = 0.677
Years 2012 to 2015
Z = 0.122
ln Val
Age

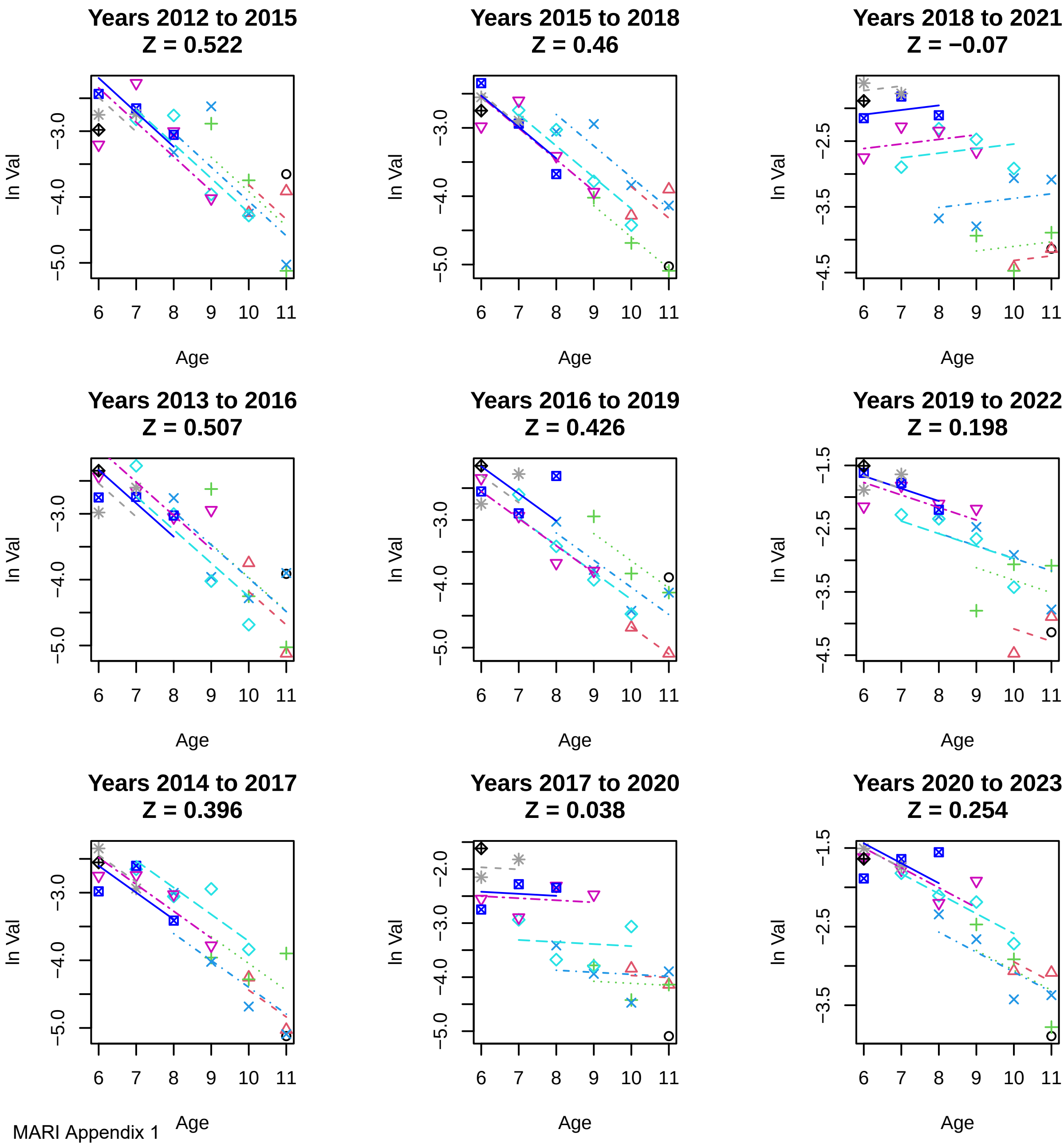

Years 2013 to 2016
Z = 0.84
Years 2016 to 2019
Z = −0.543
Years 2019 to 2022
Z = 0.115
Years 2014 to 2017
Z = 0.433
Years 2017 to 2020
Z = −0.29
Years 2020 to 2023
Z = 0.493
Years 2015 to 2018
Z = 0.192
Years 2018 to 2021
Z = −0.109
Years 2021 to 2024
Z = 0.347
ln Val
Age

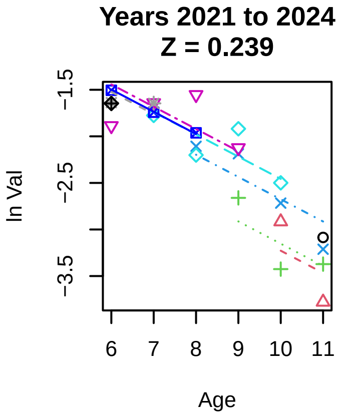

RI Fall Trawl
Residual
2
1
0
−1
−2
−3
Age
2
3
4
5
6
7
8
9
10
11

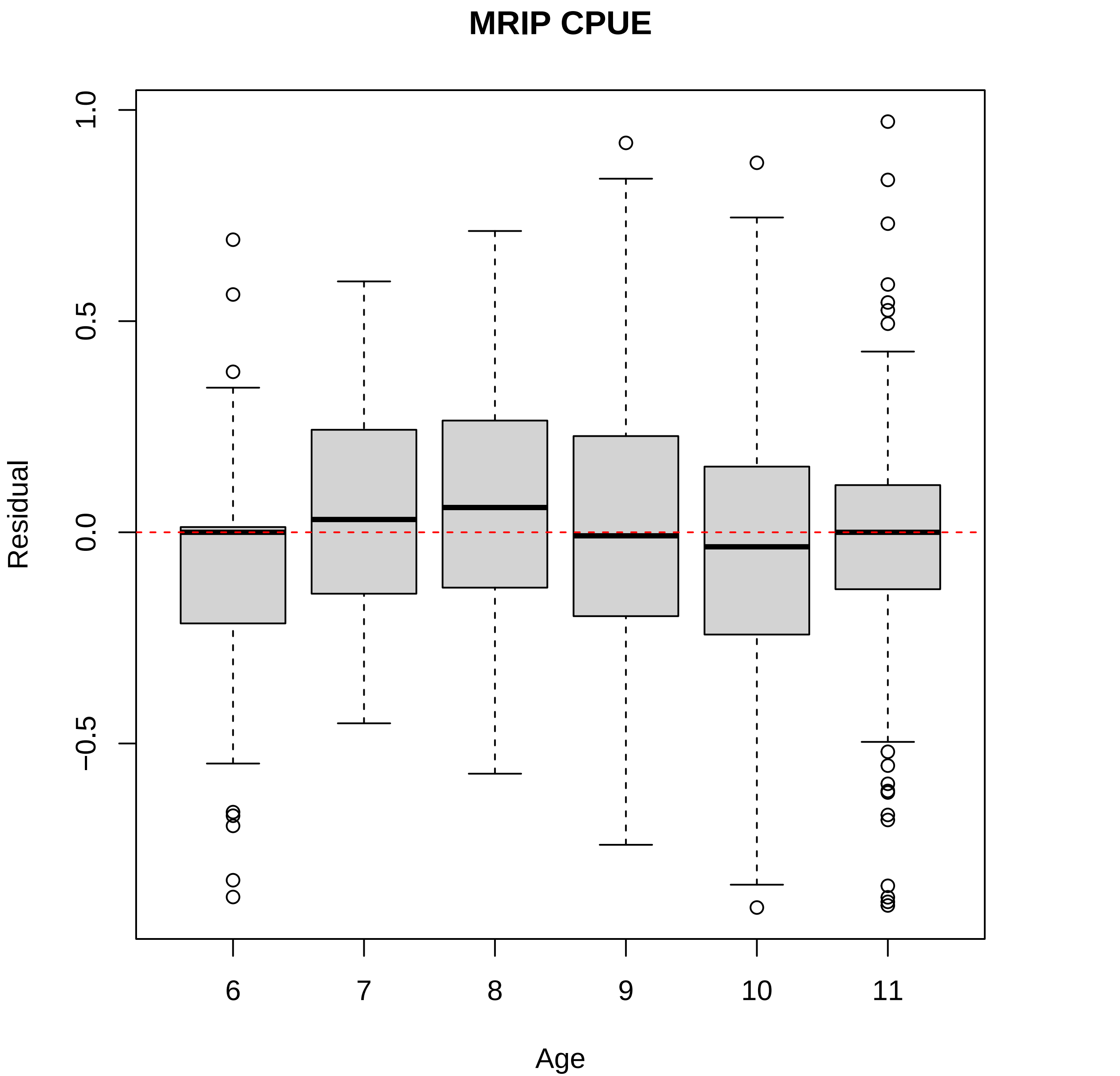

MRIP CPUE
Sinclair Z
0.0
0.2
0.4
0.6
0.8
1990
2000
2010
2020
Year

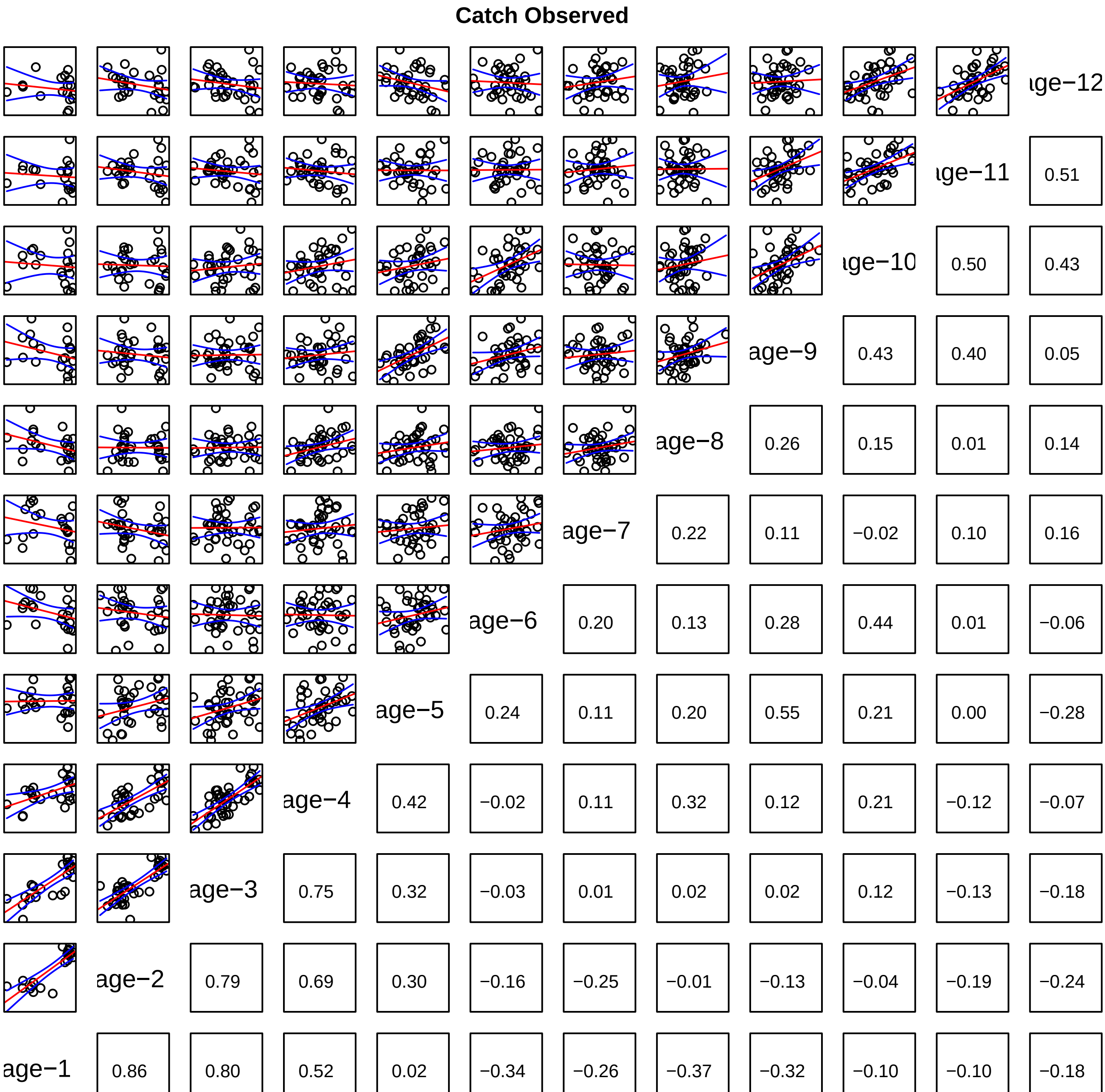

Years 1995 to 1997
Z = 0.464
Years 1997 to 2000
Z = 0.523
Years 2000 to 2003
Z = 0.586
Years 1995 to 1998
Z = 0.709
Years 1998 to 2001
Z = 0.34
Years 2001 to 2004
Z = 0.433
Years 1996 to 1999
Z = 0.753
Years 1999 to 2002
Z = 0.601
Years 2002 to 2005
Z = 0.341
ln Val
Age
6
7
8
9
10
11


Years 2003 to 2006
Z = 0.288
Years 2006 to 2009
Z = 0.443
Years 2009 to 2012
Z = 0.484
Years 2004 to 2007
Z = 0.361
Years 2007 to 2010
Z = 0.351
Years 2010 to 2013
Z = 0.159
Years 2005 to 2008
Z = 0.578
Years 2008 to 2011
Z = 0.577
Years 2011 to 2014
Z = 0.291
ln Val
Age
6 7 8 9 10 11
−2.0 −3.0 −4.0 −5.0
−2.5 −3.5 −4.5


Years 2012 to 2015
Z = 0.522
Years 2015 to 2018
Z = 0.46
Years 2018 to 2021
Z = −0.07
Years 2013 to 2016
Z = 0.507
Years 2016 to 2019
Z = 0.426
Years 2019 to 2022
Z = 0.198
Years 2014 to 2017
Z = 0.396
Years 2017 to 2020
Z = 0.038
Years 2020 to 2023
Z = 0.254
ln Val
Age

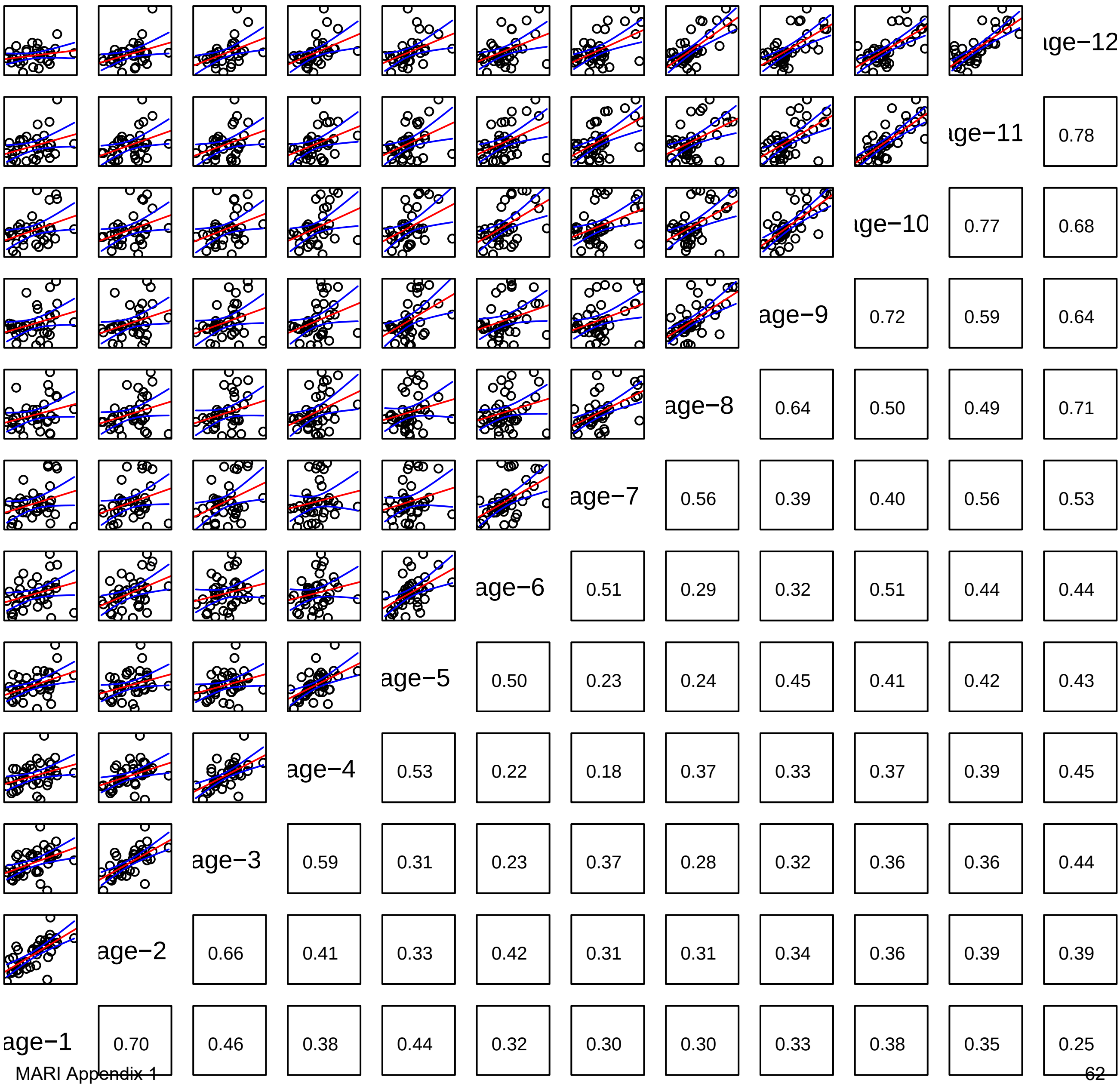

Years 2021 to 2024
Z = 0.239
ln Val
−1.5
−2.5
−3.5
6
7
8
9
10
11
Age


MRIP CPUE
Residual
1.0
0.5
0.0
−0.5
6
7
8
9
10
11
Age

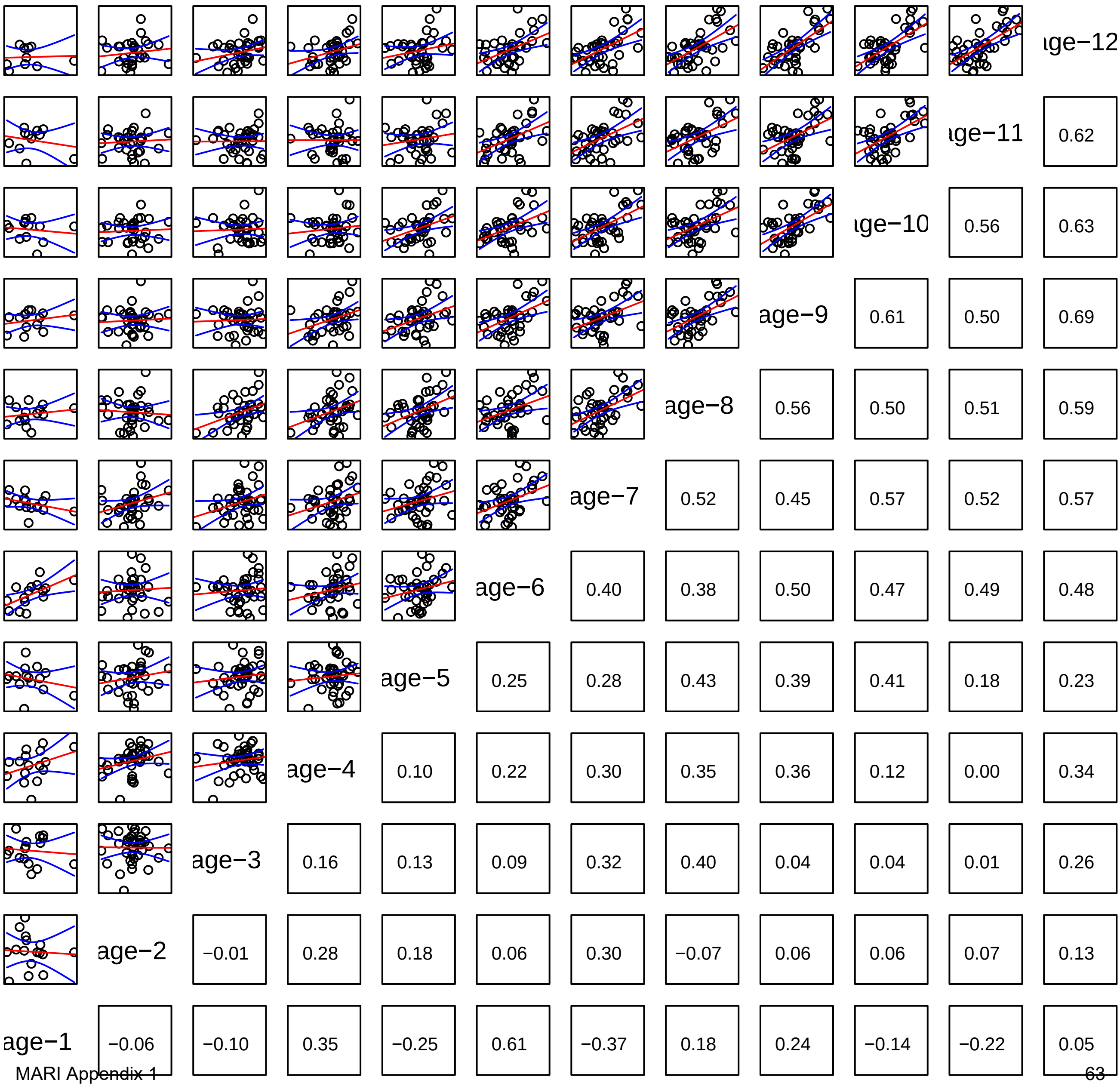


Catch Observed
ge−12
ge−11
0.51
ge−10
0.50
0.43
age−9
0.43
0.40
0.05
age−8
0.26
0.15
0.01
0.14
age−7
0.22
0.11
−0.02
0.10
0.16
age−6
0.20
0.13
0.28
0.44
0.01
−0.06
age−5
0.24
0.11
0.20
0.55
0.21
0.00
−0.28
age−4
0.42
−0.02
0.11
0.32
0.12
0.21
−0.12
−0.07
age−3
0.75
0.32
−0.03
0.01
0.02
0.02
0.12
−0.13
−0.18
age−2
0.79
0.69
0.30
−0.16
−0.25
−0.01
−0.13
−0.04
−0.19
−0.24
age−1
0.86
0.80
0.52
0.02
−0.34
−0.26
−0.37
−0.32
−0.10
−0.10
−0.18

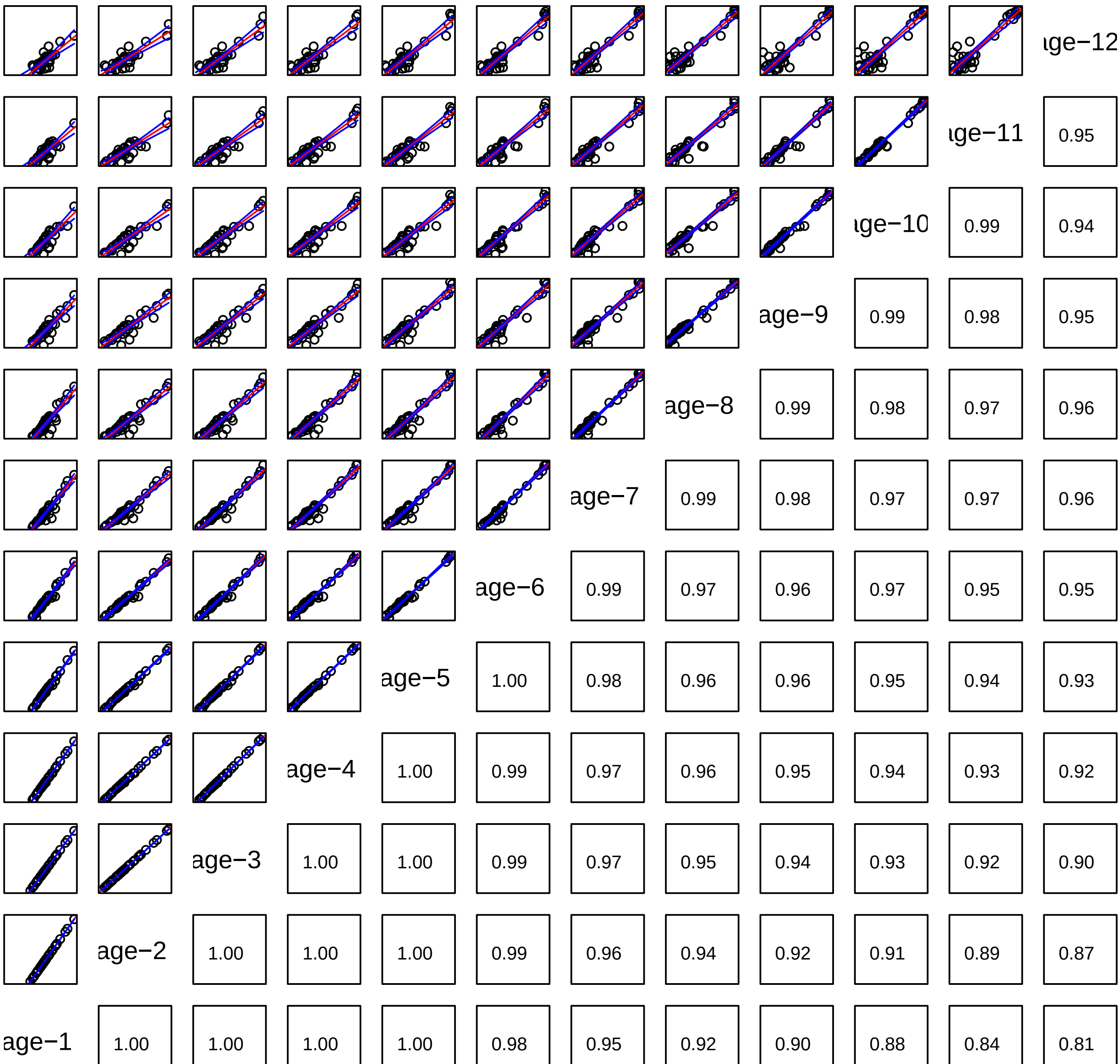
Catch Predicted



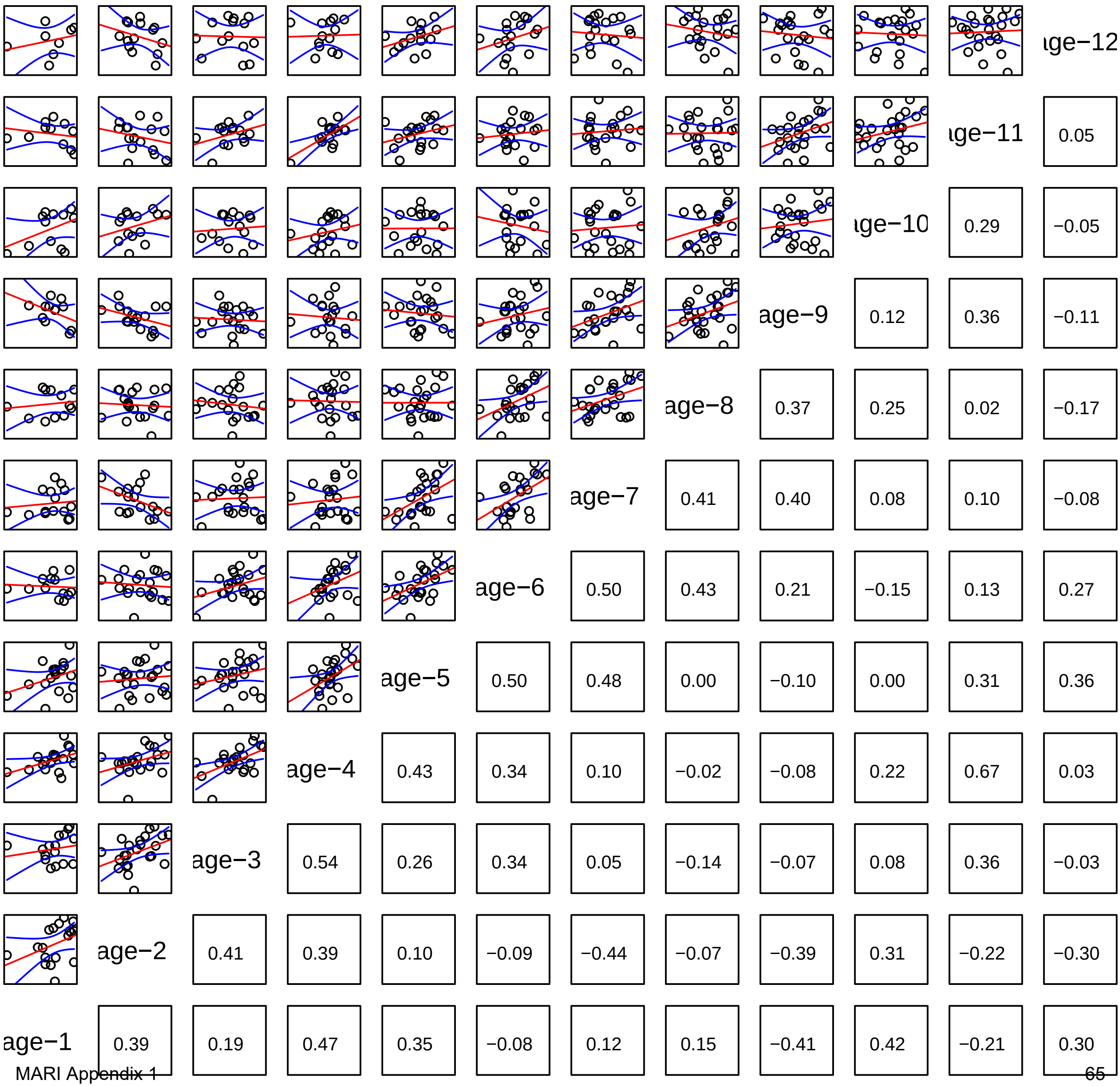
Index 1 (MA Trawl) Observed



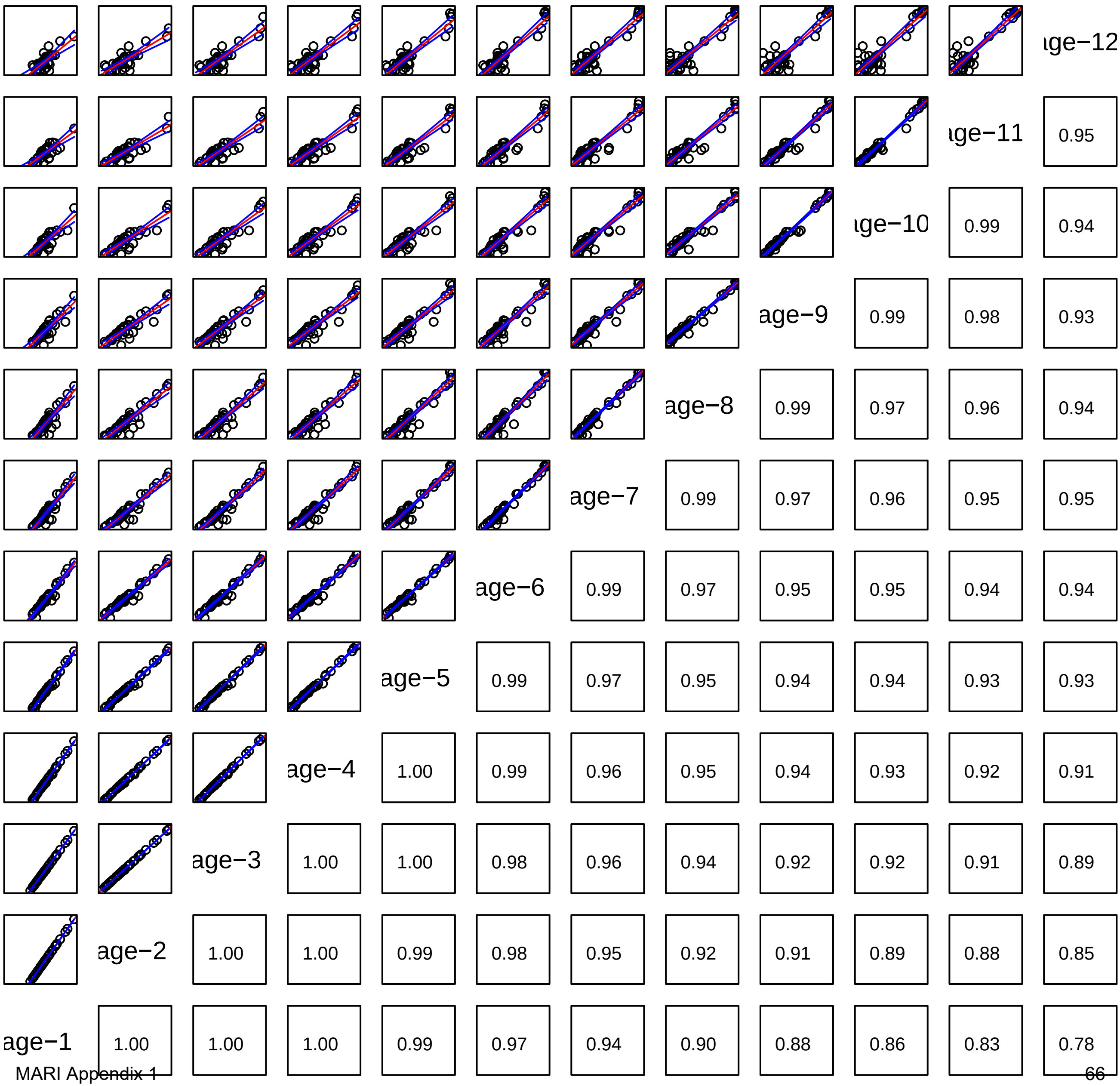
Index 1 (MA Trawl) Predicted



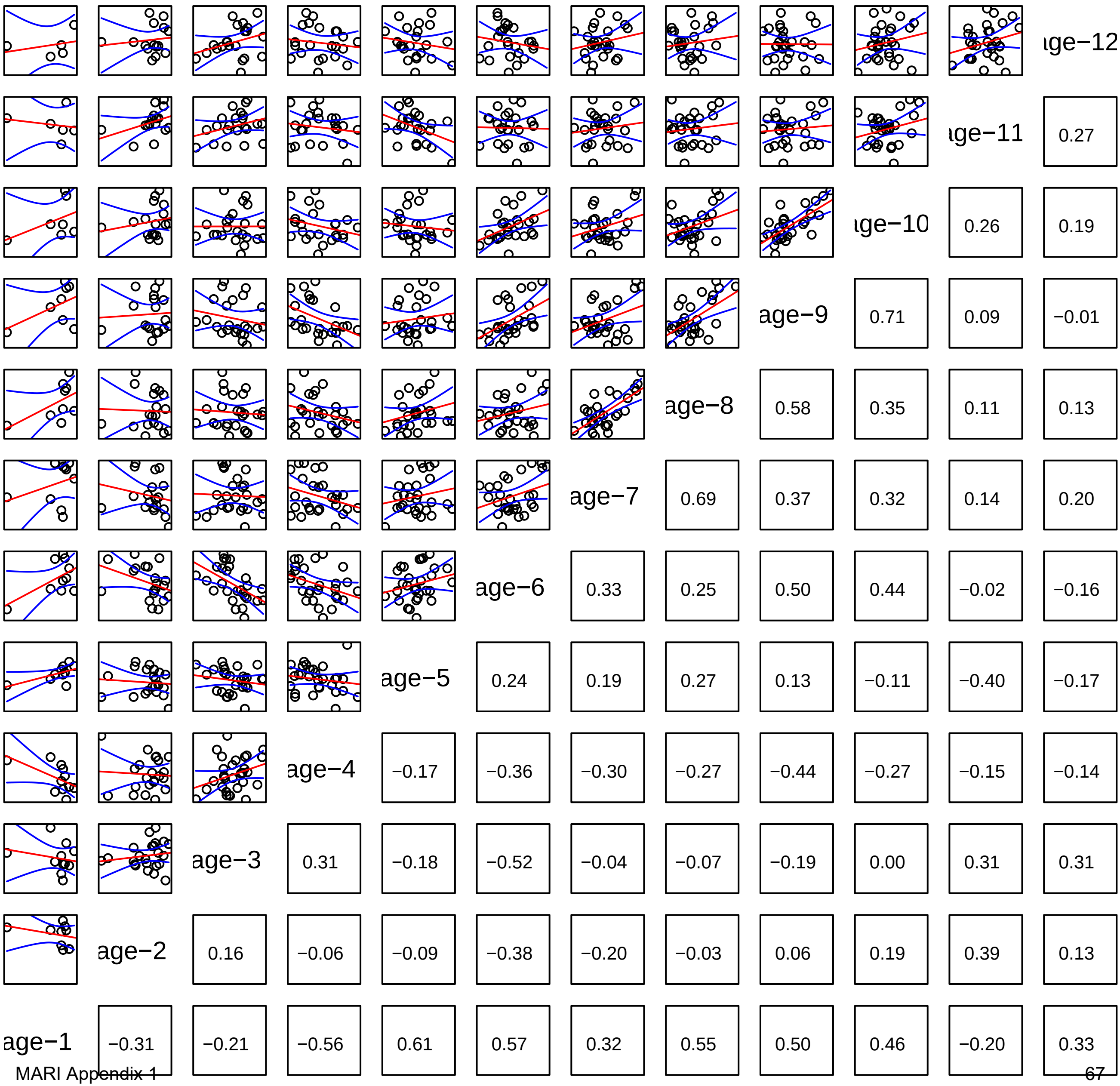
Index 2 (RI Fall Trawl) Observed



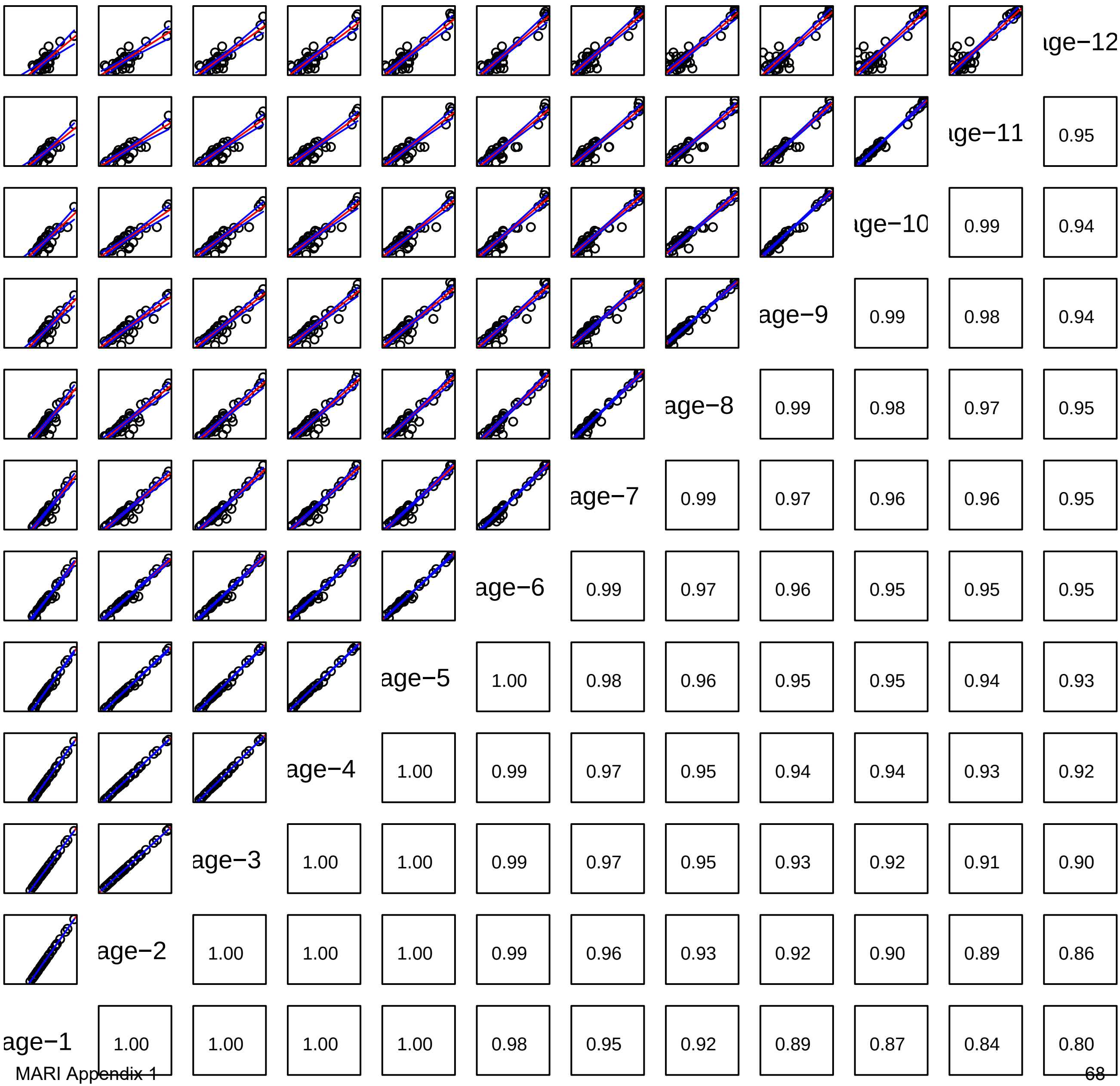
Index 2 (RI Fall Trawl) Predicted

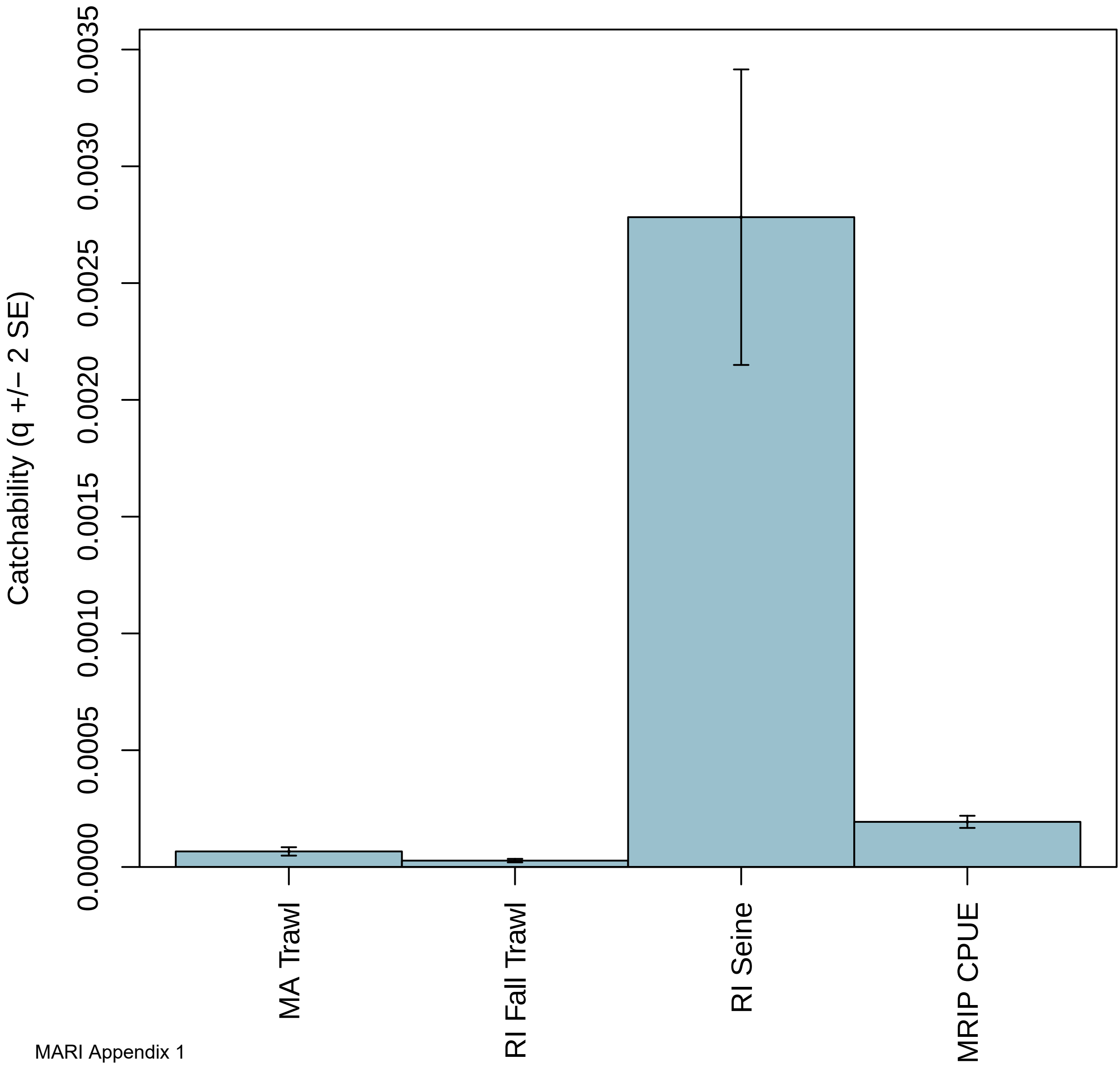


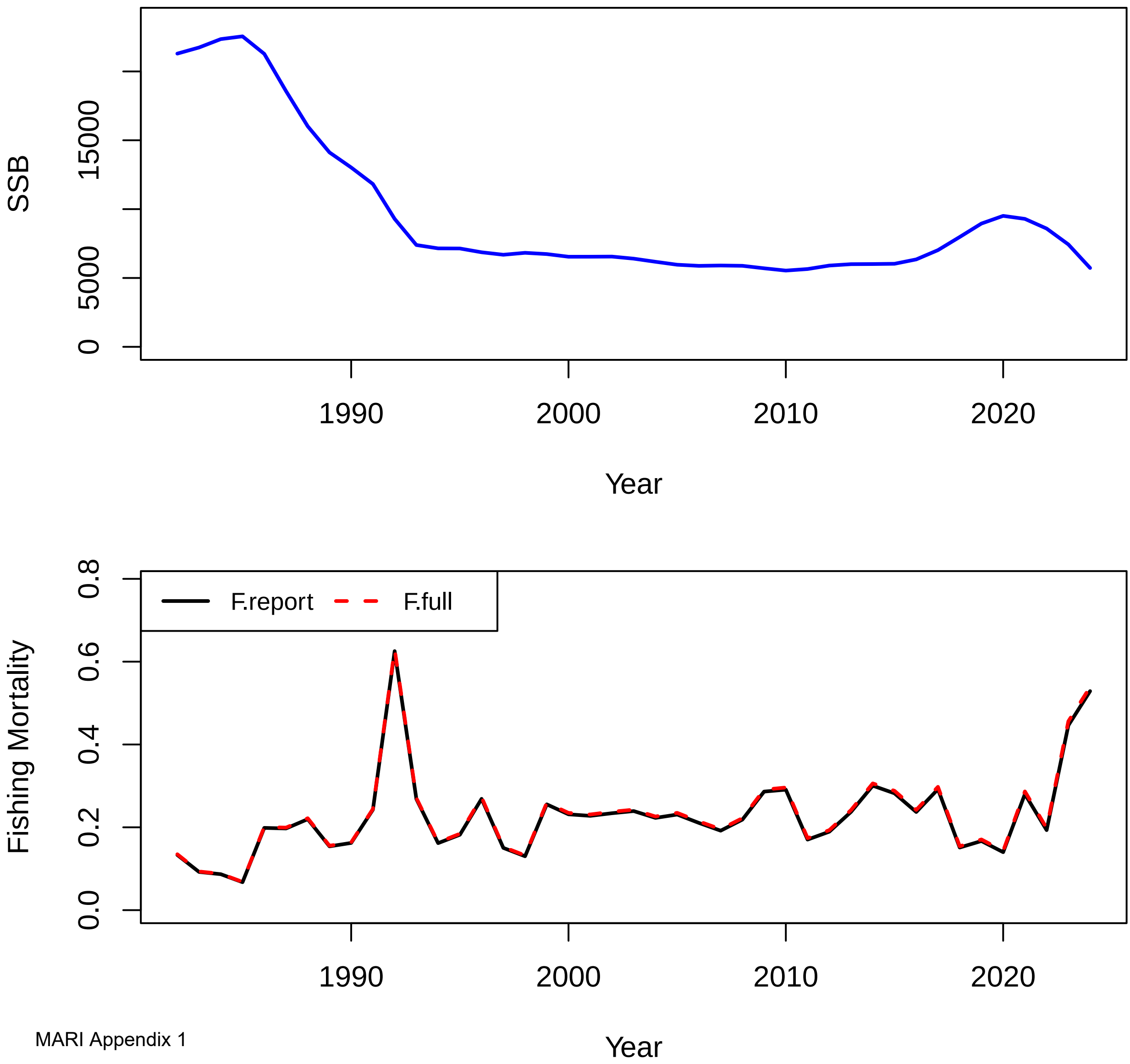
Index 4 (MRIP CPUE) Observed



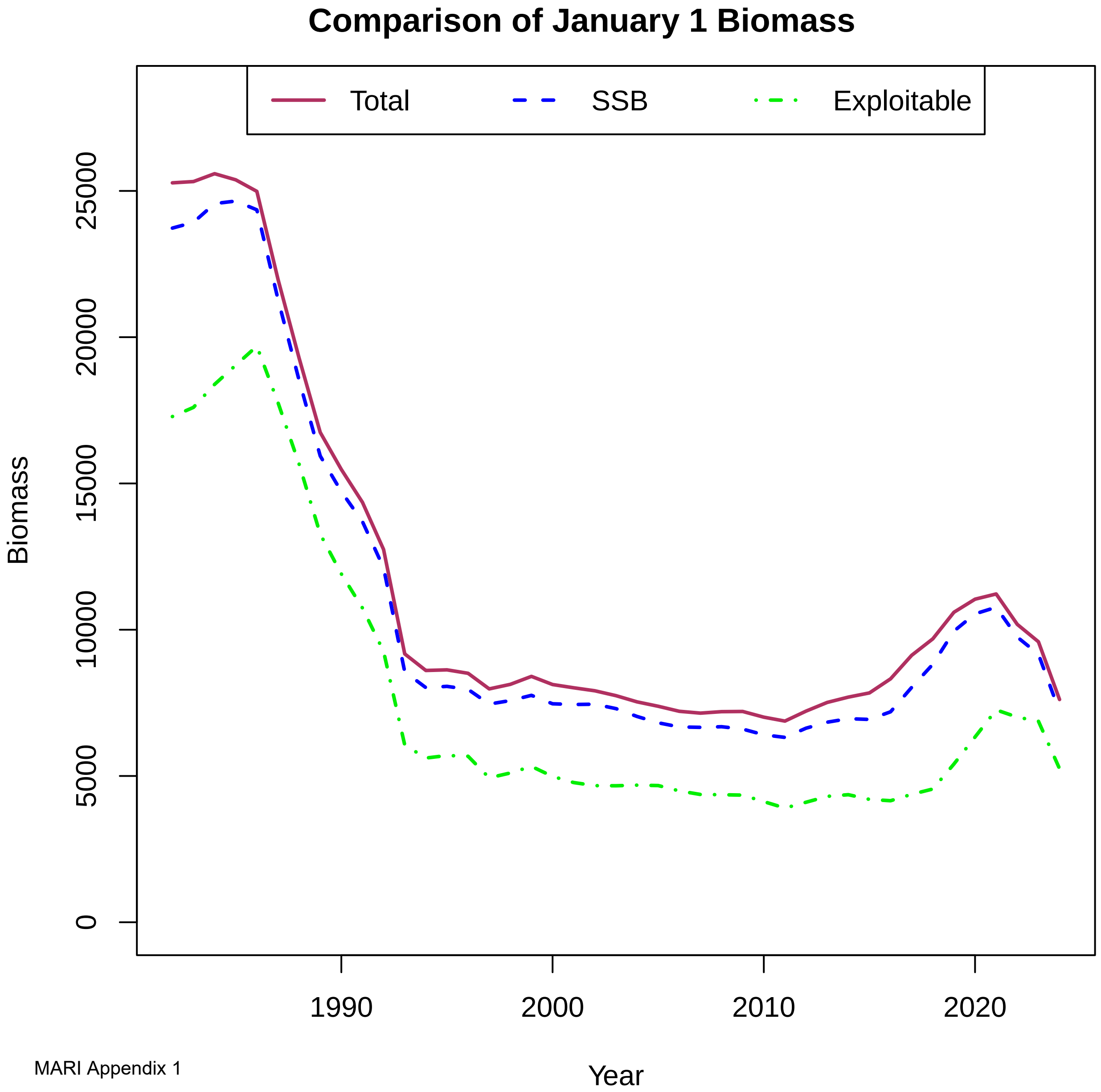
Index 4 (MRIP CPUE) Predicted



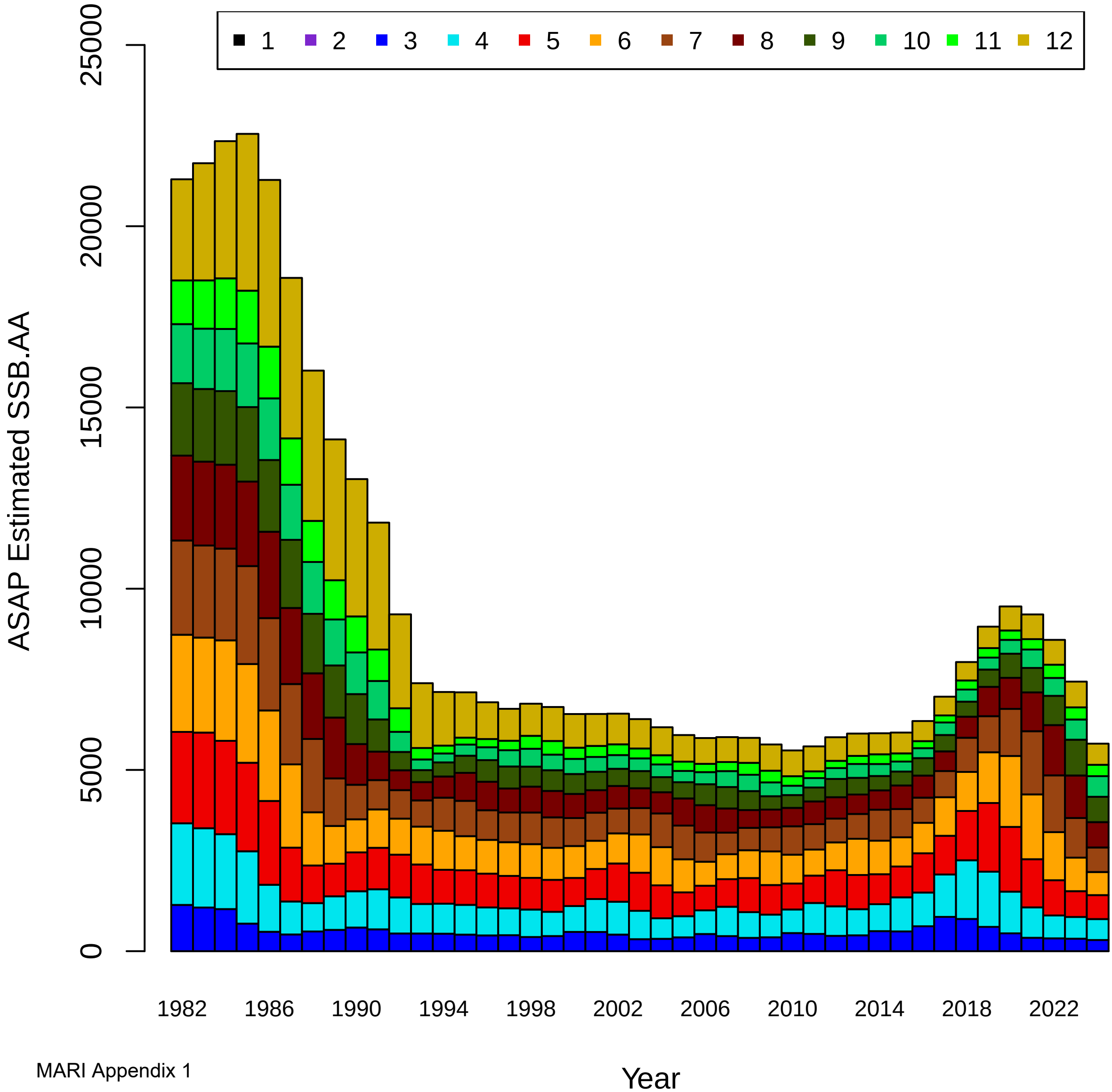

Catchability (q +/− 2 SE)
0.0000
0.0005
0.0010
0.0015
0.0020
0.0025
0.0030
0.0035
MA Trawl
RI Fall Trawl
RI Seine
MRIP CPUE

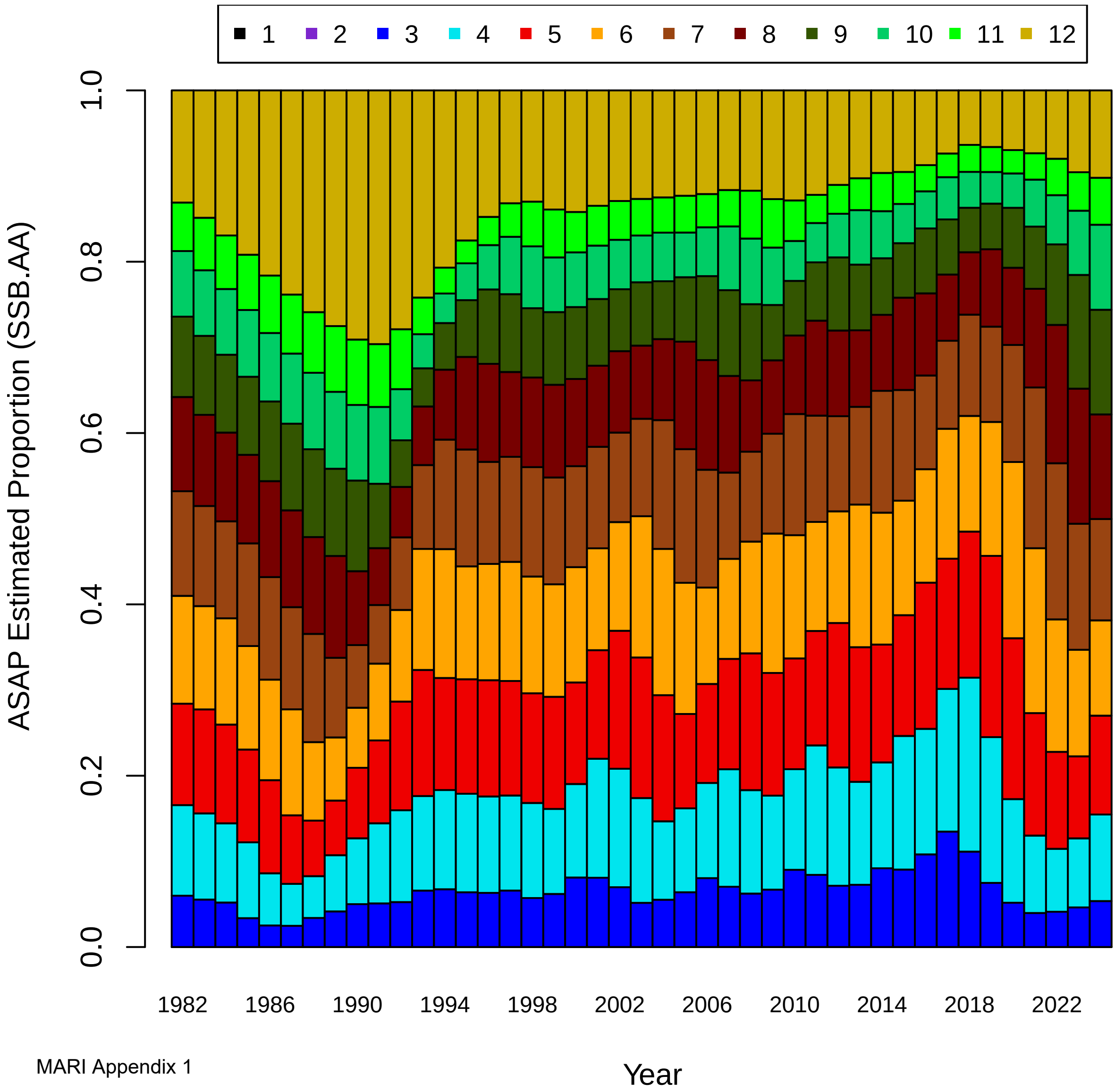


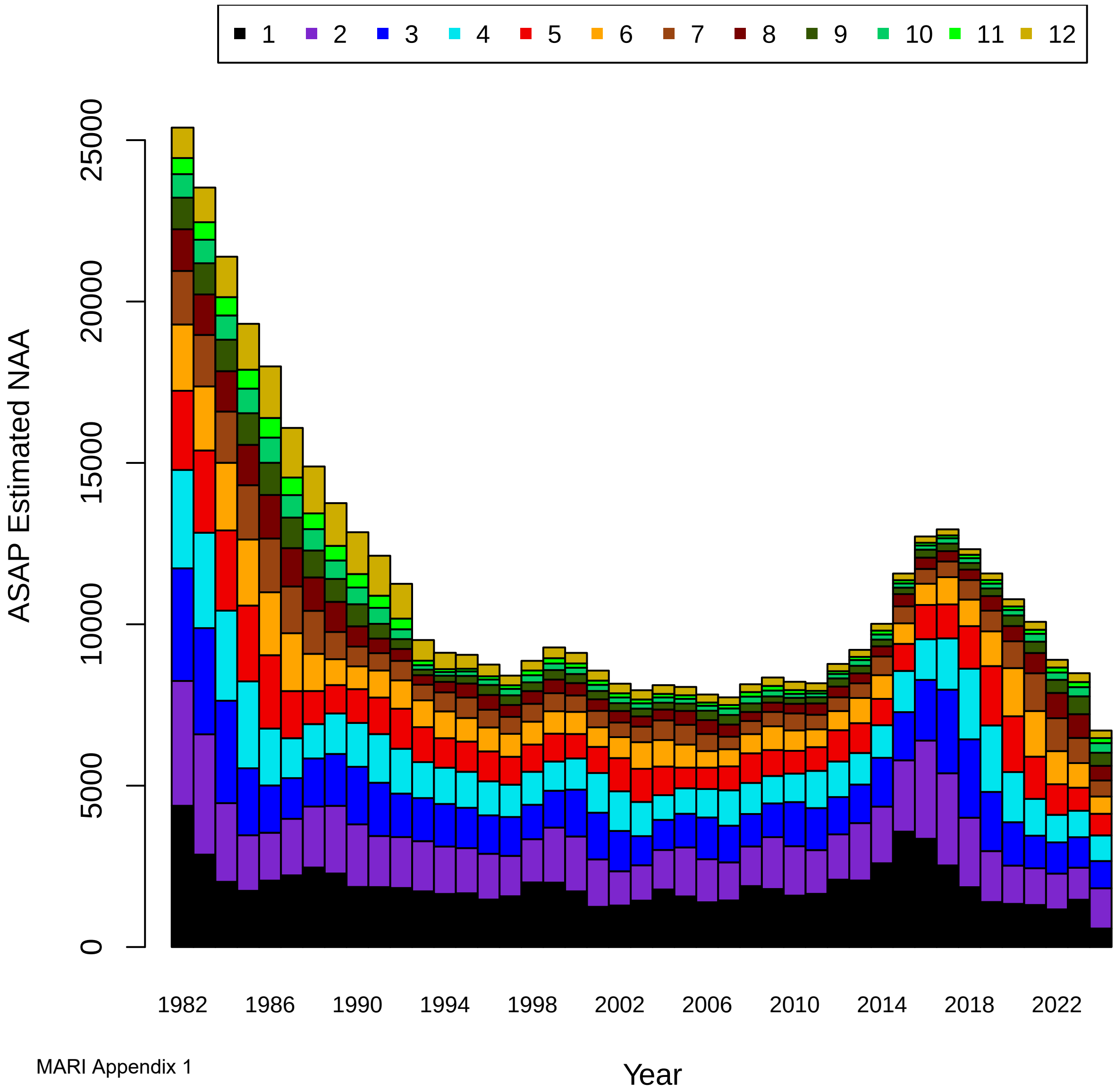
SSB
0
5000
15000
1990
2000
2010
2020
Year
Fishing Mortality
0.0
0.2
0.4
0.6
0.8
F.report
F.full
1990
2000
2010
2020
Year



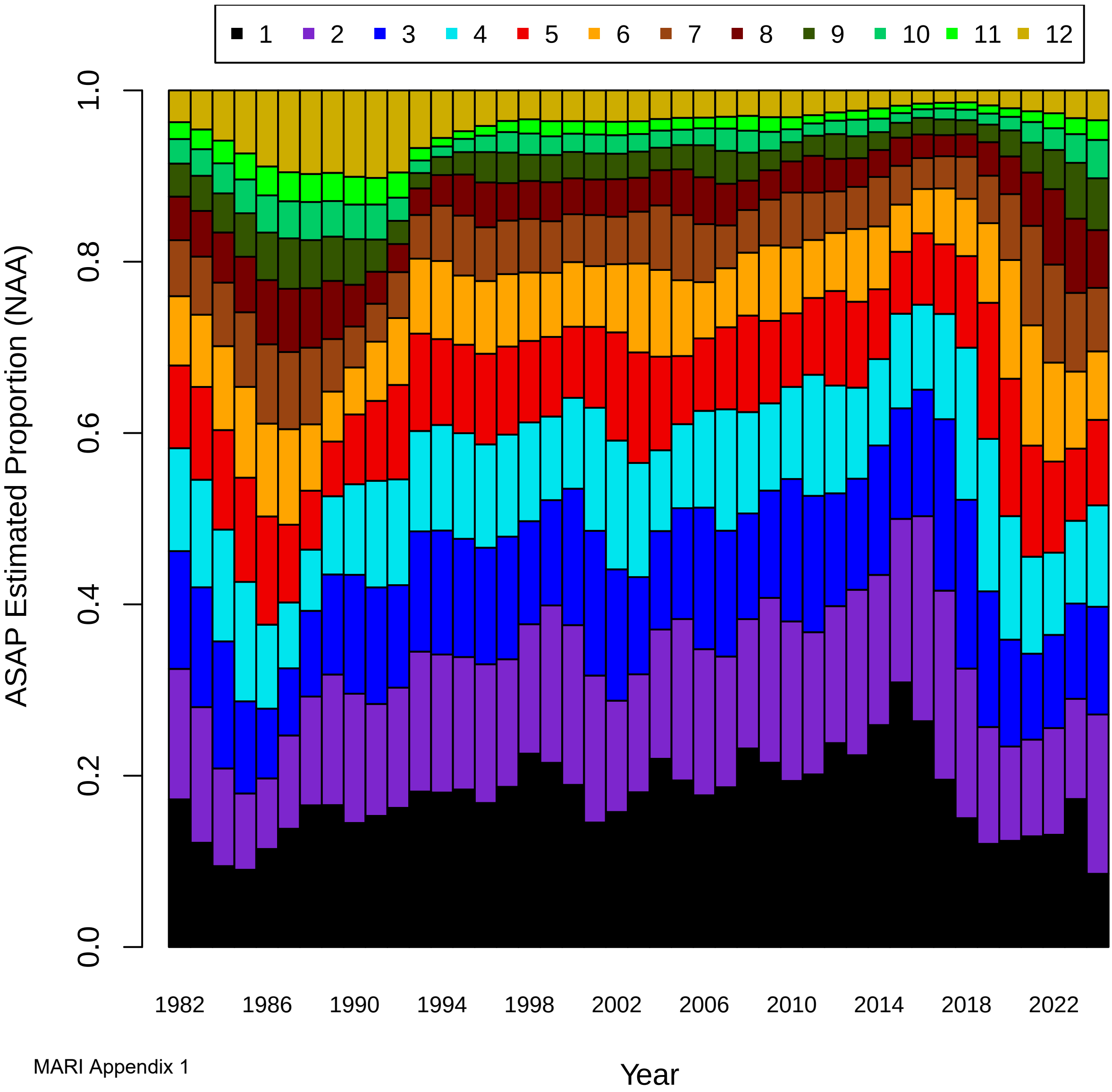
Comparison of January 1 Biomass
Total
SSB
Exploitable
Biomass
0
5000
10000
15000
20000
25000
1990
2000
2010
2020
Year

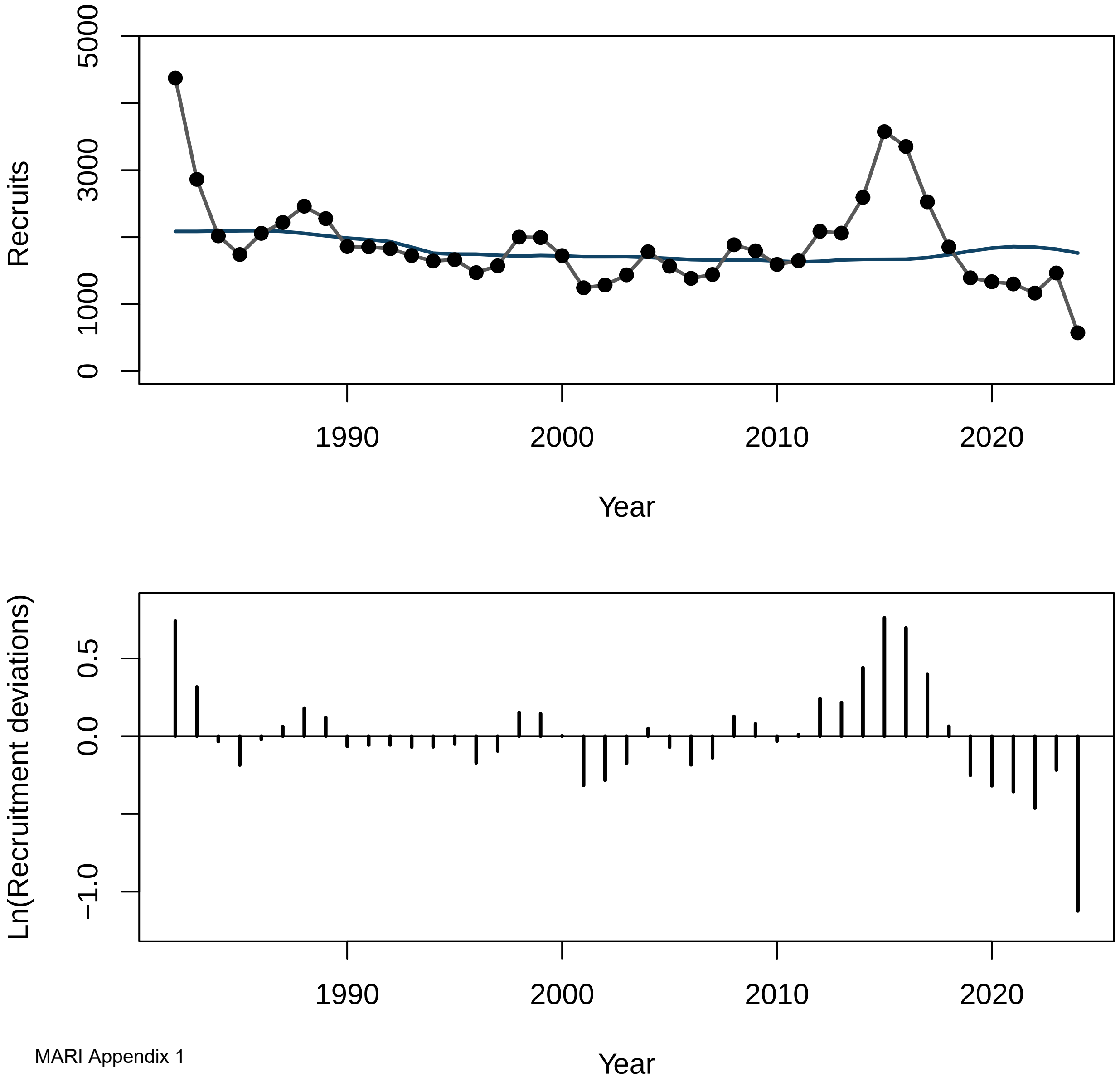

1
2
3
4
5
6
7
8
9
10
11
12
ASAP Estimated SSB.AA
0
5000
10000
15000
20000
25000
1982
1986
1990
1994
1998
2002
2006
2010
2014
2018
2022
Year


1
2
3
4
5
6
7
8
9
10
11
12
ASAP Estimated Proportion (SSB.AA)
0.0
0.2
0.4
0.6
0.8
1.0
1982
1986
1990
1994
1998
2002
2006
2010
2014
2018
2022
Year

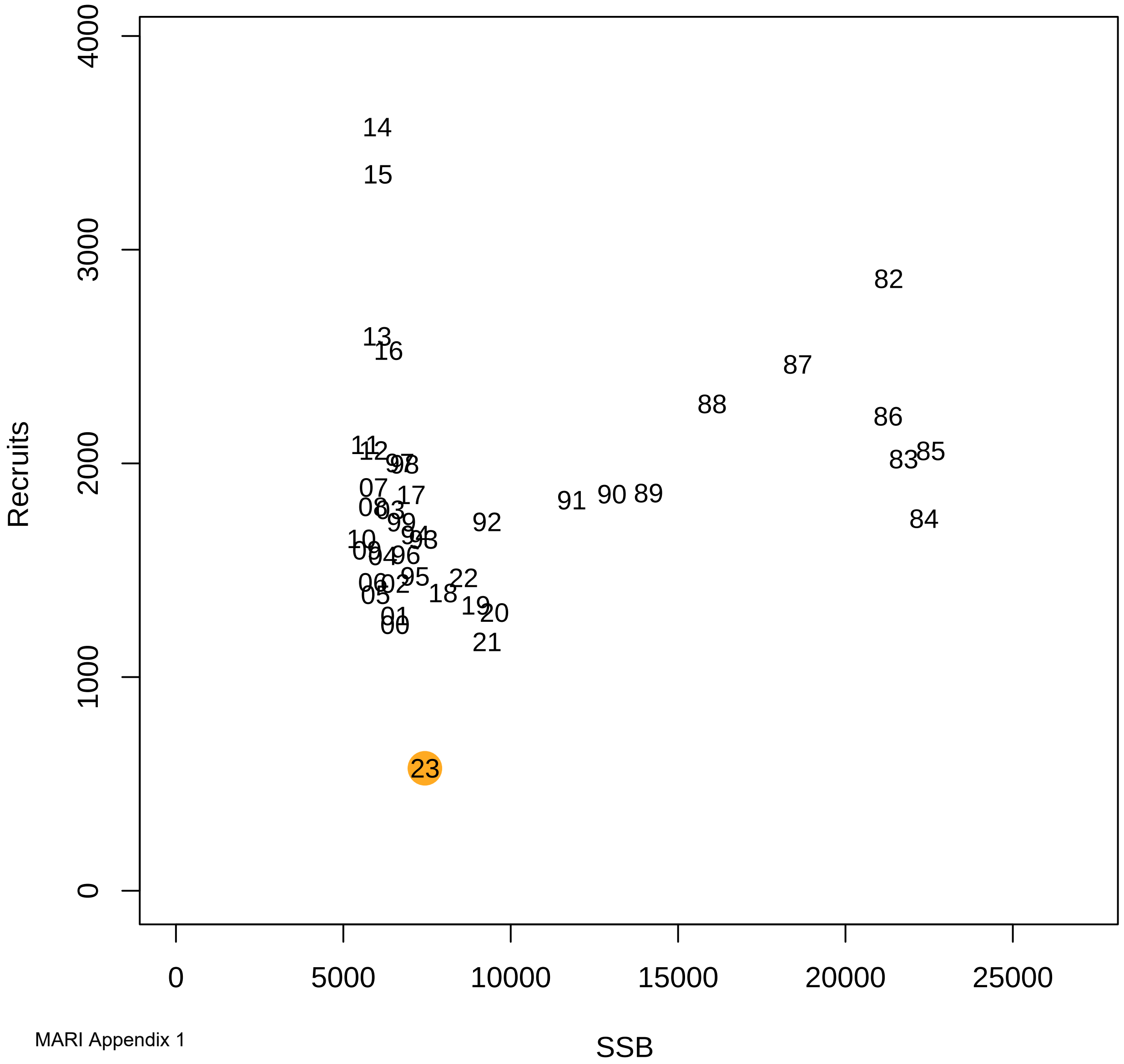


1
2
3
4
5
6
7
8
9
10
11
12
ASAP Estimated NAA
0
5000
10000
15000
20000
25000
1982
1986
1990
1994
1998
2002
2006
2010
2014
2018
2022
Year

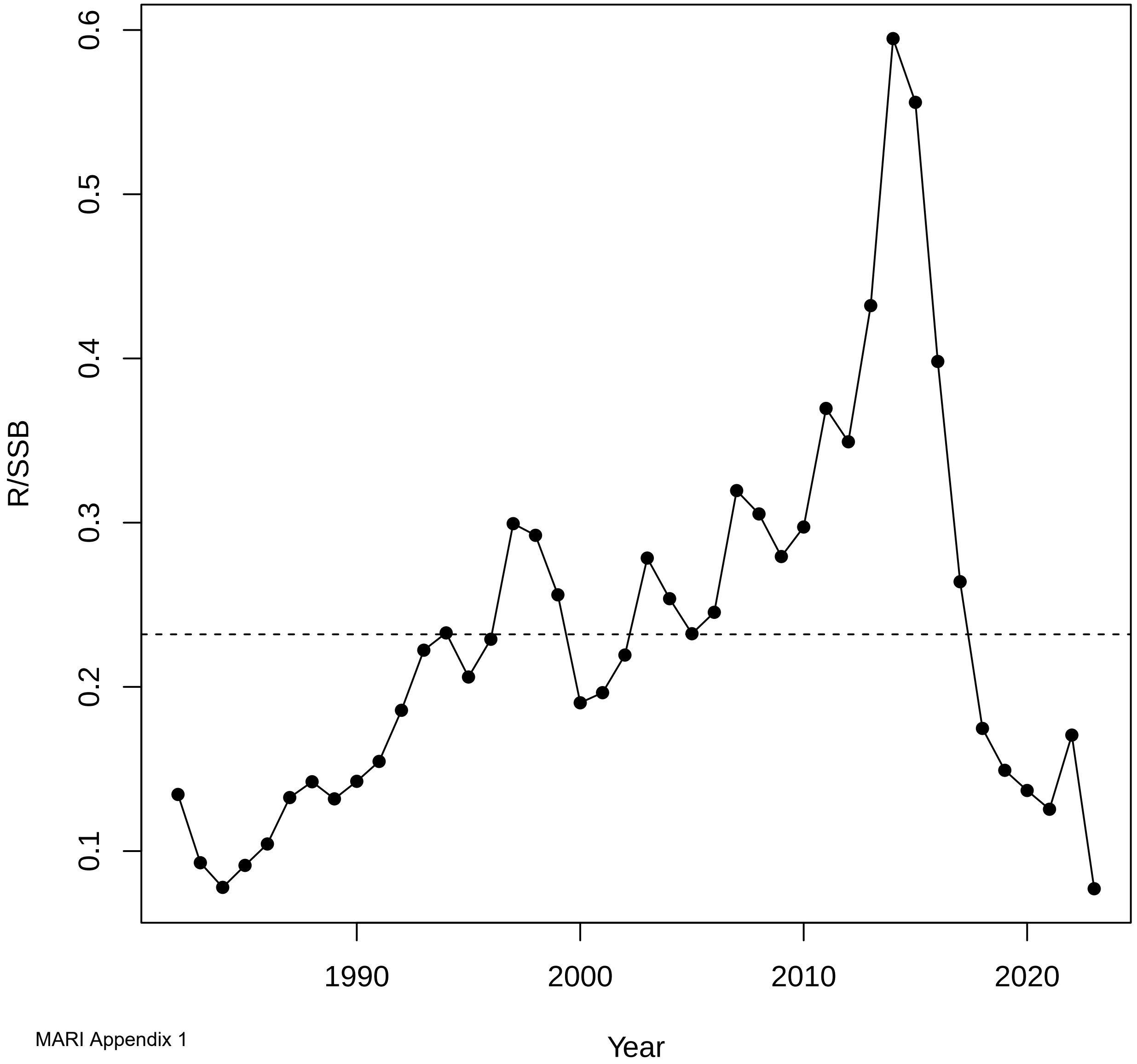

1 2 3 4 5 6 7 8 9 10 11 12
ASAP Estimated Proportion (NAA)
0.0
0.2
0.4
0.6
0.8
1.0
1982
1986
1990
1994
1998
2002
2006
2010
2014
2018
2022
Year

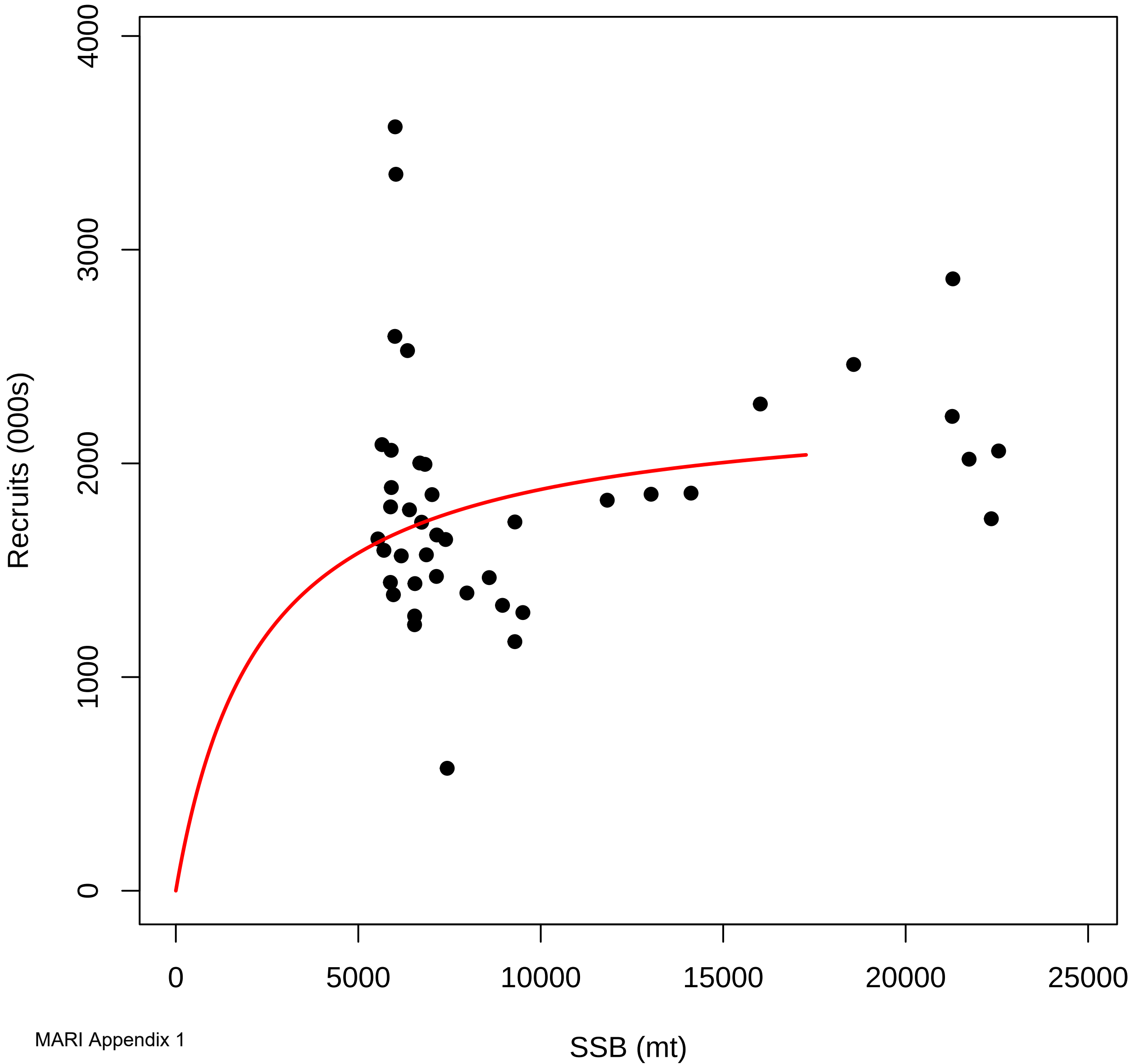


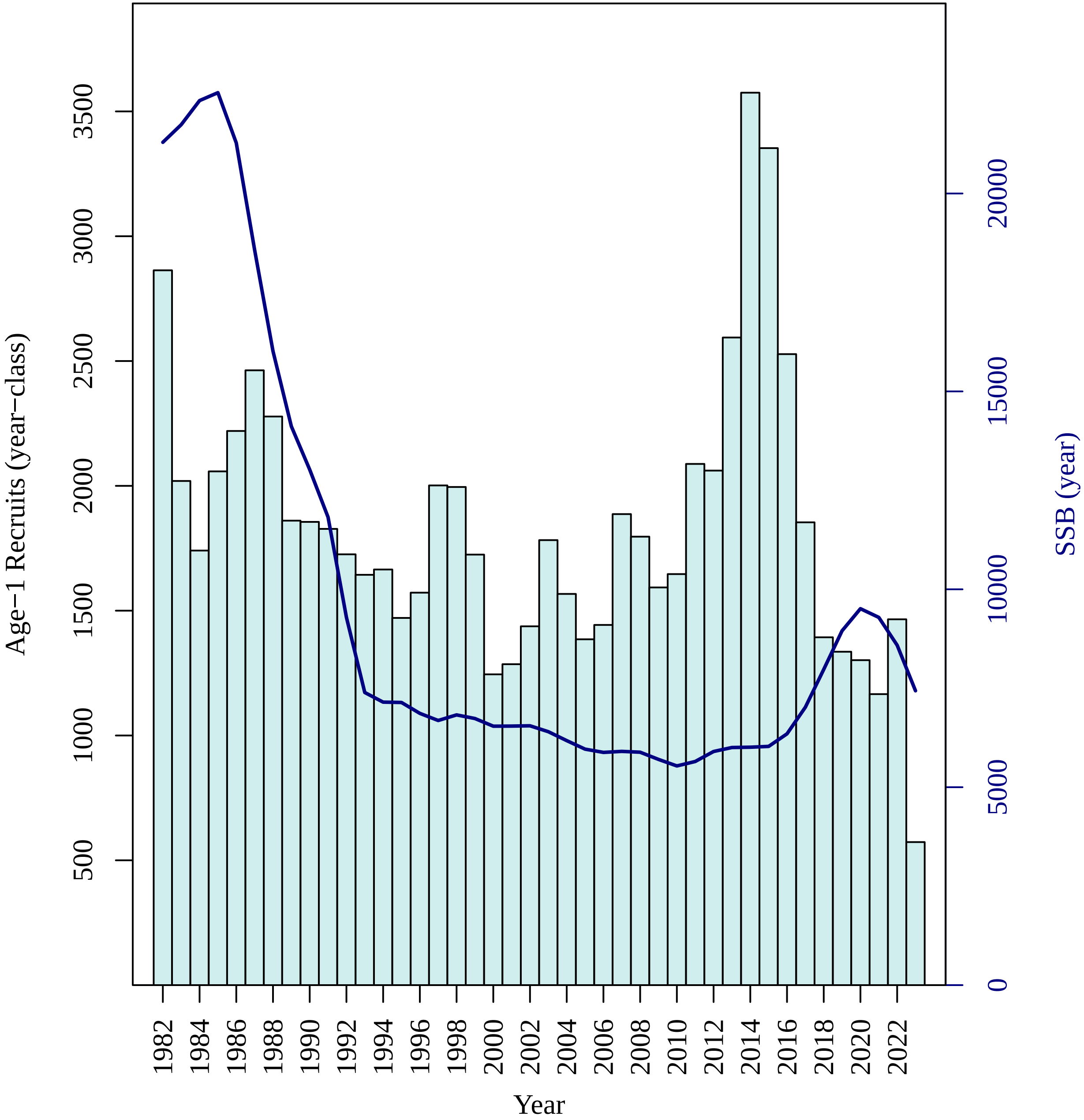
Recruits
0
1000
3000
5000
1990
2000
2010
2020
Year
Ln(Recruitment deviations)
−1.0
0.0
0.5
1990
2000
2010
2020
Year



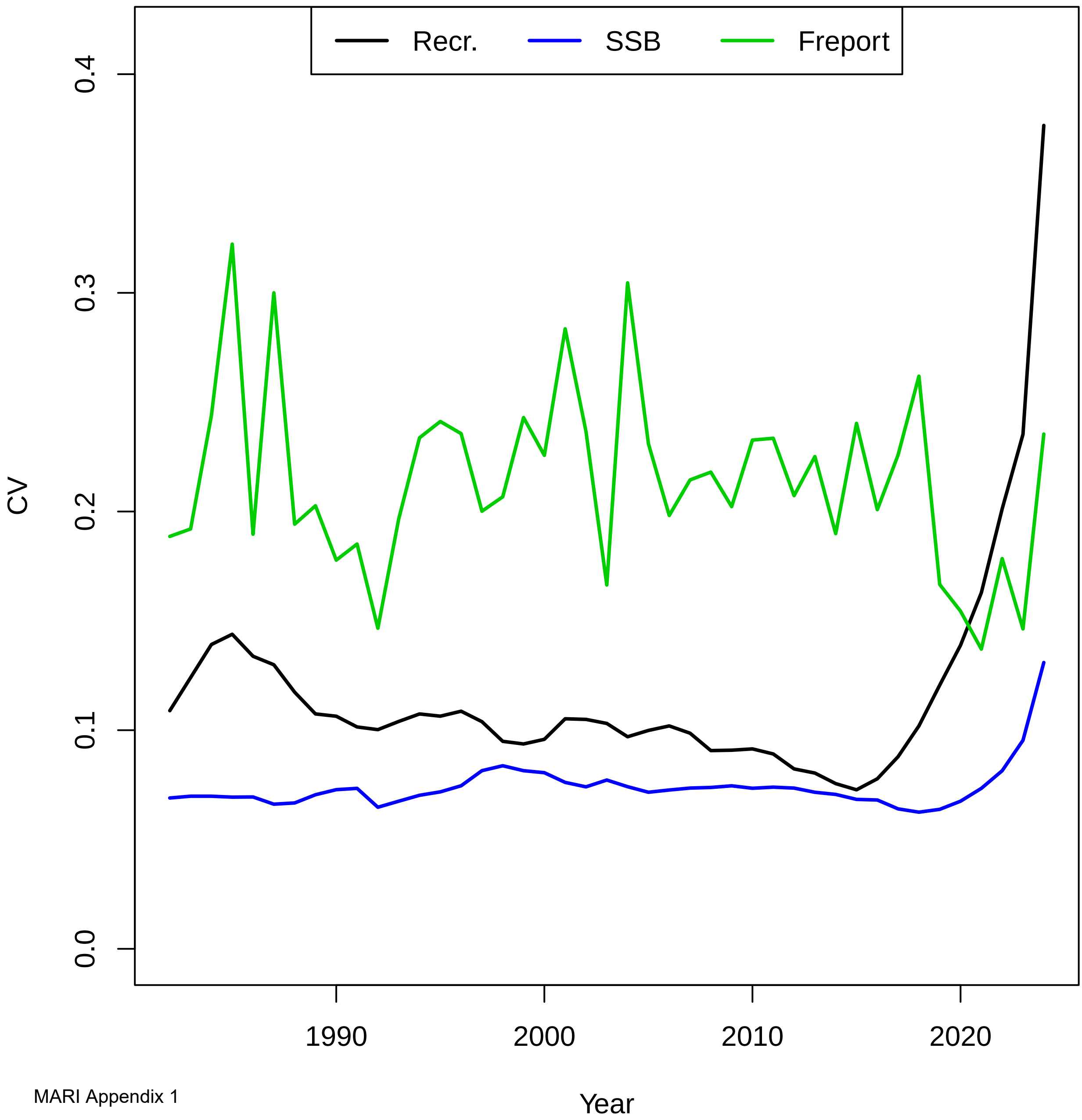
Recruits
SSB
0
1000
2000
3000
4000
0
5000
10000
15000
20000
25000
14
15
82
13
16
87
88
86
85
83
84
91
90
89
92
17
07
21
22
18
19
20
95
23

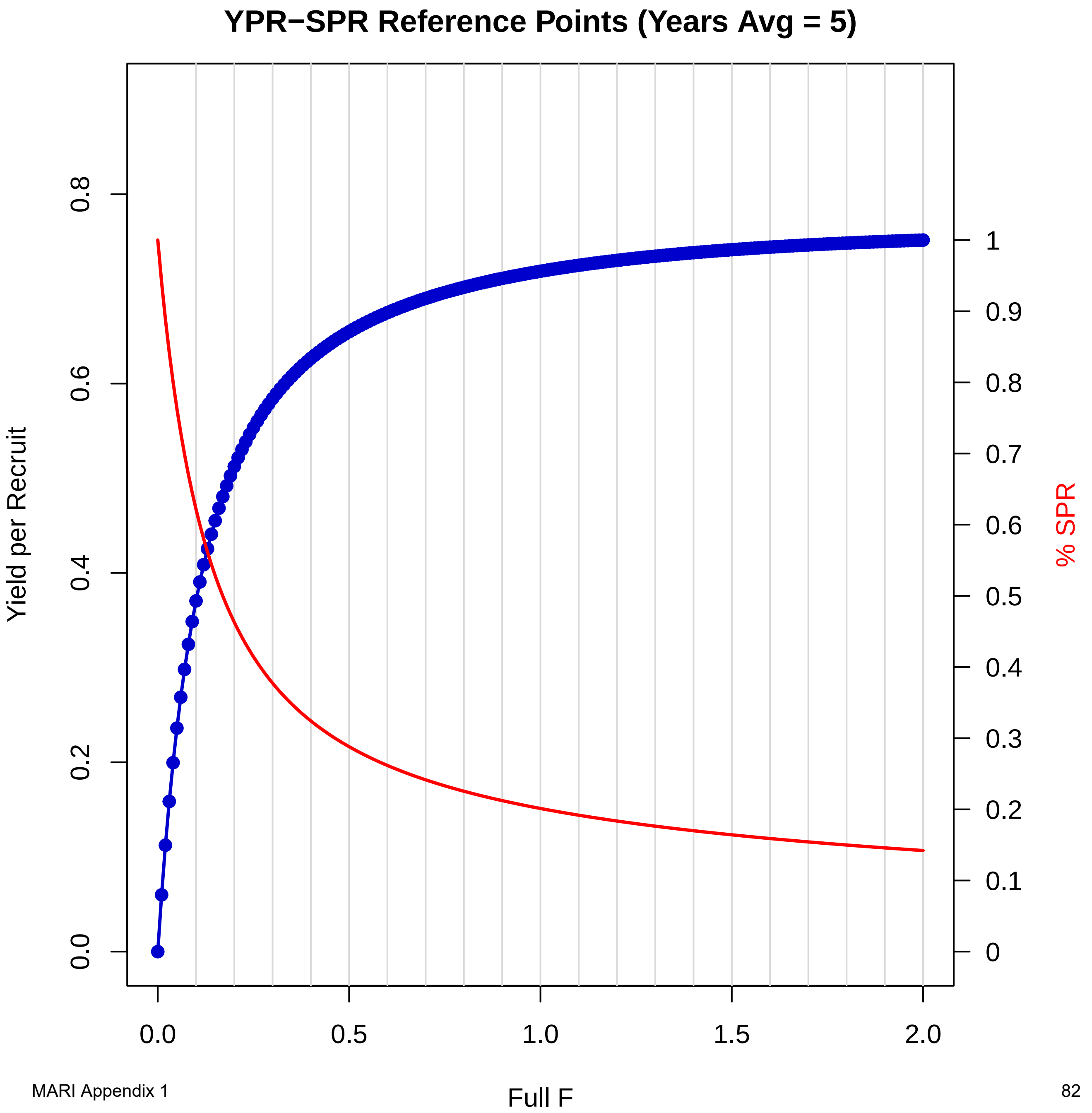

R/SSB
0.1
0.2
0.3
0.4
0.5
0.6
1990
2000
2010
2020
Year


4000
3000
2000
1000
0
Recruits (000s)
0
5000
10000
15000
20000
25000
SSB (mt)



Age−1 Recruits (year−class)
500
1000
1500
2000
2500
3000
3500
SSB (year)
0
5000
10000
15000
20000
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
Year

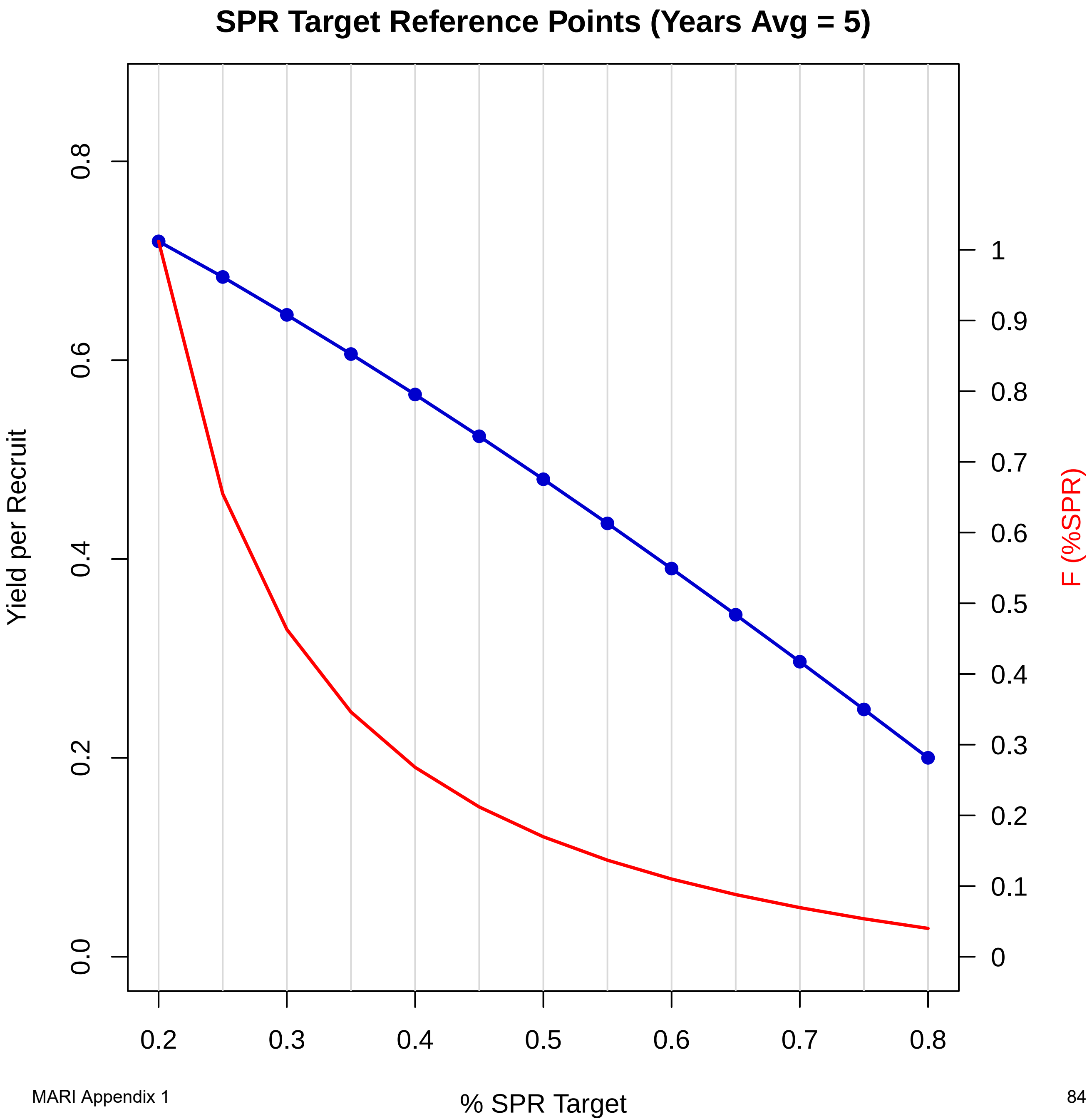

Recr.
SSB
Freport
0.0
0.1
0.2
0.3
0.4
CV
1990
2000
2010
2020
Year



YPR−SPR Reference Points (Years Avg = 5)
Yield per Recruit
0.0
0.2
0.4
0.6
0.8
% SPR
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0.0
0.5
1.0
1.5
2.0
Full F

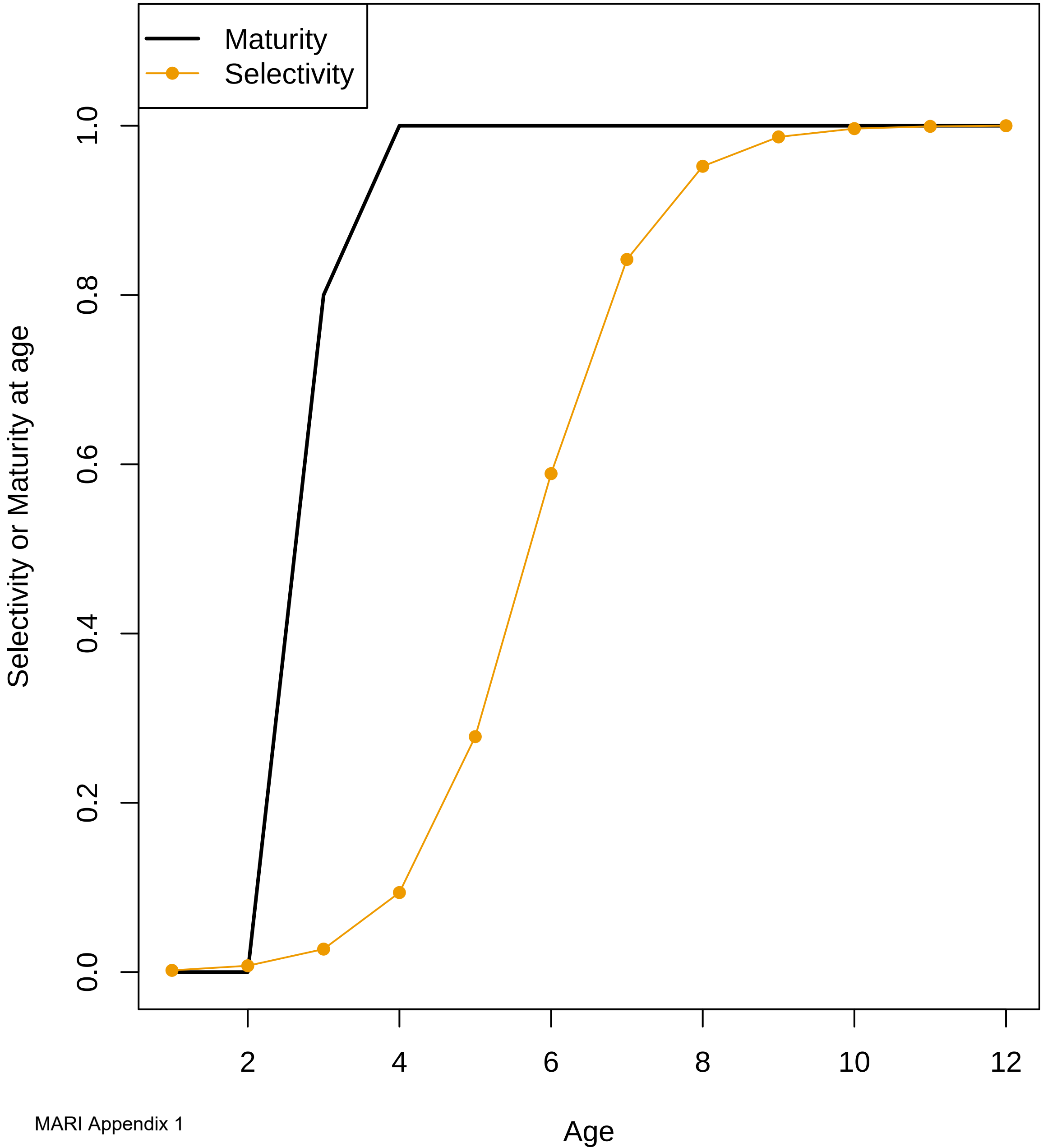
YPR−SPR Reference Points (Years Avg = 5)

F	YPR	SPR	F	YPR	SPR	F	YPR	SPR
0	0	1	0.35	0.6078	0.348	0.7	0.69	0.2415
0.01	0.06	0.9409	0.36	0.6119	0.3429	0.71	0.6913	0.2397
0.02	0.1124	0.8886	0.37	0.6158	0.3379	0.72	0.6926	0.238
0.03	0.1586	0.8421	0.38	0.6196	0.3332	0.73	0.6938	0.2363
0.04	0.1996	0.8005	0.39	0.6232	0.3286	0.74	0.695	0.2346
0.05	0.2361	0.7631	0.4	0.6266	0.3242	0.75	0.6962	0.233
0.06	0.2687	0.7293	0.41	0.6299	0.32	0.76	0.6974	0.2314
0.07	0.2981	0.6986	0.42	0.6331	0.3159	0.77	0.6985	0.2299
0.08	0.3246	0.6706	0.43	0.6362	0.312	0.78	0.6996	0.2284
0.09	0.3487	0.645	0.44	0.6392	0.3082	0.79	0.7007	0.2269
0.1	0.3705	0.6215	0.45	0.642	0.3046	0.8	0.7017	0.2254
0.11	0.3905	0.5999	0.46	0.6448	0.3011	0.81	0.7028	0.224
0.12	0.4087	0.58	0.47	0.6474	0.2976	0.82	0.7038	0.2226
0.13	0.4255	0.5615	0.48	0.65	0.2943	0.83	0.7048	0.2212
0.14	0.4409	0.5443	0.49	0.6524	0.2911	0.84	0.7057	0.2198
0.15	0.4552	0.5284	0.5	0.6548	0.288	0.85	0.7067	0.2185
0.16	0.4684	0.5135	0.51	0.6571	0.285	0.86	0.7076	0.2172
0.17	0.4806	0.4996	0.52	0.6594	0.2821	0.87	0.7085	0.2159
0.18	0.492	0.4865	0.53	0.6615	0.2793	0.88	0.7094	0.2147
0.19	0.5026	0.4743	0.54	0.6636	0.2766	0.89	0.7102	0.2135
0.2	0.5125	0.4628	0.55	0.6656	0.2739	0.9	0.7111	0.2122
0.21	0.5218	0.452	0.56	0.6676	0.2713	0.91	0.7119	0.2111
0.22	0.5305	0.4418	0.57	0.6695	0.2688	0.92	0.7127	0.2099
0.23	0.5386	0.4322	0.58	0.6714	0.2664	0.93	0.7135	0.2087
0.24	0.5463	0.4231	0.59	0.6732	0.264	0.94	0.7143	0.2076
0.25	0.5535	0.4144	0.6	0.6749	0.2617	0.95	0.7151	0.2065
0.26	0.5603	0.4062	0.61	0.6766	0.2594	0.96	0.7158	0.2054
0.27	0.5667	0.3985	0.62	0.6783	0.2572	0.97	0.7166	0.2043
0.28	0.5728	0.3911	0.63	0.6799	0.2551	0.98	0.7173	0.2033
0.29	0.5786	0.384	0.64	0.6814	0.253	0.99	0.718	0.2022
0.3	0.5841	0.3773	0.65	0.683	0.251	1	0.7187	0.2012
0.31	0.5893	0.3709	0.66	0.6844	0.249	1.01	0.7194	0.2002
0.32	0.5943	0.3648	0.67	0.6859	0.247	1.02	0.72	0.1992
0.33	0.599	0.359	0.68	0.6873	0.2451	1.03	0.7207	0.1982
0.34	0.6035	0.3534	0.69	0.6887	0.2433	1.04	0.7213	0.1973

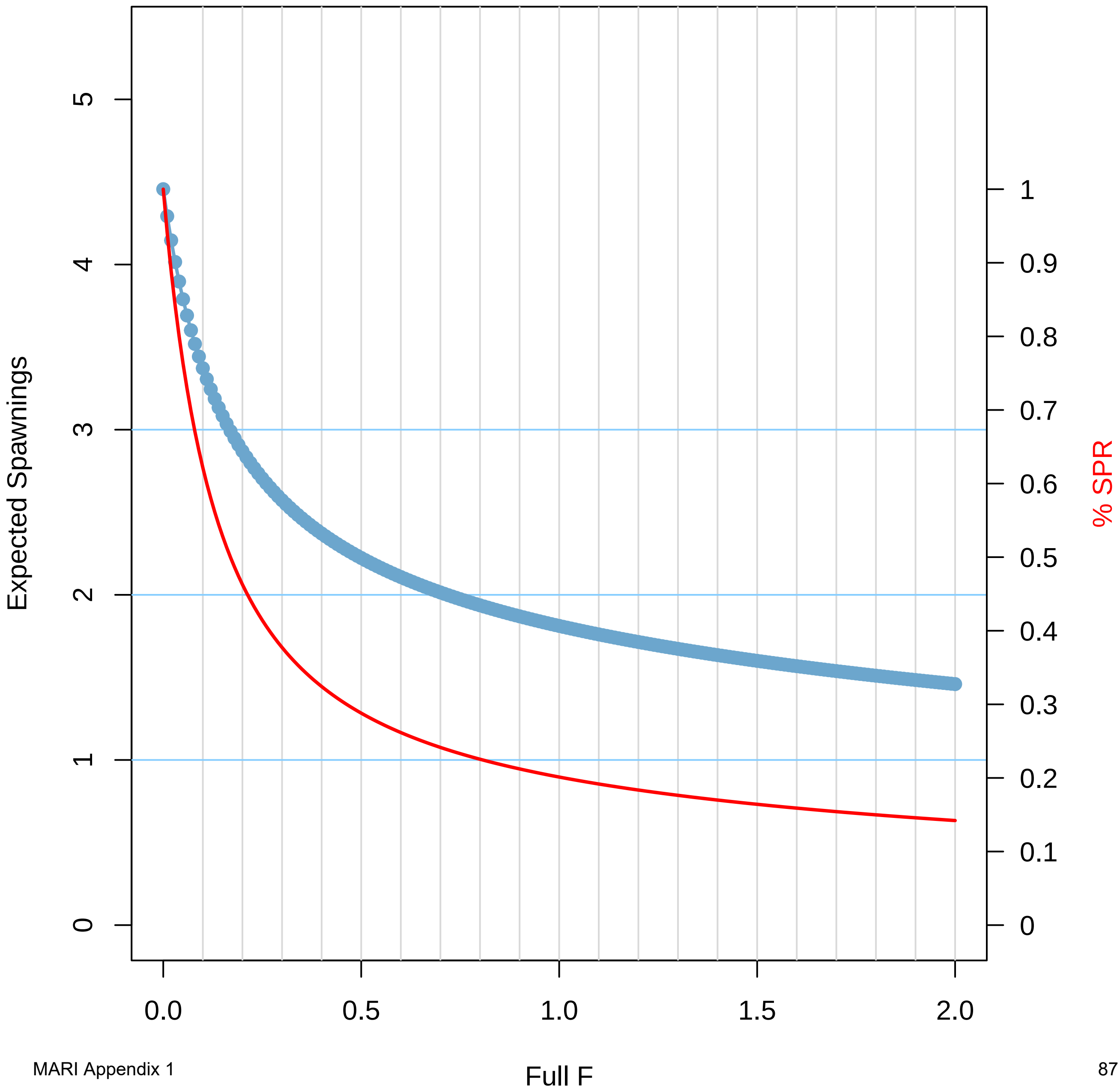

SPR Target Reference Points (Years Avg = 5)
Yield per Recruit
F (%SPR)
% SPR Target
0.0
0.2
0.4
0.6
0.8
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0.2
0.3
0.4
0.5
0.6
0.7
0.8

SPR Target Reference Points (Years Avg = 5)

% SPR	F(%SPR)	YPR
0.2	1.0119	0.7195
0.25	0.6548	0.6837
0.3	0.4631	0.6456
0.35	0.3462	0.6062
0.4	0.268	0.5655
0.45	0.2119	0.5235
0.5	0.1697	0.4802
0.55	0.1366	0.4358
0.6	0.11	0.3904
0.65	0.088	0.344
0.7	0.0695	0.2968
0.75	0.0538	0.2488
0.8	0.0401	0.2001

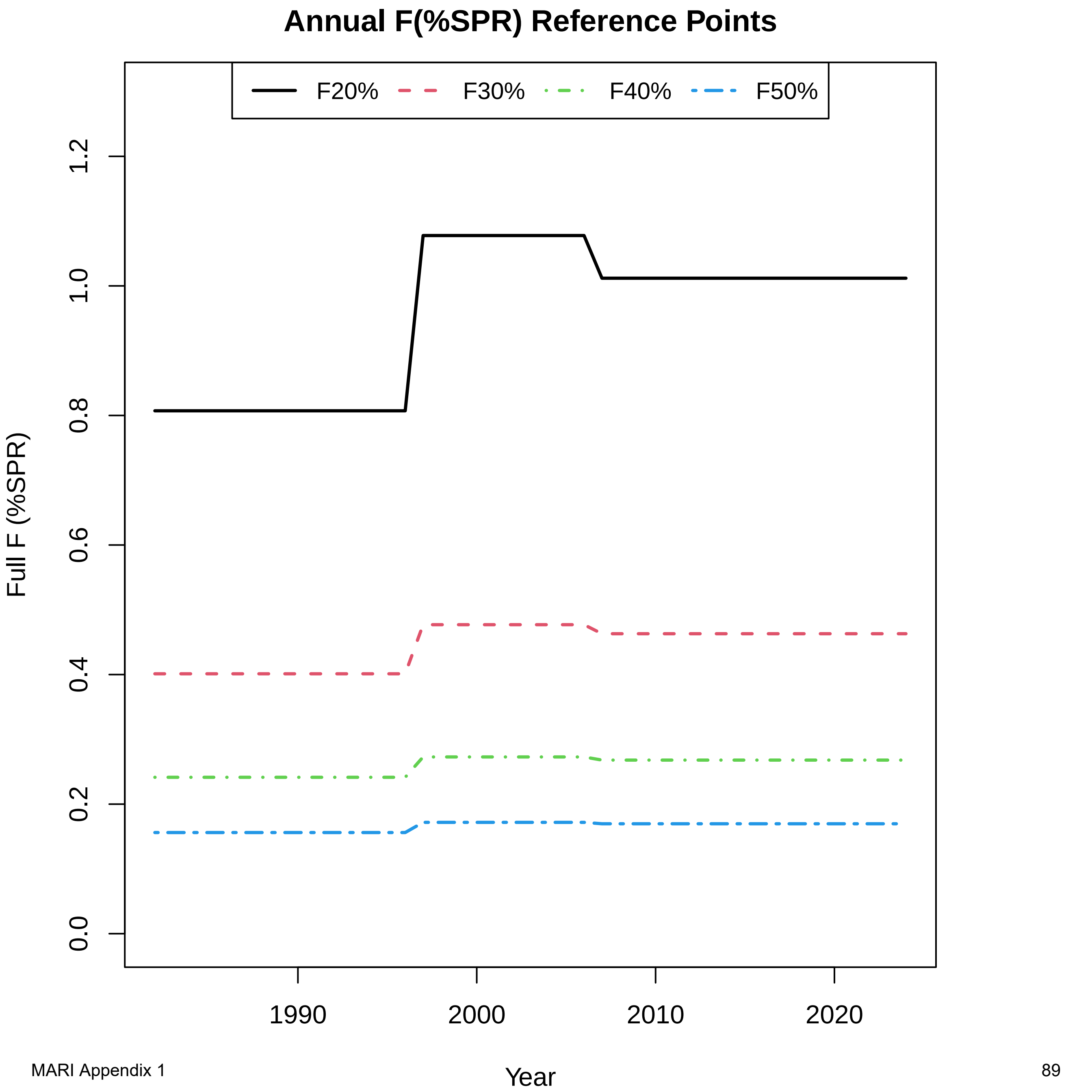

Maturity
Selectivity
Selectivity or Maturity at age
0.0
0.2
0.4
0.6
0.8
1.0
2
4
6
8
10
12
Age

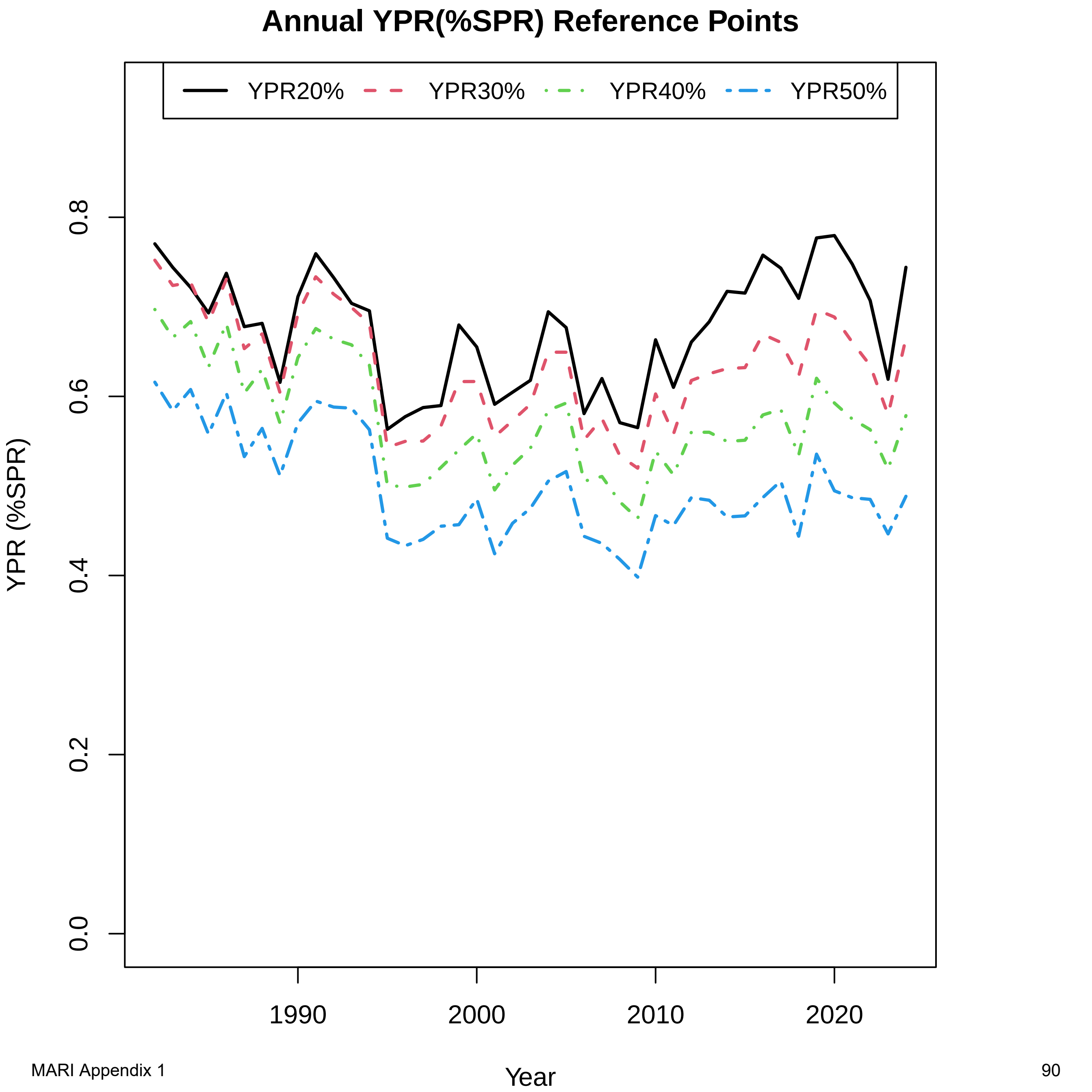
Expected Spawnings and SPR Reference Points (Years Avg = 5)



Expected Spawnings & SPR Reference Points (Years Avg = 5)

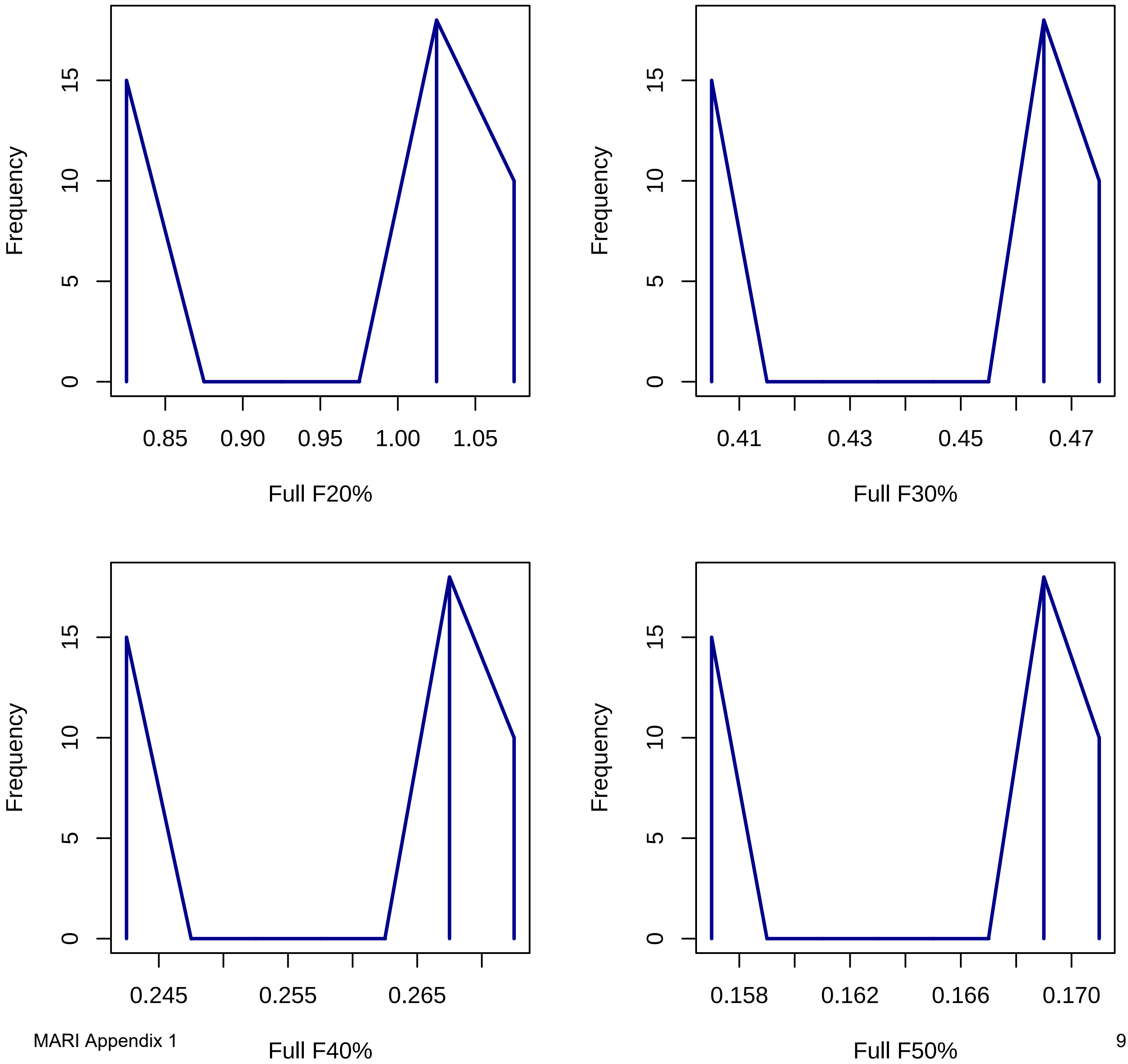
F	E[Sp]	SPR	F	E[Sp]	SPR	F	E[Sp]	SPR
0	4.4562	1	0.35	2.4634	0.348	0.7	2.0144	0.2415
0.01	4.2924	0.9409	0.36	2.4437	0.3429	0.71	2.006	0.2397
0.02	4.1464	0.8886	0.37	2.4247	0.3379	0.72	1.9978	0.238
0.03	4.0154	0.8421	0.38	2.4063	0.3332	0.73	1.9896	0.2363
0.04	3.897	0.8005	0.39	2.3885	0.3286	0.74	1.9817	0.2346
0.05	3.7896	0.7631	0.4	2.3712	0.3242	0.75	1.9738	0.233
0.06	3.6915	0.7293	0.41	2.3545	0.32	0.76	1.9661	0.2314
0.07	3.6017	0.6986	0.42	2.3382	0.3159	0.77	1.9585	0.2299
0.08	3.5191	0.6706	0.43	2.3224	0.312	0.78	1.951	0.2284
0.09	3.4427	0.645	0.44	2.307	0.3082	0.79	1.9437	0.2269
0.1	3.372	0.6215	0.45	2.2921	0.3046	0.8	1.9364	0.2254
0.11	3.3062	0.5999	0.46	2.2776	0.3011	0.81	1.9293	0.224
0.12	3.2449	0.58	0.47	2.2634	0.2976	0.82	1.9223	0.2226
0.13	3.1875	0.5615	0.48	2.2496	0.2943	0.83	1.9154	0.2212
0.14	3.1338	0.5443	0.49	2.2362	0.2911	0.84	1.9086	0.2198
0.15	3.0833	0.5284	0.5	2.2231	0.288	0.85	1.9019	0.2185
0.16	3.0357	0.5135	0.51	2.2103	0.285	0.86	1.8953	0.2172
0.17	2.9909	0.4996	0.52	2.1979	0.2821	0.87	1.8887	0.2159
0.18	2.9484	0.4865	0.53	2.1857	0.2793	0.88	1.8823	0.2147
0.19	2.9082	0.4743	0.54	2.1738	0.2766	0.89	1.876	0.2135
0.2	2.8701	0.4628	0.55	2.1622	0.2739	0.9	1.8697	0.2122
0.21	2.8339	0.452	0.56	2.1508	0.2713	0.91	1.8636	0.2111
0.22	2.7994	0.4418	0.57	2.1397	0.2688	0.92	1.8575	0.2099
0.23	2.7665	0.4322	0.58	2.1289	0.2664	0.93	1.8515	0.2087
0.24	2.7351	0.4231	0.59	2.1182	0.264	0.94	1.8456	0.2076
0.25	2.7051	0.4144	0.6	2.1078	0.2617	0.95	1.8398	0.2065
0.26	2.6763	0.4062	0.61	2.0976	0.2594	0.96	1.834	0.2054
0.27	2.6488	0.3985	0.62	2.0877	0.2572	0.97	1.8283	0.2043
0.28	2.6224	0.3911	0.63	2.0779	0.2551	0.98	1.8227	0.2033
0.29	2.597	0.384	0.64	2.0683	0.253	0.99	1.8171	0.2022
0.3	2.5726	0.3773	0.65	2.0589	0.251	1	1.8117	0.2012
0.31	2.5491	0.3709	0.66	2.0497	0.249	1.01	1.8063	0.2002
0.32	2.5265	0.3648	0.67	2.0406	0.247	1.02	1.8009	0.1992
0.33	2.5047	0.359	0.68	2.0317	0.2451	1.03	1.7956	0.1982
0.34	2.4837	0.3534	0.69	2.023	0.2433	1.04	1.7904	0.1973

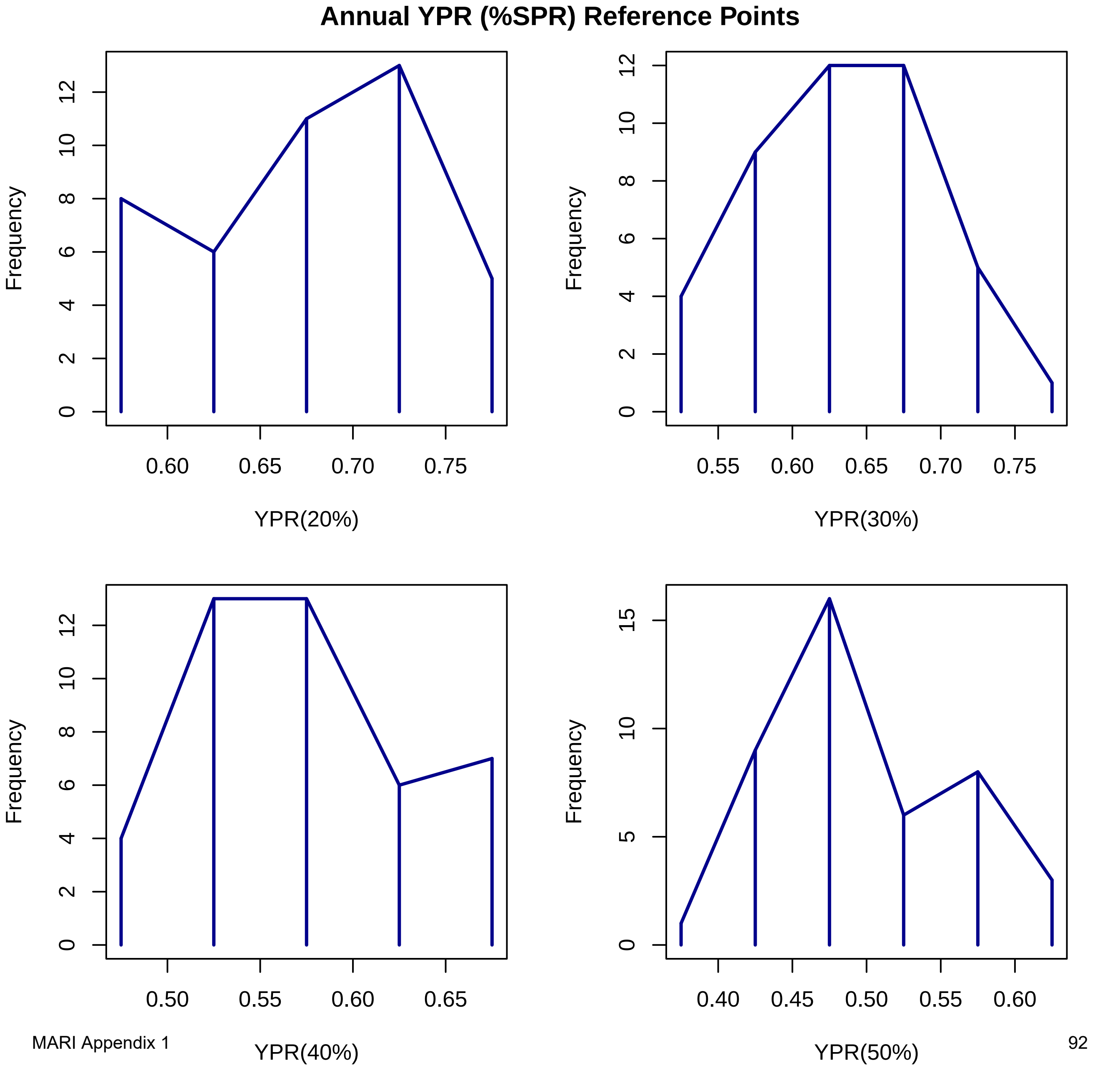

Annual F(%SPR) Reference Points
F20%
F30%
F40%
F50%
Full F (%SPR)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1990
2000
2010
2020
Year



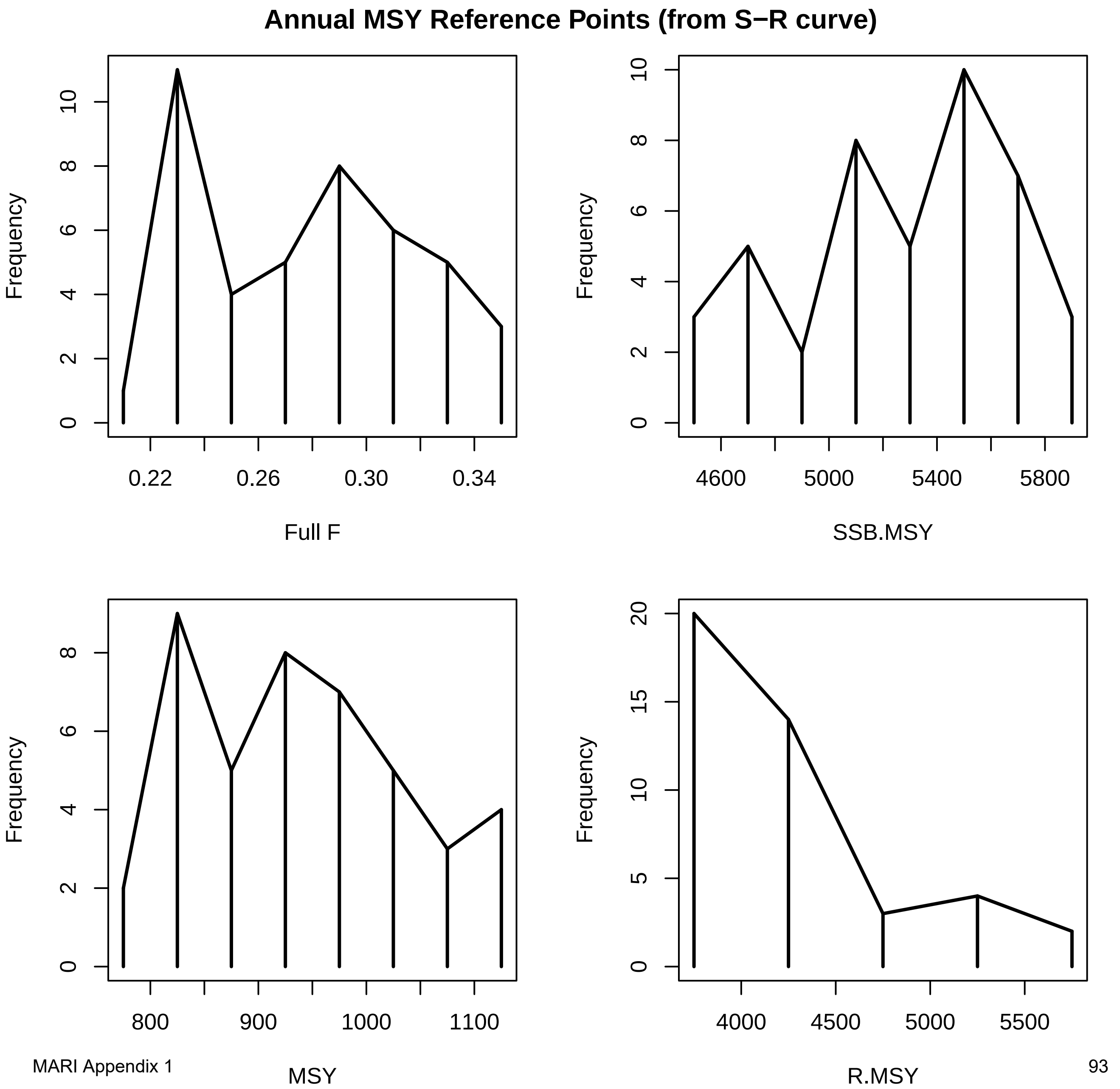
Annual YPR(%SPR) Reference Points
YPR20%
YPR30%
YPR40%
YPR50%
YPR (%SPR)
0.0
0.2
0.4
0.6
0.8
1990
2000
2010
2020
Year

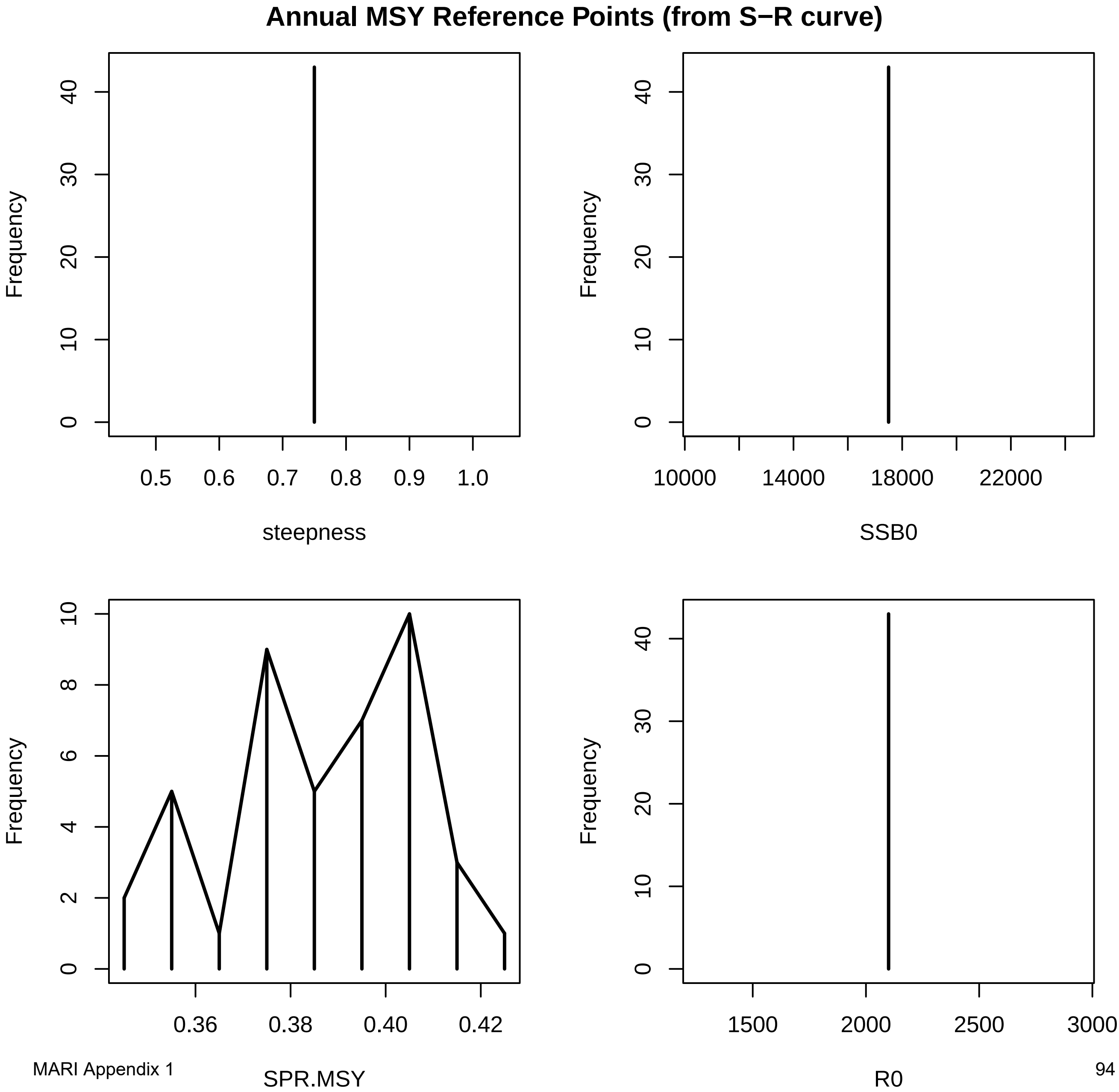
Annual F (%SPR) Reference Points

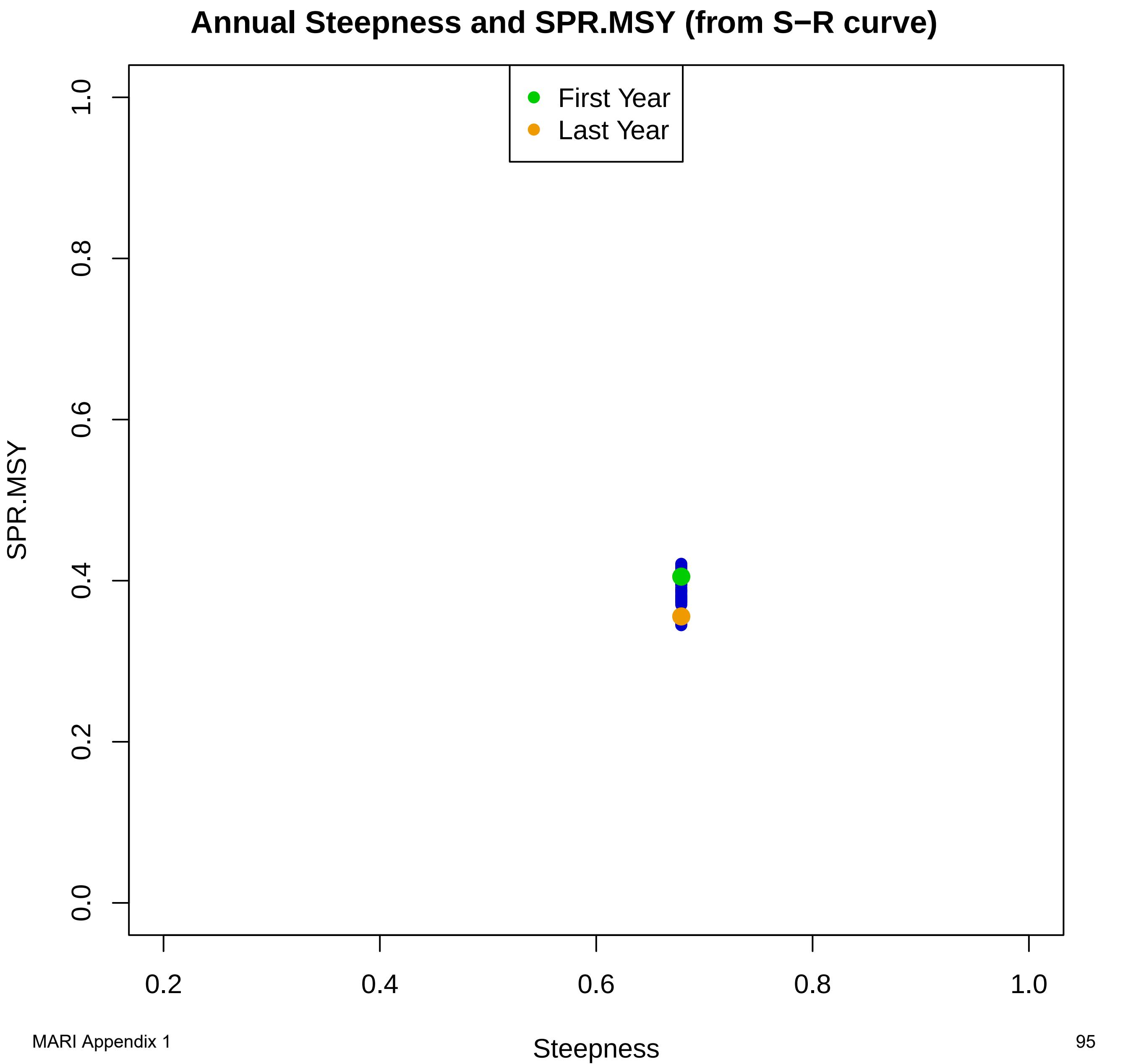




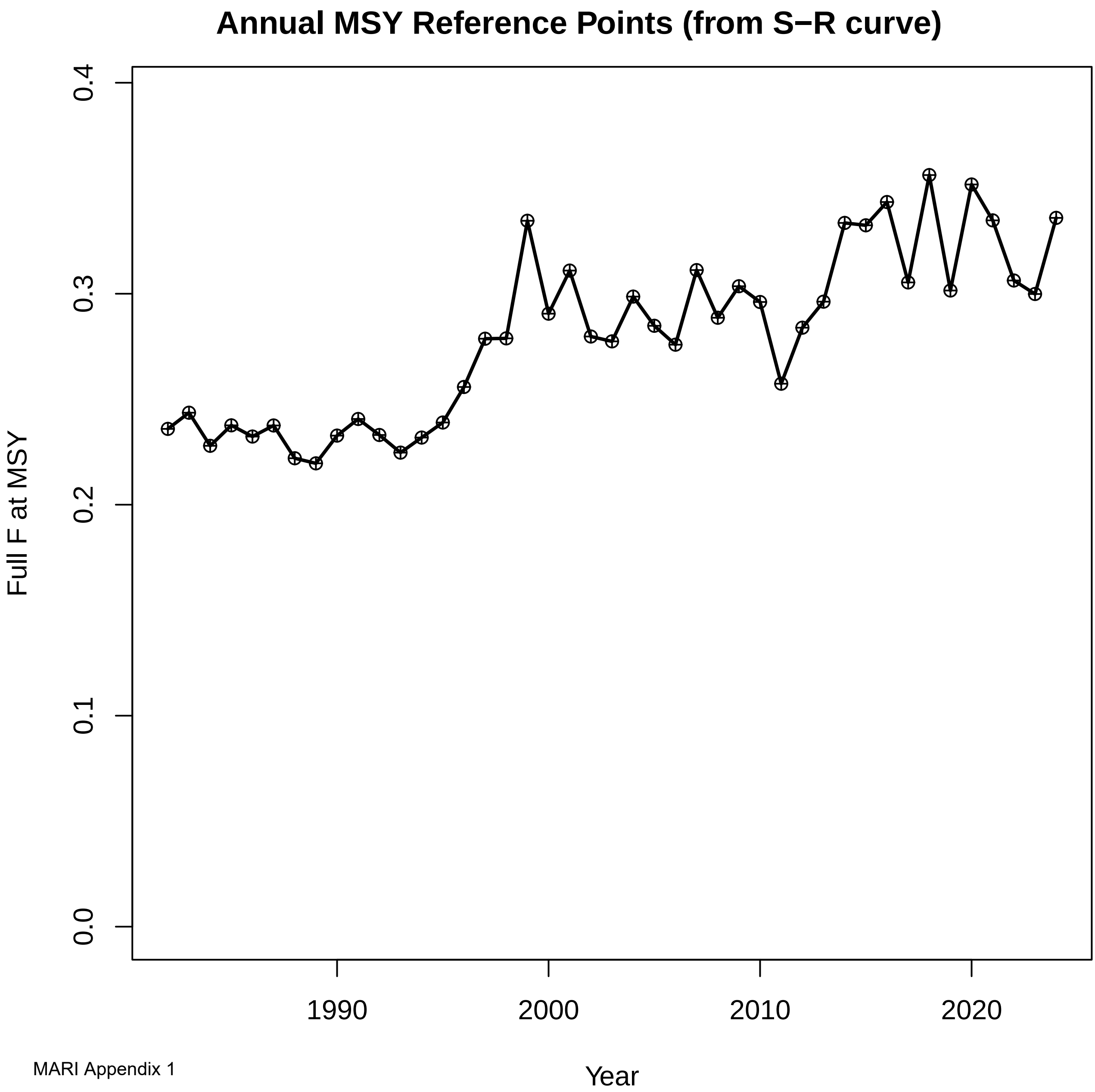
Annual YPR (%SPR) Reference Points
Frequency
YPR(20%)
0.60
0.65
0.70
0.75
0
2
4
6
8
10
12
Frequency
YPR(30%)
0.55
0.60
0.65
0.70
0.75
0
2
4
6
8
10
12
Frequency
YPR(40%)
0.50
0.55
0.60
0.65
0
2
4
6
8
10
12
Frequency
YPR(50%)
0.40
0.45
0.50
0.55
0.60
0
5
10
15


Annual MSY Reference Points (from S−R curve)
Frequency
Full F
0.22
0.26
0.30
0.34
0
2
4
6
8
10
Frequency
SSB.MSY
4600
5000
5400
5800
0
2
4
6
8
10
Frequency
MSY
800
900
1000
1100
0
2
4
6
8
Frequency
R.MSY
4000
4500
5000
5500
0
5
10
15
20

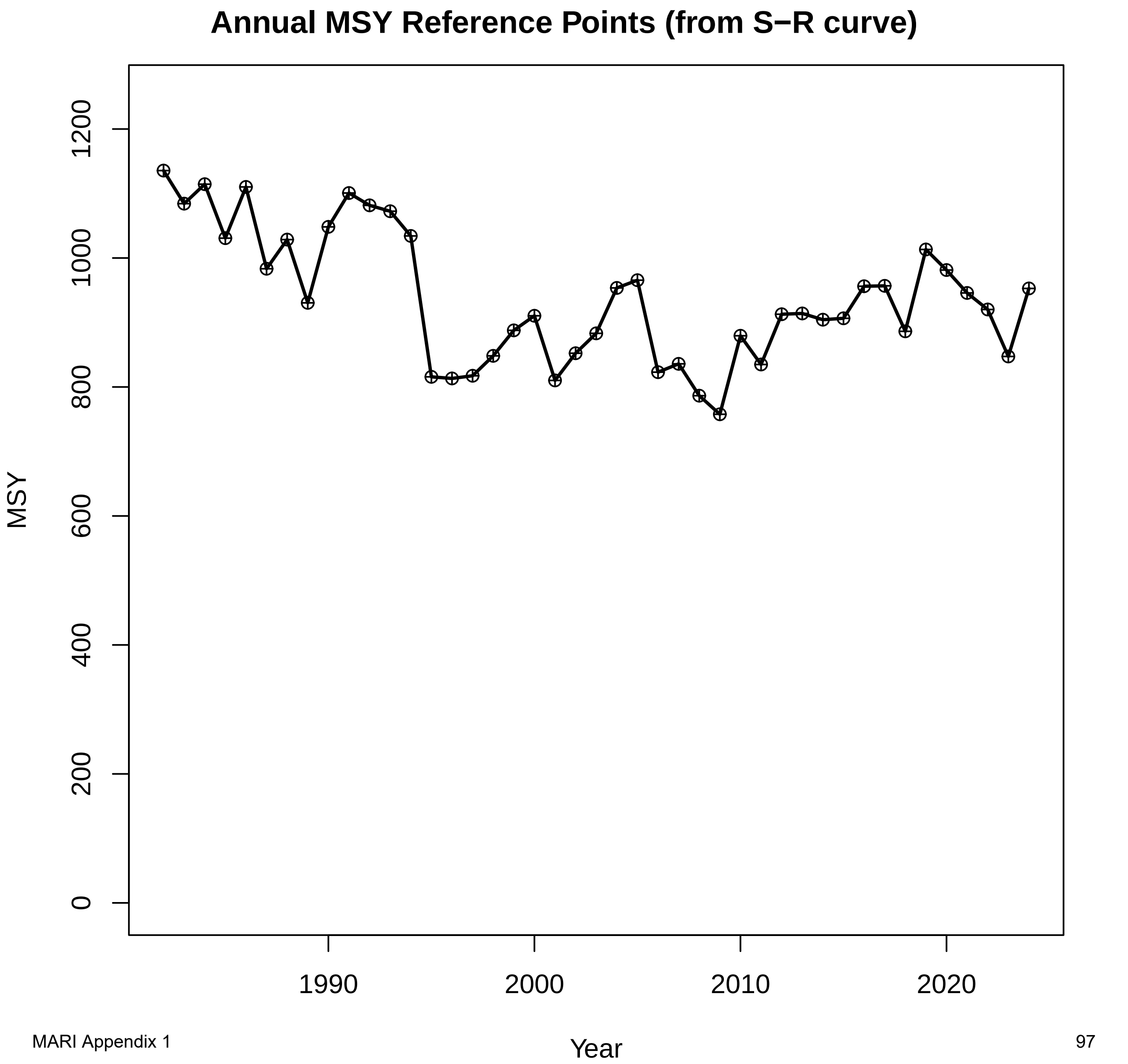

Annual MSY Reference Points (from S−R curve)
Frequency
0
10
20
30
40
0.5
0.6
0.7
0.8
0.9
1.0
steepness
Frequency
0
10
20
30
40
10000
14000
18000
22000
SSB0
Frequency
0
2
4
6
8
10
0.36
0.38
0.40
0.42
SPR.MSY
Frequency
0
10
20
30
40
1500
2000
2500
3000
R0

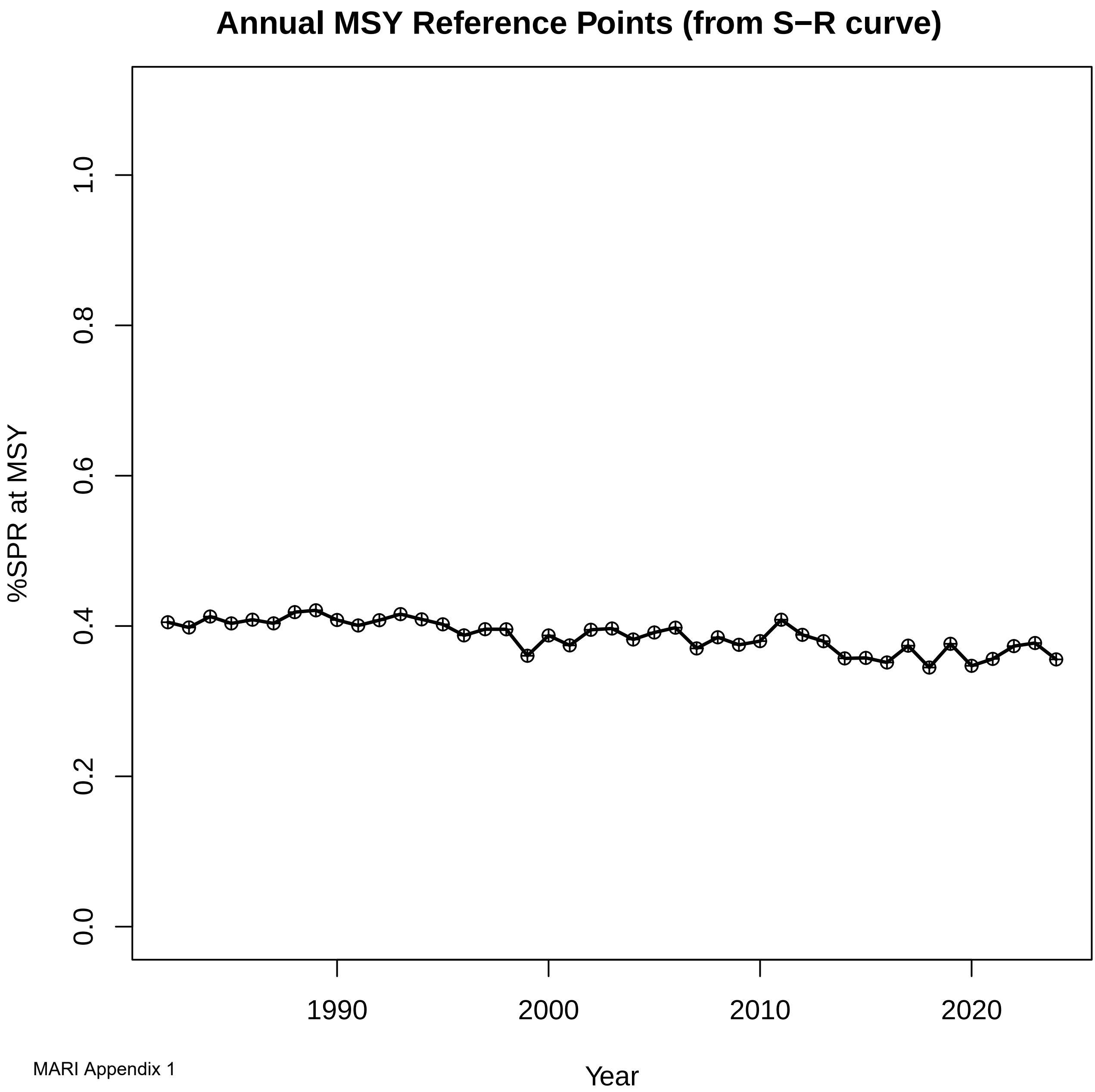


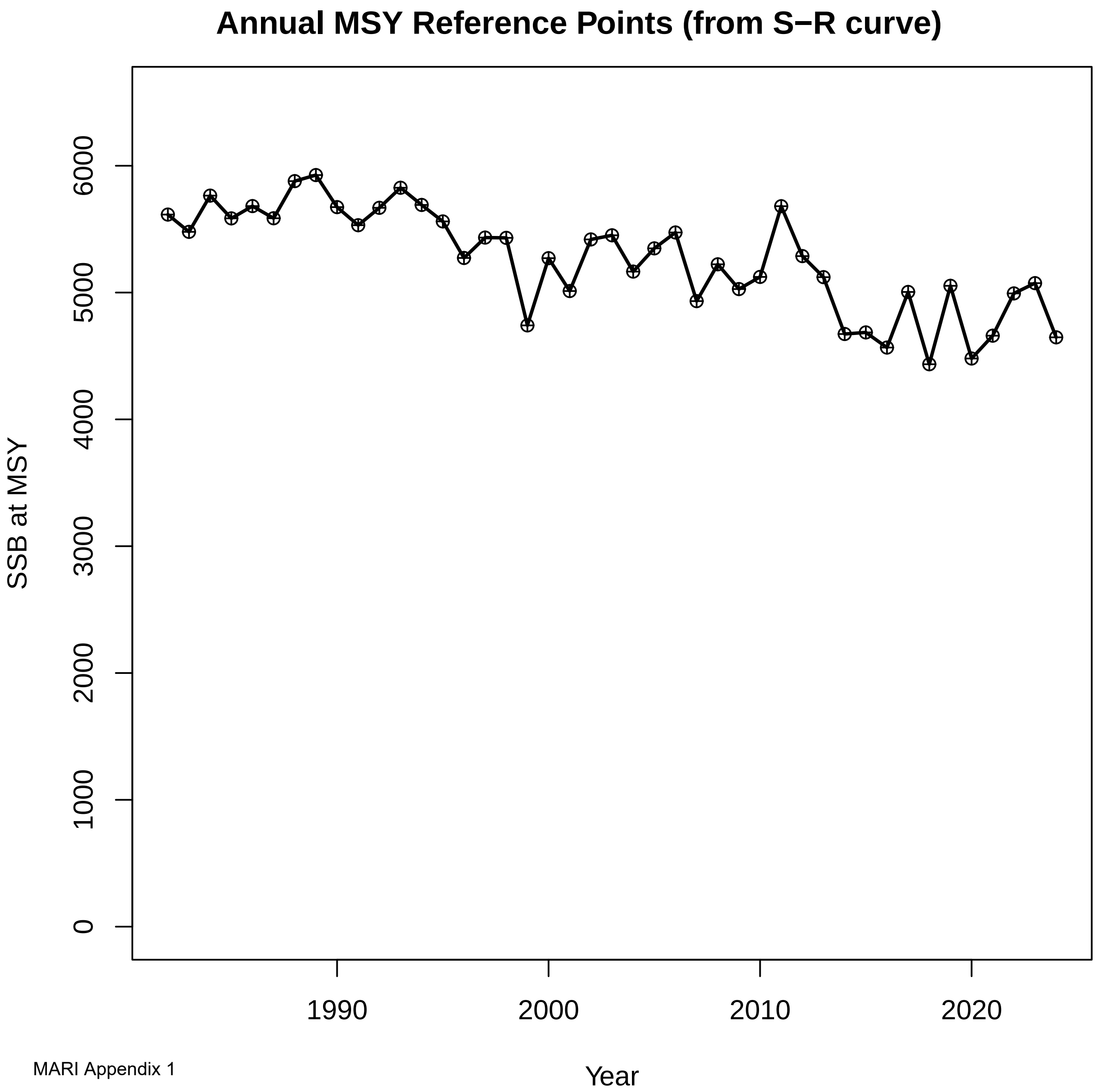
Annual Steepness and SPR.MSY (from S−R curve)
First Year
Last Year
SPR.MSY
0.0
0.2
0.4
0.6
0.8
1.0
0.2
0.4
0.6
0.8
1.0
Steepness

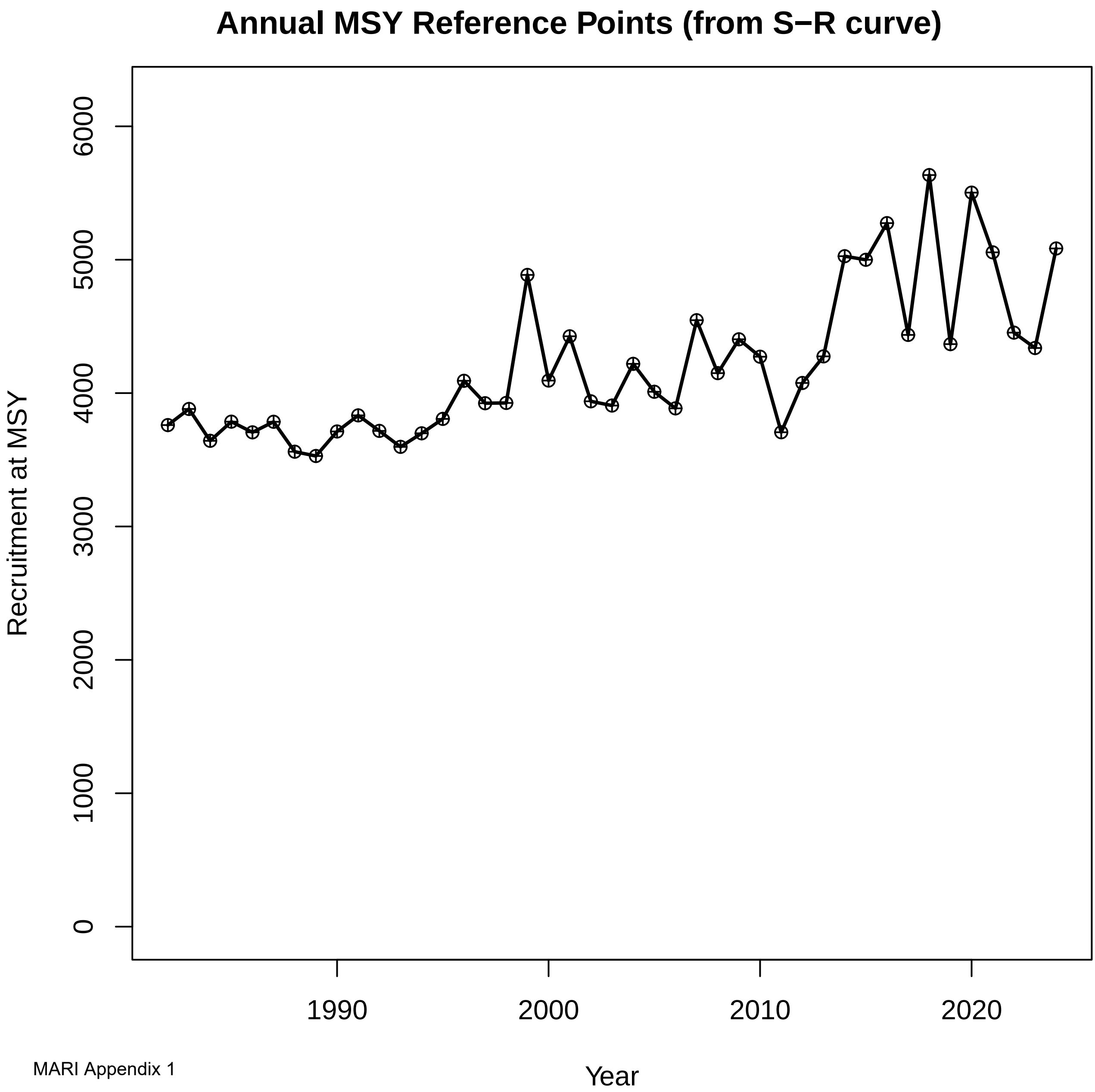


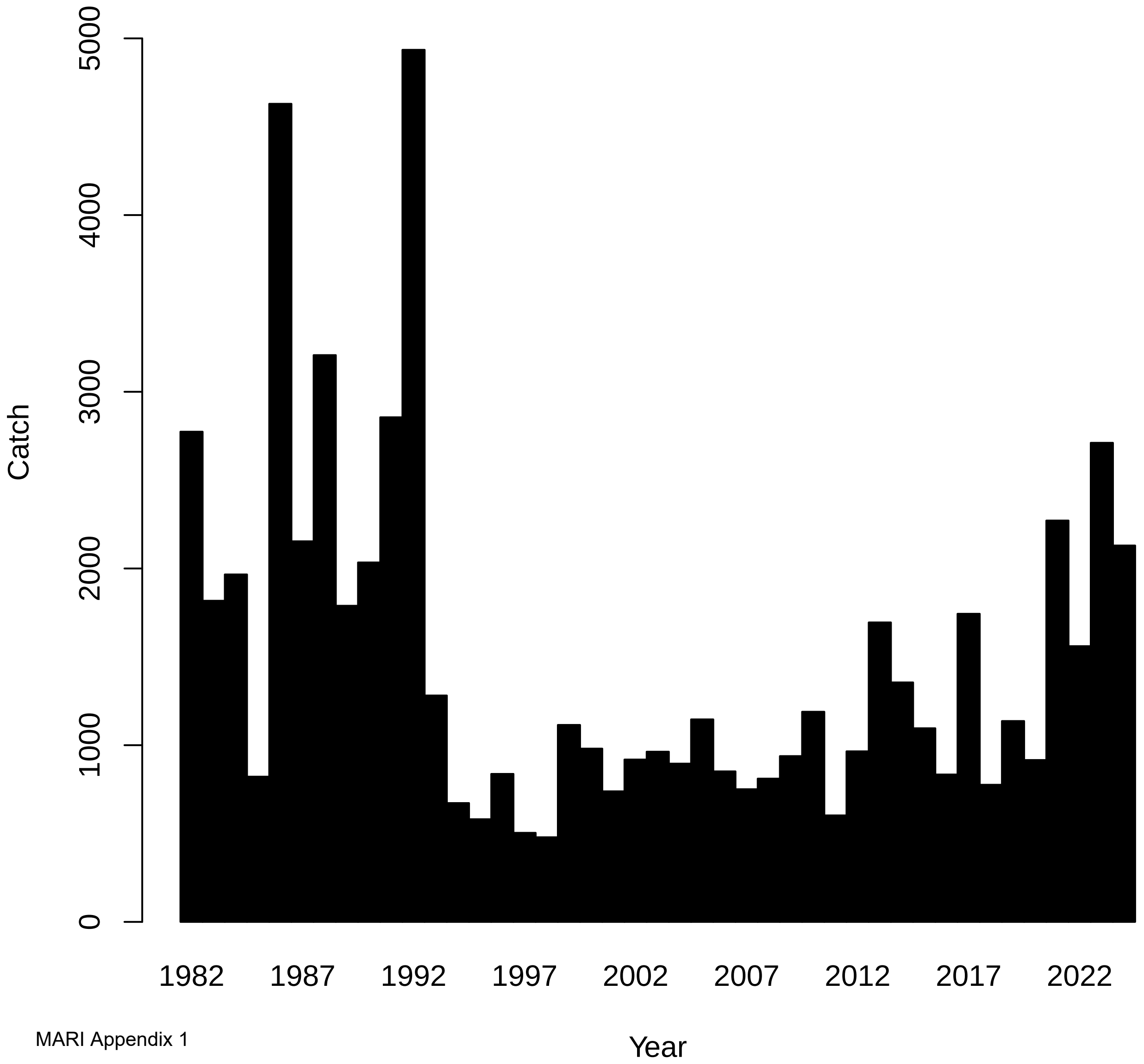
Annual MSY Reference Points (from S−R curve)
Full F at MSY
0.0
0.1
0.2
0.3
0.4
1990
2000
2010
2020
Year

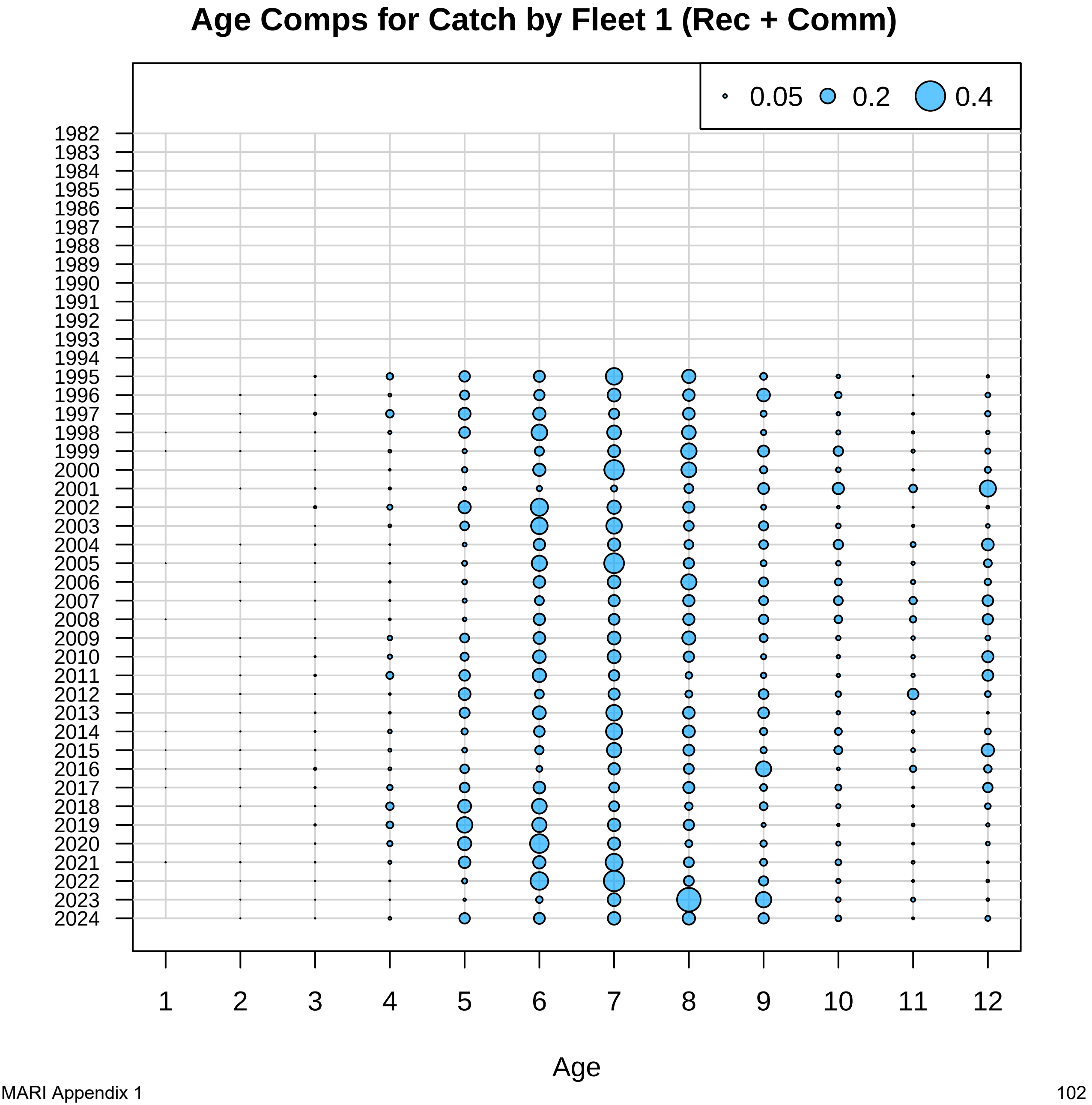

Annual MSY Reference Points (from S−R curve)
MSY
0
200
400
600
800
1000
1200
1990
2000
2010
2020
Year

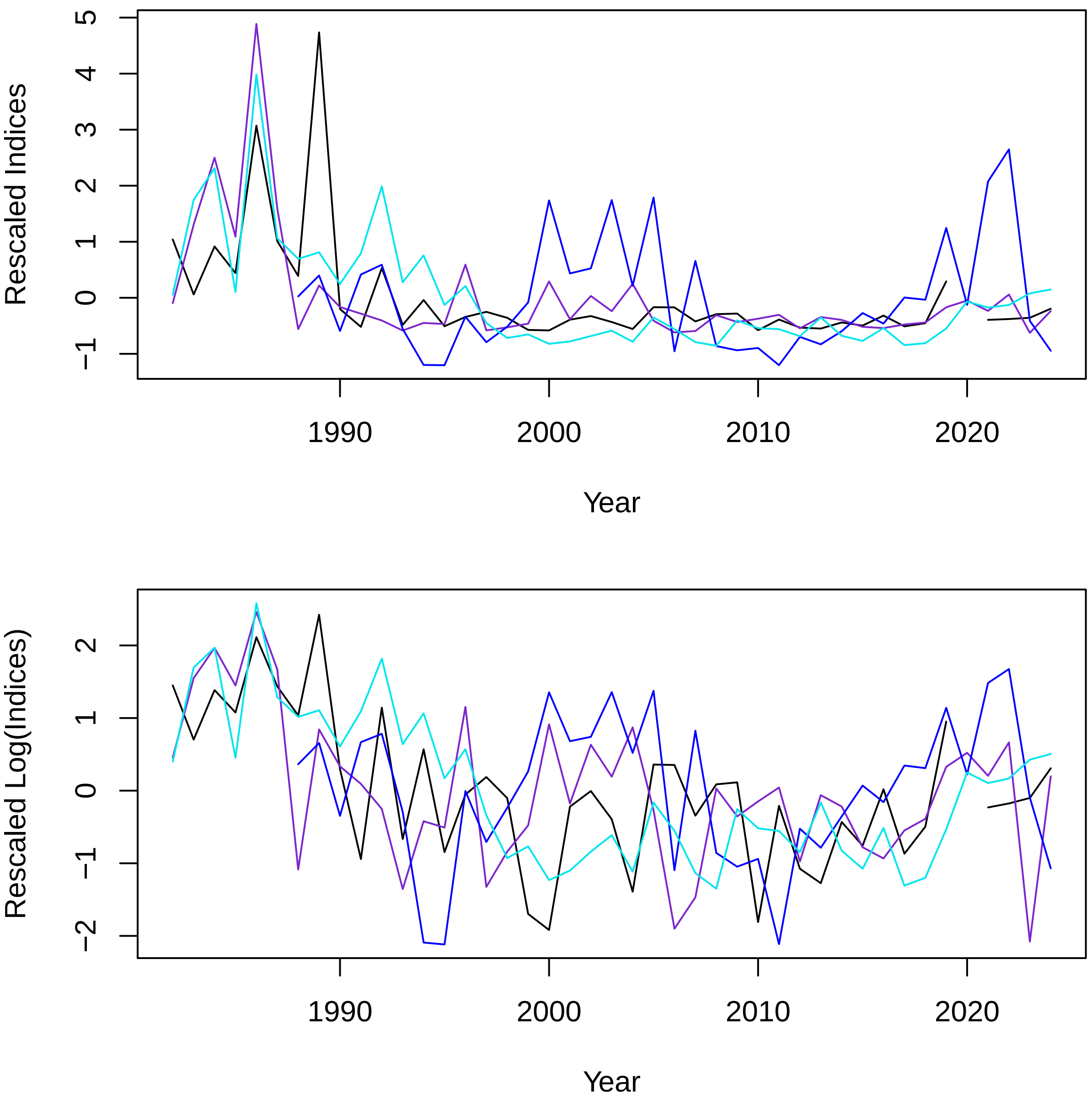

Annual MSY Reference Points (from S−R curve)
%SPR at MSY
0.0
0.2
0.4
0.6
0.8
1.0
1990
2000
2010
2020
Year

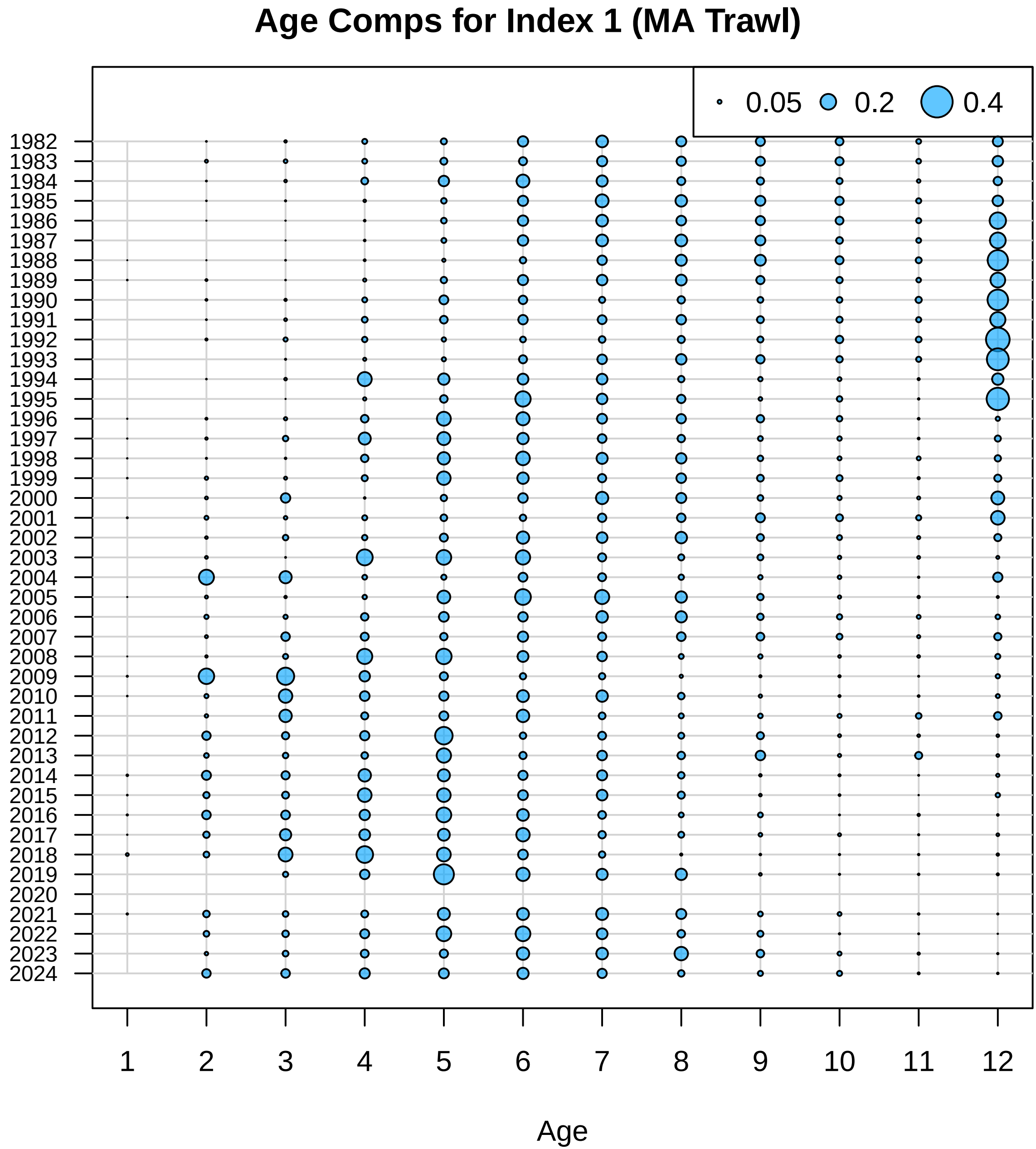

Annual MSY Reference Points (from S−R curve)
SSB at MSY
0
1000
2000
3000
4000
5000
6000
1990
2000
2010
2020
Year


Annual MSY Reference Points (from S−R curve)
Recruitment at MSY
0
1000
2000
3000
4000
5000
6000
1990
2000
2010
2020
Year

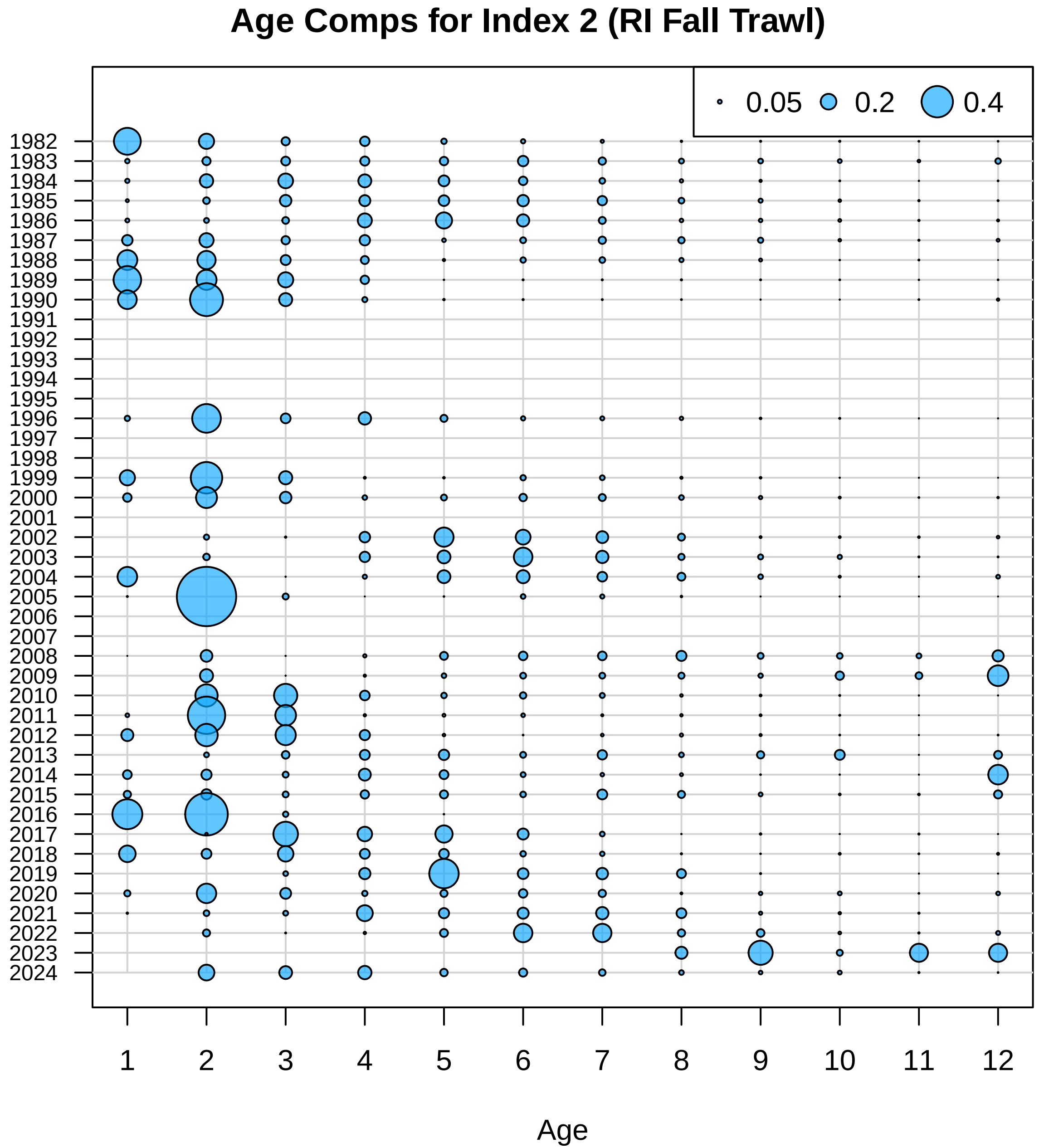

Catch
0
1000
2000
3000
4000
5000
1982
1987
1992
1997
2002
2007
2012
2017
2022
Year


Age Comps for Catch by Fleet 1 (Rec + Comm)
0.05
0.2
0.4
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
1 2 3 4 5 6 7 8 9 10 11 12
Age

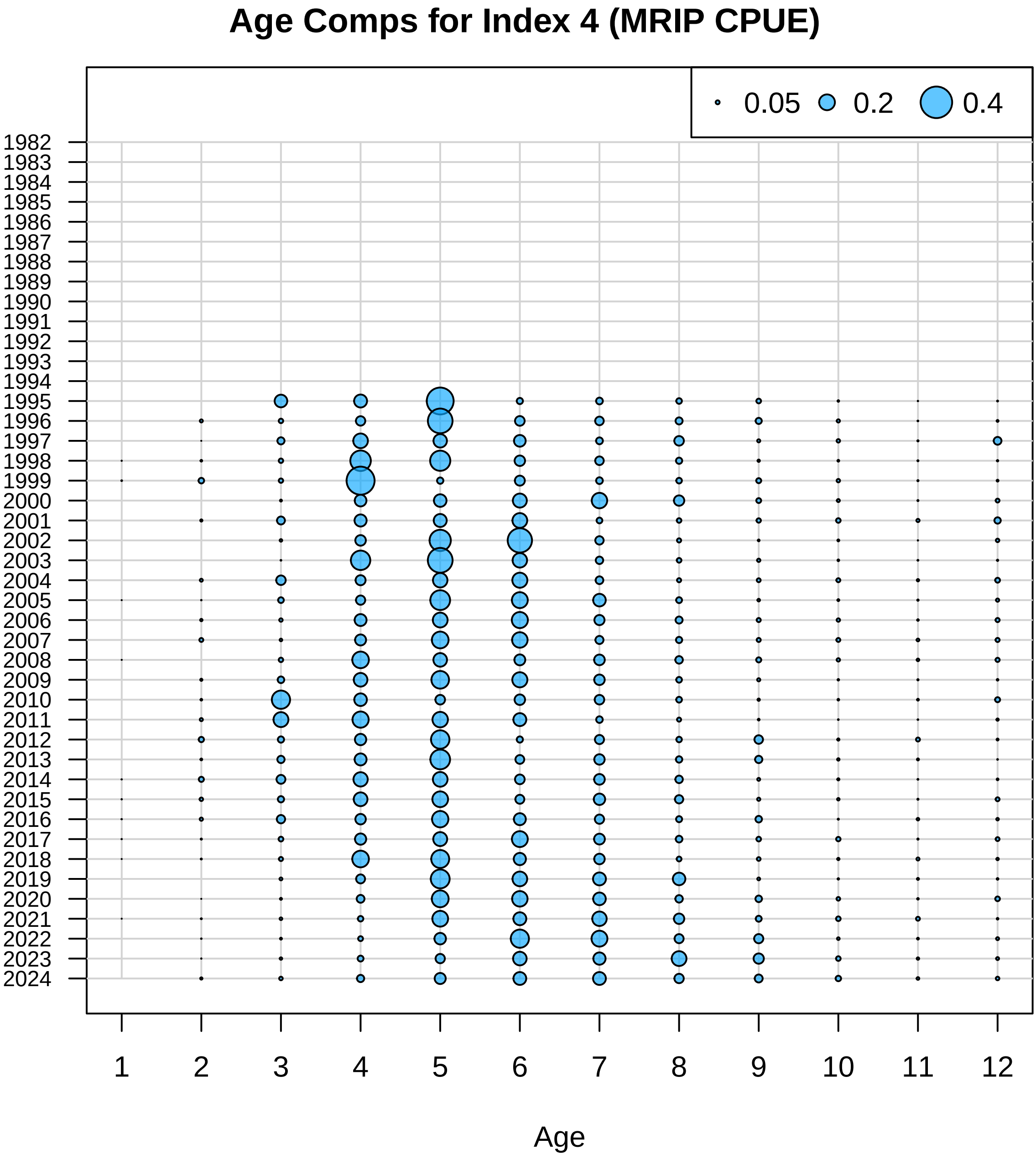

Rescaled Indices
5
4
3
2
1
0
−1
1990
2000
2010
2020
Year
Rescaled Log(Indices)
2
1
0
−1
−2
1990
2000
2010
2020
Year

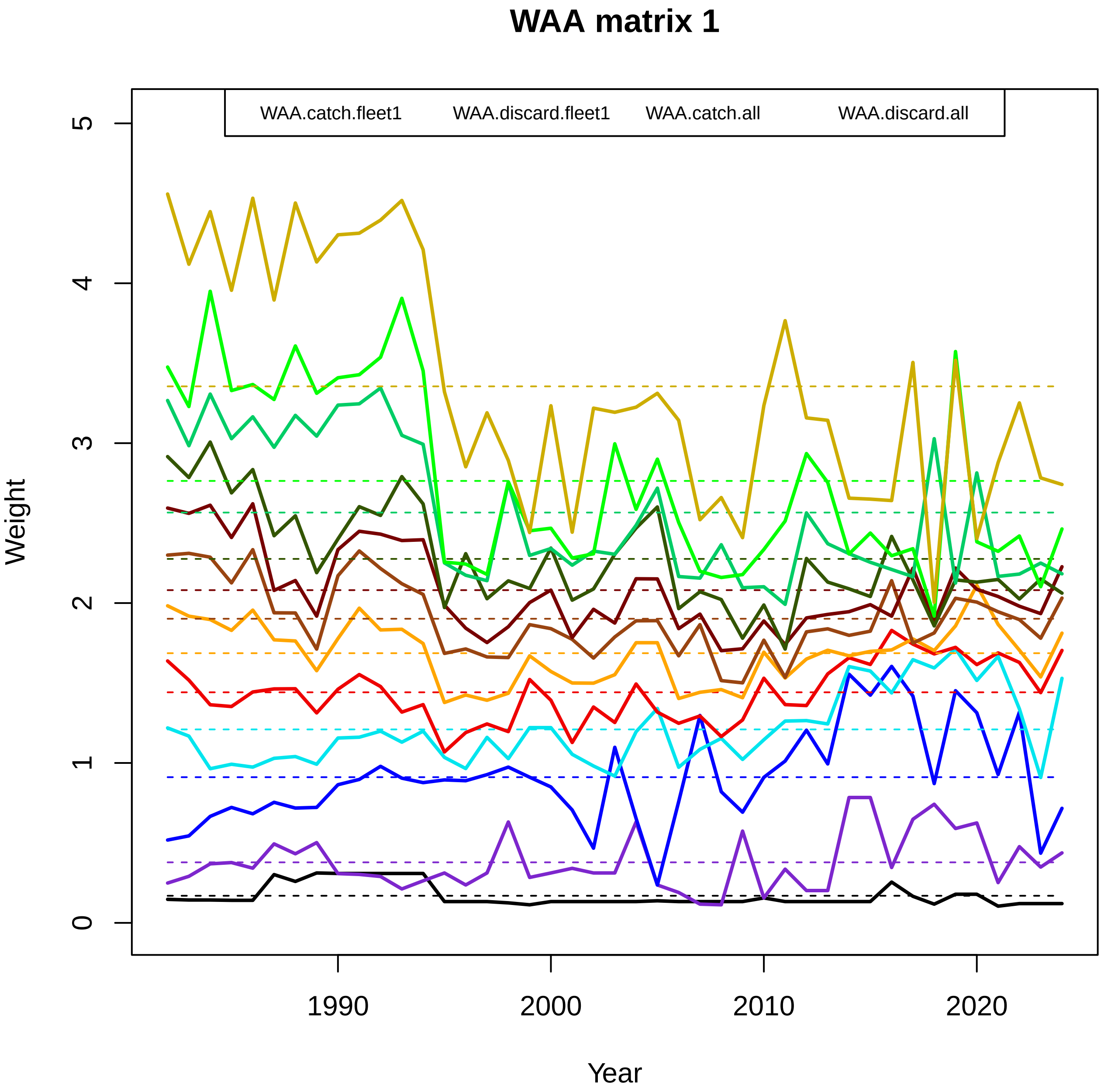


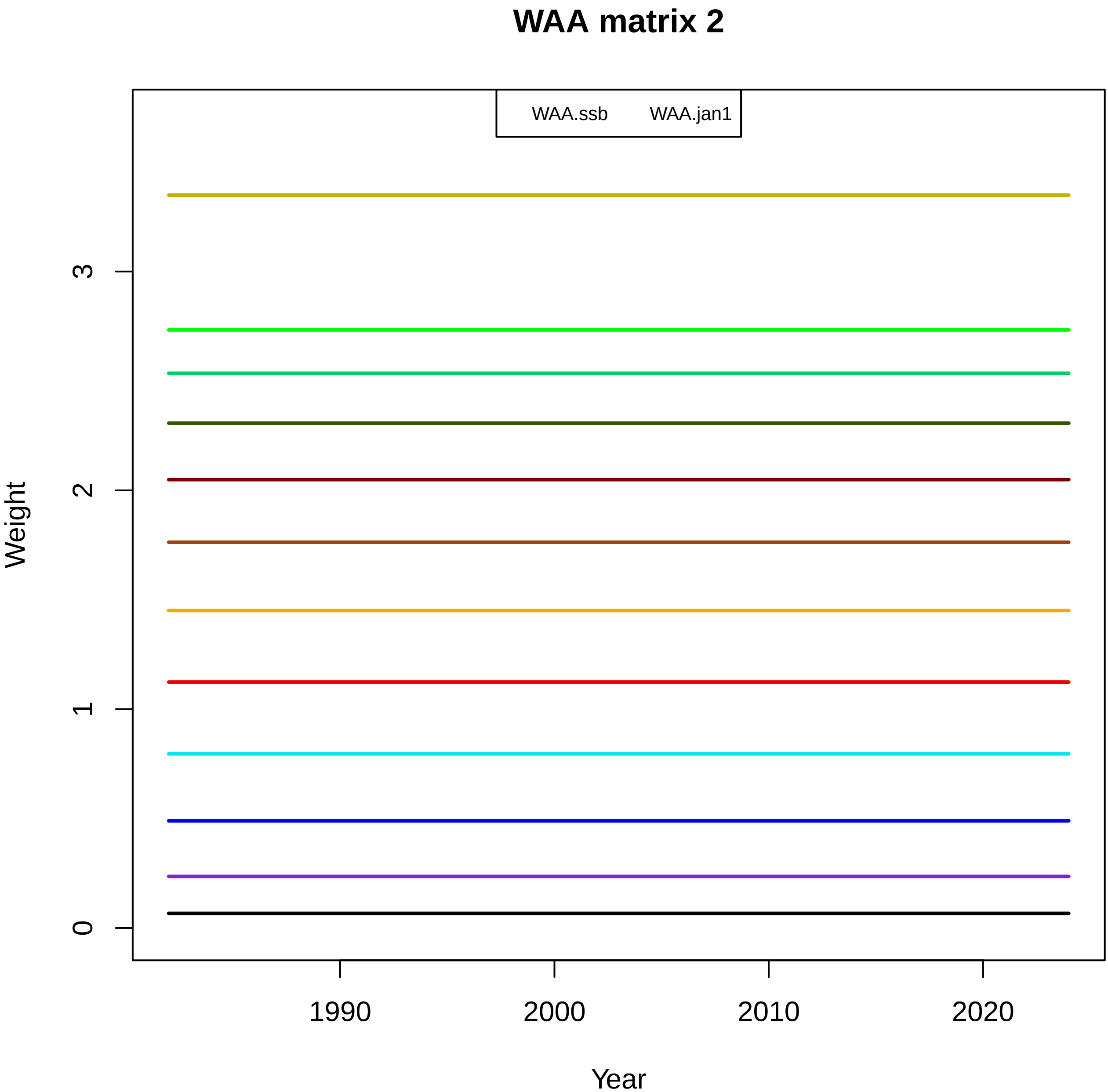
Age Comps for Index 1 (MA Trawl)
0.05
0.2
0.4
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
1
2
3
4
5
6
7
8
9
10
11
12
Age

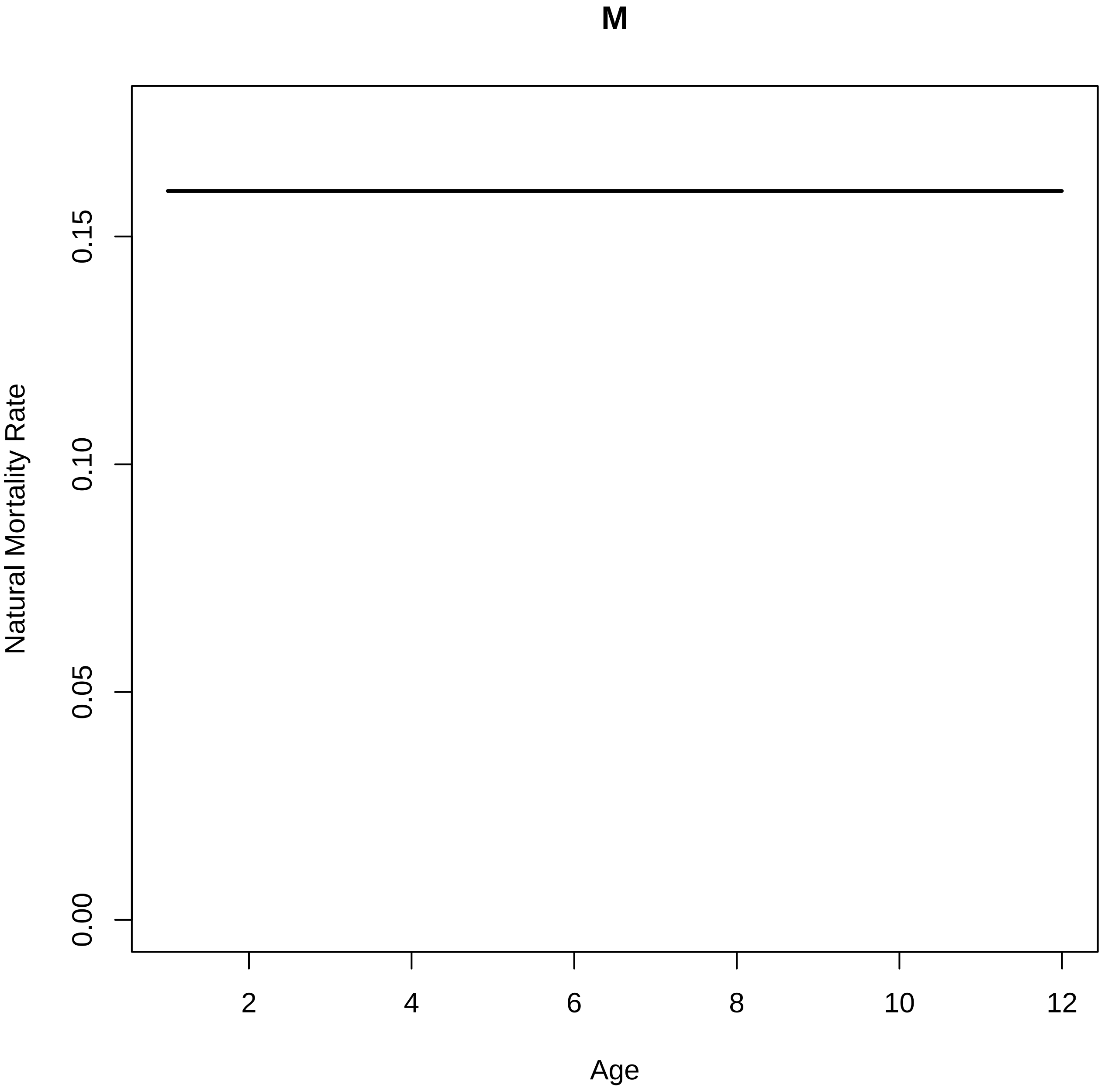


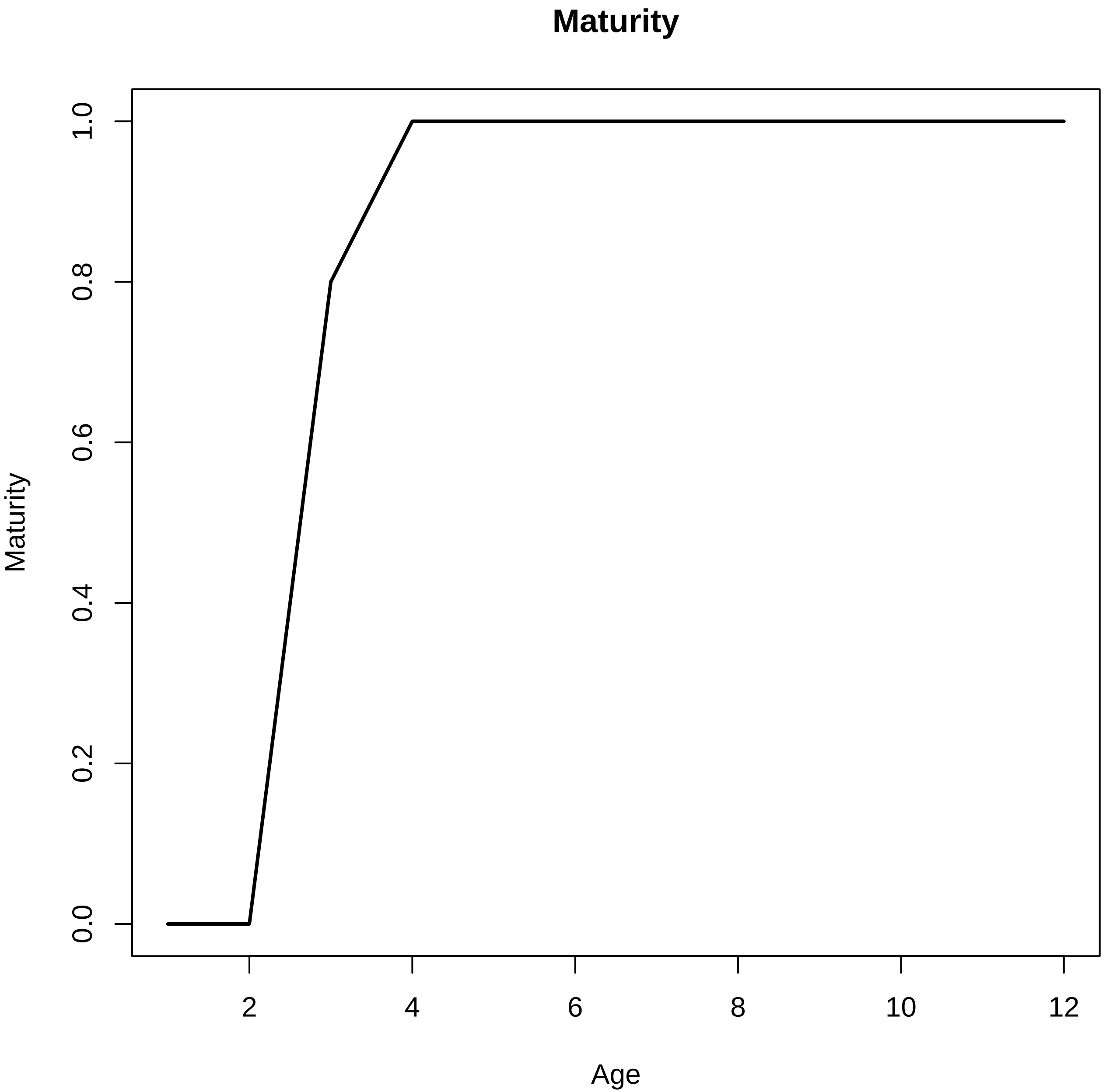
Age Comps for Index 2 (RI Fall Trawl)
0.05
0.2
0.4
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
1
2
3
4
5
6
7
8
9
10
11
12
Age


Age Comps for Index 4 (MRIP CPUE)
0.05
0.2
0.4
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
1
2
3
4
5
6
7
8
9
10
11
12
Age


WAA matrix 1
WAA.catch.fleet1
WAA.discard.fleet1
WAA.catch.all
WAA.discard.all
Weight
Year
0
1
2
3
4
5
1990
2000
2010
2020


WAA matrix 2
WAA.ssb
WAA.jan1
Weight
0
1
2
3
1990
2000
2010
2020
Year


M
Natural Mortality Rate
0.00
0.05
0.10
0.15
2
4
6
8
10
12
Age


Maturity
1.0
0.8
0.6
0.4
0.2
0.0
Maturity
2
4
6
8
10
12
Age

MARI Appendix 2: Retrospective Adjustment and Sensitivity Runs

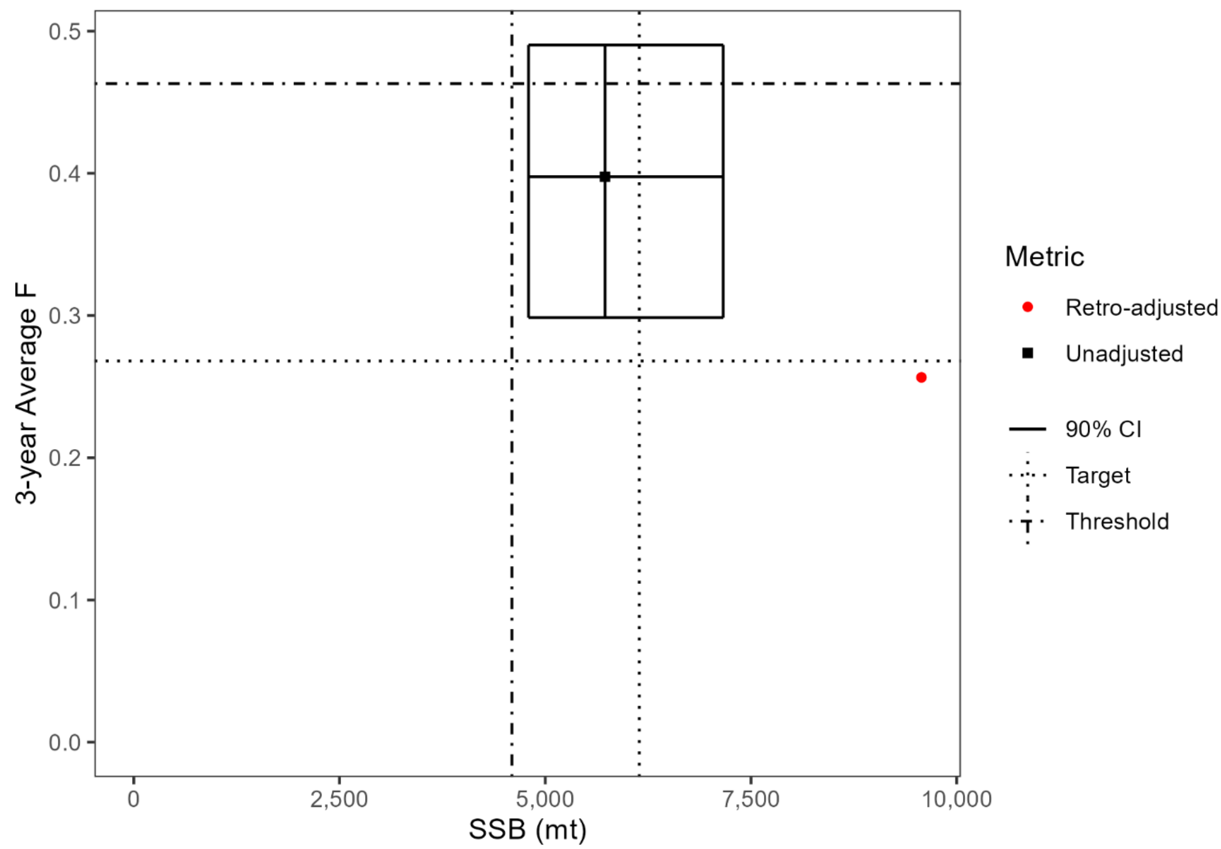


Figure A2.1. Comparison of retrospective adjusted status in 2025 with the base model status. Solid black lines indicate the 90% confidence intervals of the estimates of SSB and F.

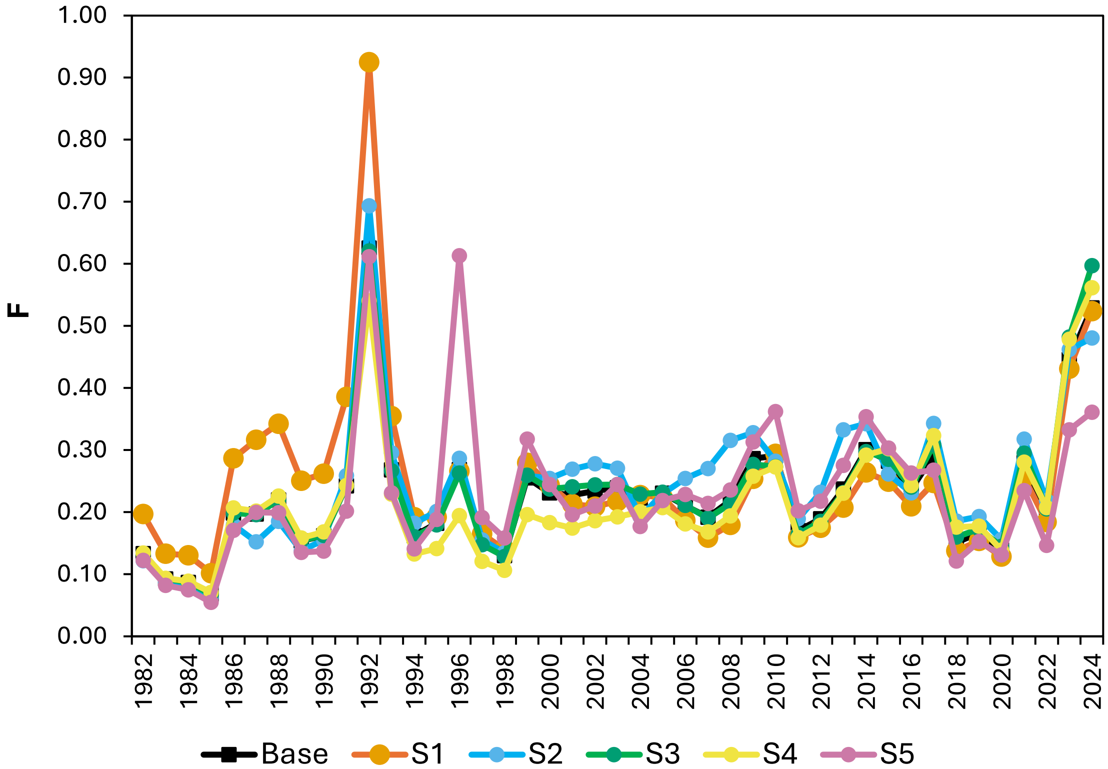


Figure A2.2. Estimates of annual F for sensitivity runs of the ASAP model.

<u>Sensitivity Analysis</u>

Run 1: Exclude MA trawl survey

Run 2: Exclude RI trawl survey

Run 3: Exclude RI seine survey

Run 4: Exclude MRIP index

Run 5: Survey CVs unadjusted for optimizing diagnostic RMSE error

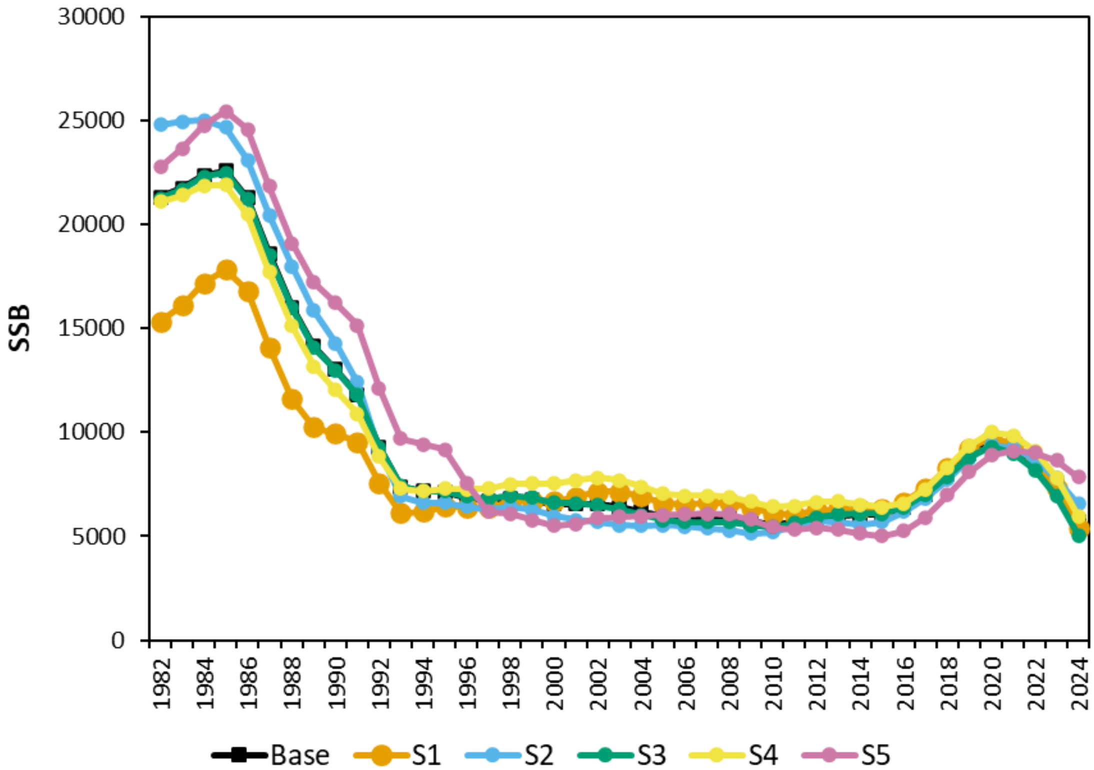


Figure A2.3. Estimates of annual SSB for sensitivity runs of the ASAP model.

<u>Sensitivity Analysis</u>

Run 1: Exclude MA trawl survey

Run 2: Exclude RI trawl survey

Run 3: Exclude RI seine survey

Run 4: Exclude MRIP index

Run 5: Survey CVs unadjusted for optimizing diagnostic RMSE error

LIS Appendix 1: ASAP Input, Diagnostic, and Results Plots for the Base Run

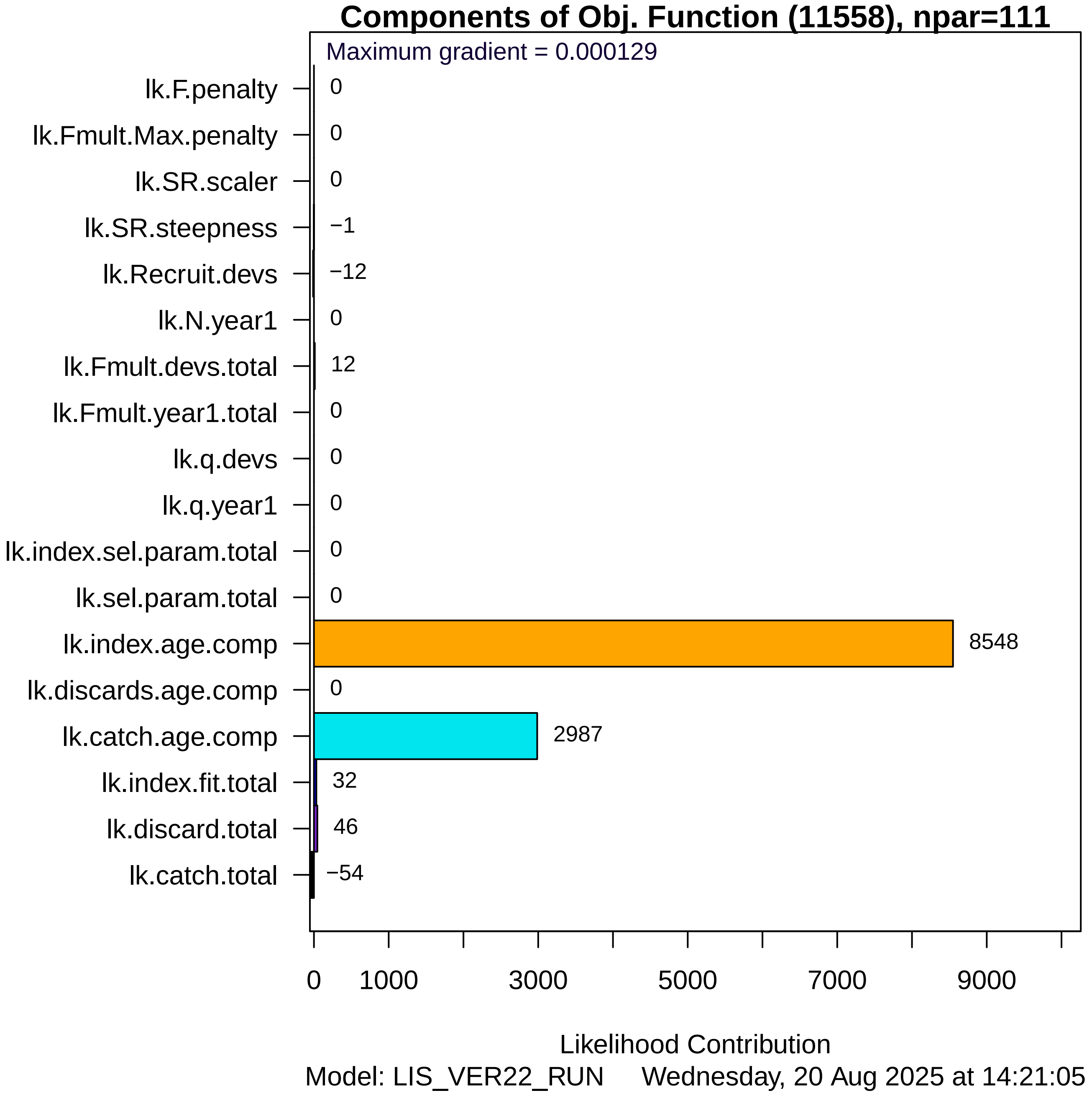
File = LIS_VER22_RUN.dat

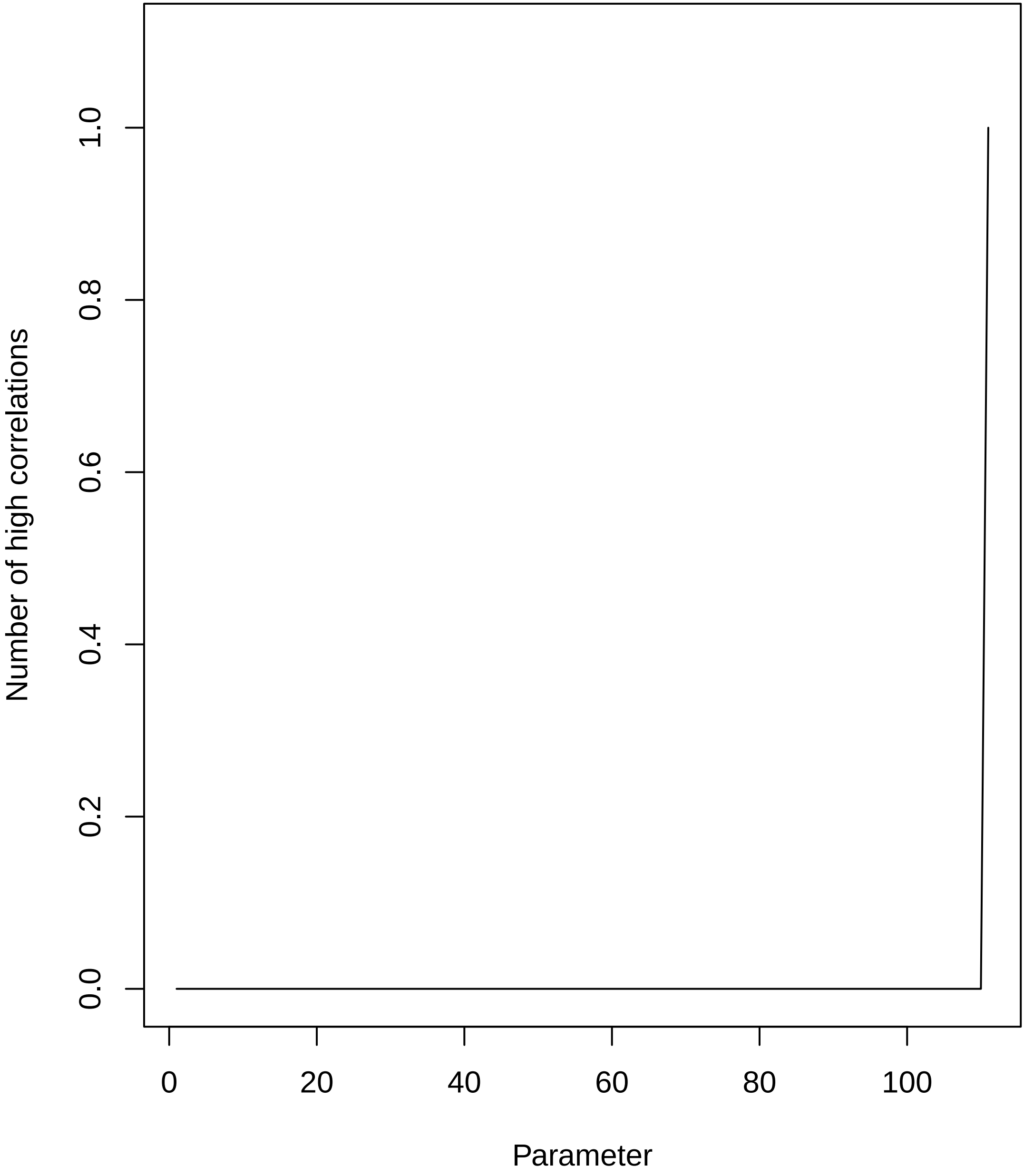
ASAP3 run on Wednesday, 20 Aug 2025 at 14:21:05

dir = Final_run_ver22\VER22_run

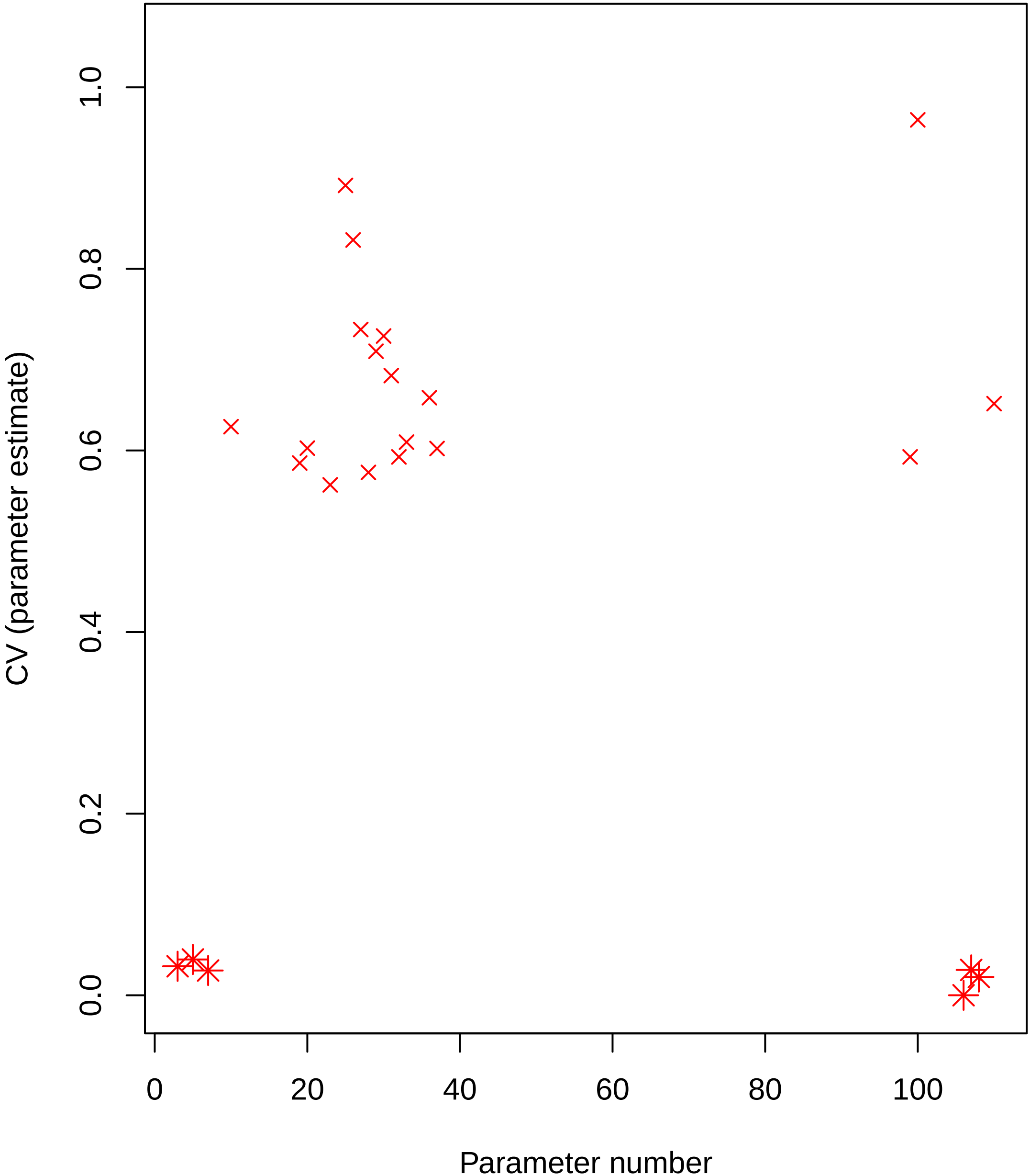
ASAPplots version = 0.2.18

npar = 111, maximum gradient = 0.000128619


Components of Obj. Function (11558), npar=111
Maximum gradient = 0.000129
lk.F.penalty
lk.Fmult.Max.penalty
lk.SR.scaler
lk.SR.steepness
lk.Recruit.devs
lk.N.year1
lk.Fmult.devs.total
lk.Fmult.year1.total
lk.q.devs
lk.q.year1
lk.index.sel.param.total
lk.sel.param.total
lk.index.age.comp
lk.discards.age.comp
lk.catch.age.comp
lk.index.fit.total
lk.discard.total
lk.catch.total
0
0
0
−1
−12
0
12
0
0
0
0
0
8548
0
2987
32
46
−54
0
1000
3000
5000
7000
9000
Likelihood Contribution
Model: LIS_VER22_RUN Wednesday, 20 Aug 2025 at 14:21:05

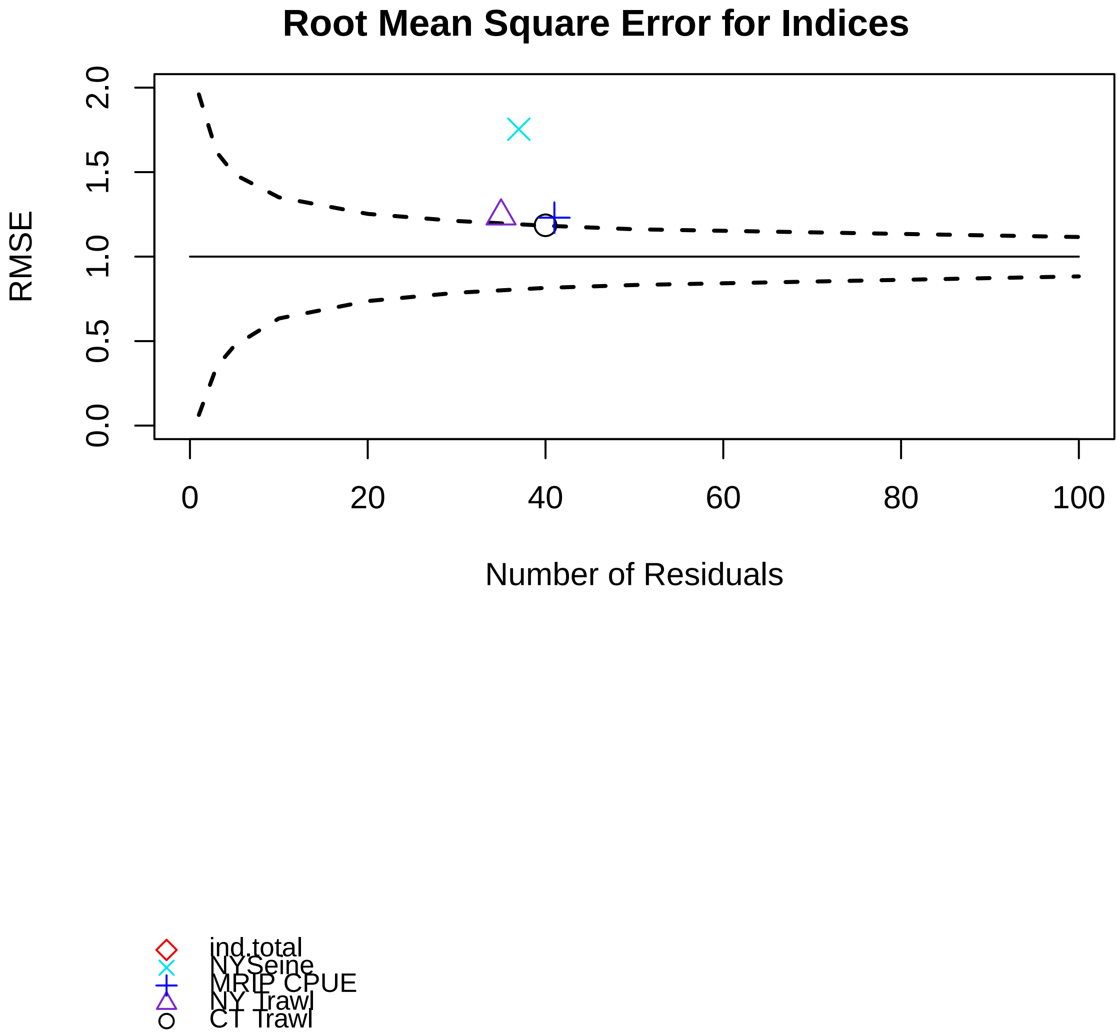


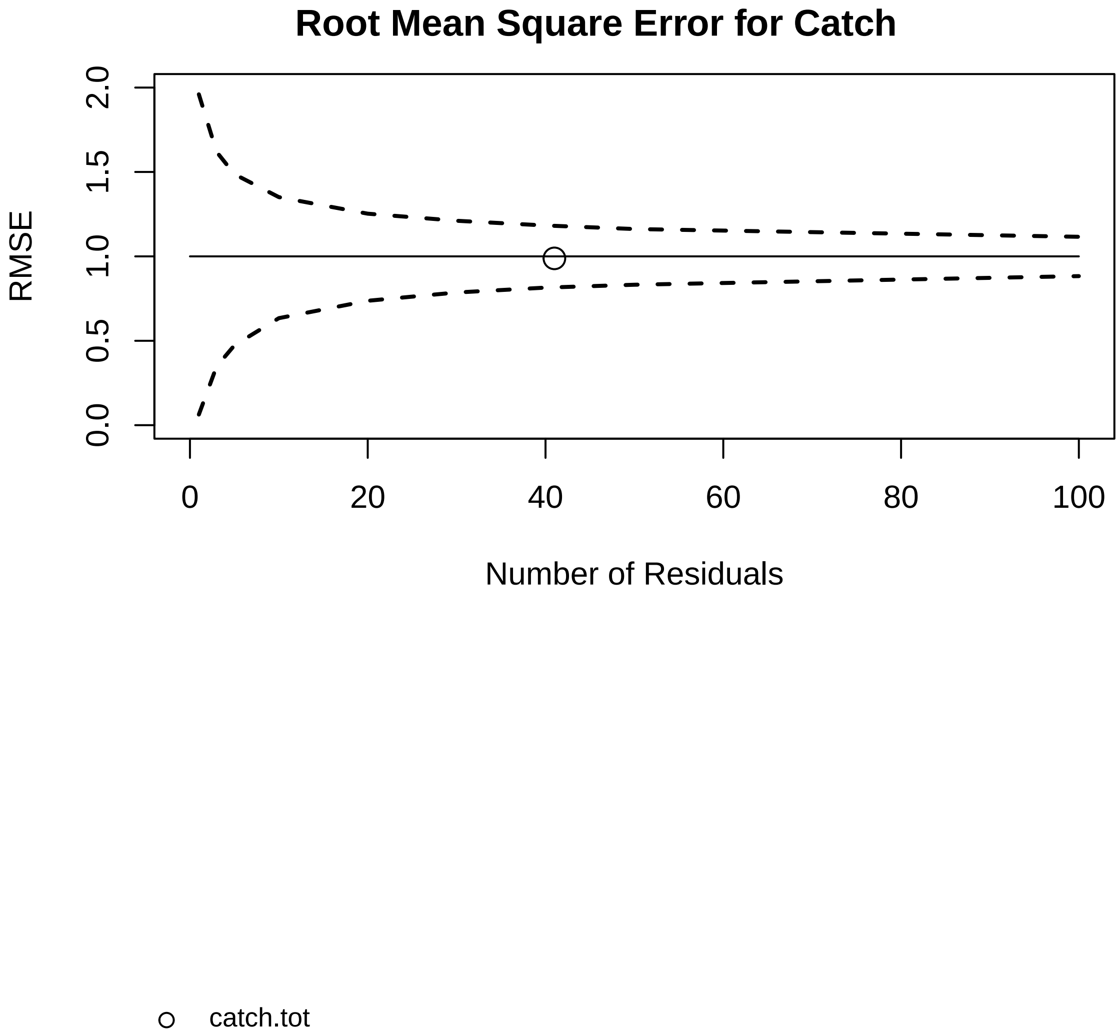
Number of high correlations
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Parameter


CV (parameter estimate)
1.0
0.8
0.6
0.4
0.2
0.0
0
20
40
60
80
100
Parameter number

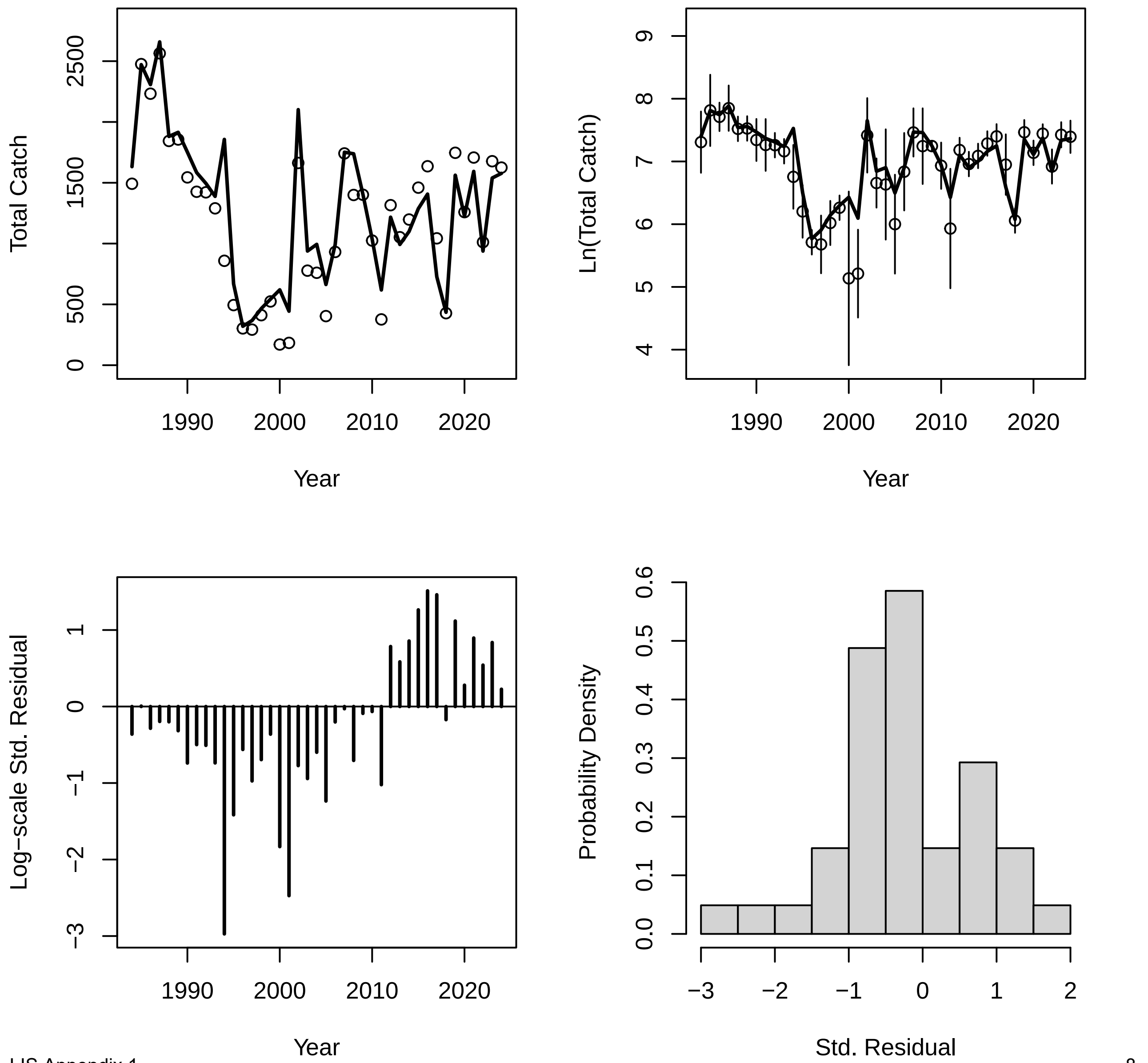
Root Mean Square Error computed from Standardized Residuals

Component	# resids	RMSE
catch.tot	41	0.988
discard.tot	0	0
ind01	40	1.19
ind02	35	1.24
ind03	41	1.23
ind04	37	1.75
ind.total	153	1.37
N.year1	0	0
Fmult.year1	0	0
Fmult.devs.total	40	1.09
recruit.devs	41	0.599
fleet.sel.params	0	0
index.sel.params	0	0
q.year1	0	0
q.devs	0	0
SR.steepness	1	0.0494
SR.scaler	0	0

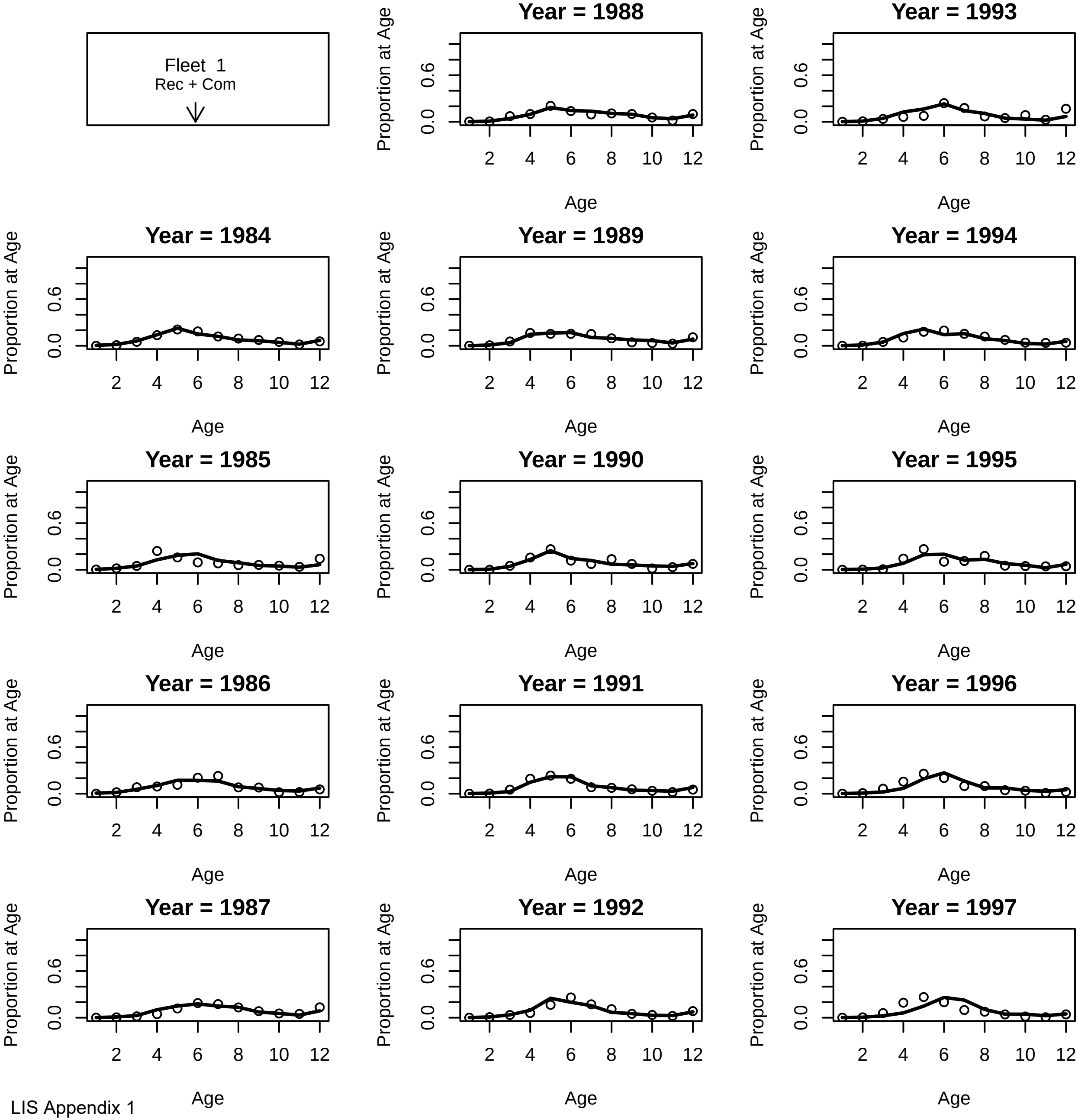

Root Mean Square Error for Indices
RMSE
0.0
0.5
1.0
1.5
2.0
0
20
40
60
80
100
Number of Residuals
ind.total
NYSeine
MRIP CPUE
NY Trawl
CT Trawl

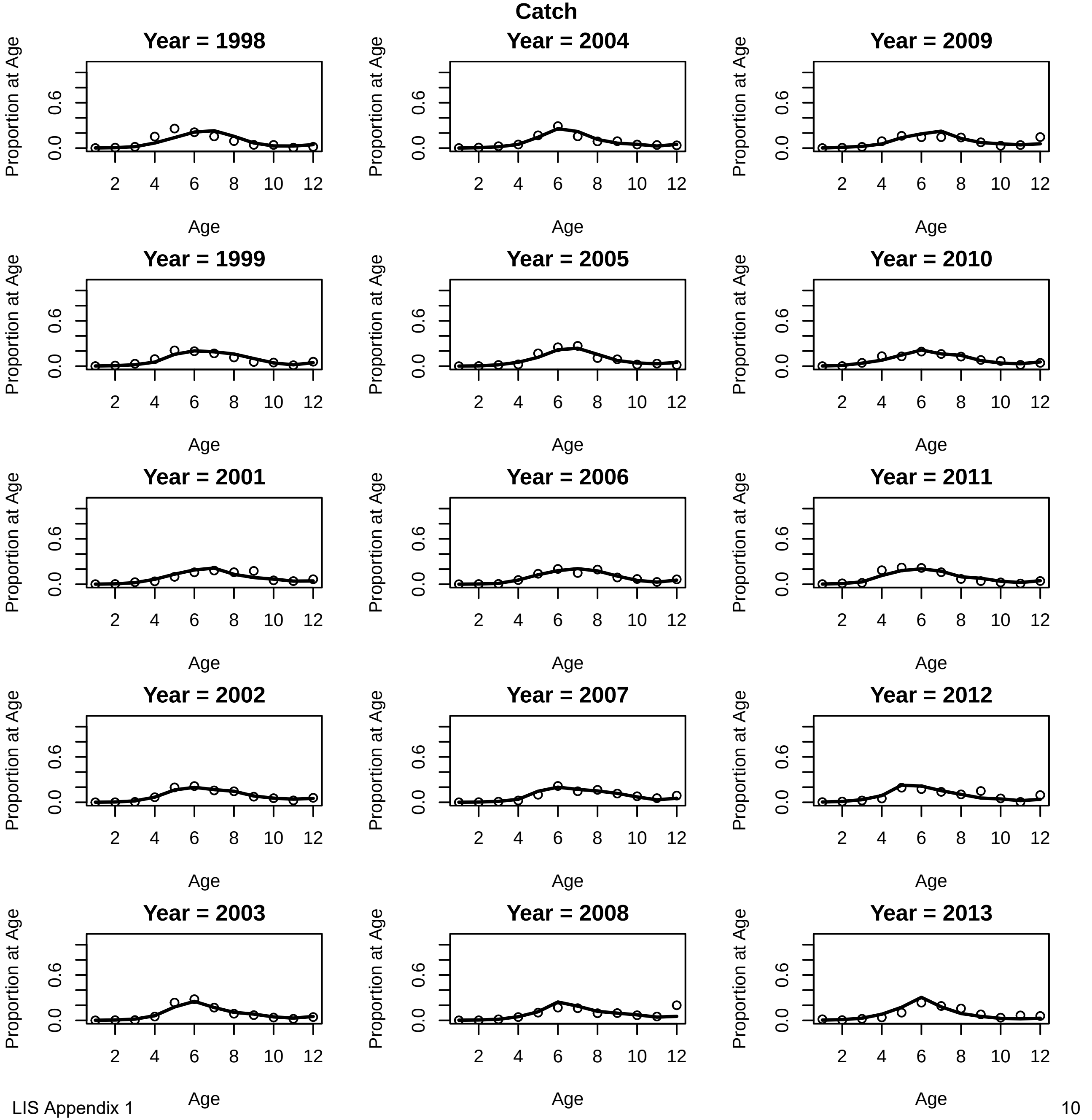

Root Mean Square Error for Catch
RMSE
0.0
0.5
1.0
1.5
2.0
0
20
40
60
80
100
Number of Residuals
catch.tot

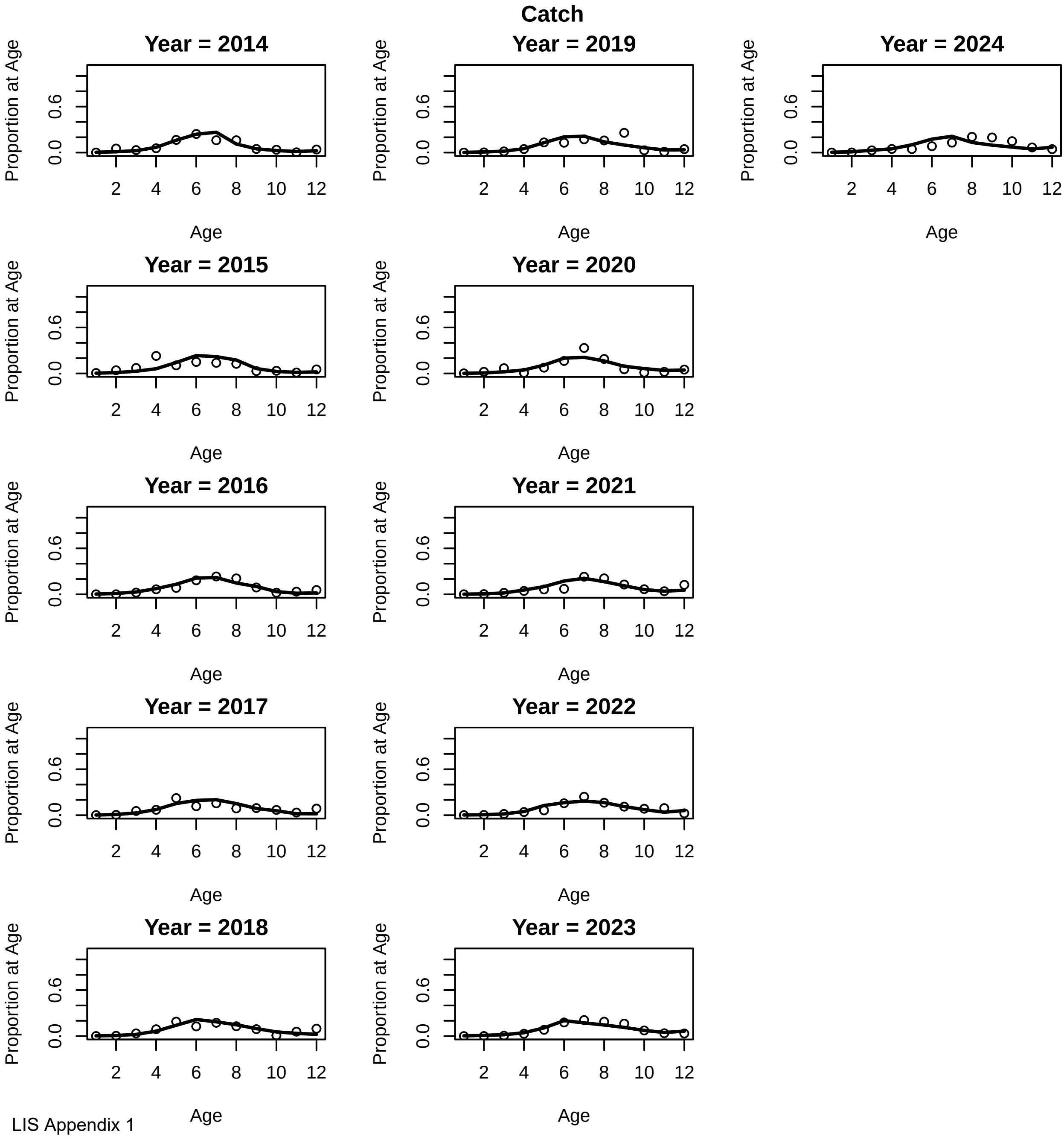
Fleet 1 Catch (Rec + Com)

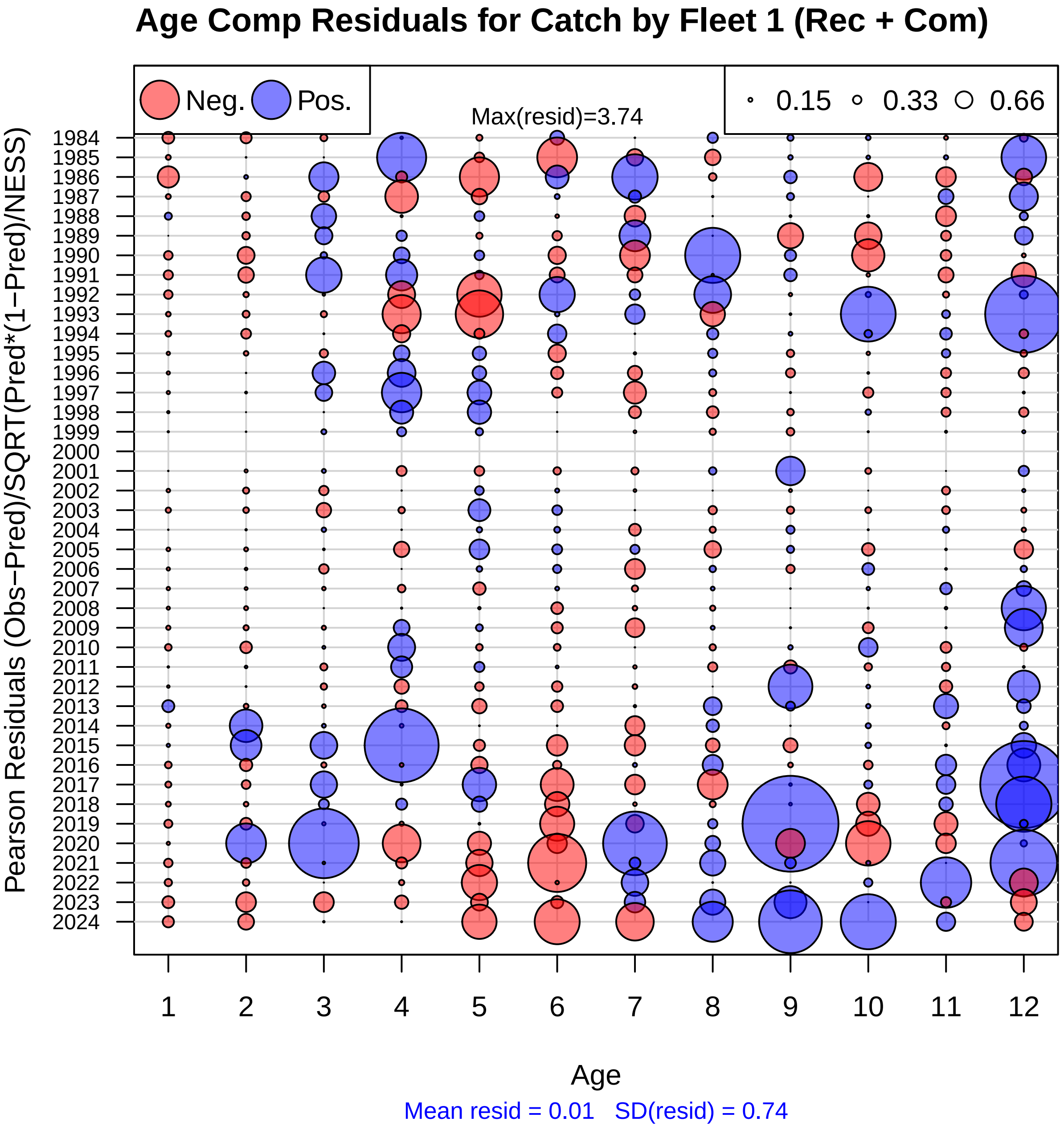


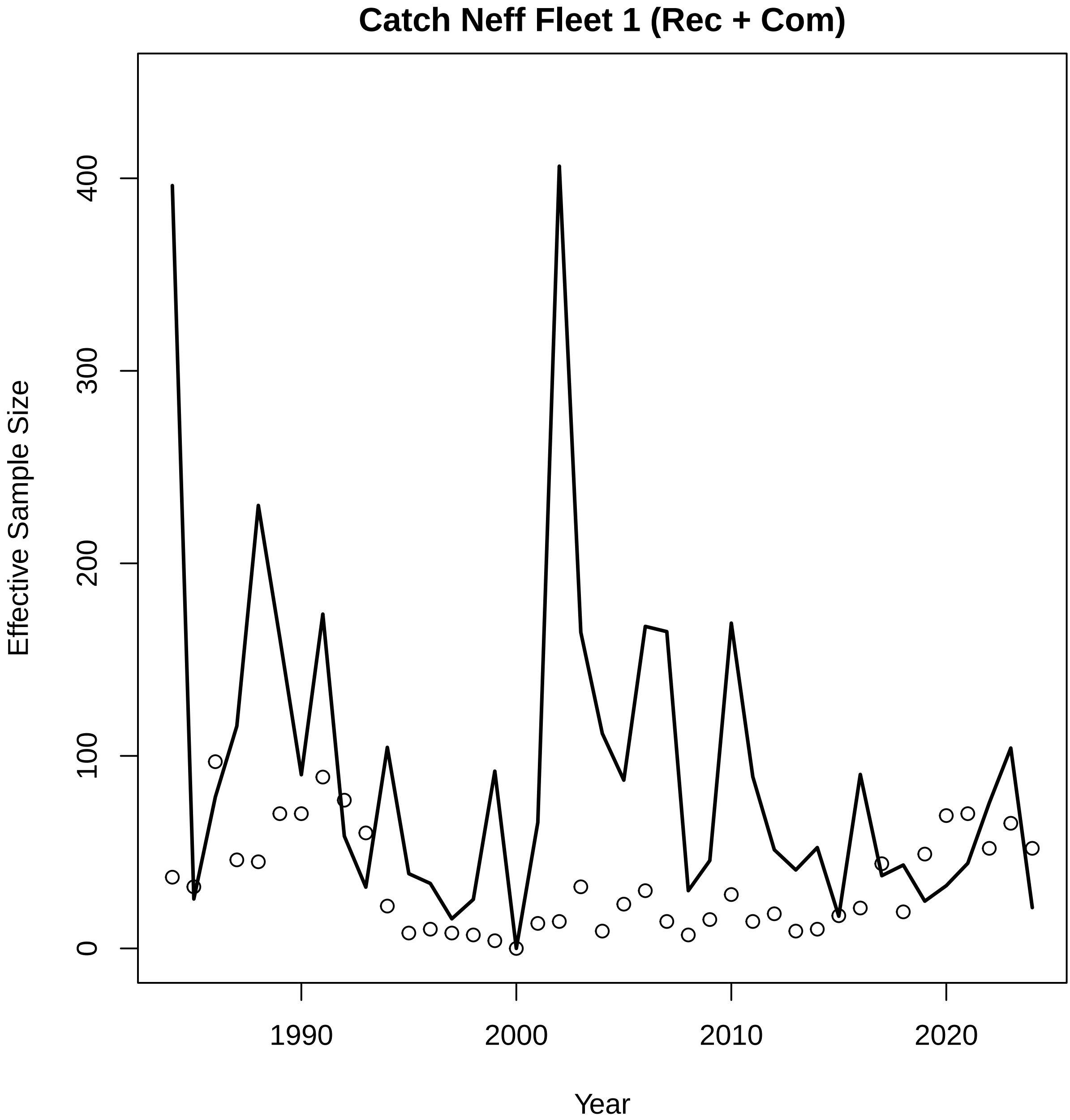
Catch


Fleet 1
Rec + Com
Year = 1984
Year = 1985
Year = 1986
Year = 1987
Year = 1988
Year = 1989
Year = 1990
Year = 1991
Year = 1992
Year = 1993
Year = 1994
Year = 1995
Year = 1996
Year = 1997
Proportion at Age
0.0
0.6
Age
2
4
6
8
10
12

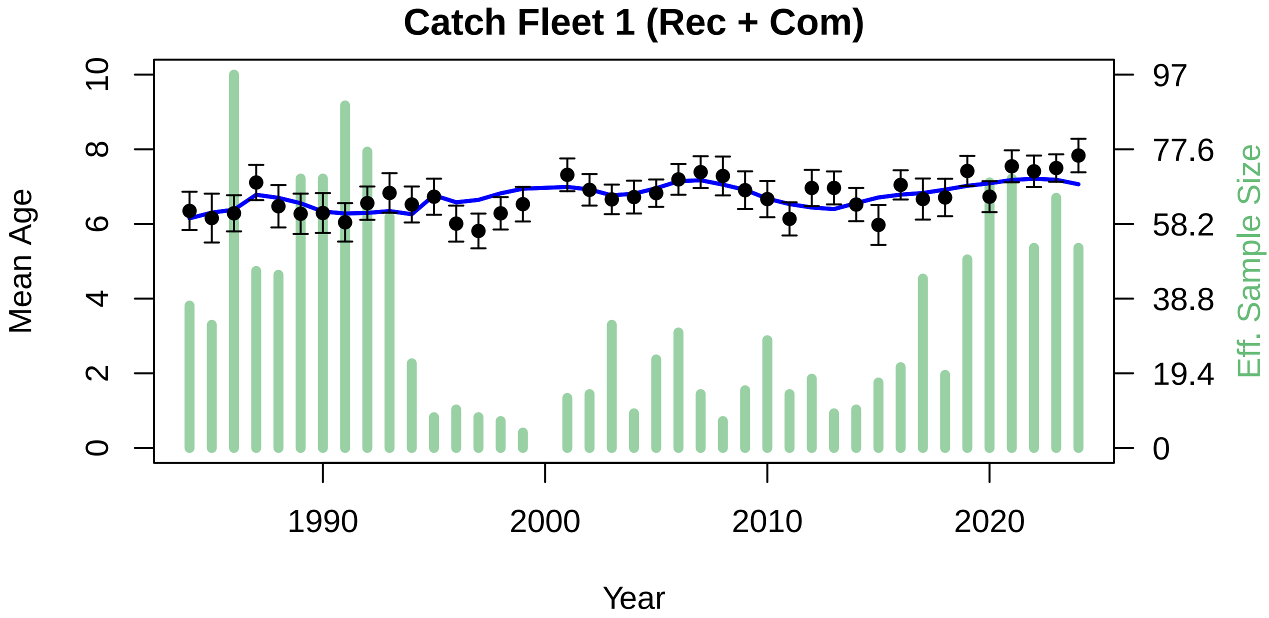

Catch
Year = 1998
Year = 2004
Year = 2009
Year = 1999
Year = 2005
Year = 2010
Year = 2001
Year = 2006
Year = 2011
Year = 2002
Year = 2007
Year = 2012
Year = 2003
Year = 2008
Year = 2013
Proportion at Age
0.0
0.6
2
4
6
8
10
12
Age


Catch
Year = 2014
Year = 2019
Year = 2024
Year = 2015
Year = 2020
Year = 2016
Year = 2021
Year = 2017
Year = 2022
Year = 2018
Year = 2023
Proportion at Age
0.0
0.6
Age
2
4
6
8
10
12

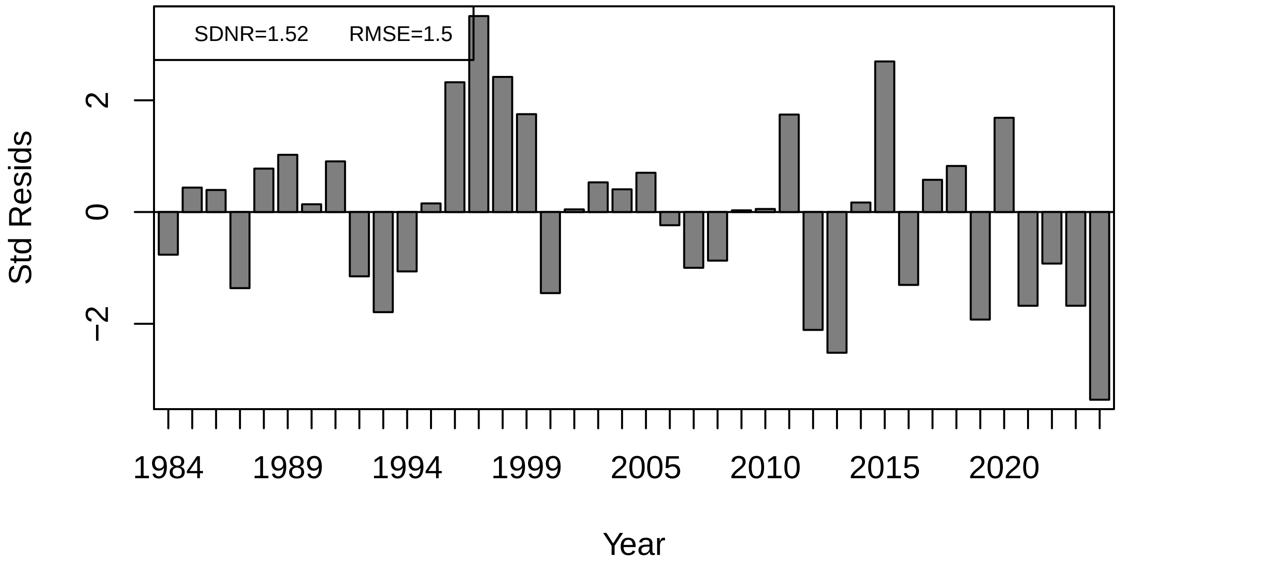

Age Comp Residuals for Catch by Fleet 1 (Rec + Com)
Neg.
Pos.
0.15
0.33
0.66
Max(resid)=3.74
Pearson Residuals (Obs−Pred)/SQRT(Pred*(1−Pred)/NESS)
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
1
2
3
4
5
6
7
8
9
10
11
12
Age
Mean resid = 0.01 SD(resid) = 0.74



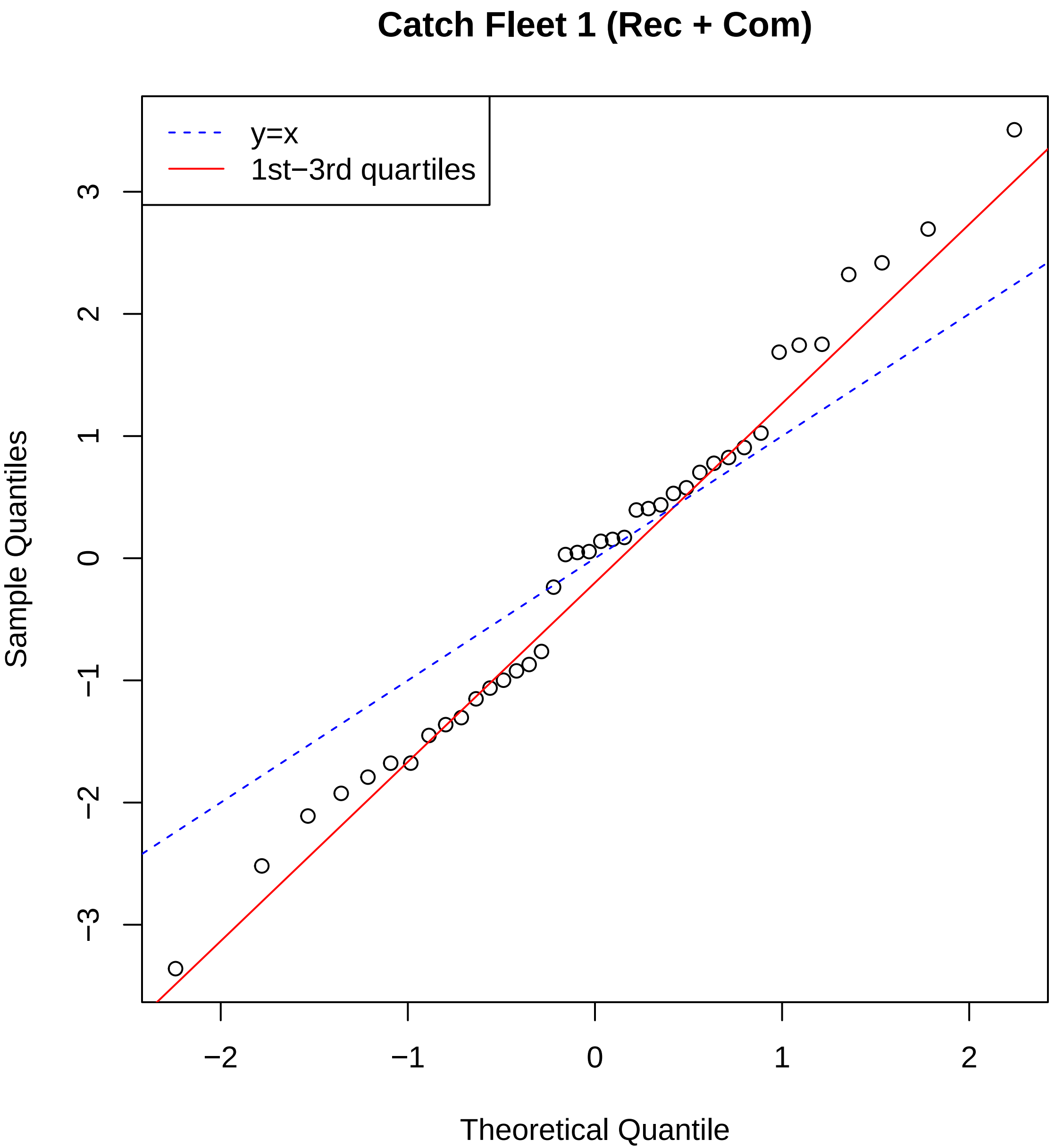
Catch Neff Fleet 1 (Rec + Com)
Effective Sample Size
0
100
200
300
400
1990
2000
2010
2020
Year



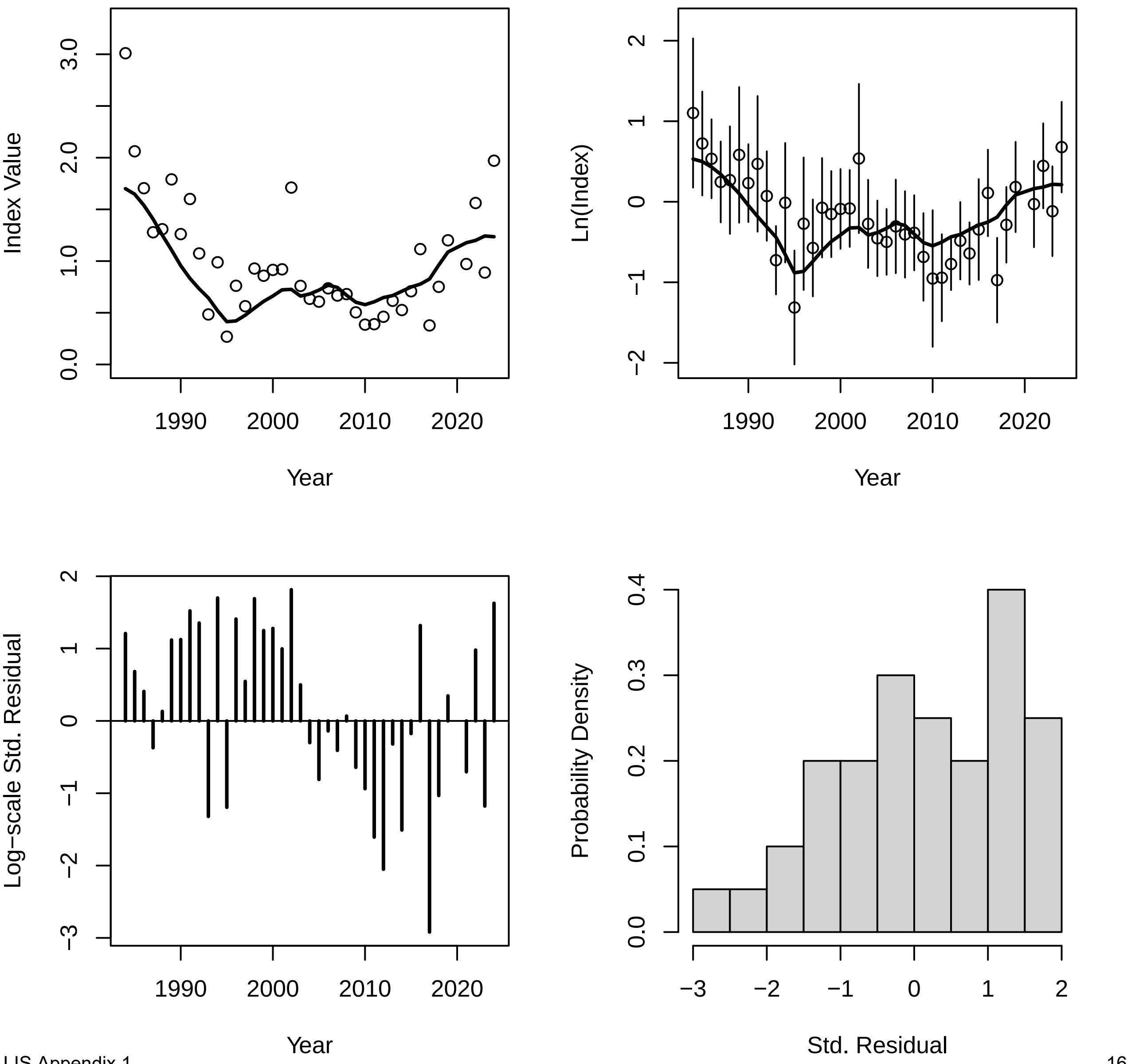
Catch Fleet 1 (Rec + Com)
Mean Age
0
2
4
6
8
10
97
77.6
58.2
38.8
19.4
0
Eff. Sample Size
1990
2000
2010
2020
Year



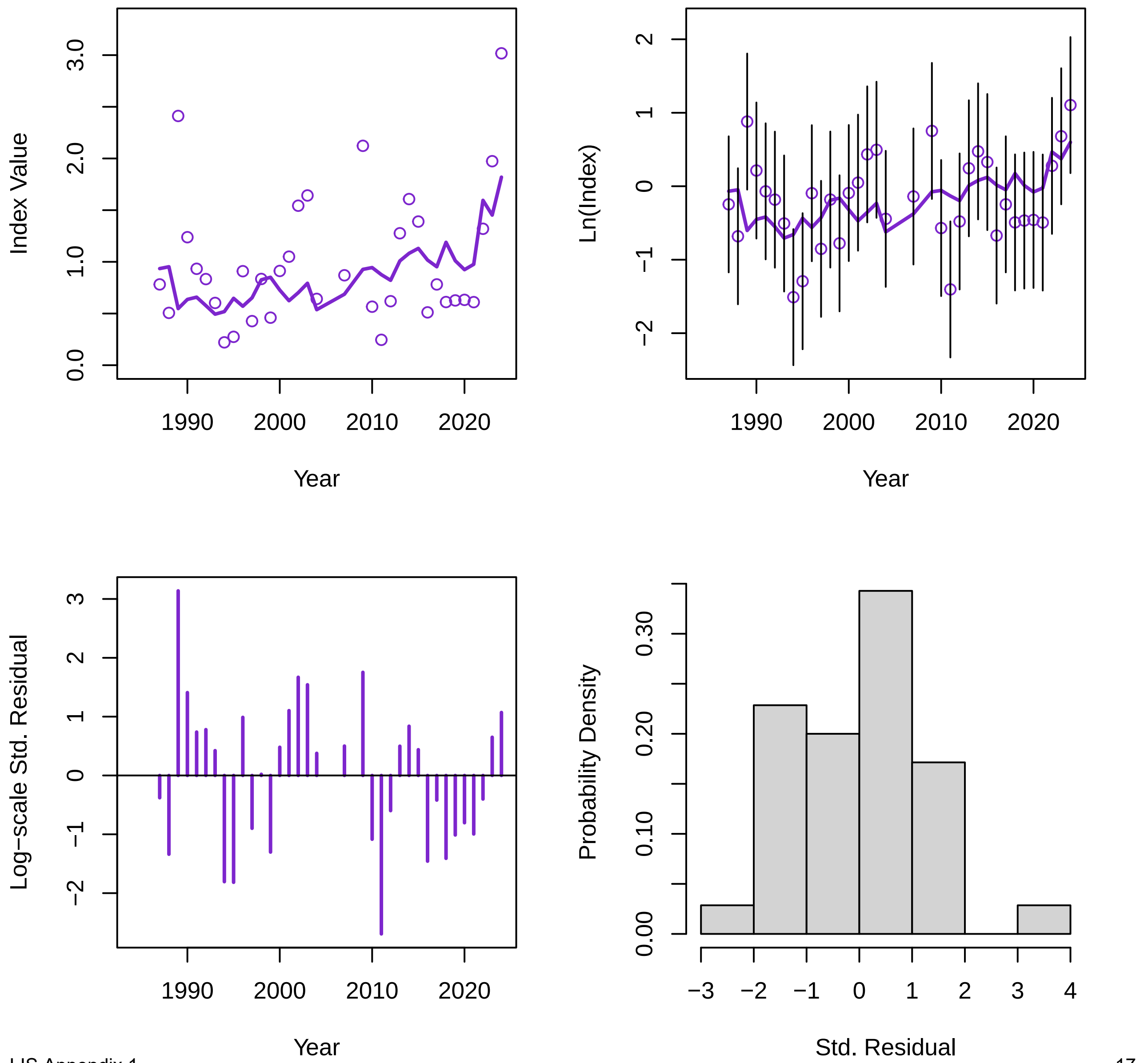
SDNR=1.52
RMSE=1.5
Std Resids
−2
0
2
1984
1989
1994
1999
2005
2010
2015
2020
Year


Catch Fleet 1 (Rec + Com)
y=x
1st−3rd quartiles
Sample Quantiles
Theoretical Quantile
−3
−2
−1
0
1
2
3
−2
−1
0
1
2

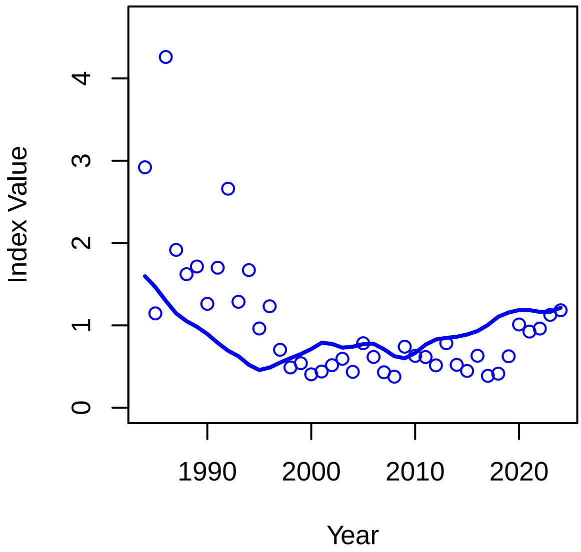
Index 1 (CT Trawl)

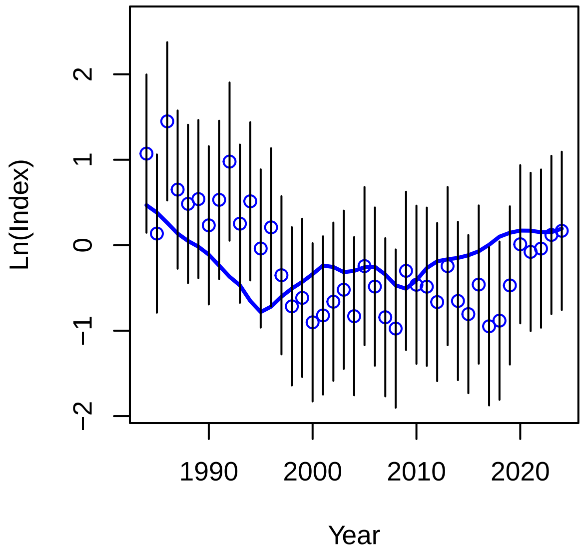


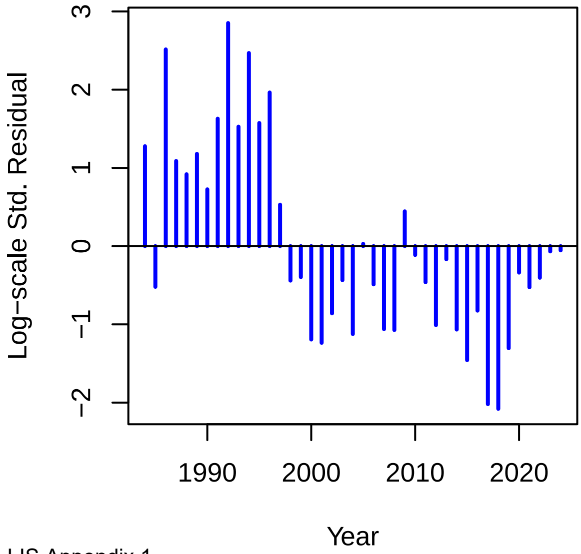
Index 2 (NY Trawl)

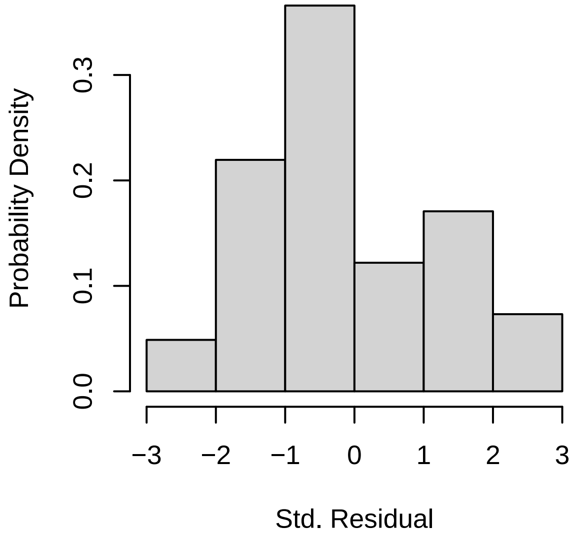


Index 3 (MRIP CPUE)

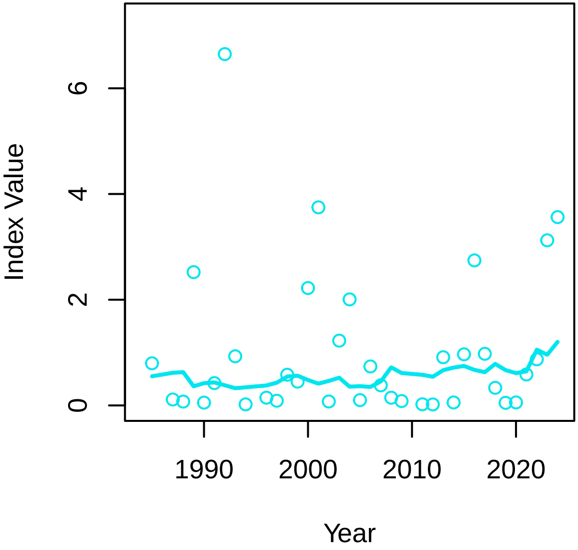


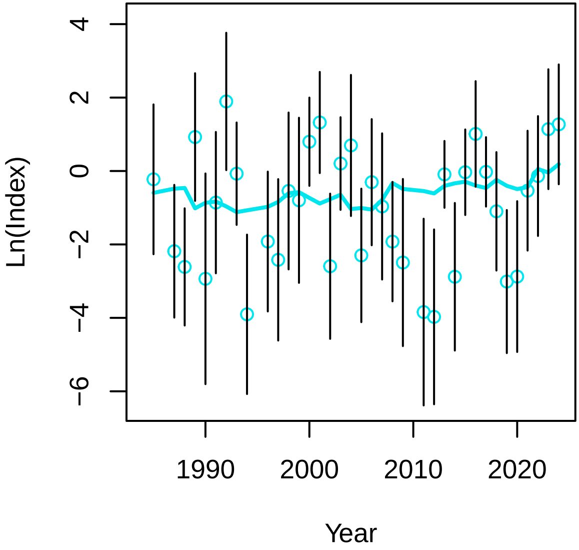


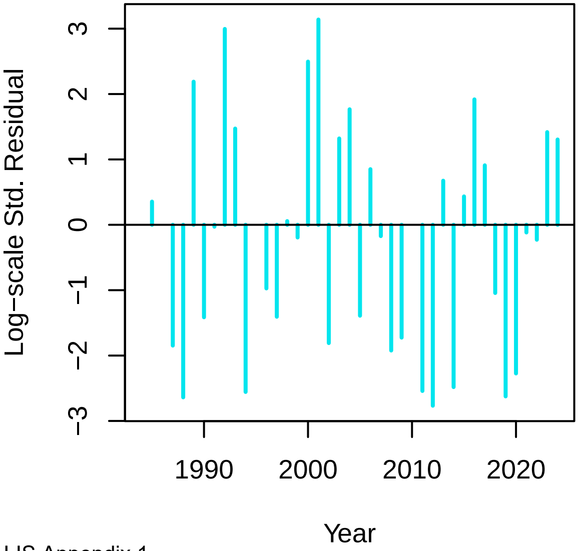


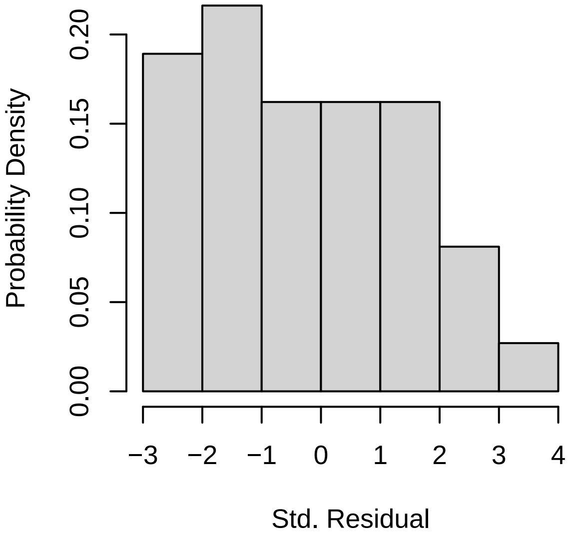


Index 4 (NYSeine)

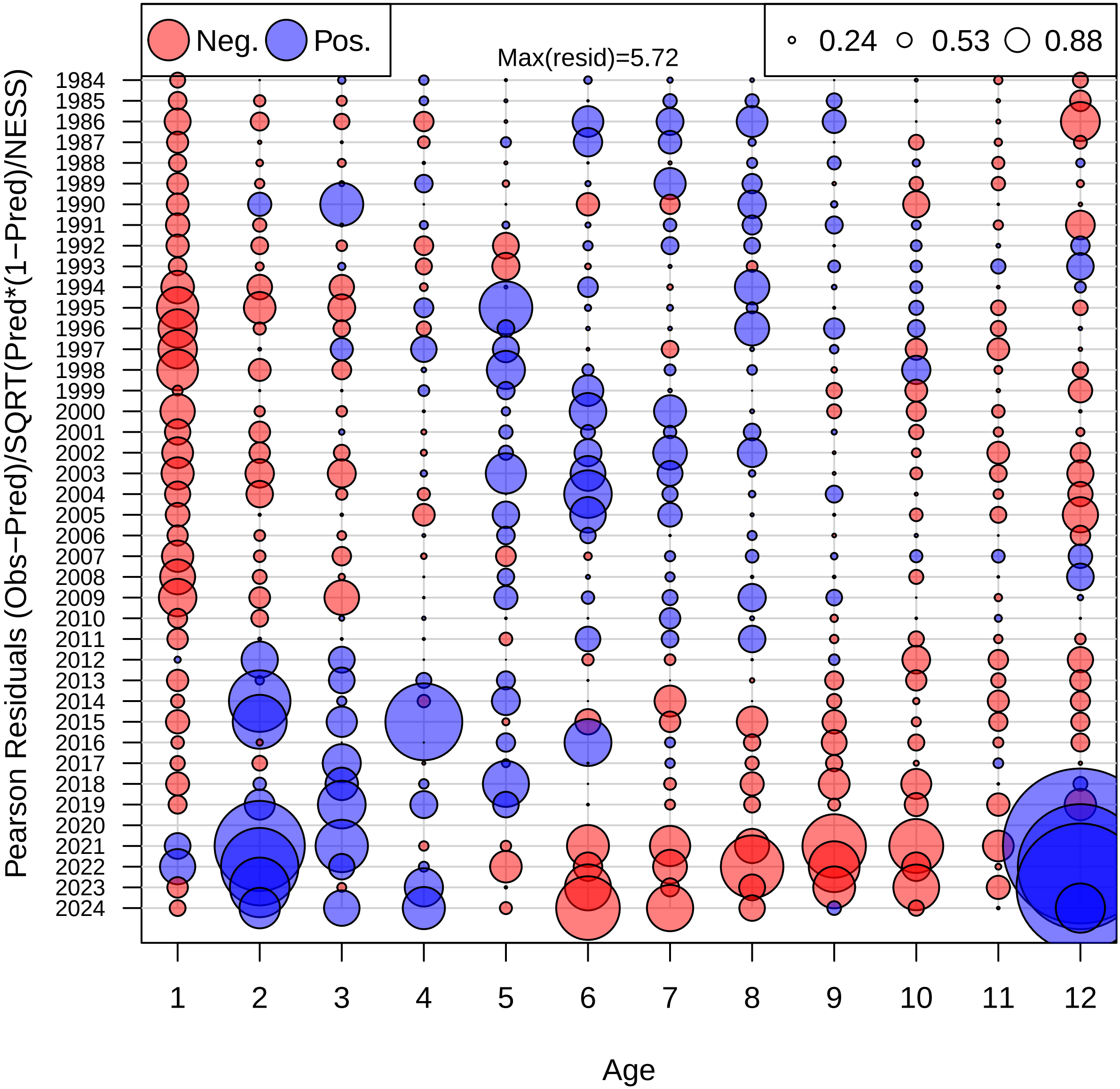




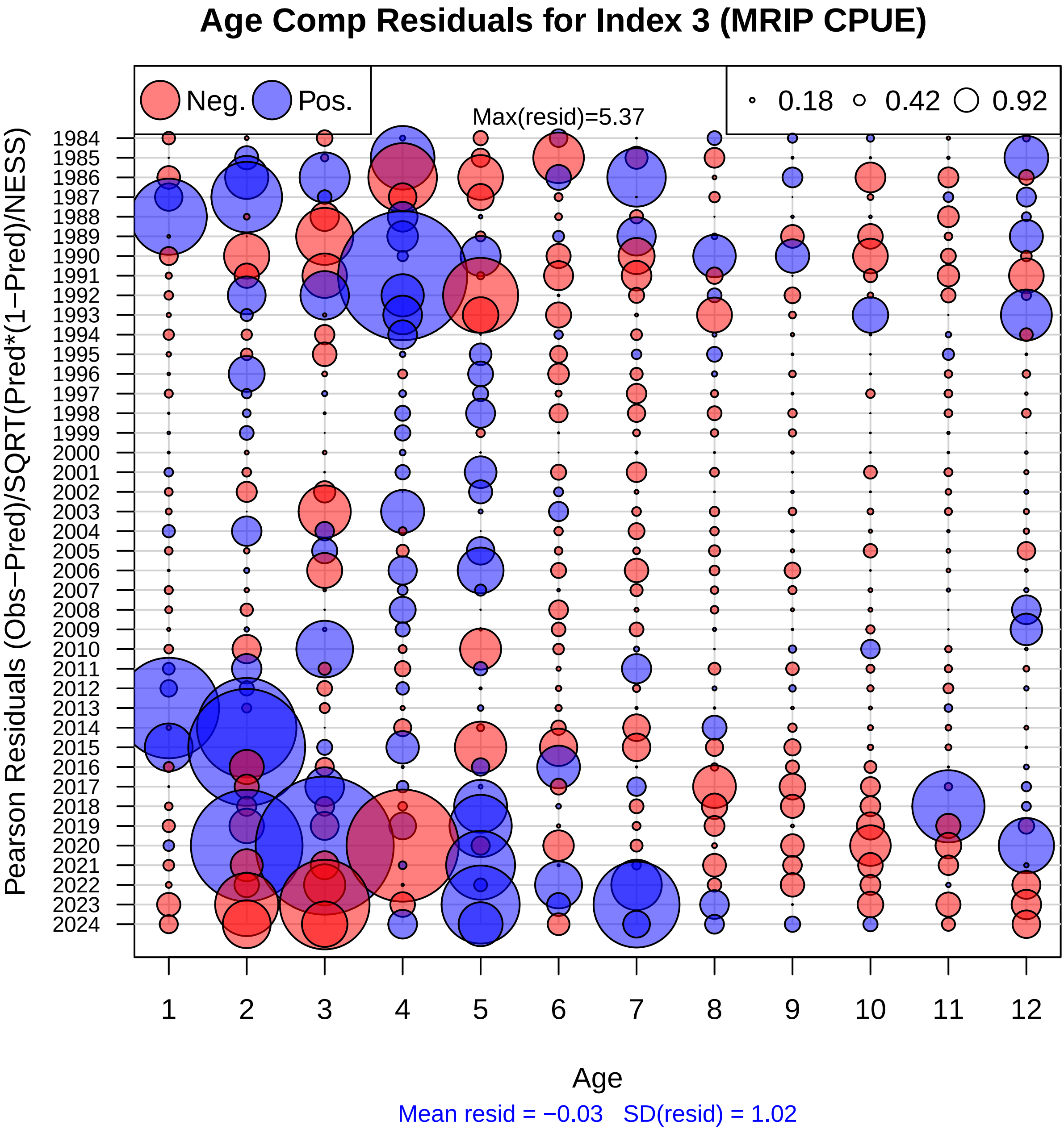




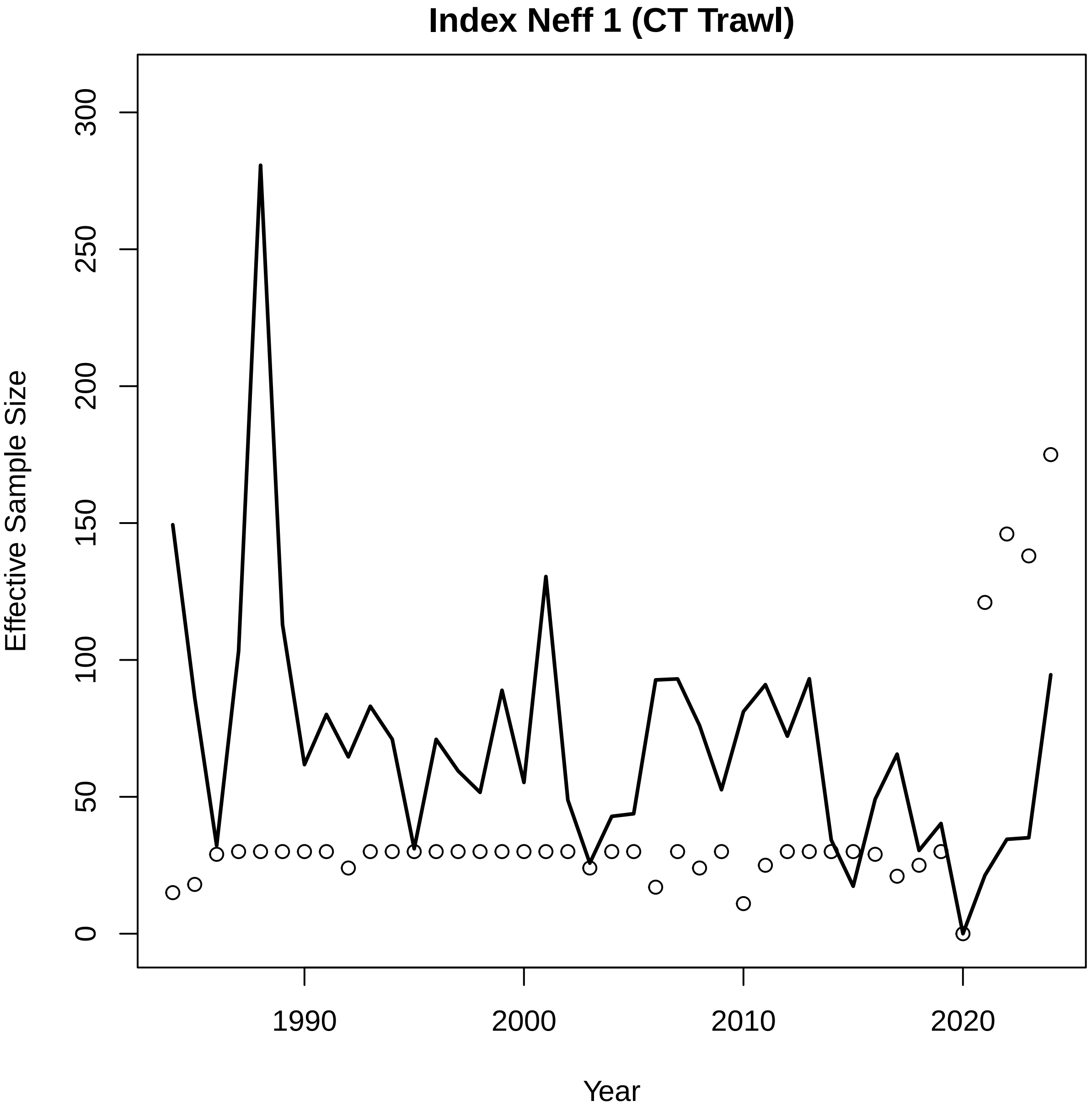
Age Comp Residuals for Index 1 (CT Trawl)

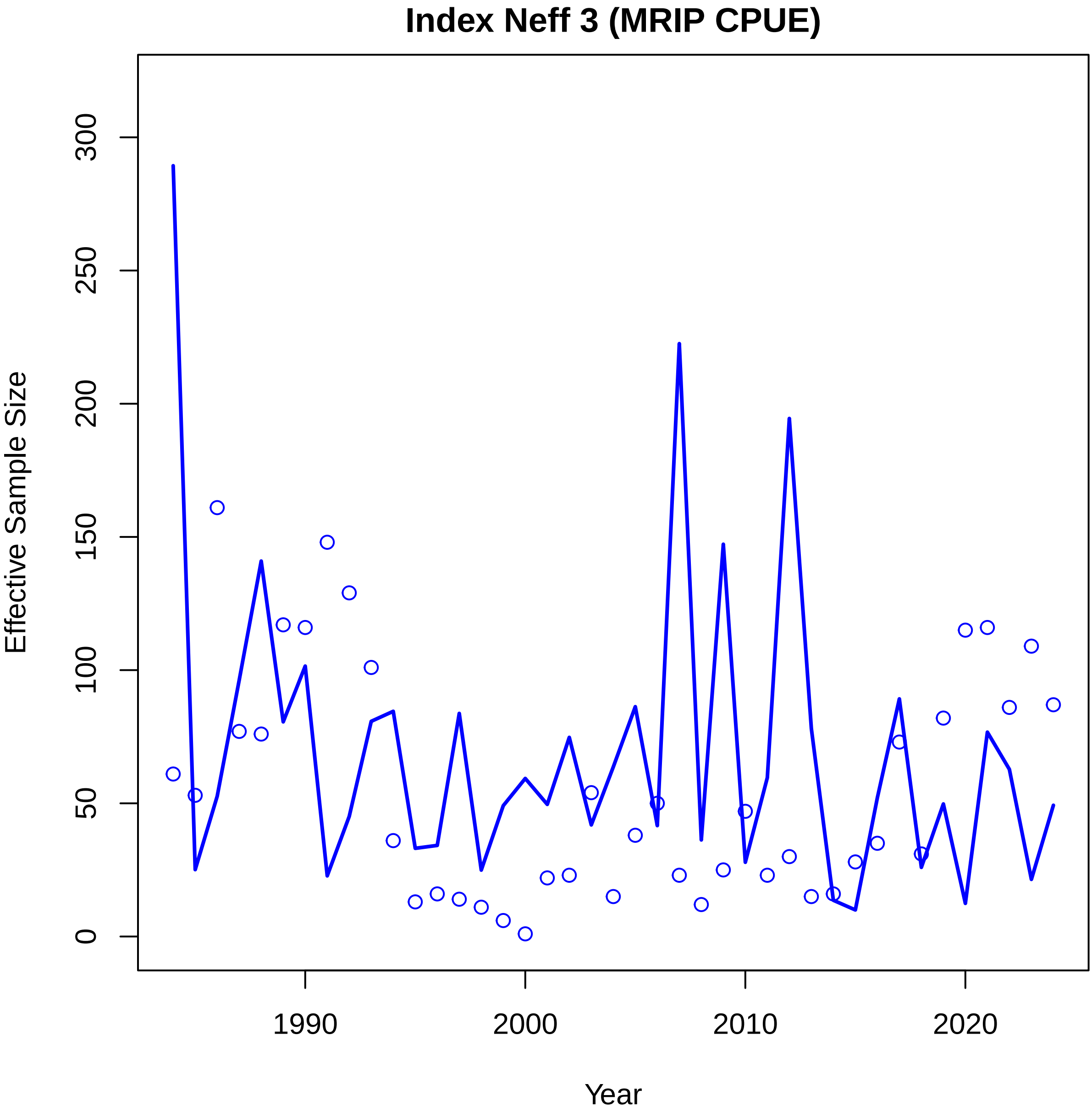


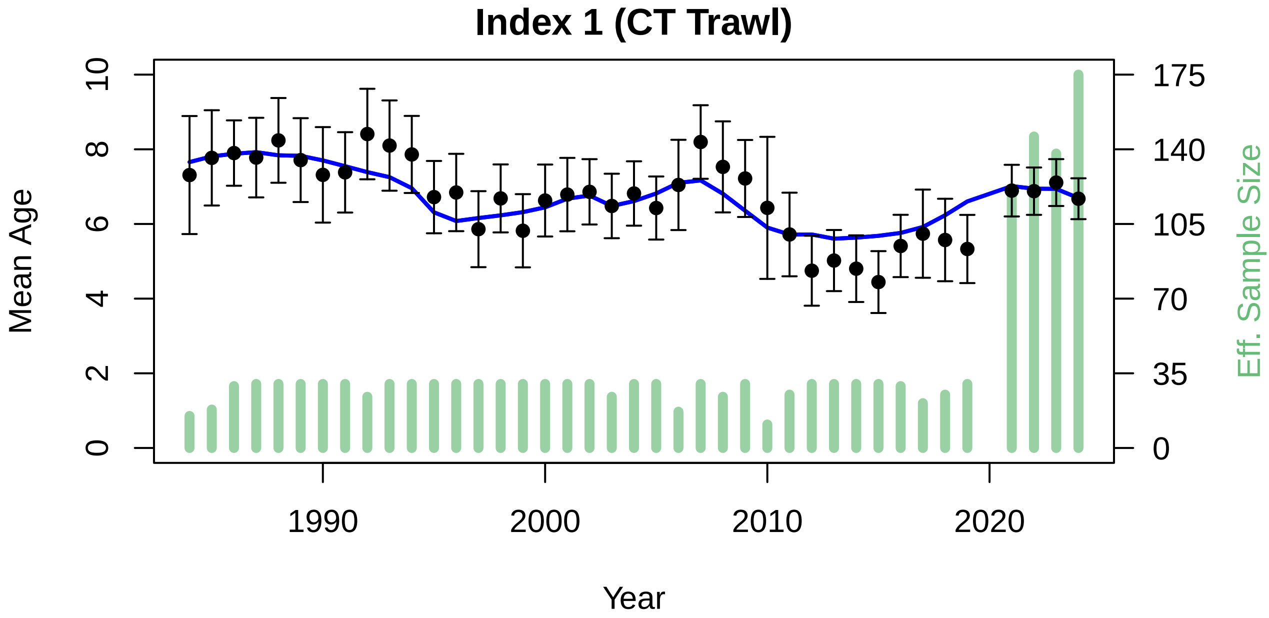
Mean resid = −0.03   SD(resid) = 0.89



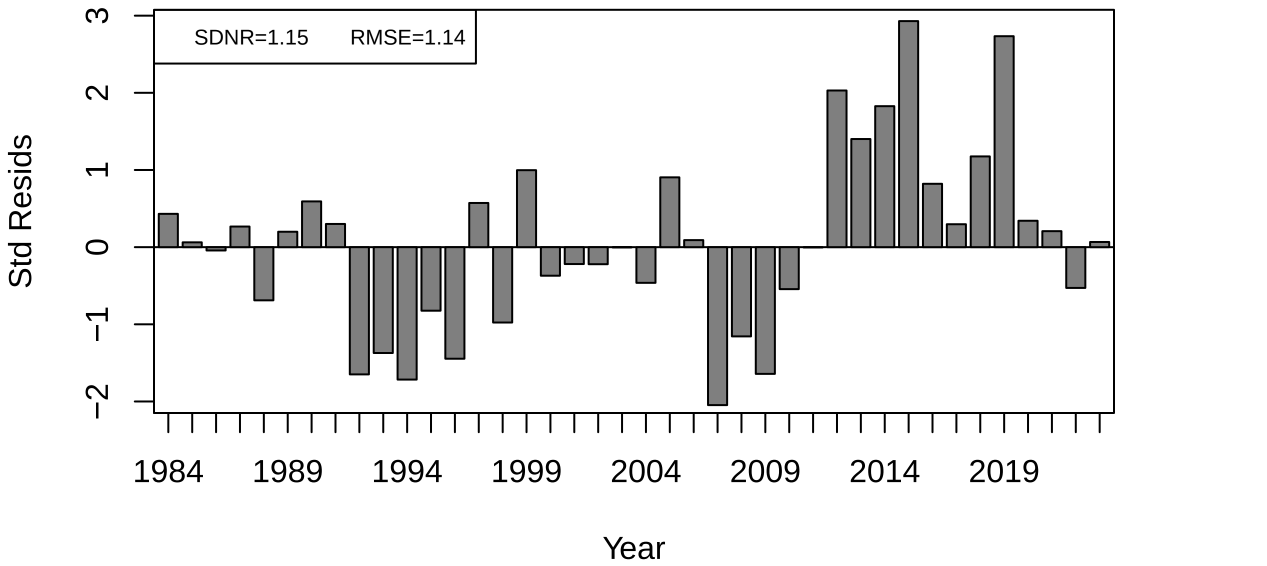
Age Comp Residuals for Index 3 (MRIP CPUE)
Neg.
Pos.
0.18
0.42
0.92
Max(resid)=5.37
Pearson Residuals (Obs−Pred)/SQRT(Pred*(1−Pred)/NESS)
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
1
2
3
4
5
6
7
8
9
10
11
12
Age
Mean resid = −0.03 SD(resid) = 1.02


Index Neff 1 (CT Trawl)
Effective Sample Size
Year
0
50
100
150
200
250
300
1990
2000
2010
2020

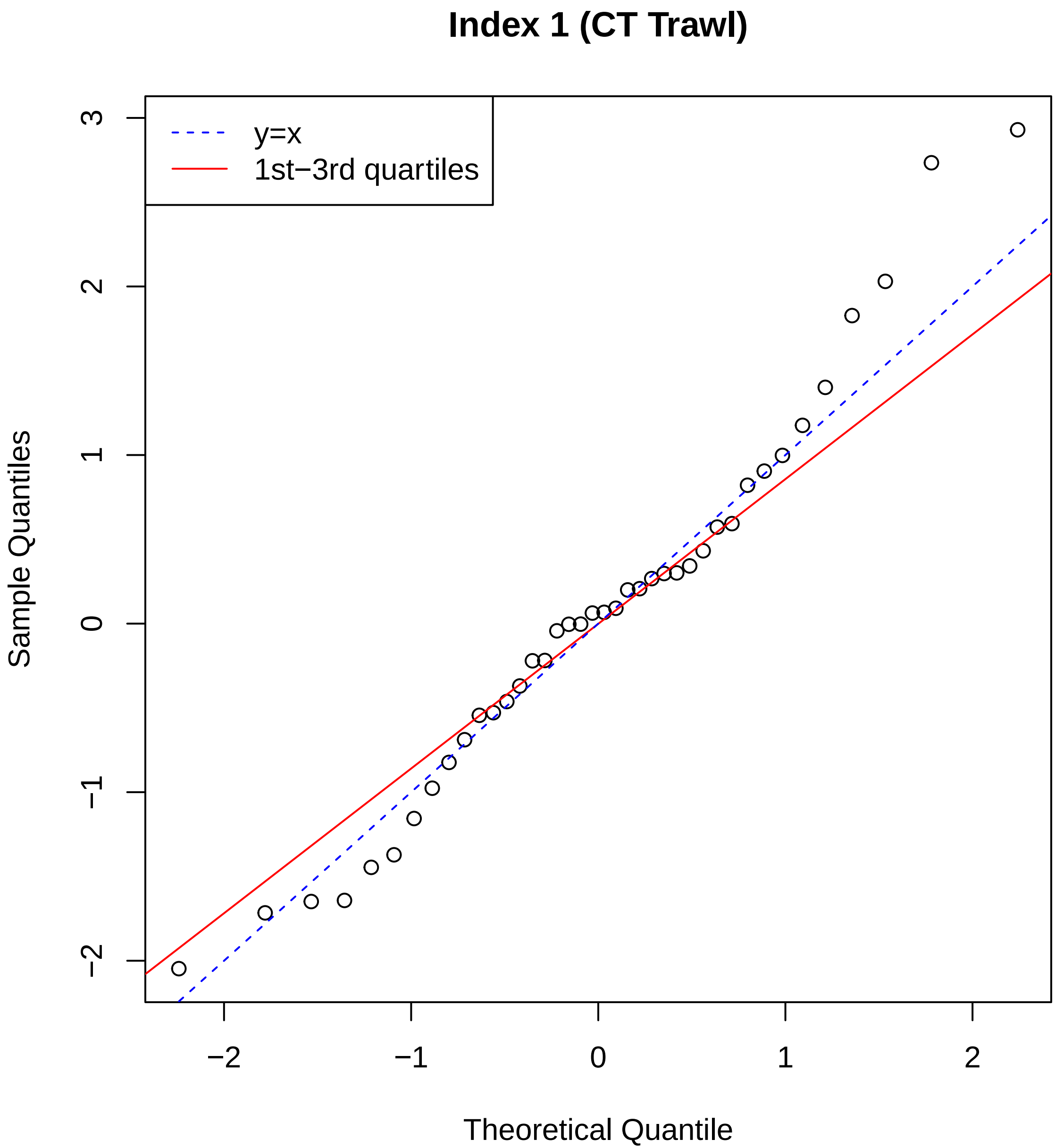

Index Neff 3 (MRIP CPUE)
Effective Sample Size
Year
0
50
100
150
200
250
300
1990
2000
2010
2020

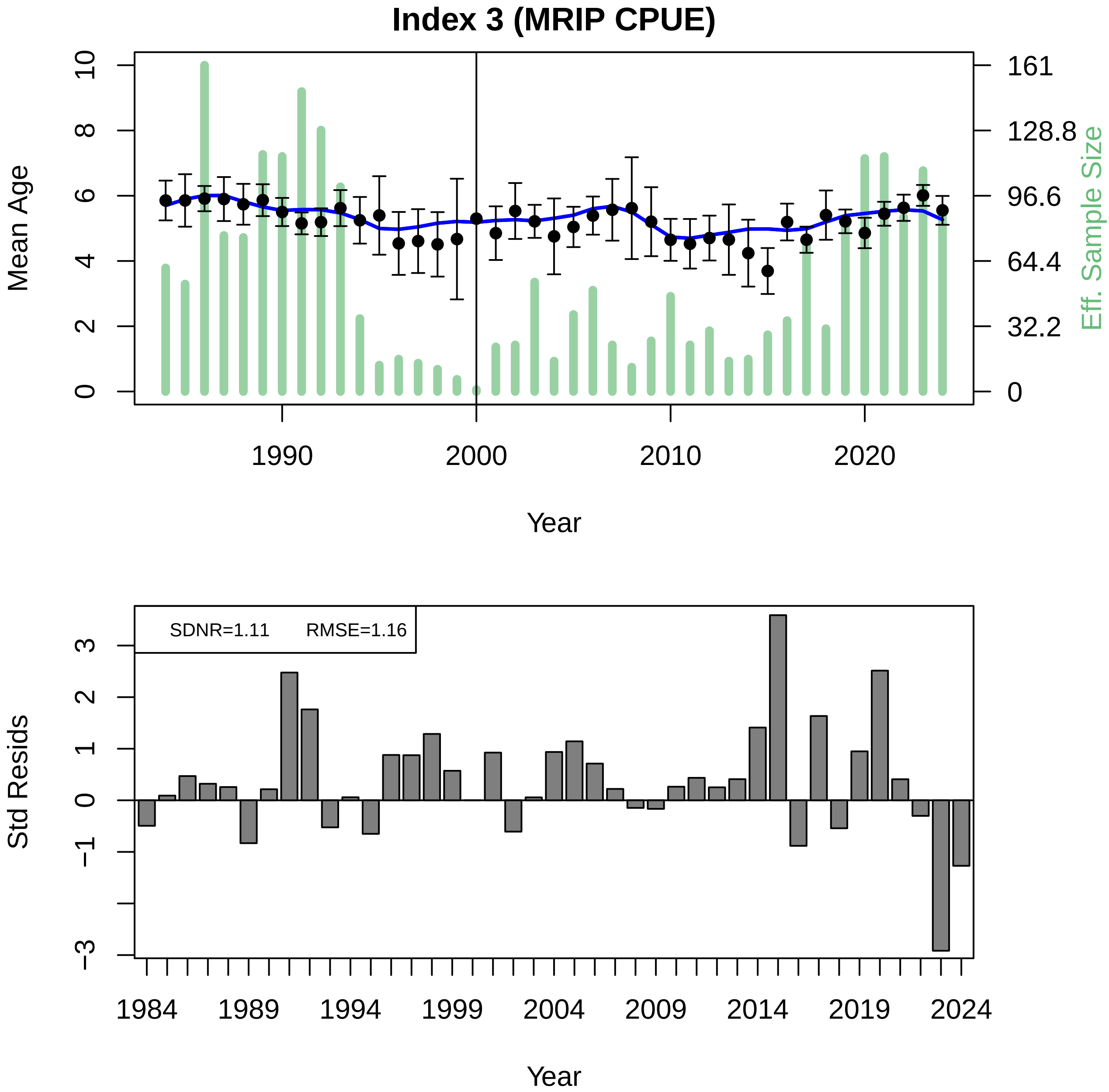


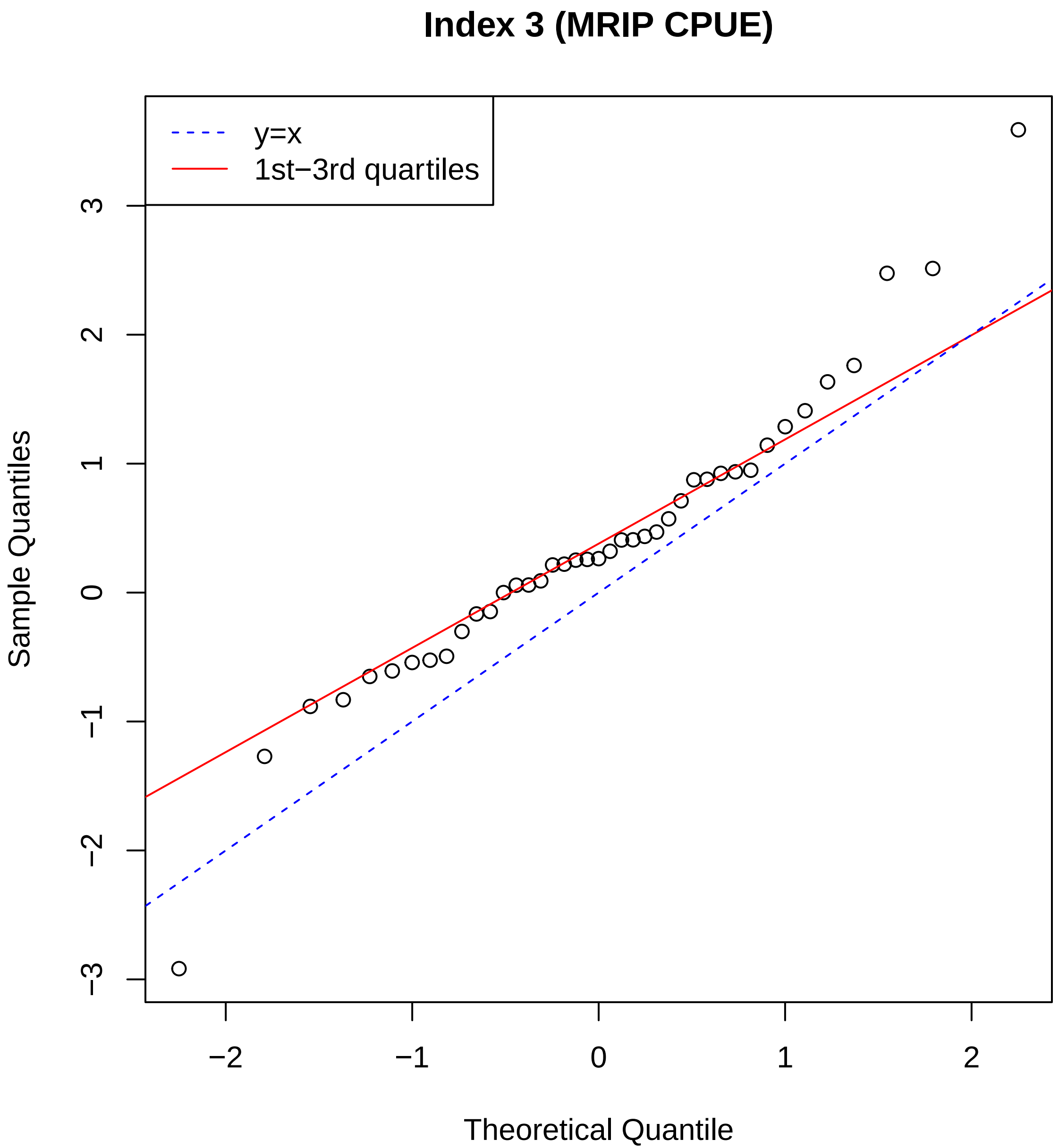
Index 1 (CT Trawl)
Mean Age
Eff. Sample Size
Year
0
2
4
6
8
10
0
35
70
105
140
175
1990
2000
2010
2020



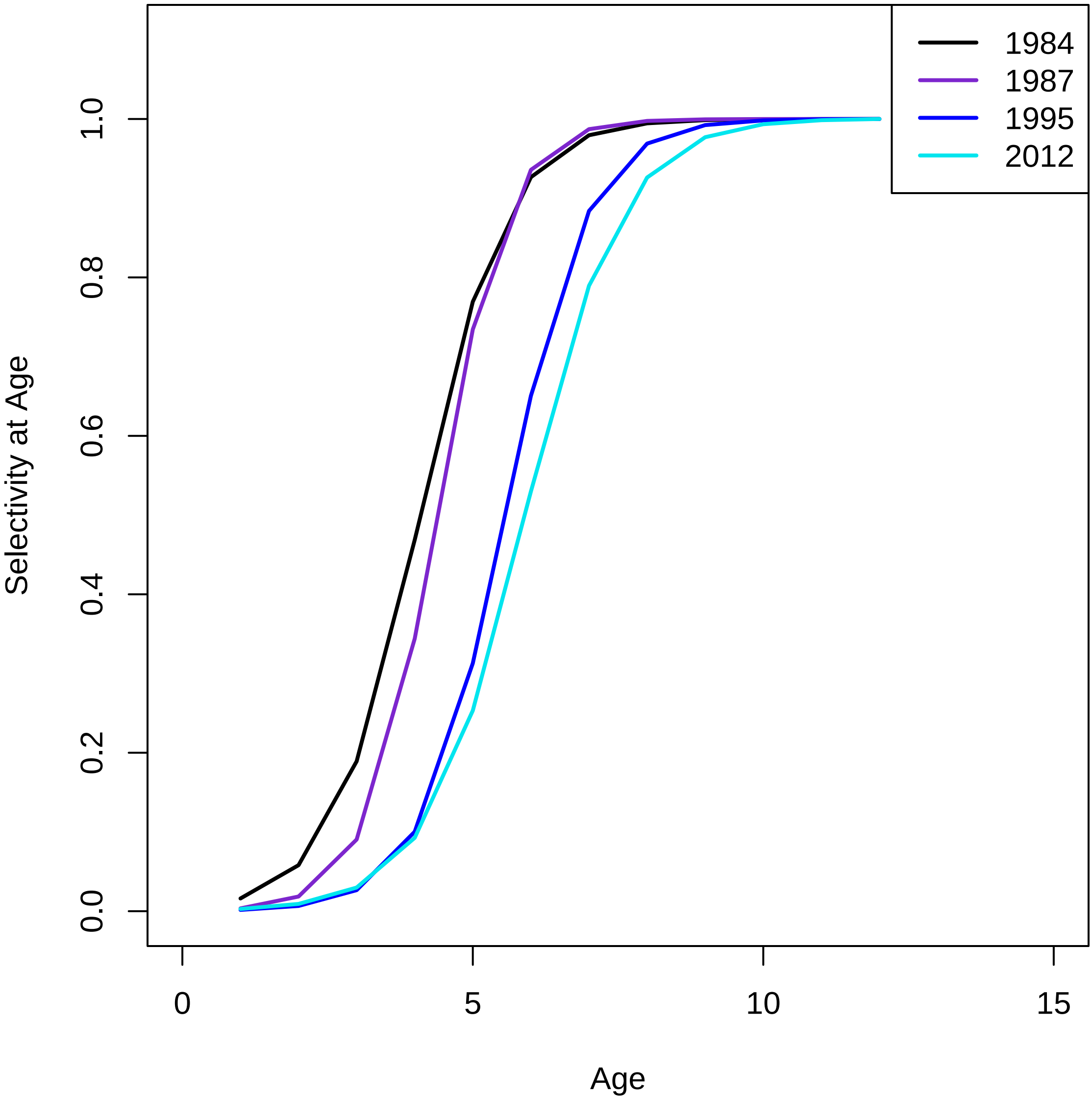
SDNR=1.15
RMSE=1.14
Std Resids
Year
−2
−1
0
1
2
3
1984
1989
1994
1999
2004
2009
2014
2019

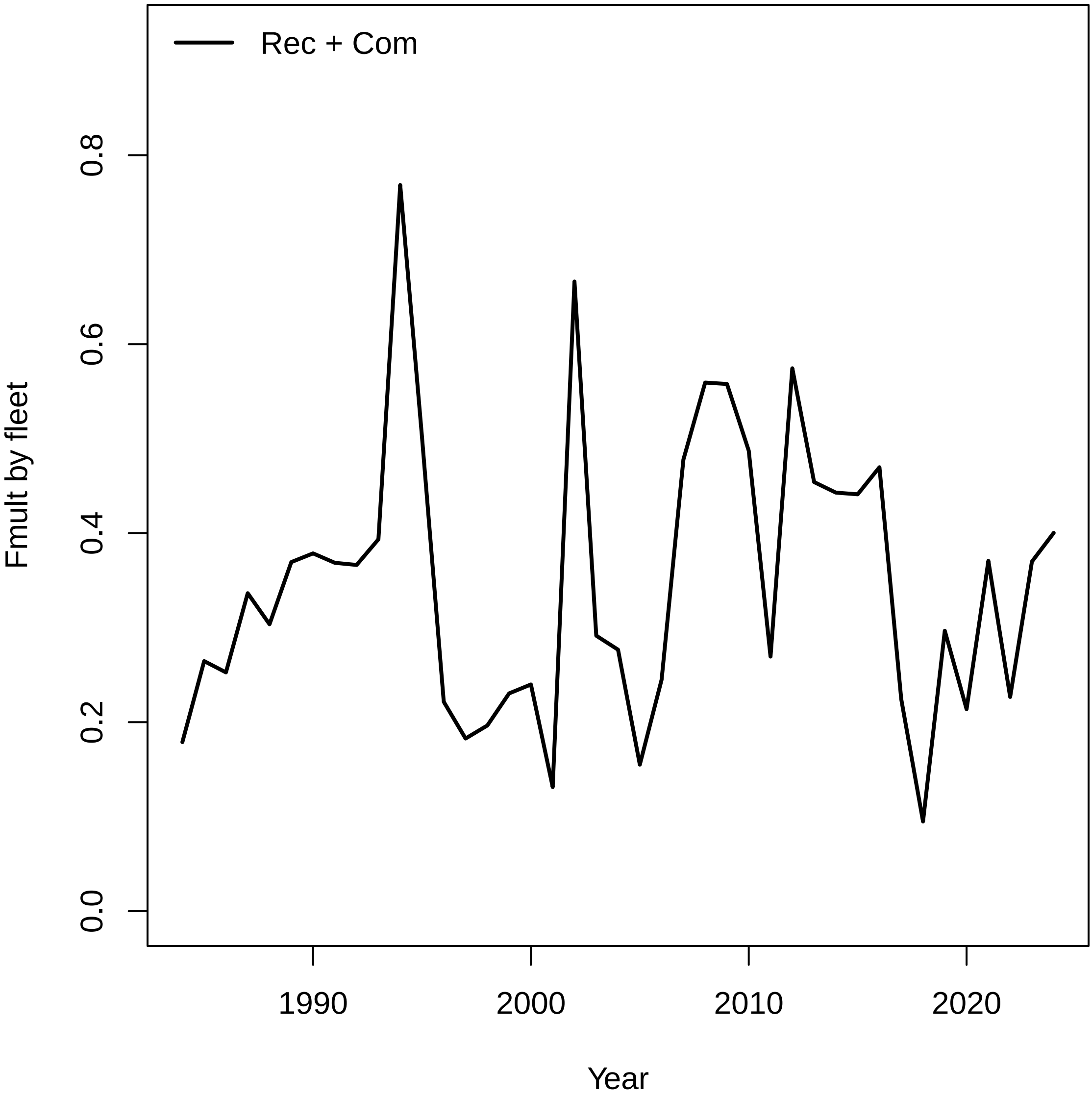

Index 1 (CT Trawl)
y=x
1st−3rd quartiles
Sample Quantiles
Theoretical Quantile
−2
−1
0
1
2
3

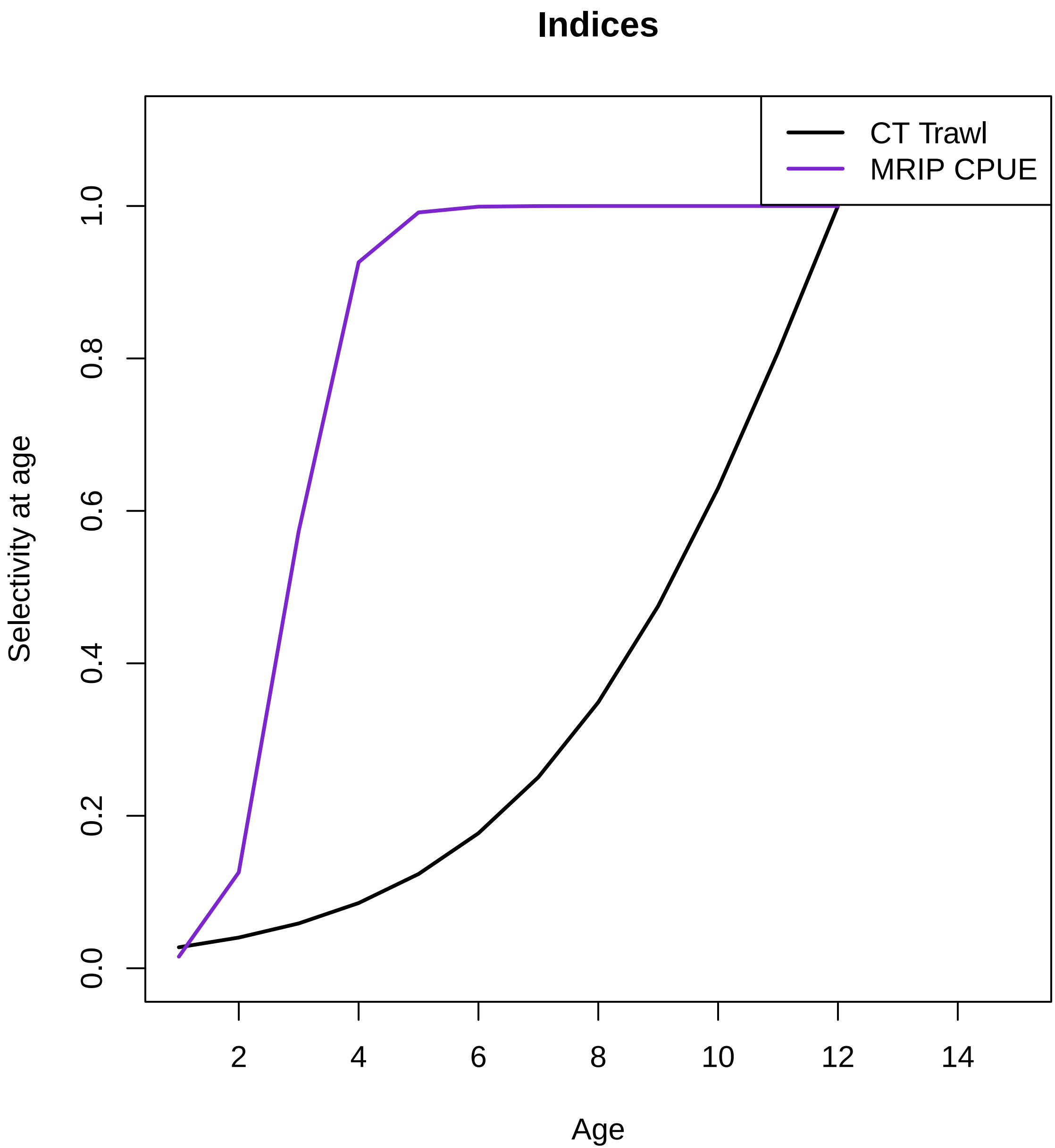

Index 3 (MRIP CPUE)
Mean Age
Eff. Sample Size
Year
0
2
4
6
8
10
0
32.2
64.4
96.6
128.8
161
1990
2000
2010
2020
SDNR=1.11
RMSE=1.16
Std Resids
−3
−1
0
1
2
3
1984
1989
1994
1999
2004
2009
2014
2019
2024
Year


Index 3 (MRIP CPUE)
y=x
1st−3rd quartiles
Sample Quantiles
Theoretical Quantile
−3
−2
−1
0
1
2
3
−2
−1
0
1
2

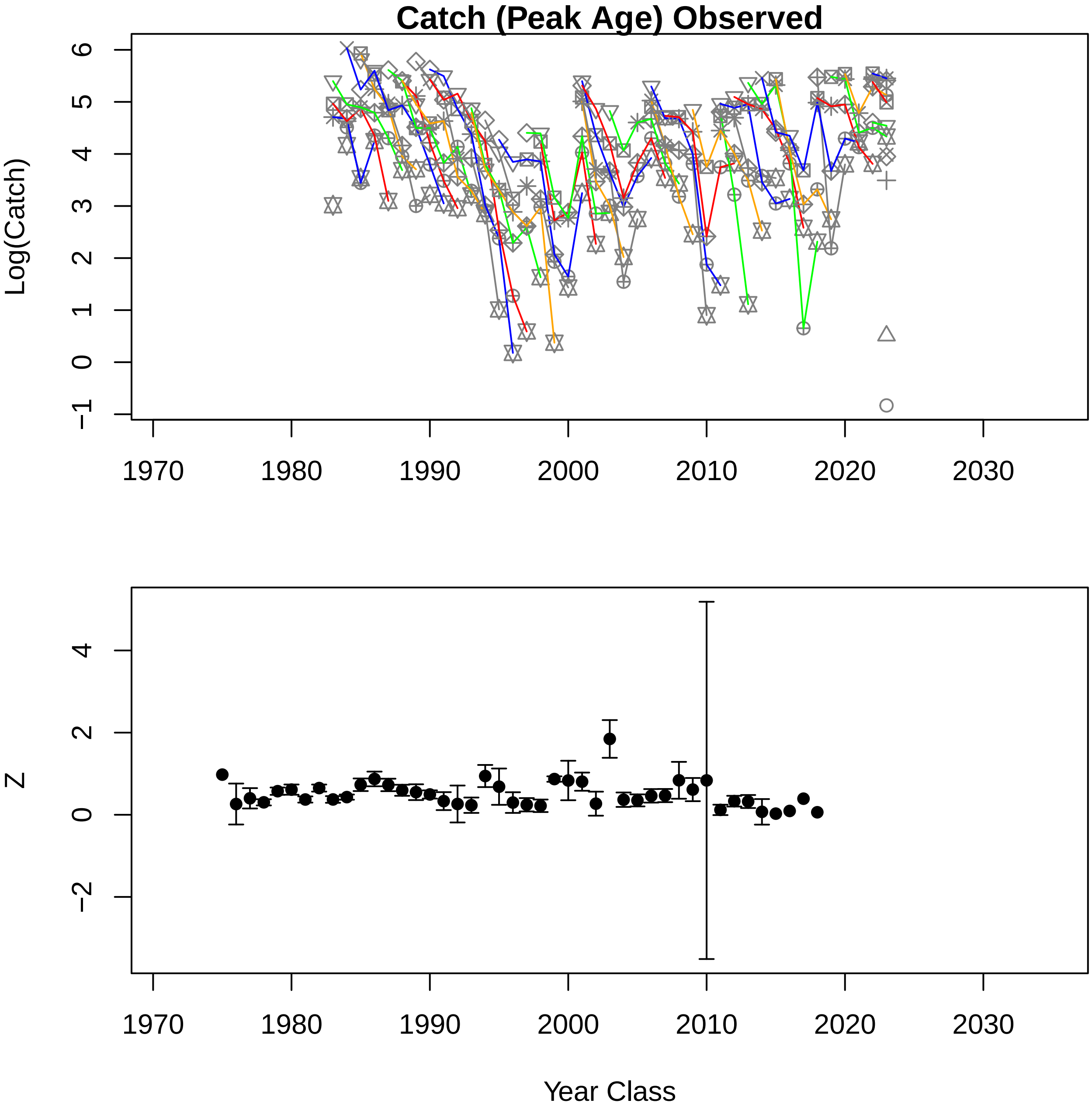
Fleet 1 (Rec + Com)

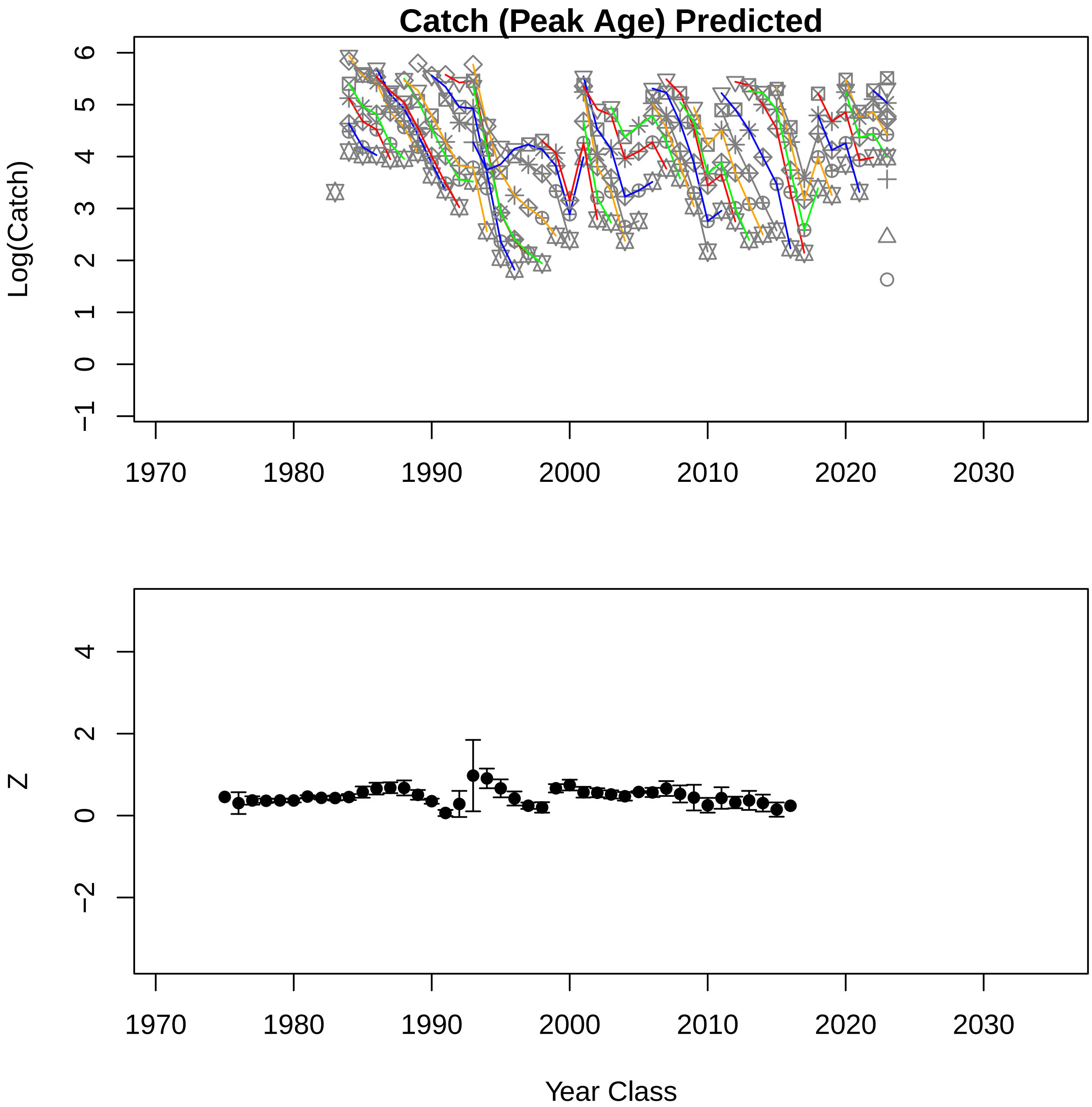


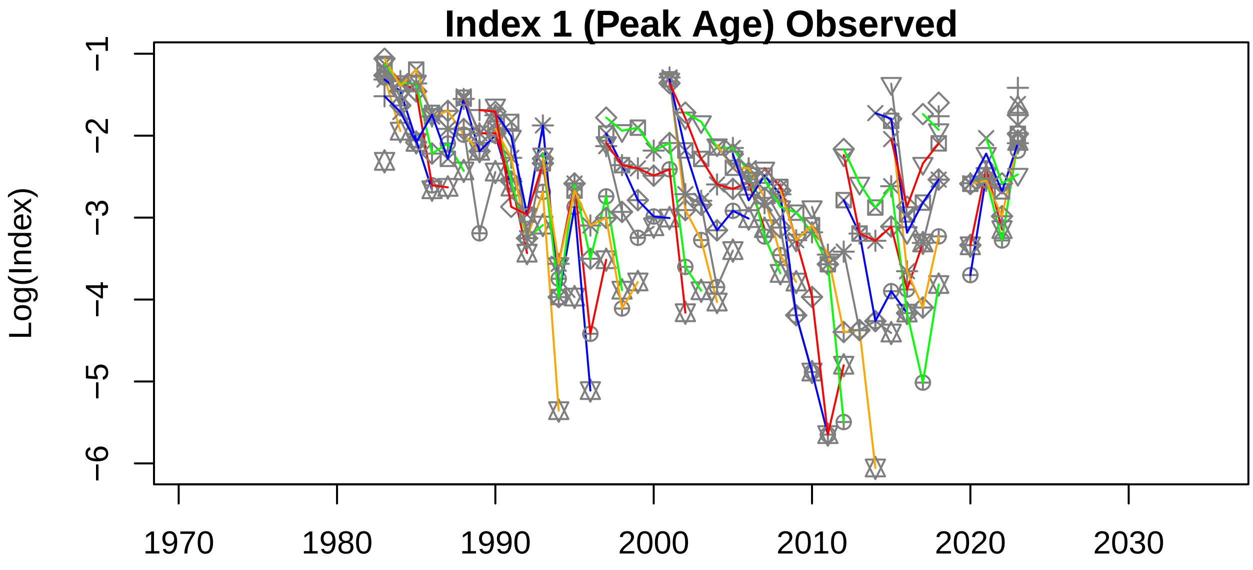

Rec + Com
Fmult by fleet
0.0
0.2
0.4
0.6
0.8
1990
2000
2010
2020
Year

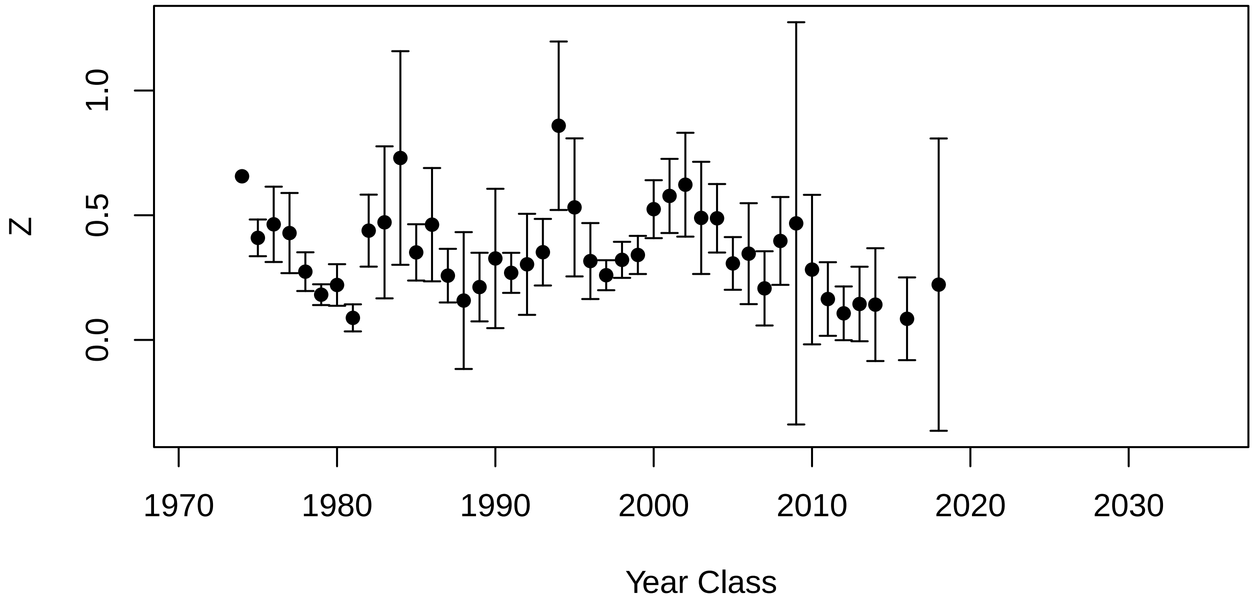


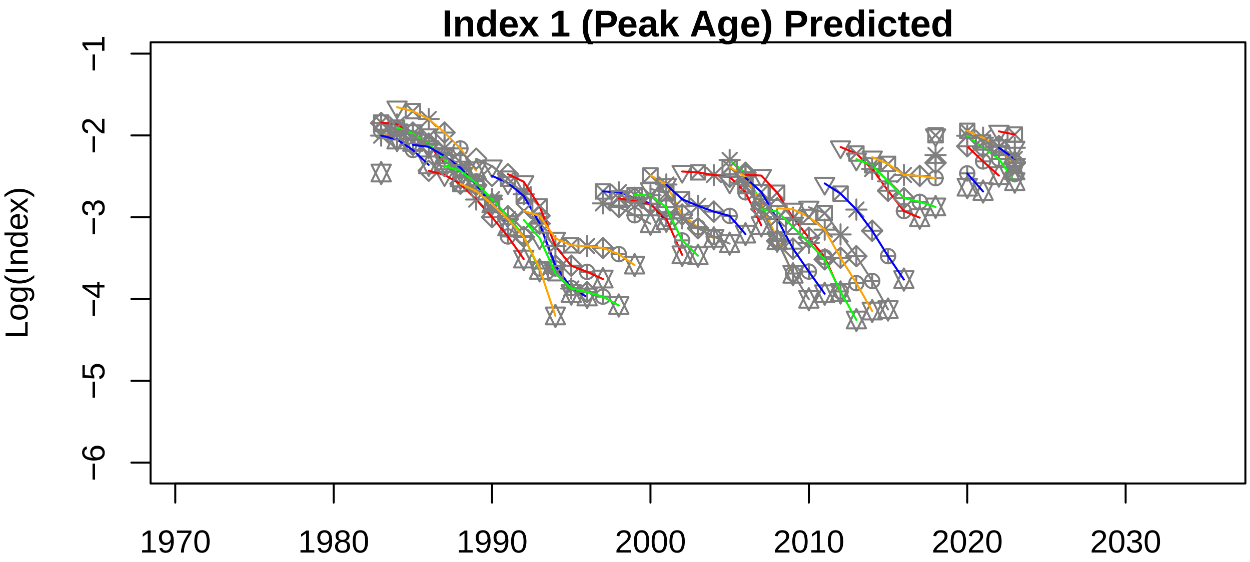
Indices
CT Trawl
MRIP CPUE
Selectivity at age
0.0
0.2
0.4
0.6
0.8
1.0
2
4
6
8
10
12
14
Age

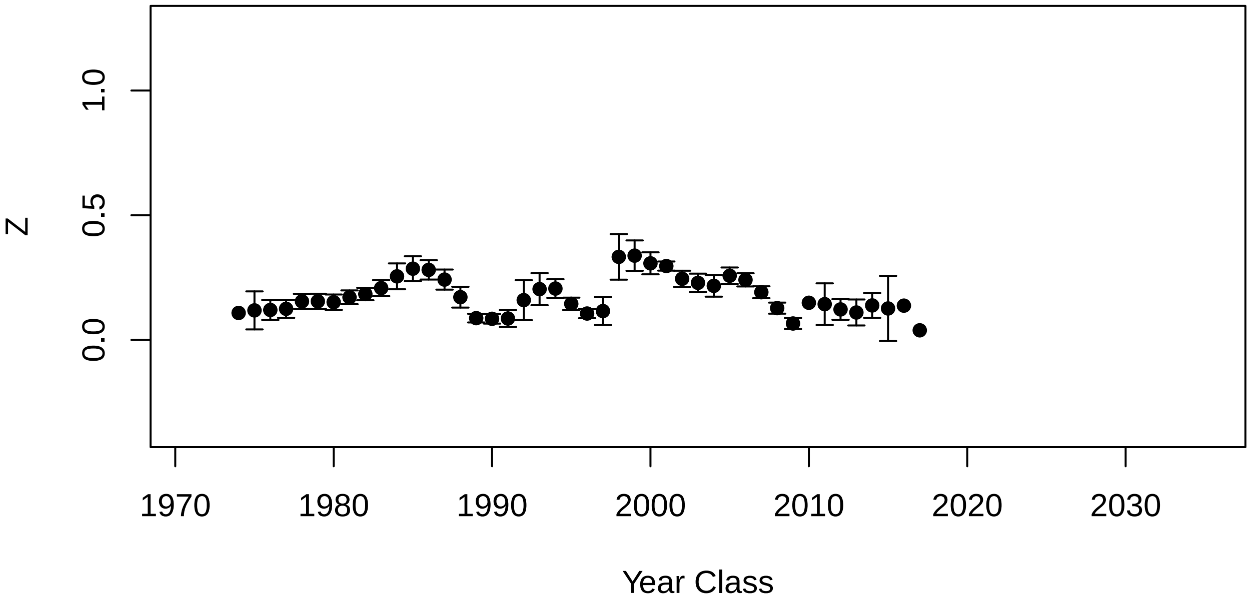

Catch (Peak Age) Observed
Log(Catch)
6
5
4
3
2
1
0
−1
1970
1980
1990
2000
2010
2020
2030
Z
4
2
0
−2
1970
1980
1990
2000
2010
2020
2030
Year Class

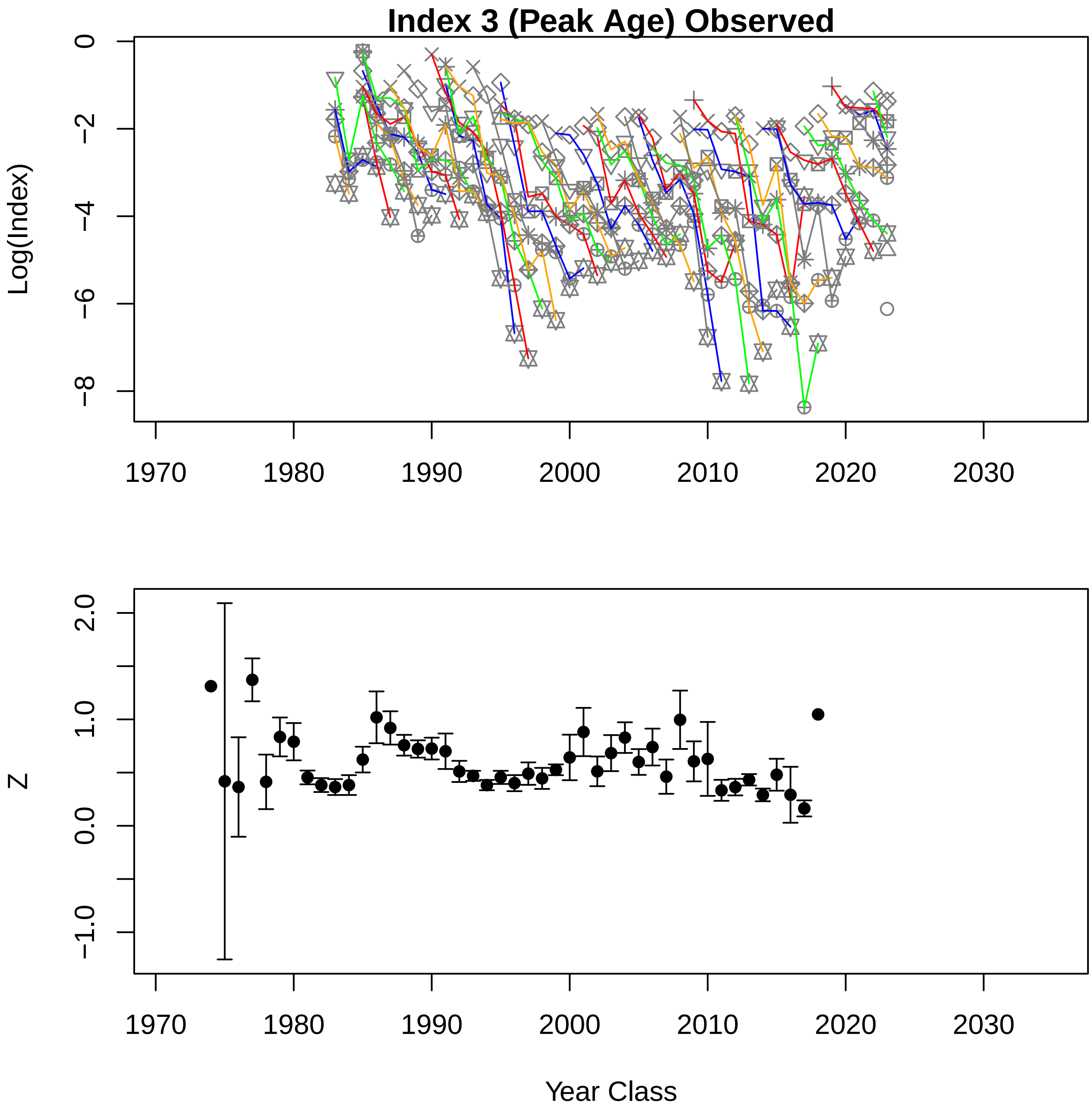

Catch (Peak Age) Predicted
Log(Catch)
-1
0
1
2
3
4
5
6
1970
1980
1990
2000
2010
2020
2030
Z
-2
0
2
4
1970
1980
1990
2000
2010
2020
2030
Year Class

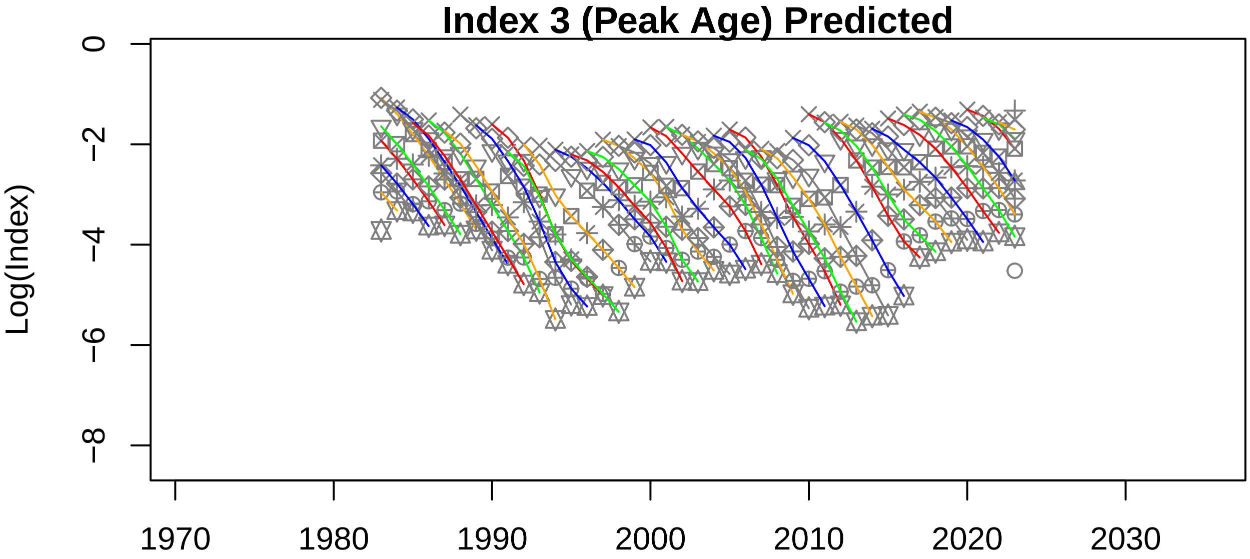

Index 1 (Peak Age) Observed
Log(Index)
−1
−2
−3
−4
−5
−6
1970
1980
1990
2000
2010
2020
2030

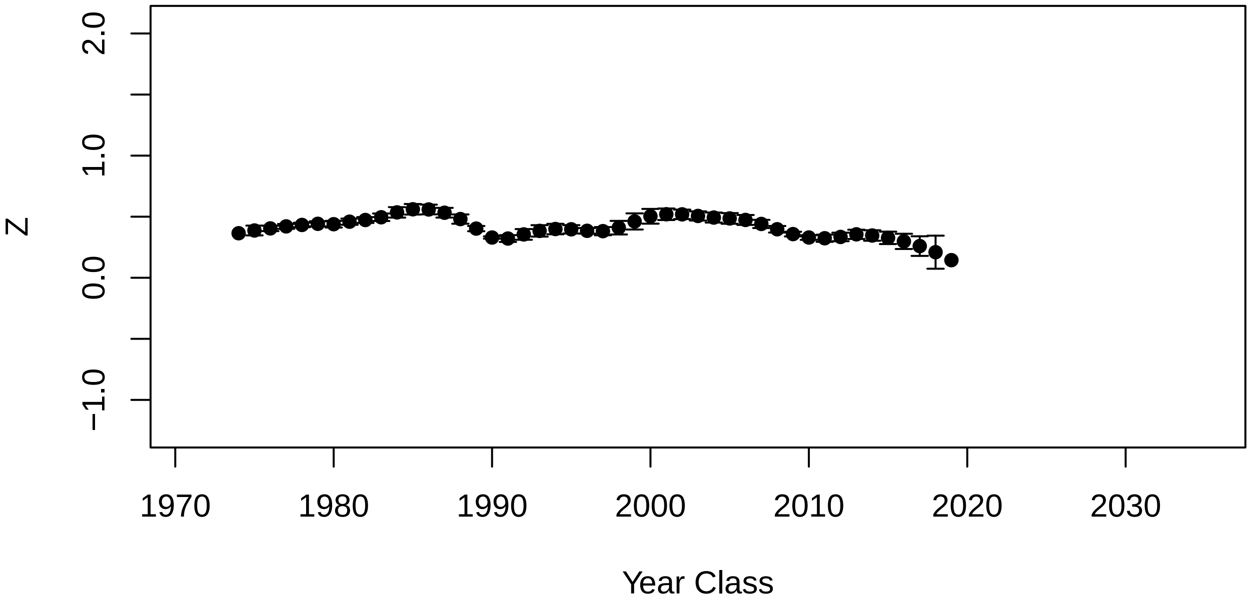

Z
1.0
0.5
0.0
1970
1980
1990
2000
2010
2020
2030
Year Class

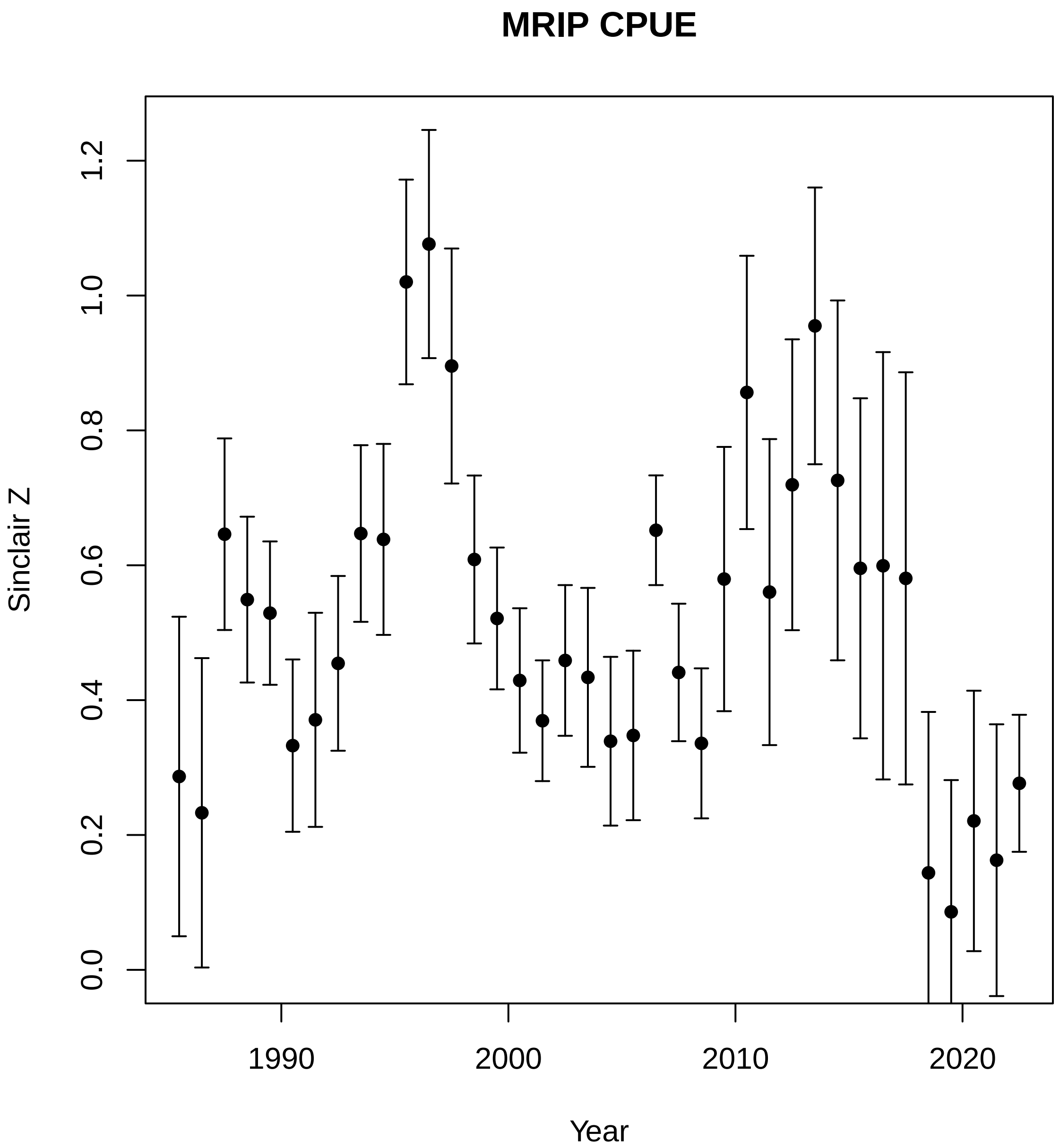

Index 1 (Peak Age) Predicted
Log(Index)
−1
−2
−3
−4
−5
−6
1970
1980
1990
2000
2010
2020
2030

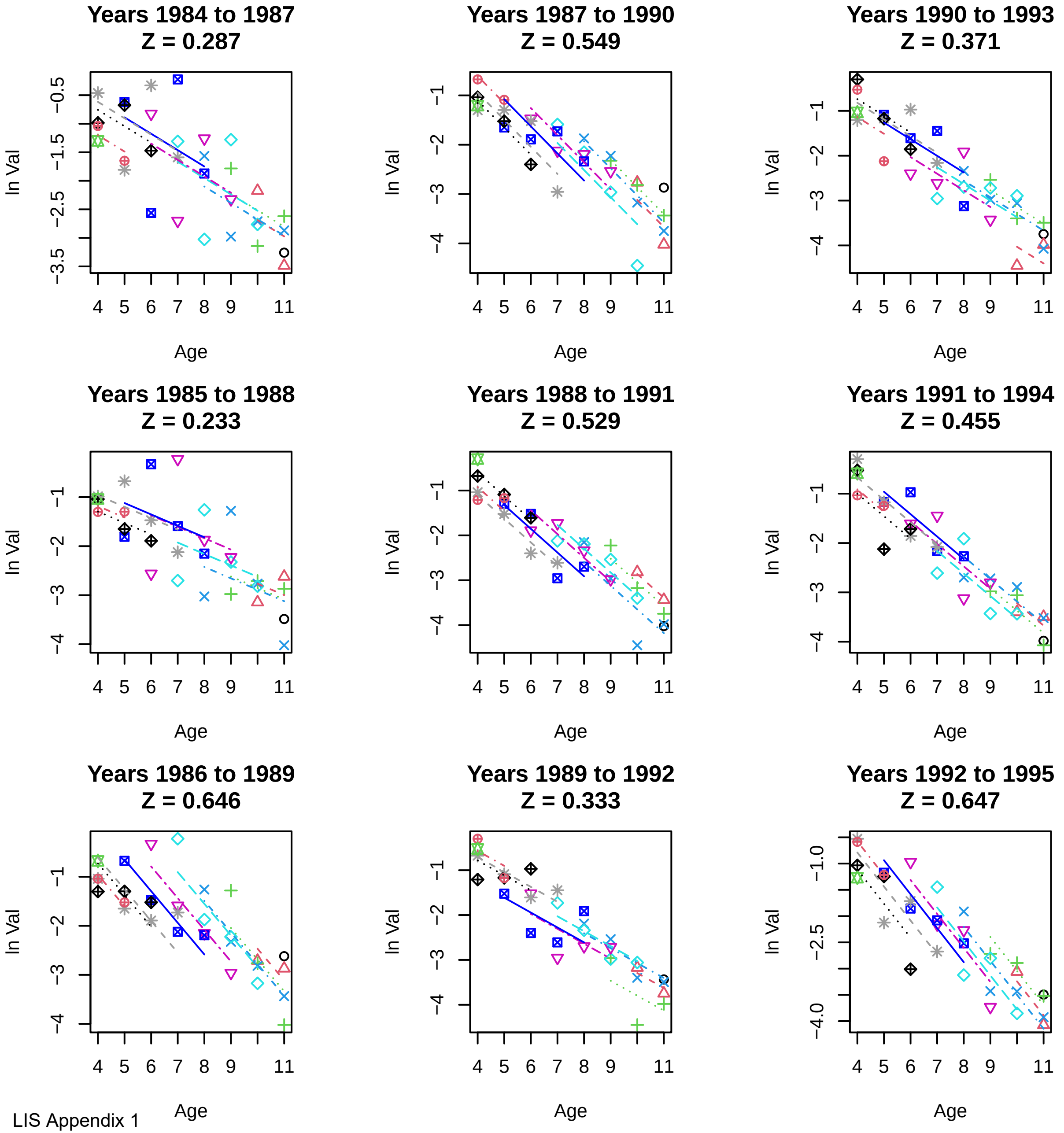

Z
1.0
0.5
0.0
1970
1980
1990
2000
2010
2020
2030
Year Class


Index 3 (Peak Age) Observed
Log(Index)
0
−2
−4
−6
−8
1970
1980
1990
2000
2010
2020
2030
Z
2.0
1.0
0.0
−1.0
1970
1980
1990
2000
2010
2020
2030
Year Class

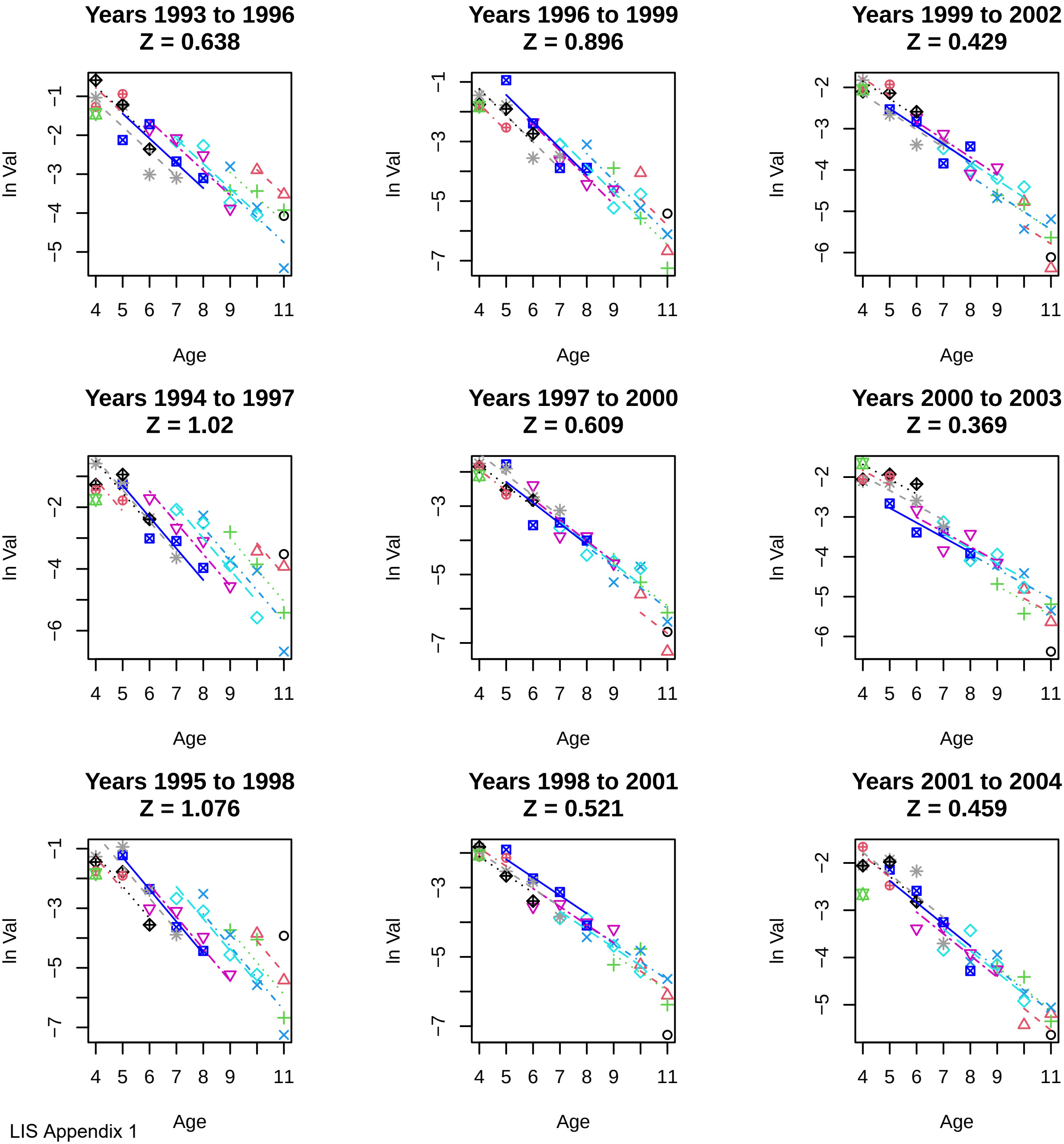

Index 3 (Peak Age) Predicted
Log(Index)
0
−2
−4
−6
−8
1970
1980
1990
2000
2010
2020
2030

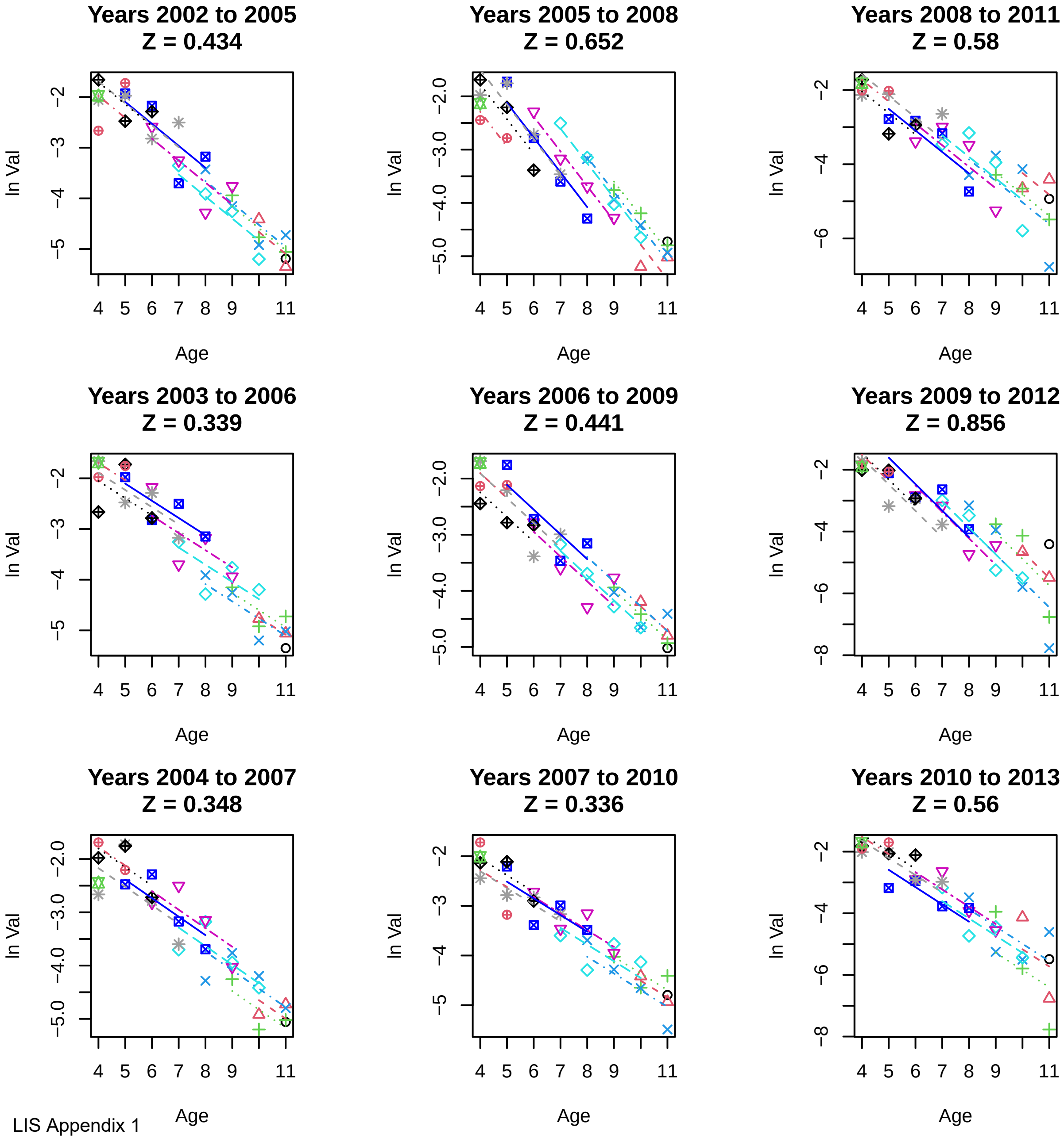

Z
2.0
1.0
0.0
−1.0
1970
1980
1990
2000
2010
2020
2030
Year Class


MRIP CPUE
Sinclair Z
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1990
2000
2010
2020
Year

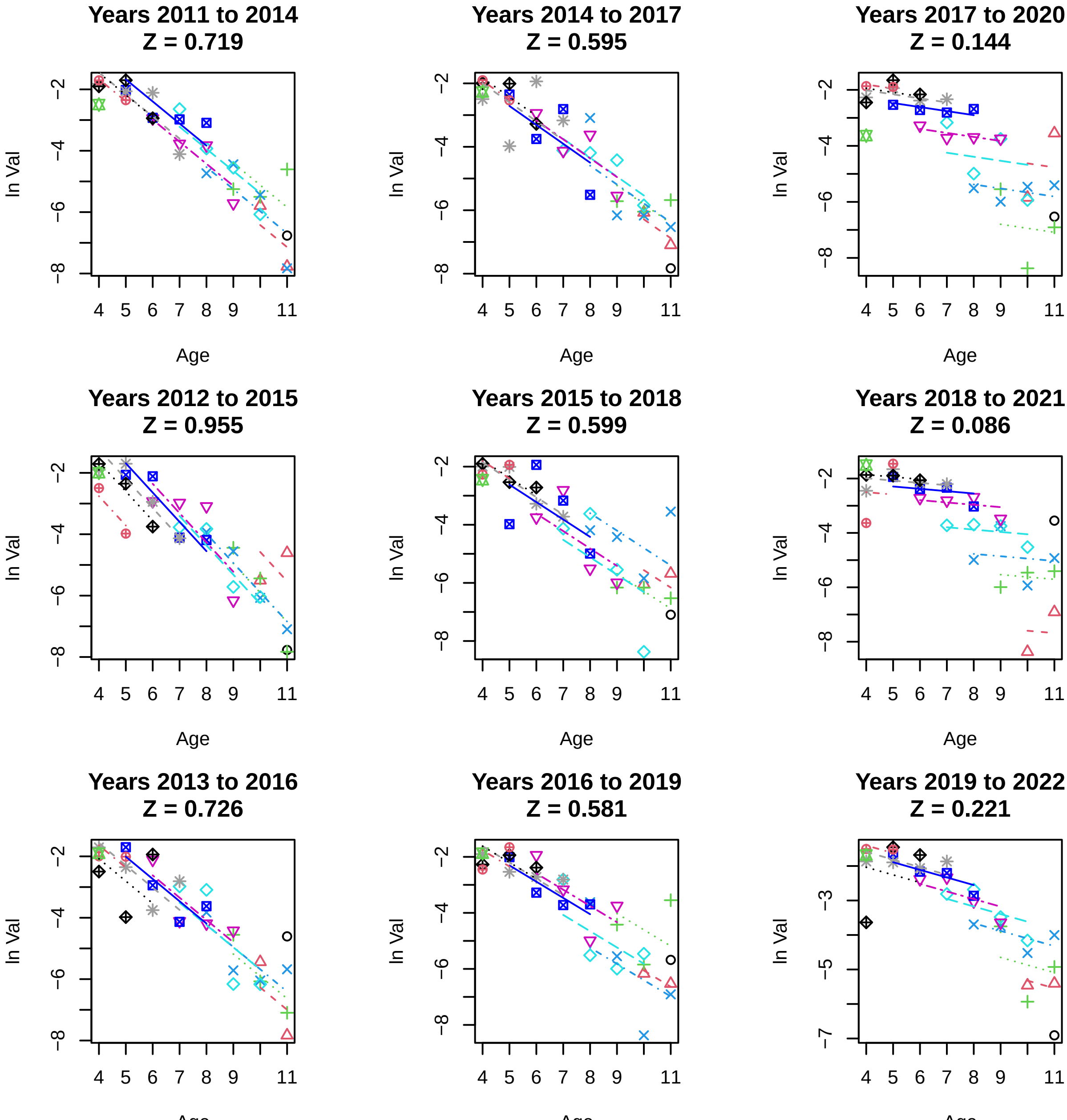


Years 1984 to 1987
Z = 0.287
Years 1987 to 1990
Z = 0.549
Years 1990 to 1993
Z = 0.371
Years 1985 to 1988
Z = 0.233
Years 1988 to 1991
Z = 0.529
Years 1991 to 1994
Z = 0.455
Years 1986 to 1989
Z = 0.646
Years 1989 to 1992
Z = 0.333
Years 1992 to 1995
Z = 0.647
ln Val
Age
4 5 6 7 8 9 11

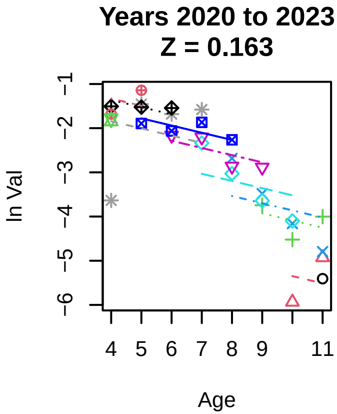

Years 1993 to 1996
Z = 0.638
Years 1996 to 1999
Z = 0.896
Years 1999 to 2002
Z = 0.429
Years 1994 to 1997
Z = 1.02
Years 1997 to 2000
Z = 0.609
Years 2000 to 2003
Z = 0.369
Years 1995 to 1998
Z = 1.076
Years 1998 to 2001
Z = 0.521
Years 2001 to 2004
Z = 0.459
ln Val
Age

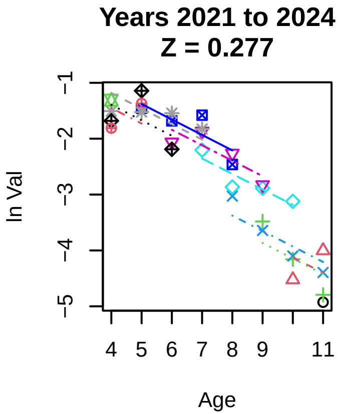


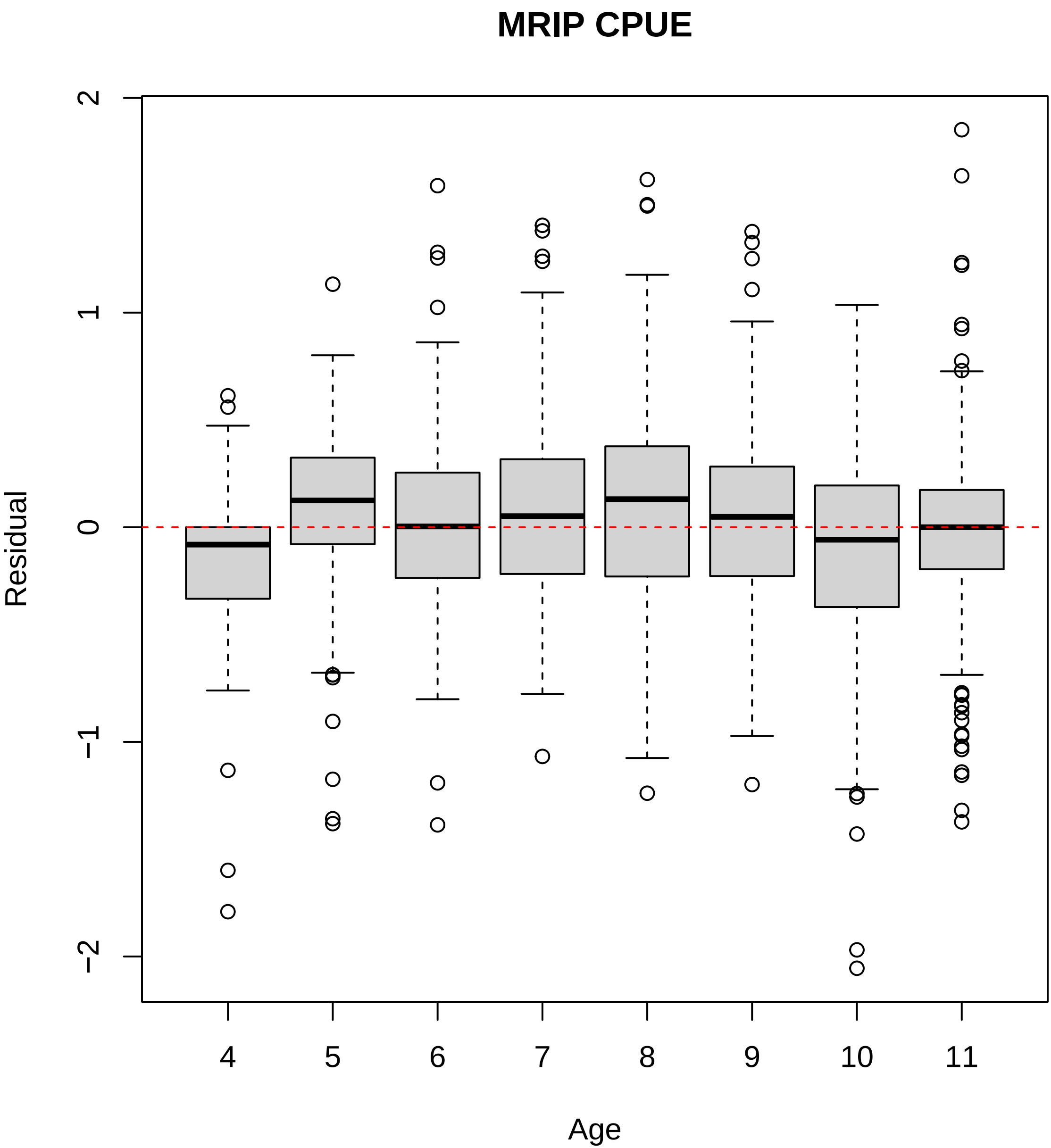
Years 2002 to 2005
Z = 0.434
Years 2005 to 2008
Z = 0.652
Years 2008 to 2011
Z = 0.58
Years 2003 to 2006
Z = 0.339
Years 2006 to 2009
Z = 0.441
Years 2009 to 2012
Z = 0.856
Years 2004 to 2007
Z = 0.348
Years 2007 to 2010
Z = 0.336
Years 2010 to 2013
Z = 0.56
ln Val
Age



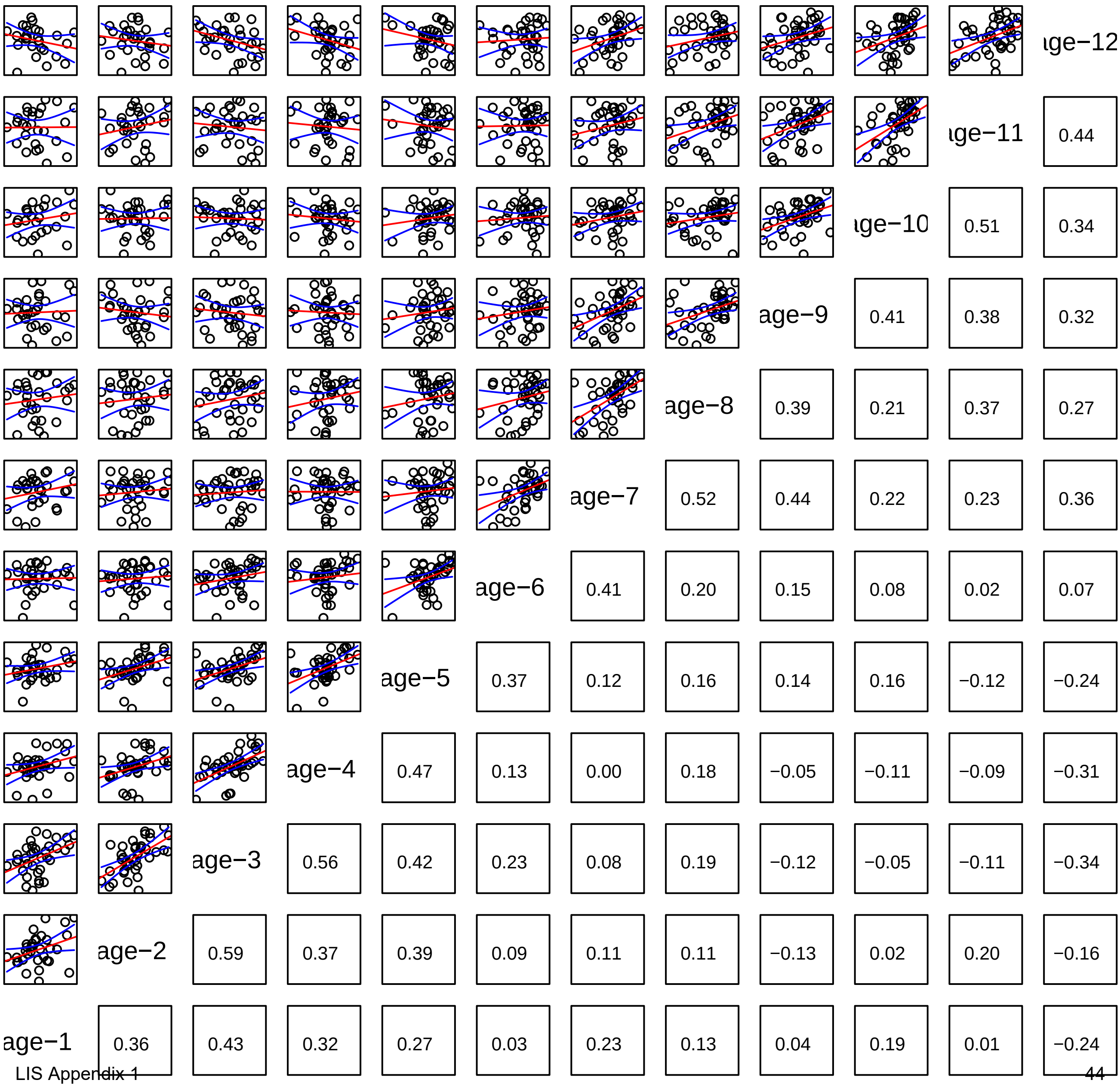
Years 2011 to 2014
Z = 0.719
Years 2014 to 2017
Z = 0.595
Years 2017 to 2020
Z = 0.144
Years 2012 to 2015
Z = 0.955
Years 2015 to 2018
Z = 0.599
Years 2018 to 2021
Z = 0.086
Years 2013 to 2016
Z = 0.726
Years 2016 to 2019
Z = 0.581
Years 2019 to 2022
Z = 0.221
ln Val
Age
−2
−4
−6
−8
−3
−5
−7
4
5
6
7
8
9
11

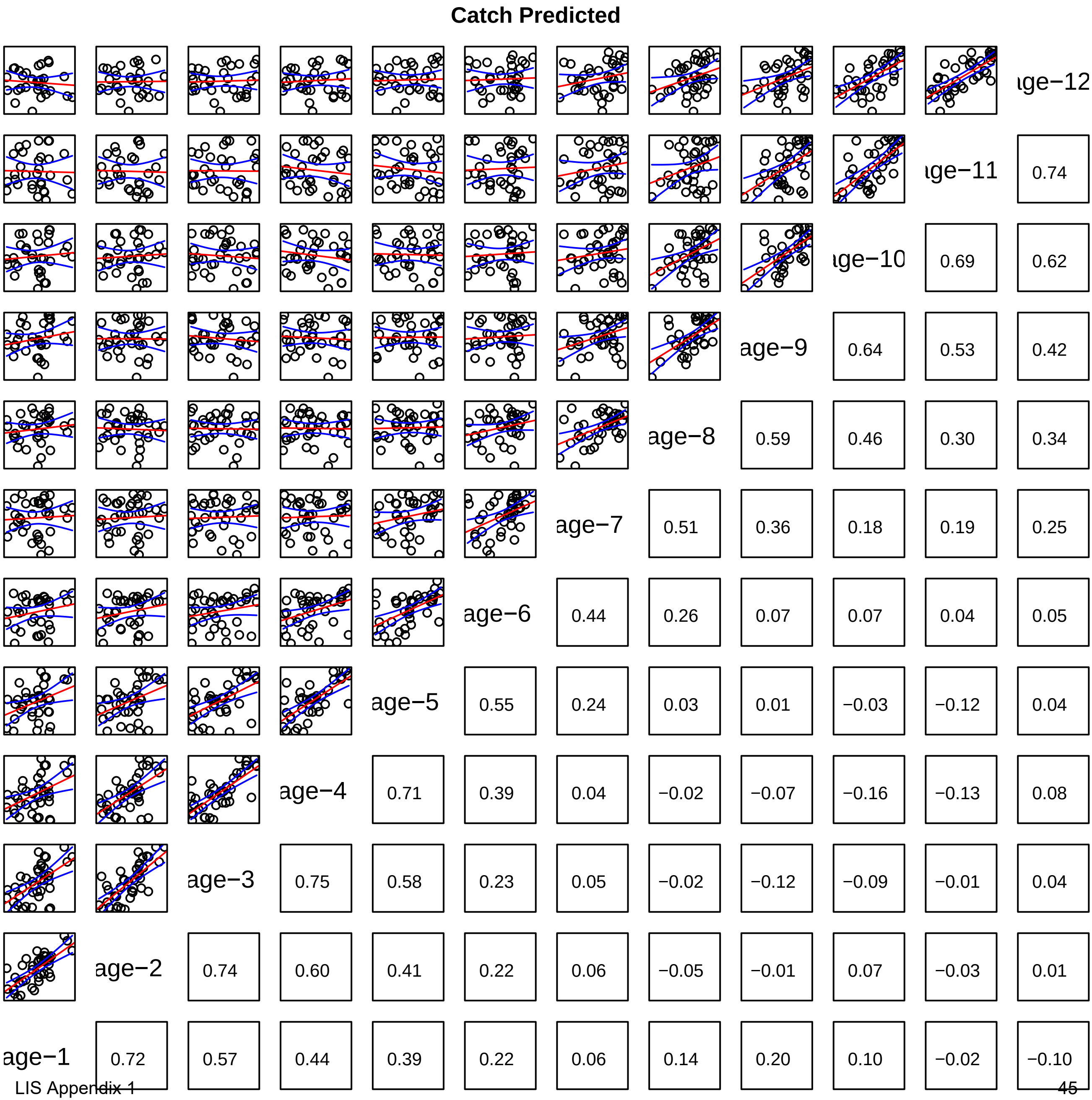

Years 2020 to 2023
Z = 0.163
ln Val
−1
−2
−3
−4
−5
−6
4
5
6
7
8
9
11
Age


Years 2021 to 2024
Z = 0.277
ln Val
−1
−2
−3
−4
−5
4
5
6
7
8
9
11
Age


MRIP CPUE
Residual
Age
2
1
0
−1
−2
4
5
6
7
8
9
10
11

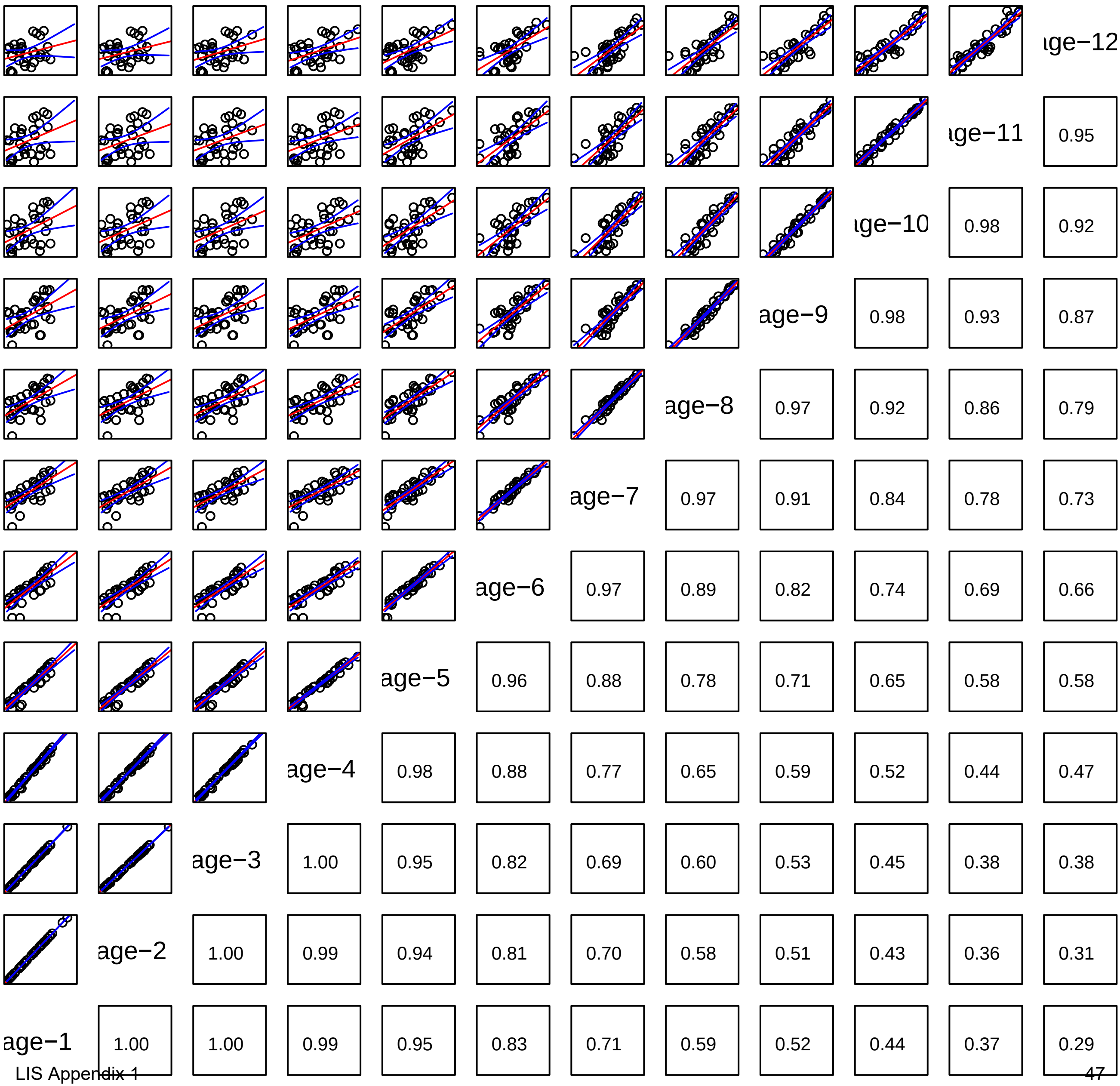
Catch Observed



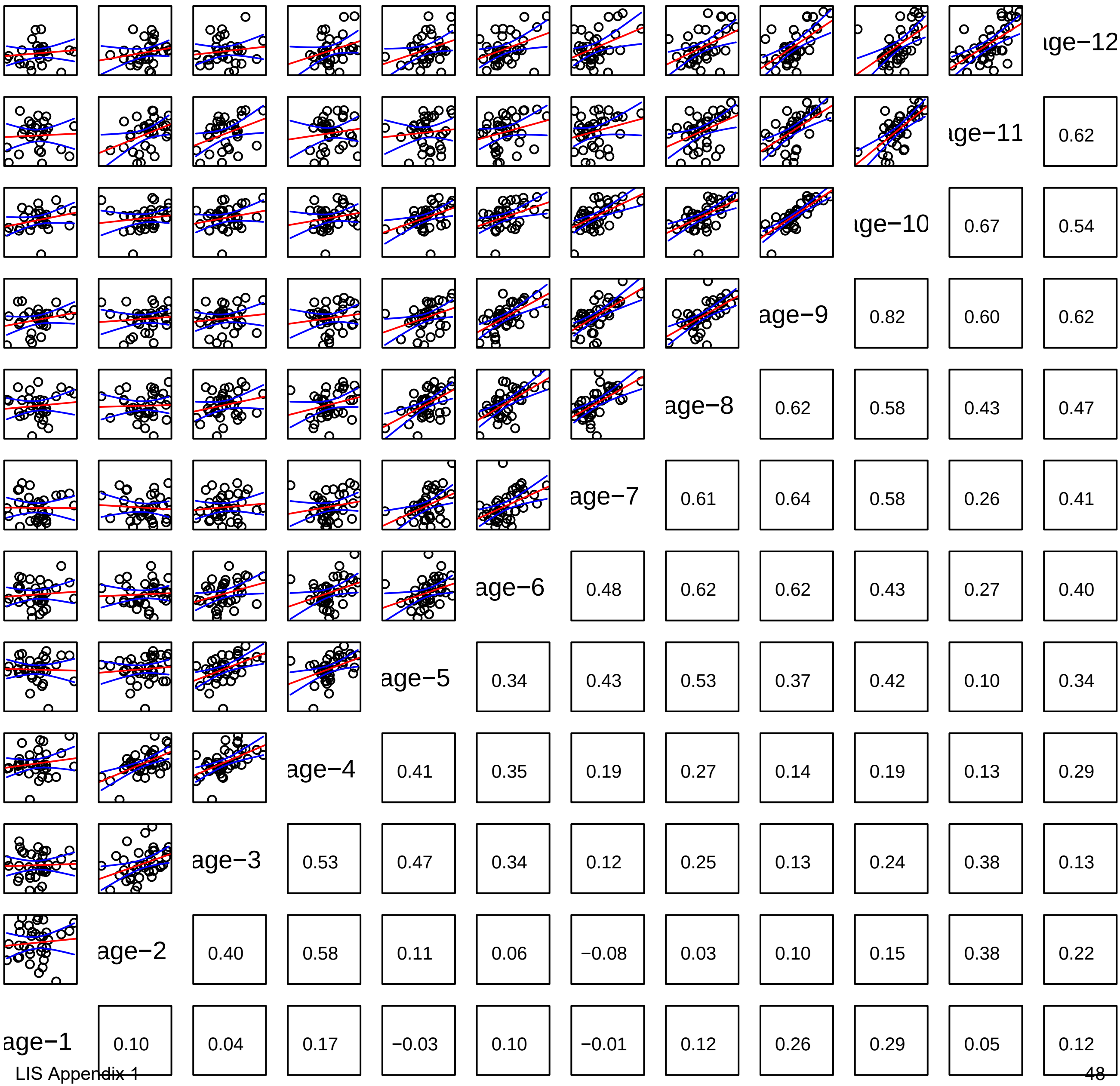

Catch Predicted
age−12
age−11
0.74
age−10
0.69
0.62
age−9
0.64
0.53
0.42
age−8
0.59
0.46
0.30
0.34
age−7
0.51
0.36
0.18
0.19
0.25
age−6
0.44
0.26
0.07
0.07
0.04
0.05
age−5
0.55
0.24
0.03
0.01
−0.03
−0.12
0.04
age−4
0.71
0.39
0.04
−0.02
−0.07
−0.16
−0.13
0.08
age−3
0.75
0.58
0.23
0.05
−0.02
−0.12
−0.09
−0.01
0.04
age−2
0.74
0.60
0.41
0.22
0.06
−0.05
−0.01
0.07
−0.03
0.01
age−1
0.72
0.57
0.44
0.39
0.22
0.06
0.14
0.20
0.10
−0.02
−0.10

Index 1 (CT Trawl) Observed

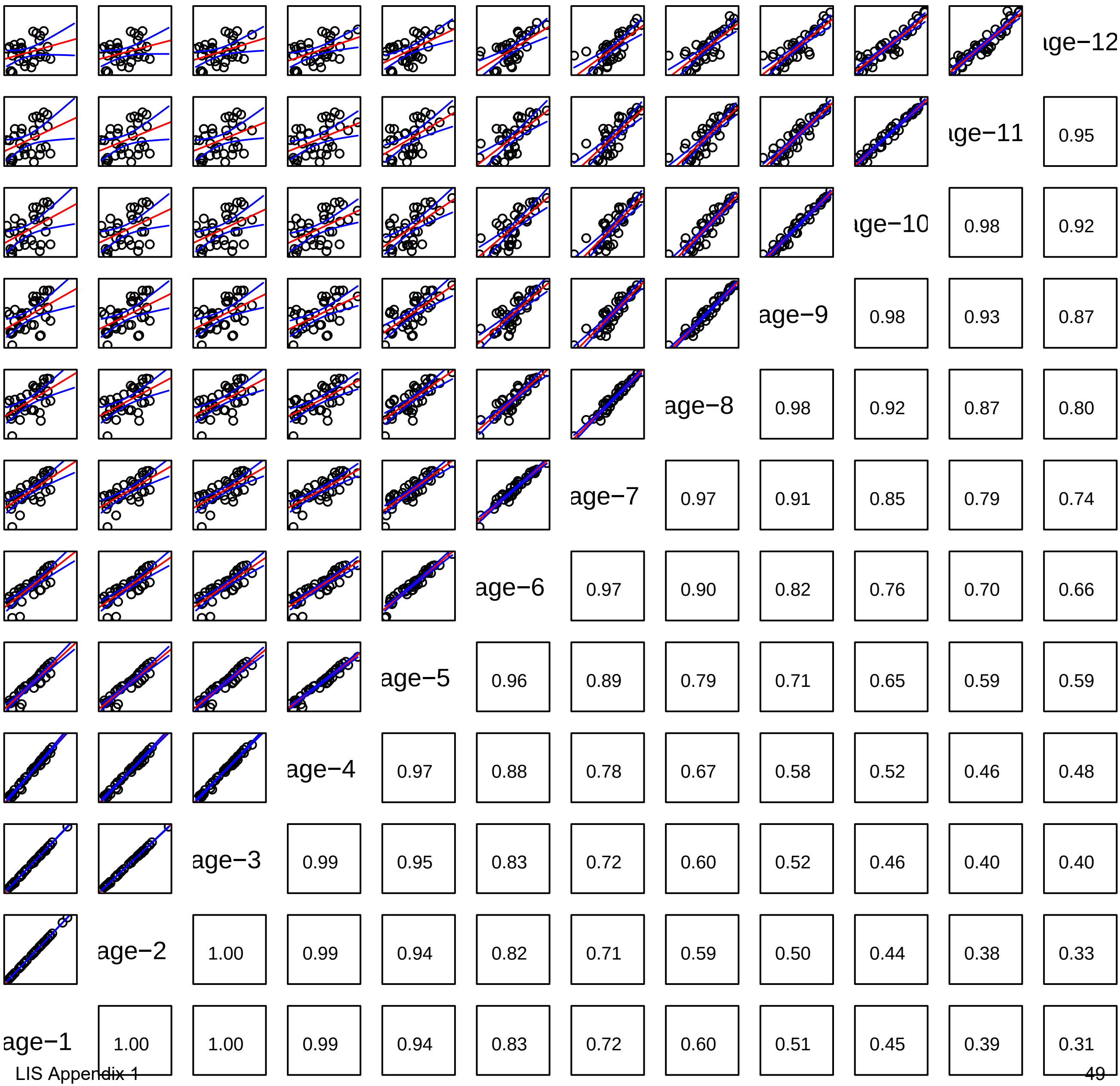
Index 1 (CT Trawl) Predicted

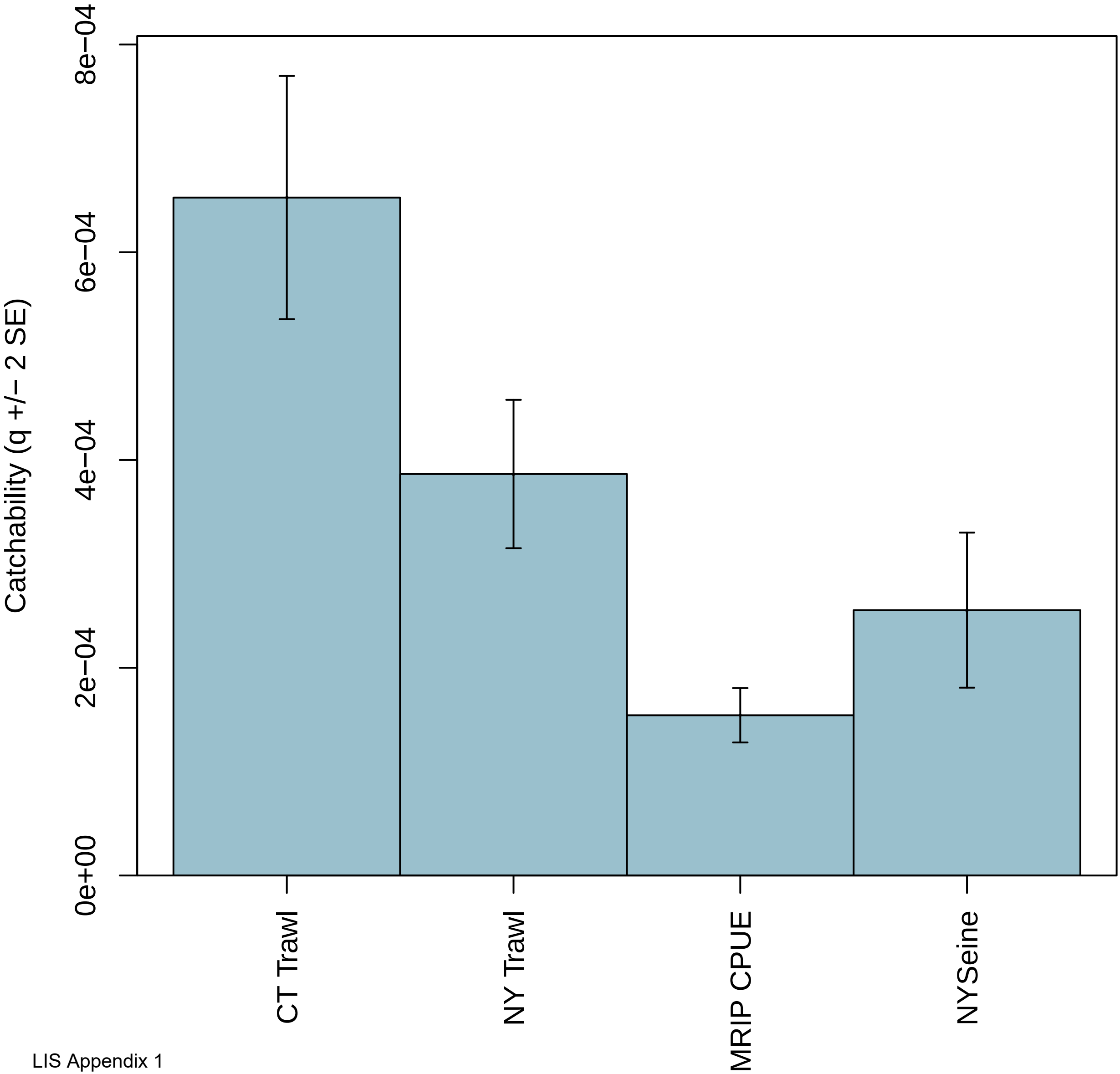


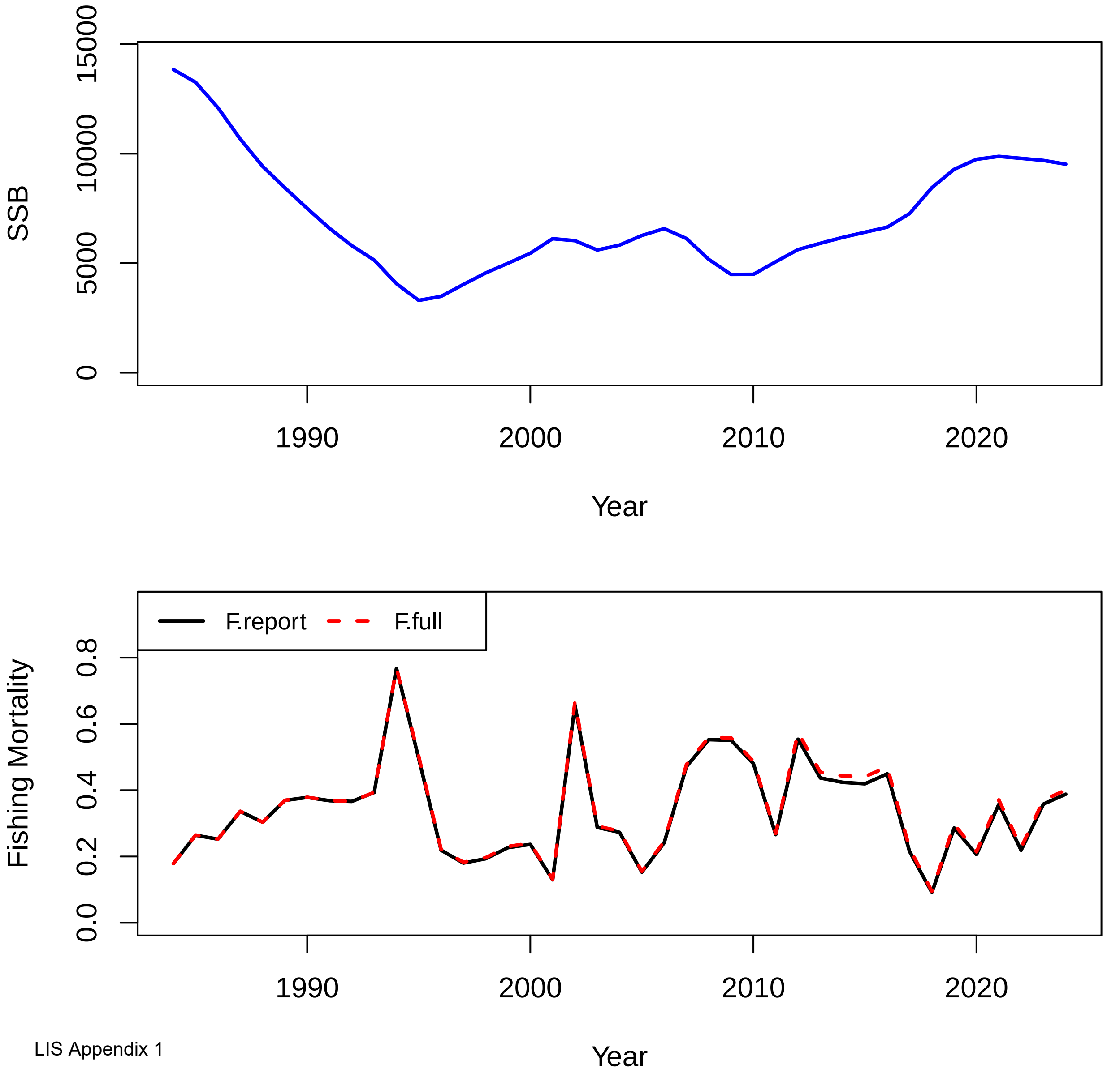
Index 3 (MRIP CPUE) Observed



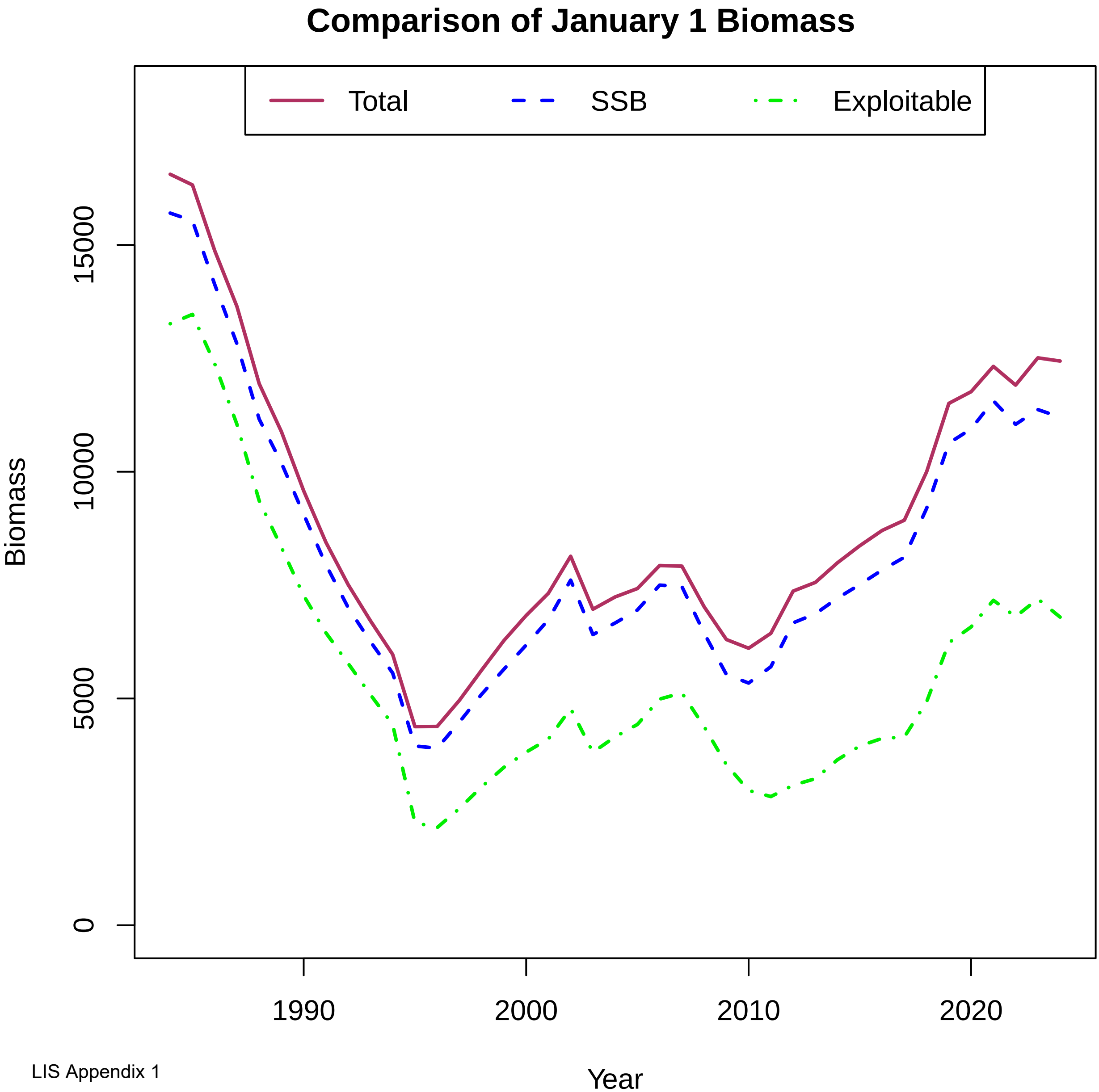
Index 3 (MRIP CPUE) Predicted

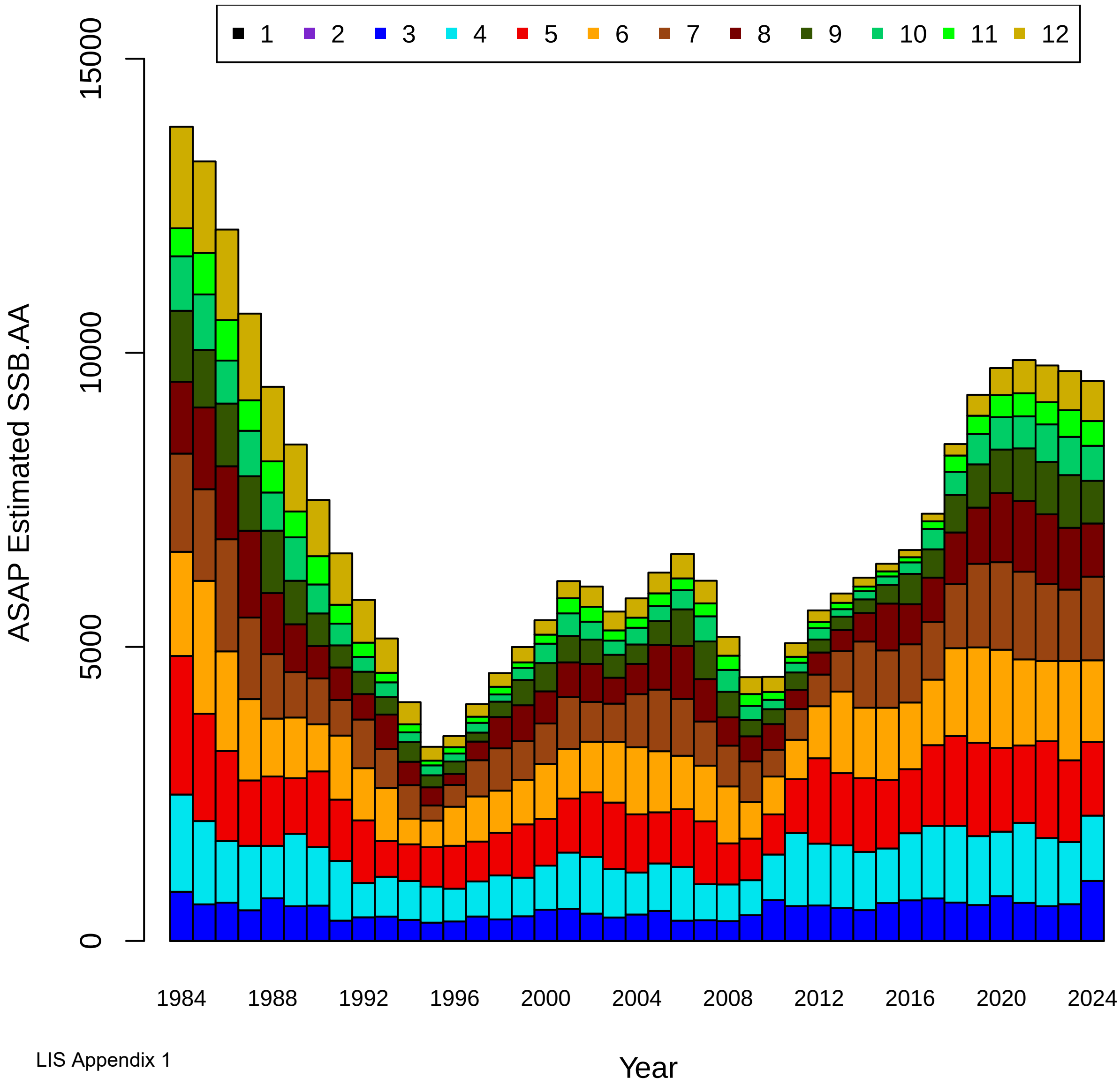


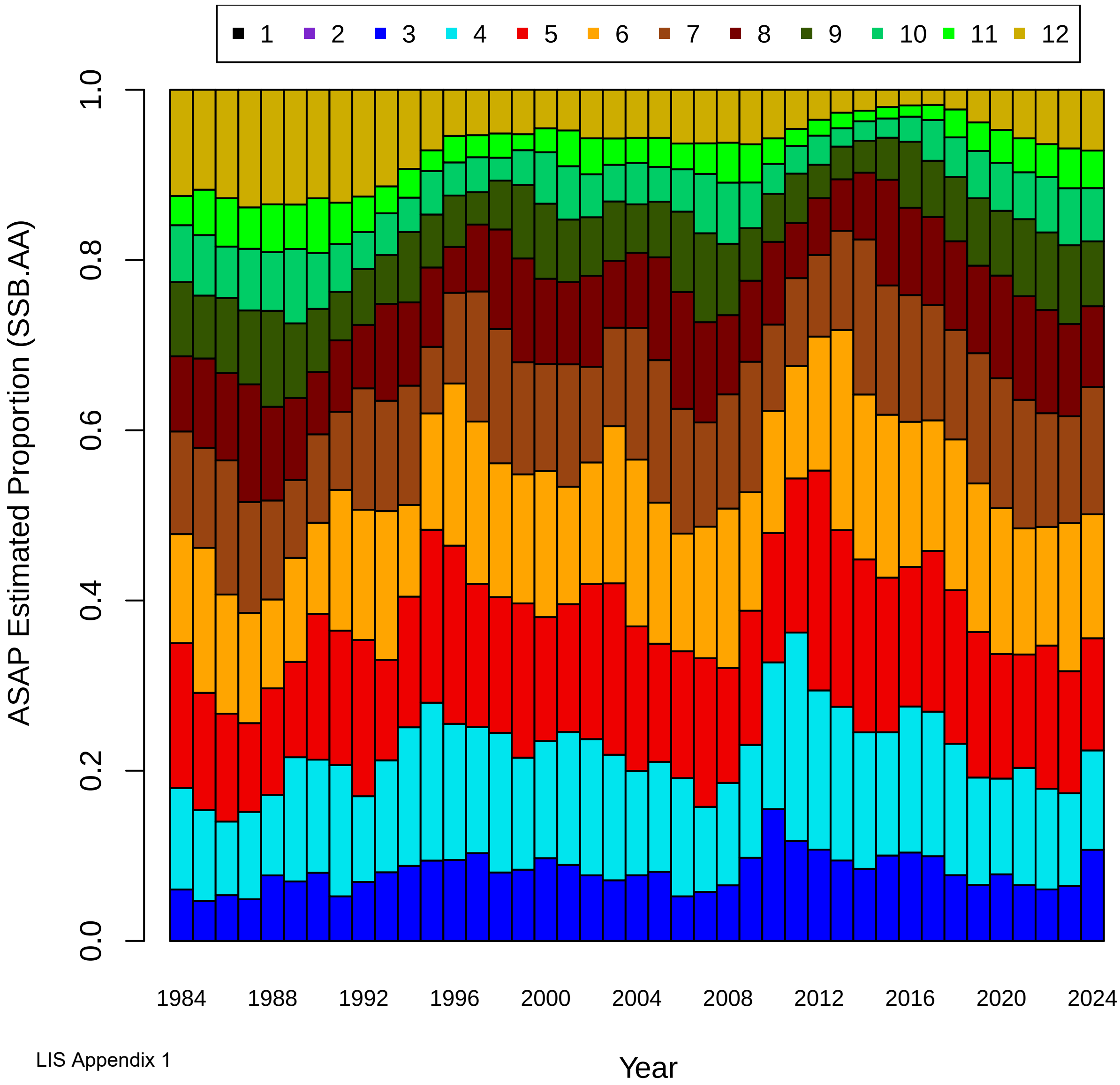

Catchability (q +/− 2 SE)
8e−04
6e−04
4e−04
2e−04
0e+00
CT Trawl
NY Trawl
MRIP CPUE
NYSeine

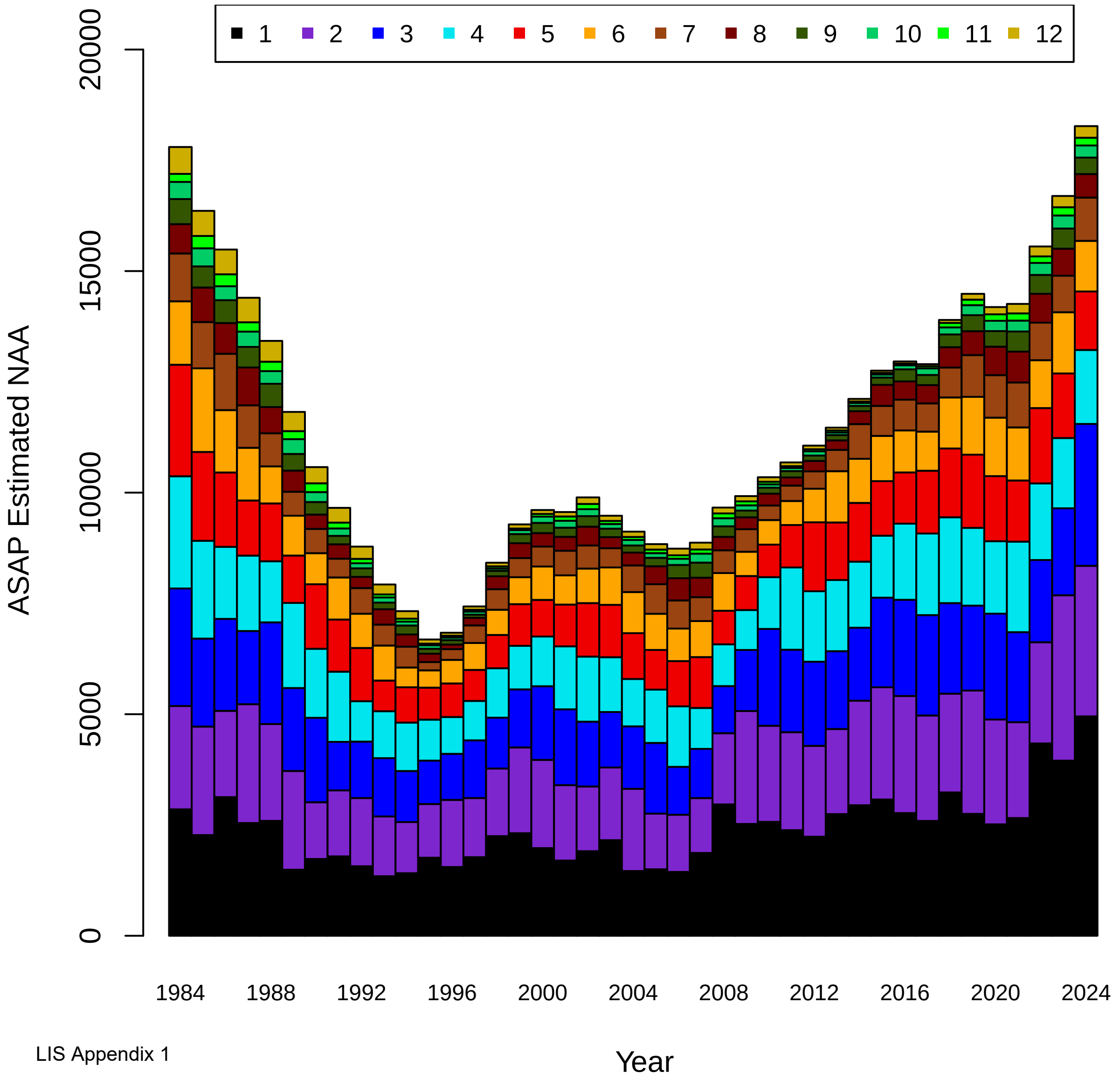


SSB
0
5000
10000
15000
1990
2000
2010
2020
Year
F.report
F.full
Fishing Mortality
0.0
0.2
0.4
0.6
0.8
1990
2000
2010
2020
Year

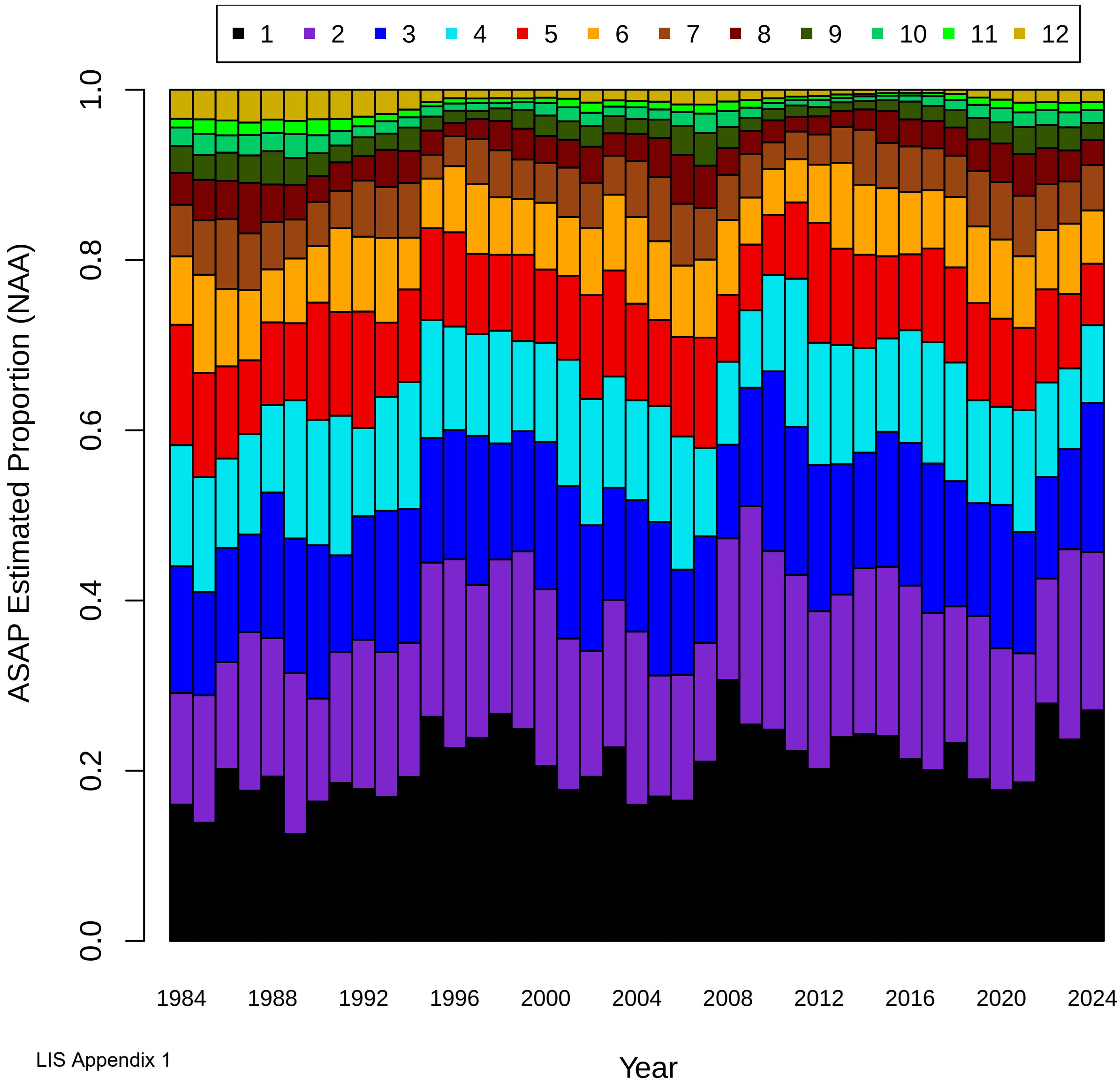

Comparison of January 1 Biomass
Total
SSB
Exploitable
Biomass
15000
10000
5000
0
1990
2000
2010
2020
Year

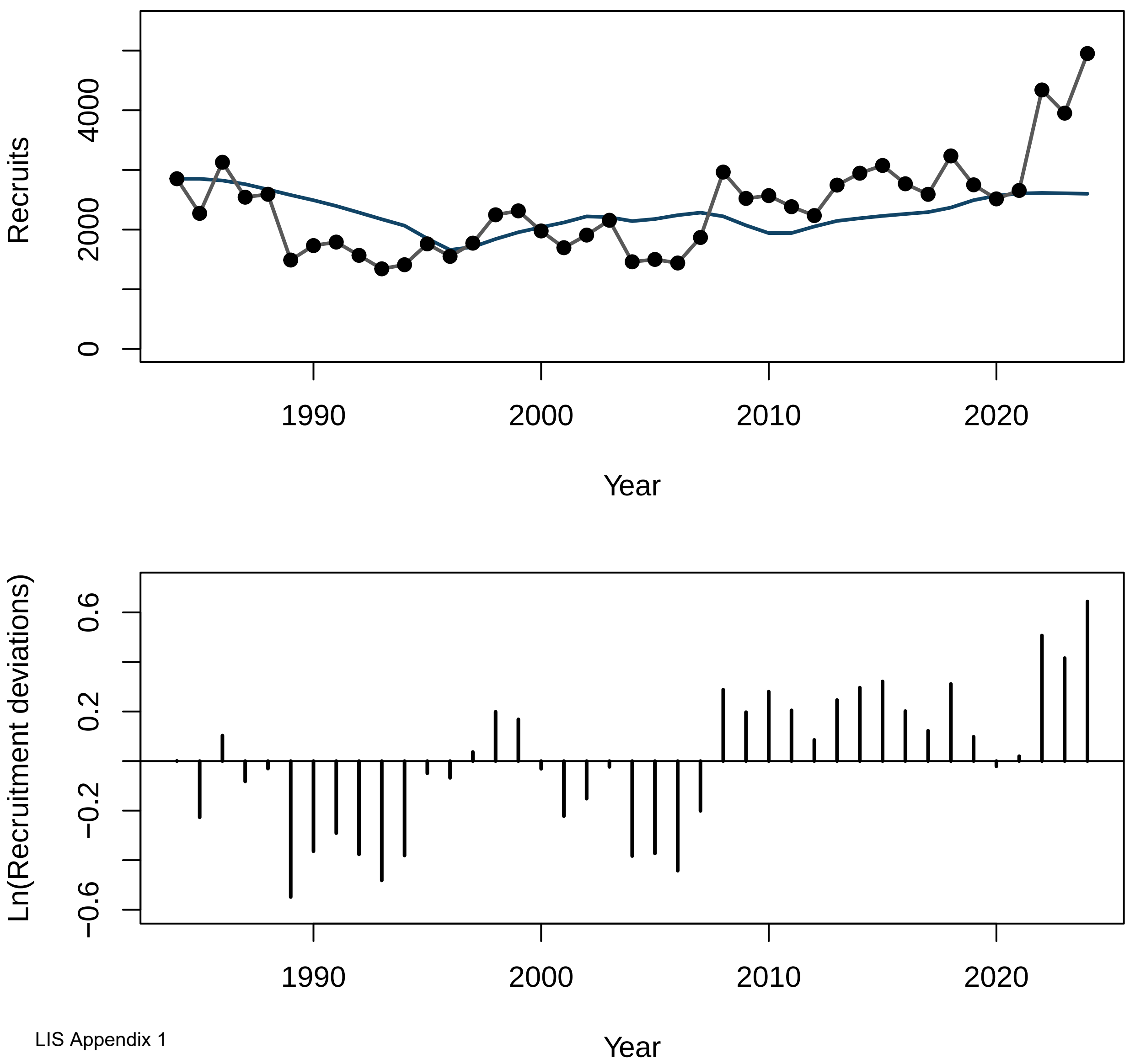

1
2
3
4
5
6
7
8
9
10
11
12
ASAP Estimated SSB.AA
0
5000
10000
15000
1984
1988
1992
1996
2000
2004
2008
2012
2016
2020
2024
Year

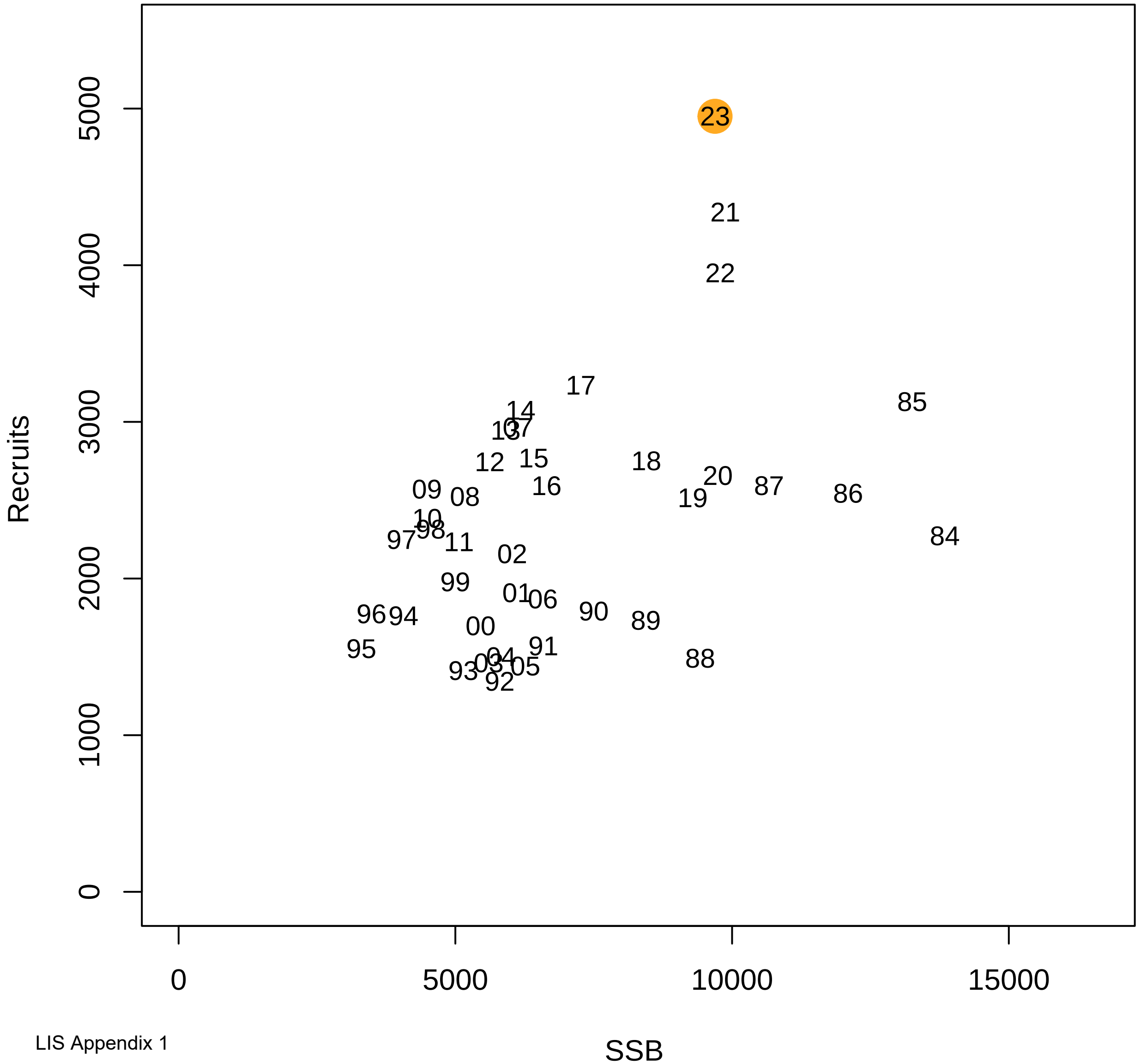

1
2
3
4
5
6
7
8
9
10
11
12
ASAP Estimated Proportion (SSB.AA)
0.0
0.2
0.4
0.6
0.8
1.0
1984
1988
1992
1996
2000
2004
2008
2012
2016
2020
2024
Year



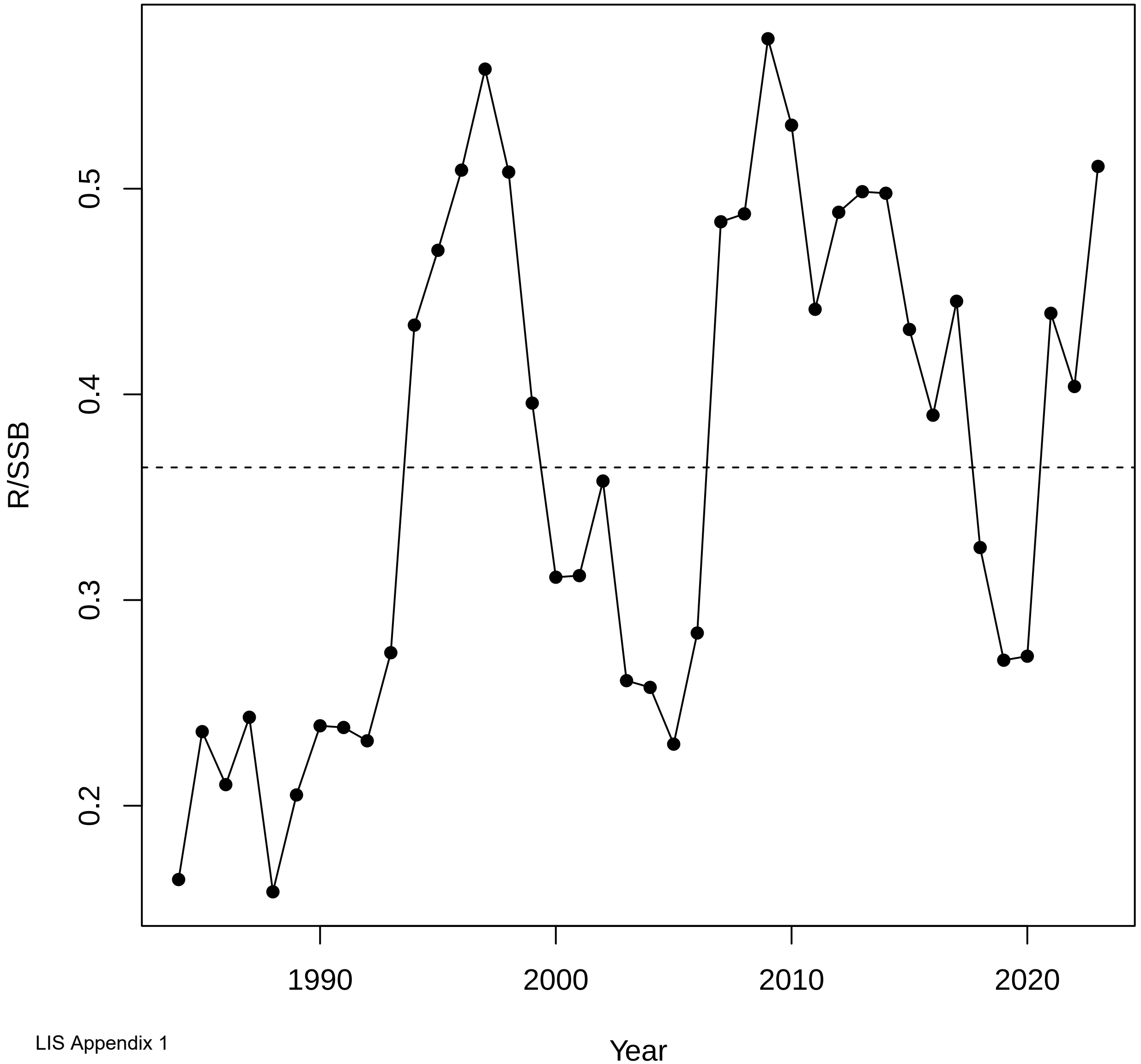
1
2
3
4
5
6
7
8
9
10
11
12
ASAP Estimated NAA
0
5000
10000
15000
20000
1984
1988
1992
1996
2000
2004
2008
2012
2016
2020
2024
Year

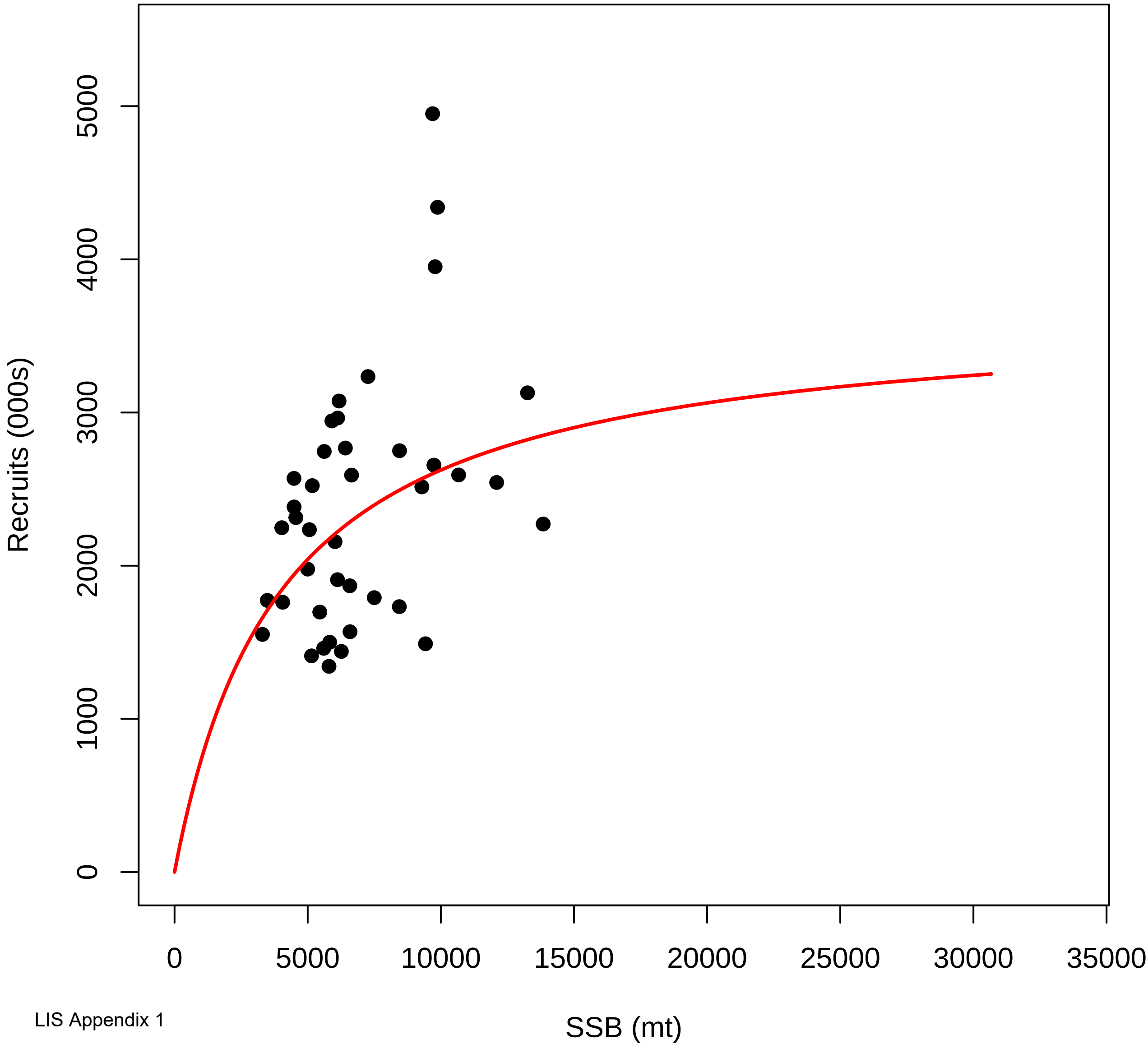

1 2 3 4 5 6 7 8 9 10 11 12
ASAP Estimated Proportion (NAA)
0.0
0.2
0.4
0.6
0.8
1.0
1984
1988
1992
1996
2000
2004
2008
2012
2016
2020
2024
Year


Recruits
0
2000
4000
1990
2000
2010
2020
Year
Ln(Recruitment deviations)
−0.6
−0.2
0.2
0.6
1990
2000
2010
2020
Year

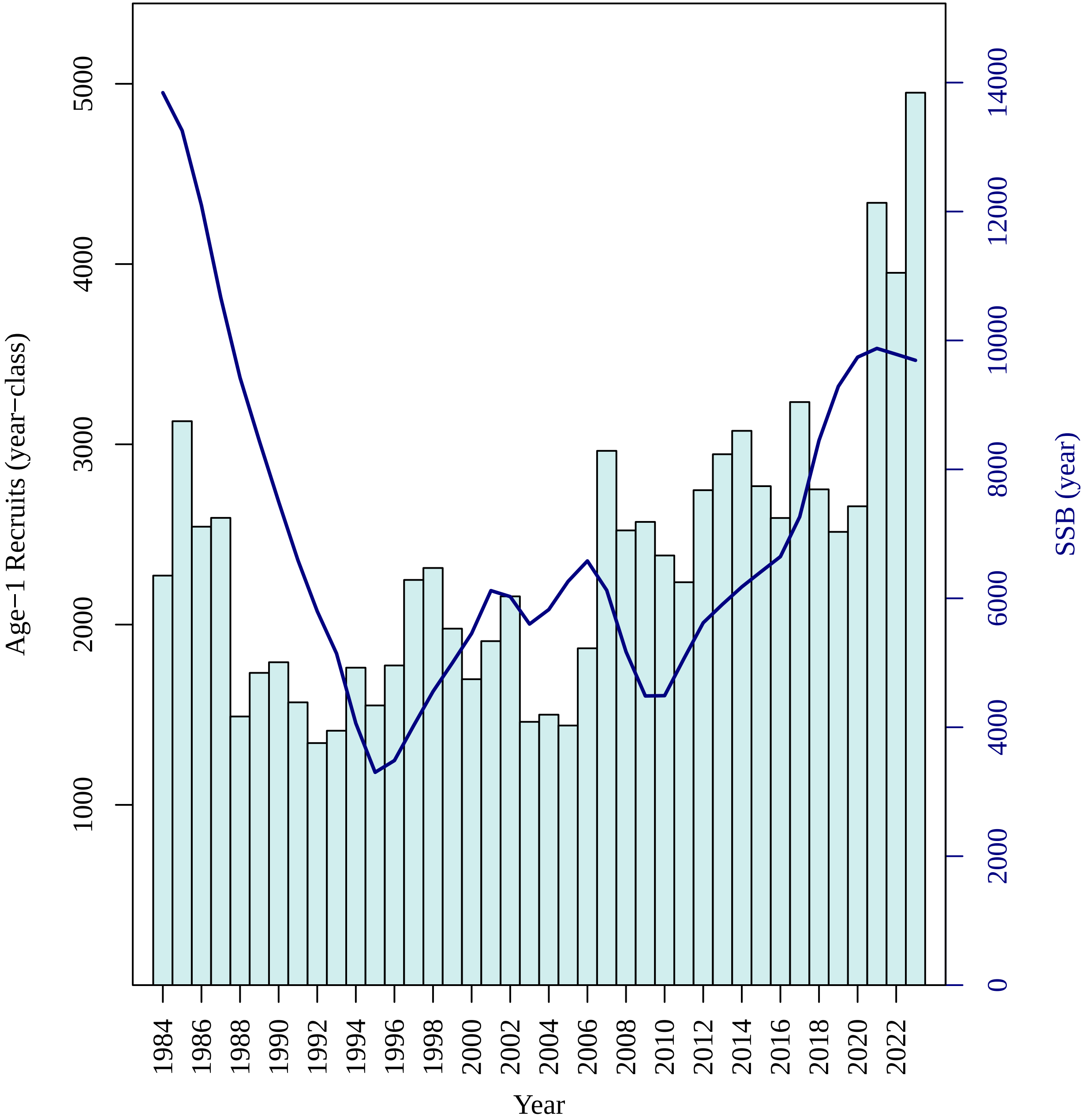


Recruits
0
1000
2000
3000
4000
5000
SSB
0
5000
10000
15000
23
21
22
17
85
14
13
07
12
15
18
20
87
86
09
08
16
19
10
98
97
11
02
84
99
01
06
90
89
96
94
00
95
91
04
03
93
05
88
92

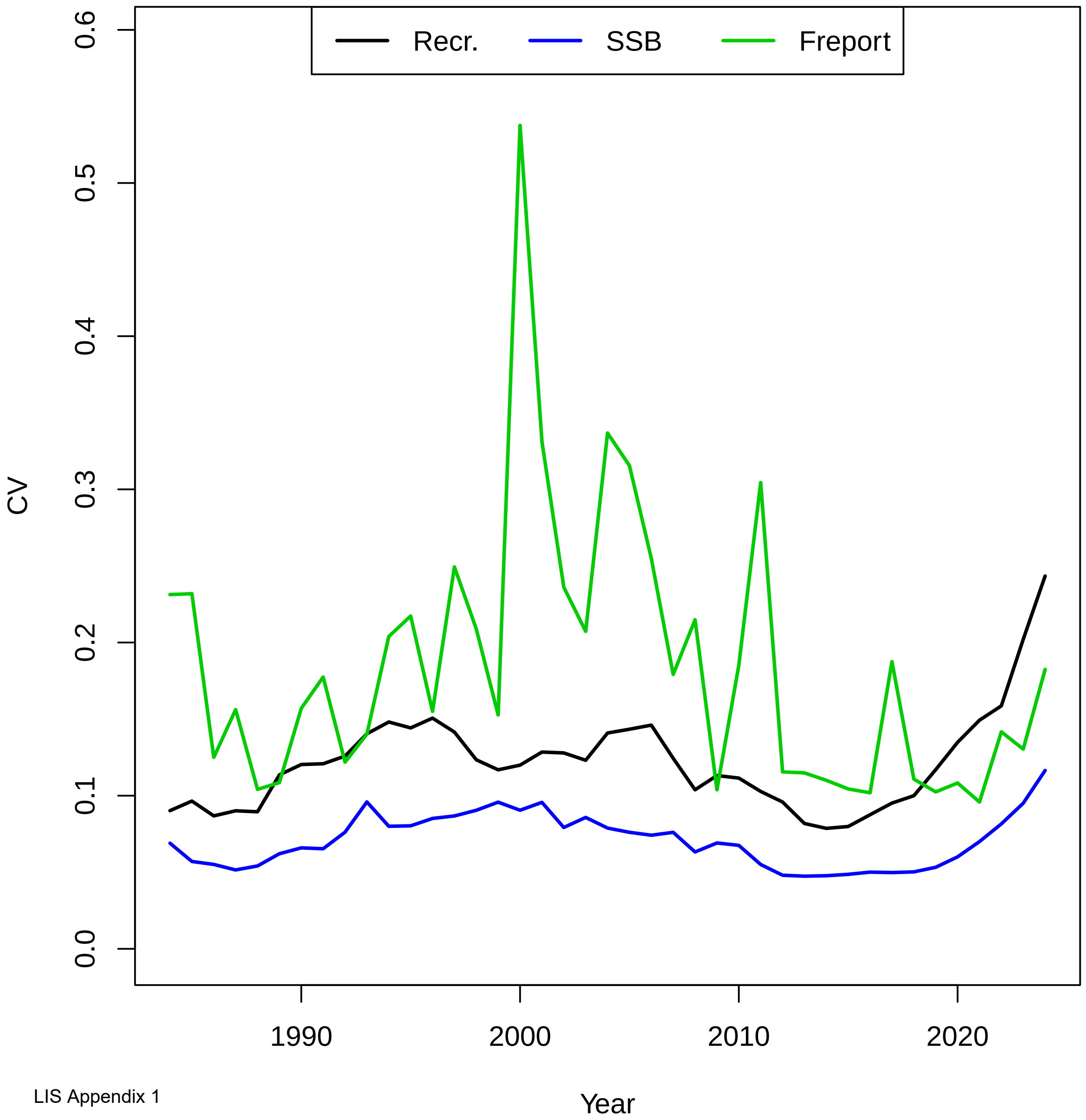

R/SSB
0.2
0.3
0.4
0.5
1990
2000
2010
2020
Year



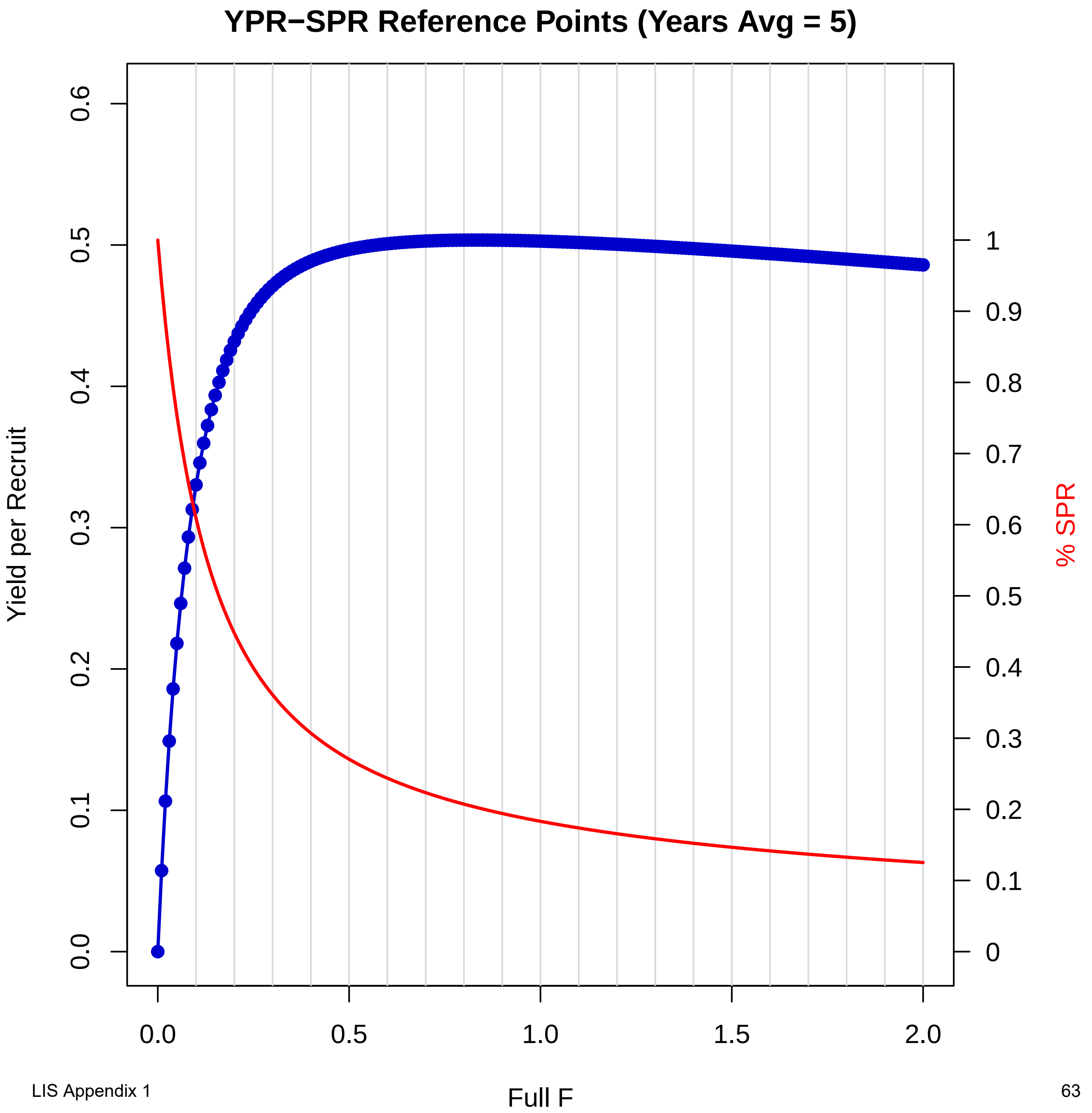
Recruits (000s)
0
1000
2000
3000
4000
5000
0
5000
10000
15000
20000
25000
30000
35000
SSB (mt)



Age−1 Recruits (year−class)
1000
2000
3000
4000
5000
SSB (year)
0
2000
4000
6000
8000
10000
12000
14000
Year
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022

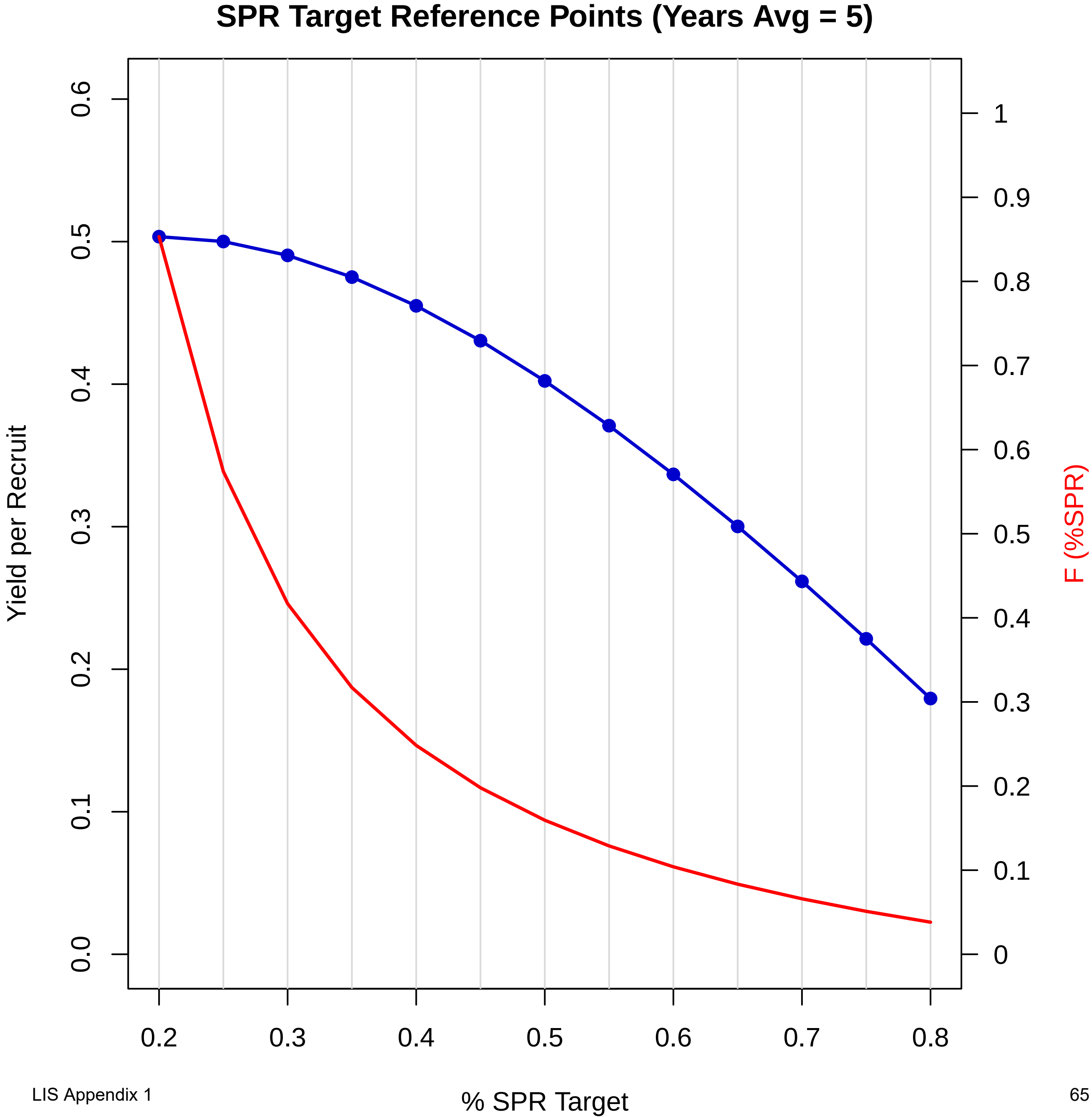


Recr.
SSB
Freport
0.0
0.1
0.2
0.3
0.4
0.5
0.6
CV
1990
2000
2010
2020
Year


YPR−SPR Reference Points (Years Avg = 5)
Yield per Recruit
% SPR
Full F
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0.0
0.5
1.0
1.5
2.0

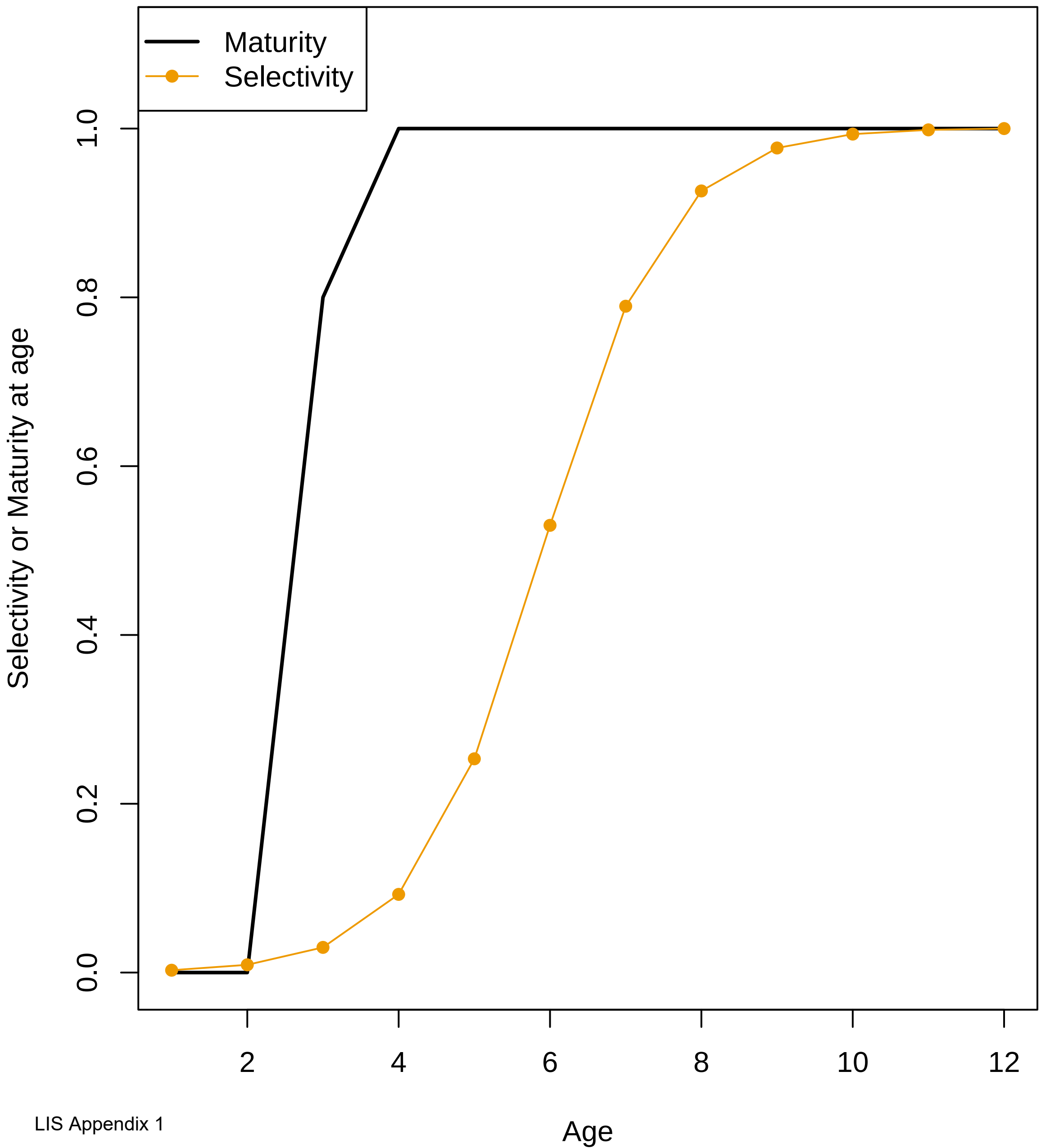
YPR−SPR Reference Points (Years Avg = 5)

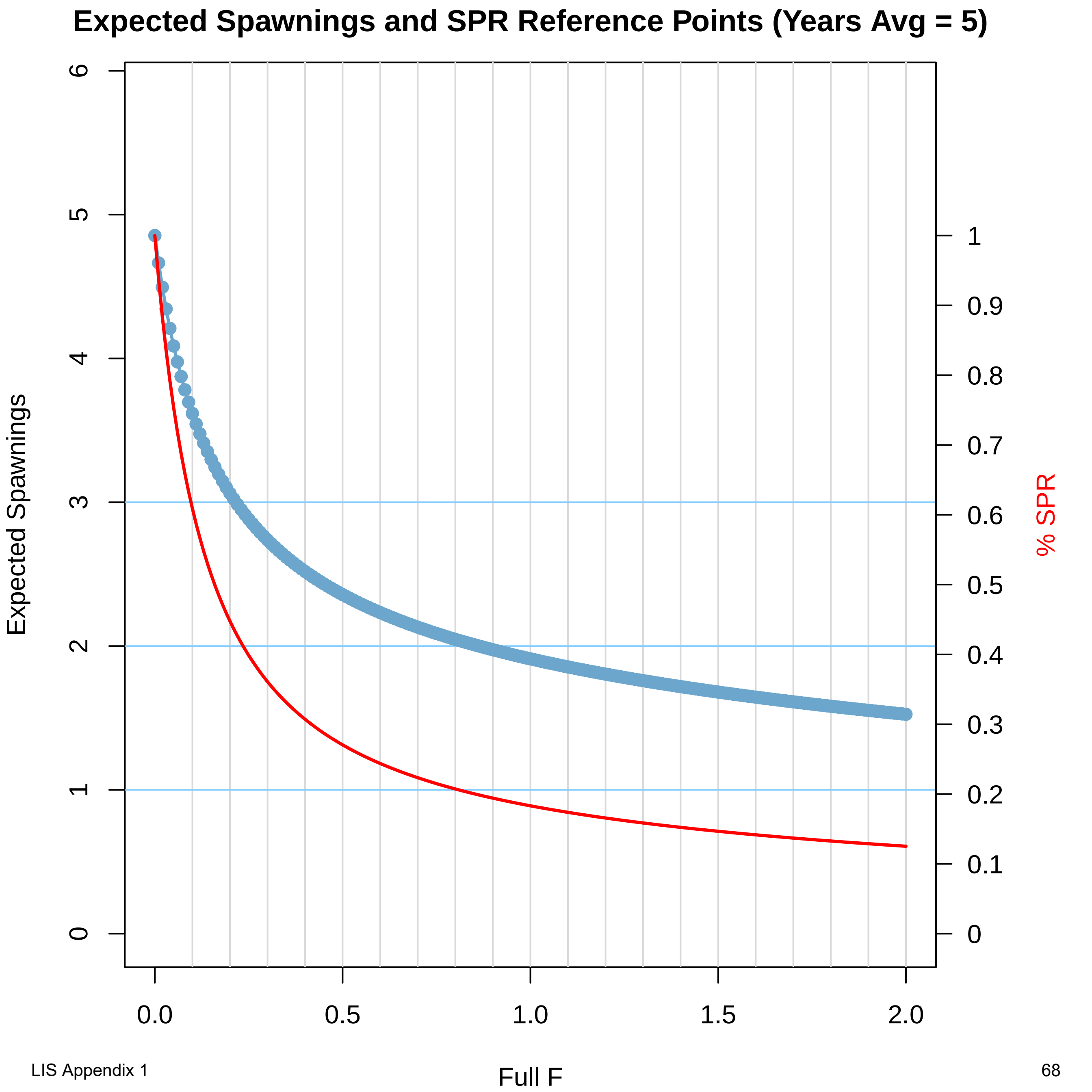
F	YPR	SPR	F	YPR	SPR	F	YPR	SPR
0	0	1	0.35	0.4814	0.3312	0.7	0.5028	0.2234
0.01	0.0573	0.9381	0.36	0.4831	0.326	0.71	0.5029	0.2217
0.02	0.1065	0.8836	0.37	0.4846	0.321	0.72	0.503	0.2199
0.03	0.149	0.8354	0.38	0.486	0.3162	0.73	0.5031	0.2182
0.04	0.1859	0.7924	0.39	0.4873	0.3116	0.74	0.5032	0.2166
0.05	0.2181	0.7539	0.4	0.4885	0.3071	0.75	0.5032	0.2149
0.06	0.2464	0.7192	0.41	0.4896	0.3028	0.76	0.5033	0.2133
0.07	0.2713	0.6877	0.42	0.4907	0.2987	0.77	0.5033	0.2118
0.08	0.2933	0.6591	0.43	0.4916	0.2947	0.78	0.5034	0.2103
0.09	0.3129	0.6329	0.44	0.4925	0.2909	0.79	0.5034	0.2088
0.1	0.3303	0.609	0.45	0.4934	0.2872	0.8	0.5034	0.2073
0.11	0.3458	0.587	0.46	0.4942	0.2836	0.81	0.5035	0.2059
0.12	0.3598	0.5667	0.47	0.4949	0.2802	0.82	0.5035	0.2045
0.13	0.3723	0.5479	0.48	0.4956	0.2768	0.83	0.5035	0.2031
0.14	0.3835	0.5304	0.49	0.4962	0.2736	0.84	0.5035	0.2017
0.15	0.3937	0.5142	0.5	0.4968	0.2704	0.85	0.5035	0.2004
0.16	0.4028	0.4991	0.51	0.4973	0.2674	0.86	0.5035	0.1991
0.17	0.4111	0.485	0.52	0.4979	0.2645	0.87	0.5034	0.1978
0.18	0.4186	0.4717	0.53	0.4983	0.2616	0.88	0.5034	0.1966
0.19	0.4255	0.4593	0.54	0.4988	0.2588	0.89	0.5034	0.1954
0.2	0.4317	0.4477	0.55	0.4992	0.2561	0.9	0.5033	0.1941
0.21	0.4374	0.4367	0.56	0.4996	0.2535	0.91	0.5033	0.193
0.22	0.4426	0.4264	0.57	0.4999	0.251	0.92	0.5033	0.1918
0.23	0.4473	0.4166	0.58	0.5003	0.2485	0.93	0.5032	0.1907
0.24	0.4516	0.4073	0.59	0.5006	0.2461	0.94	0.5031	0.1895
0.25	0.4556	0.3986	0.6	0.5009	0.2438	0.95	0.5031	0.1884
0.26	0.4592	0.3903	0.61	0.5011	0.2415	0.96	0.503	0.1873
0.27	0.4626	0.3824	0.62	0.5014	0.2393	0.97	0.503	0.1863
0.28	0.4657	0.3749	0.63	0.5016	0.2371	0.98	0.5029	0.1852
0.29	0.4685	0.3678	0.64	0.5018	0.235	0.99	0.5028	0.1842
0.3	0.4711	0.361	0.65	0.502	0.233	1	0.5027	0.1832
0.31	0.4735	0.3545	0.66	0.5022	0.231	1.01	0.5026	0.1822
0.32	0.4757	0.3483	0.67	0.5024	0.229	1.02	0.5026	0.1812
0.33	0.4778	0.3423	0.68	0.5025	0.2271	1.03	0.5025	0.1802
0.34	0.4797	0.3366	0.69	0.5026	0.2252	1.04	0.5024	0.1792


SPR Target Reference Points (Years Avg = 5)
Yield per Recruit
F (%SPR)
% SPR Target
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

SPR Target Reference Points (Years Avg = 5)

% SPR	F(%SPR)	YPR
0.2	0.8532	0.5035
0.25	0.574	0.5001
0.3	0.4168	0.4903
0.35	0.3171	0.4751
0.4	0.2484	0.455
0.45	0.198	0.4305
0.5	0.1594	0.4023
0.55	0.1288	0.3709
0.6	0.104	0.3367
0.65	0.0834	0.3002
0.7	0.066	0.2616
0.75	0.0511	0.2213
0.8	0.0382	0.1794

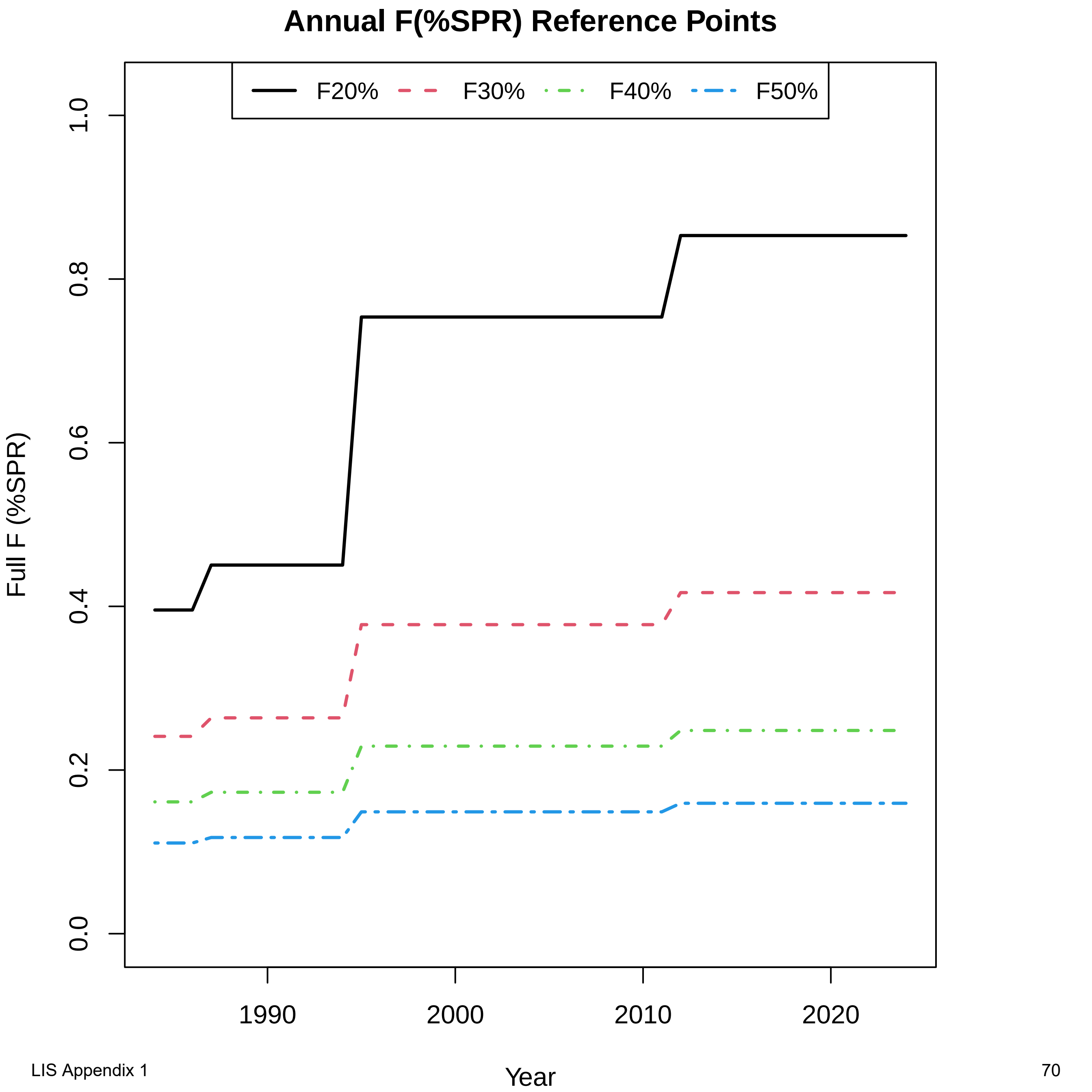

Maturity
Selectivity
Selectivity or Maturity at age
0.0
0.2
0.4
0.6
0.8
1.0
2
4
6
8
10
12
Age

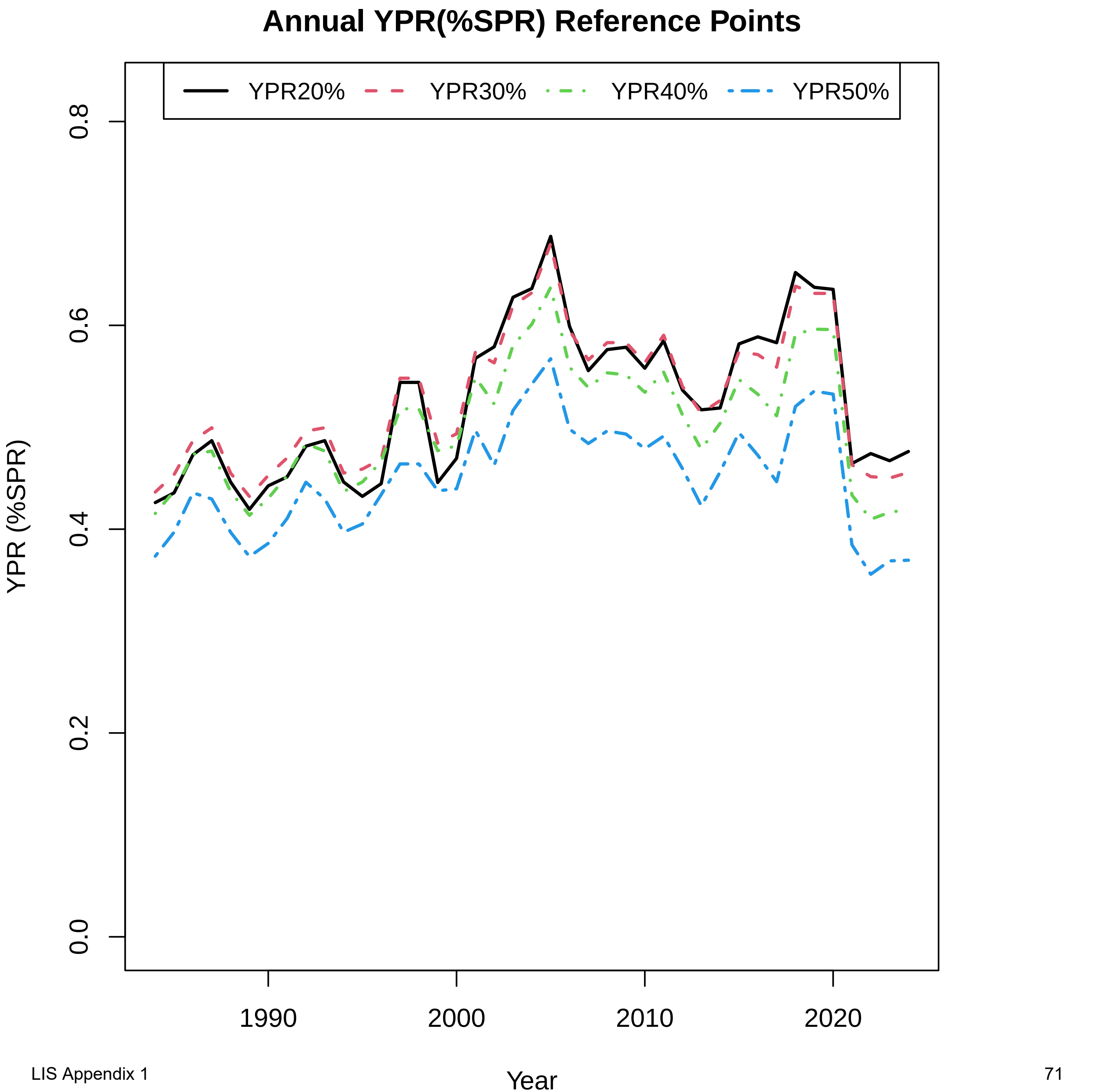


Expected Spawnings and SPR Reference Points (Years Avg = 5)
Expected Spawnings
% SPR
Full F
0
1
2
3
4
5
6
0.0
0.5
1.0
1.5
2.0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

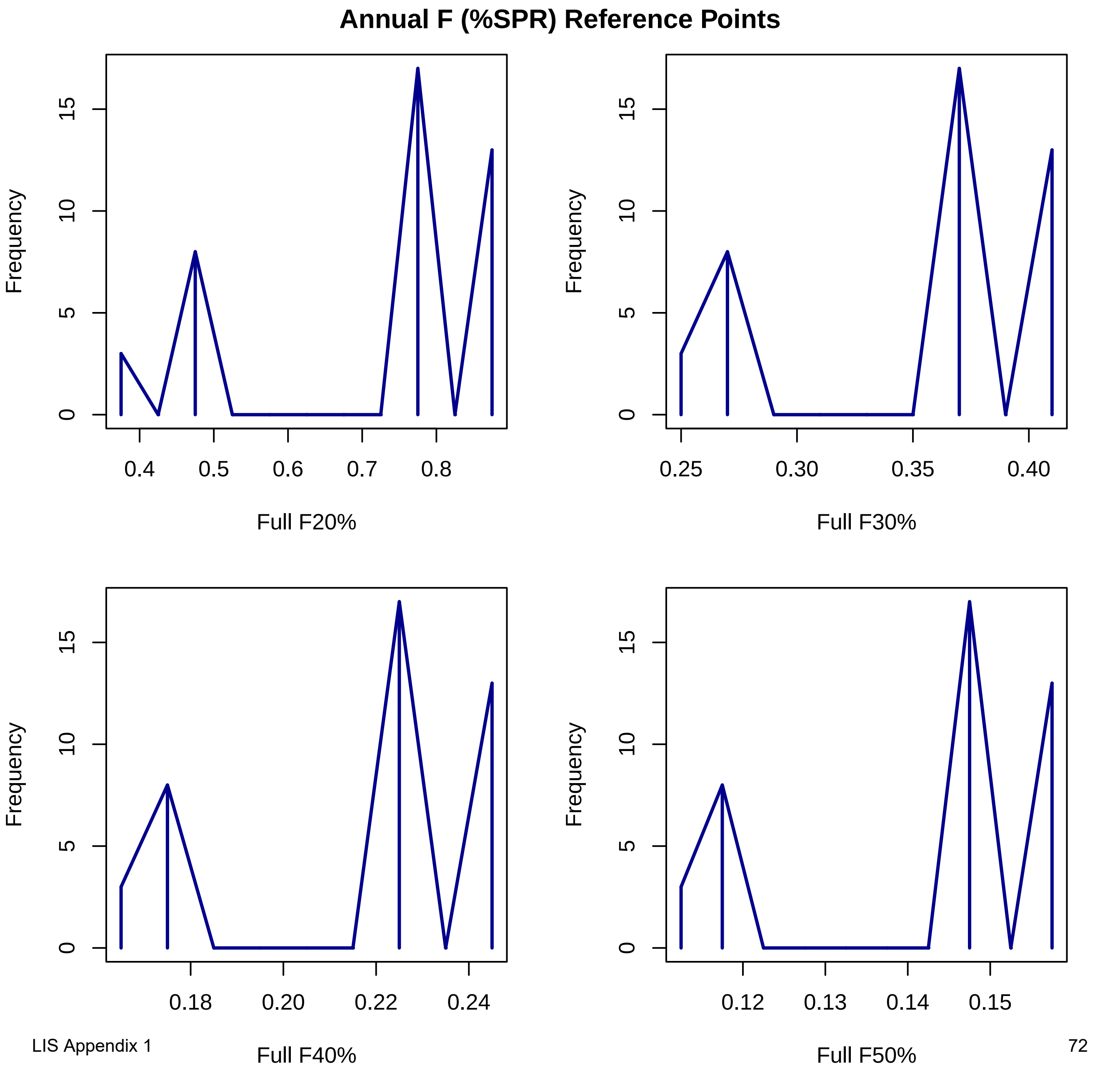
Expected Spawnings & SPR Reference Points (Years Avg = 5)

F	E[Sp]	SPR	F	E[Sp]	SPR	F	E[Sp]	SPR
0	4.8546	1	0.35	2.6187	0.3312	0.7	2.1315	0.2234
0.01	4.6639	0.9381	0.36	2.5974	0.326	0.71	2.1224	0.2217
0.02	4.495	0.8836	0.37	2.5767	0.321	0.72	2.1134	0.2199
0.03	4.3444	0.8354	0.38	2.5567	0.3162	0.73	2.1046	0.2182
0.04	4.2091	0.7924	0.39	2.5374	0.3116	0.74	2.0959	0.2166
0.05	4.0869	0.7539	0.4	2.5186	0.3071	0.75	2.0874	0.2149
0.06	3.9759	0.7192	0.41	2.5004	0.3028	0.76	2.079	0.2133
0.07	3.8746	0.6877	0.42	2.4828	0.2987	0.77	2.0708	0.2118
0.08	3.7817	0.6591	0.43	2.4656	0.2947	0.78	2.0627	0.2103
0.09	3.6962	0.6329	0.44	2.449	0.2909	0.79	2.0547	0.2088
0.1	3.6172	0.609	0.45	2.4328	0.2872	0.8	2.0468	0.2073
0.11	3.5439	0.587	0.46	2.417	0.2836	0.81	2.039	0.2059
0.12	3.4757	0.5667	0.47	2.4017	0.2802	0.82	2.0314	0.2045
0.13	3.4122	0.5479	0.48	2.3867	0.2768	0.83	2.0239	0.2031
0.14	3.3527	0.5304	0.49	2.3721	0.2736	0.84	2.0165	0.2017
0.15	3.2969	0.5142	0.5	2.3579	0.2704	0.85	2.0092	0.2004
0.16	3.2444	0.4991	0.51	2.3441	0.2674	0.86	2.002	0.1991
0.17	3.195	0.485	0.52	2.3306	0.2645	0.87	1.9949	0.1978
0.18	3.1484	0.4717	0.53	2.3174	0.2616	0.88	1.9879	0.1966
0.19	3.1042	0.4593	0.54	2.3045	0.2588	0.89	1.981	0.1954
0.2	3.0624	0.4477	0.55	2.2919	0.2561	0.9	1.9742	0.1941
0.21	3.0227	0.4367	0.56	2.2796	0.2535	0.91	1.9675	0.193
0.22	2.9849	0.4264	0.57	2.2675	0.251	0.92	1.9609	0.1918
0.23	2.9489	0.4166	0.58	2.2557	0.2485	0.93	1.9544	0.1907
0.24	2.9146	0.4073	0.59	2.2442	0.2461	0.94	1.948	0.1895
0.25	2.8818	0.3986	0.6	2.2329	0.2438	0.95	1.9416	0.1884
0.26	2.8505	0.3903	0.61	2.2219	0.2415	0.96	1.9353	0.1873
0.27	2.8205	0.3824	0.62	2.211	0.2393	0.97	1.9291	0.1863
0.28	2.7917	0.3749	0.63	2.2004	0.2371	0.98	1.923	0.1852
0.29	2.764	0.3678	0.64	2.19	0.235	0.99	1.917	0.1842
0.3	2.7375	0.361	0.65	2.1798	0.233	1	1.911	0.1832
0.31	2.7119	0.3545	0.66	2.1698	0.231	1.01	1.9051	0.1822
0.32	2.6874	0.3483	0.67	2.16	0.229	1.02	1.8993	0.1812
0.33	2.6636	0.3423	0.68	2.1503	0.2271	1.03	1.8935	0.1802
0.34	2.6408	0.3366	0.69	2.1408	0.2252	1.04	1.8878	0.1792

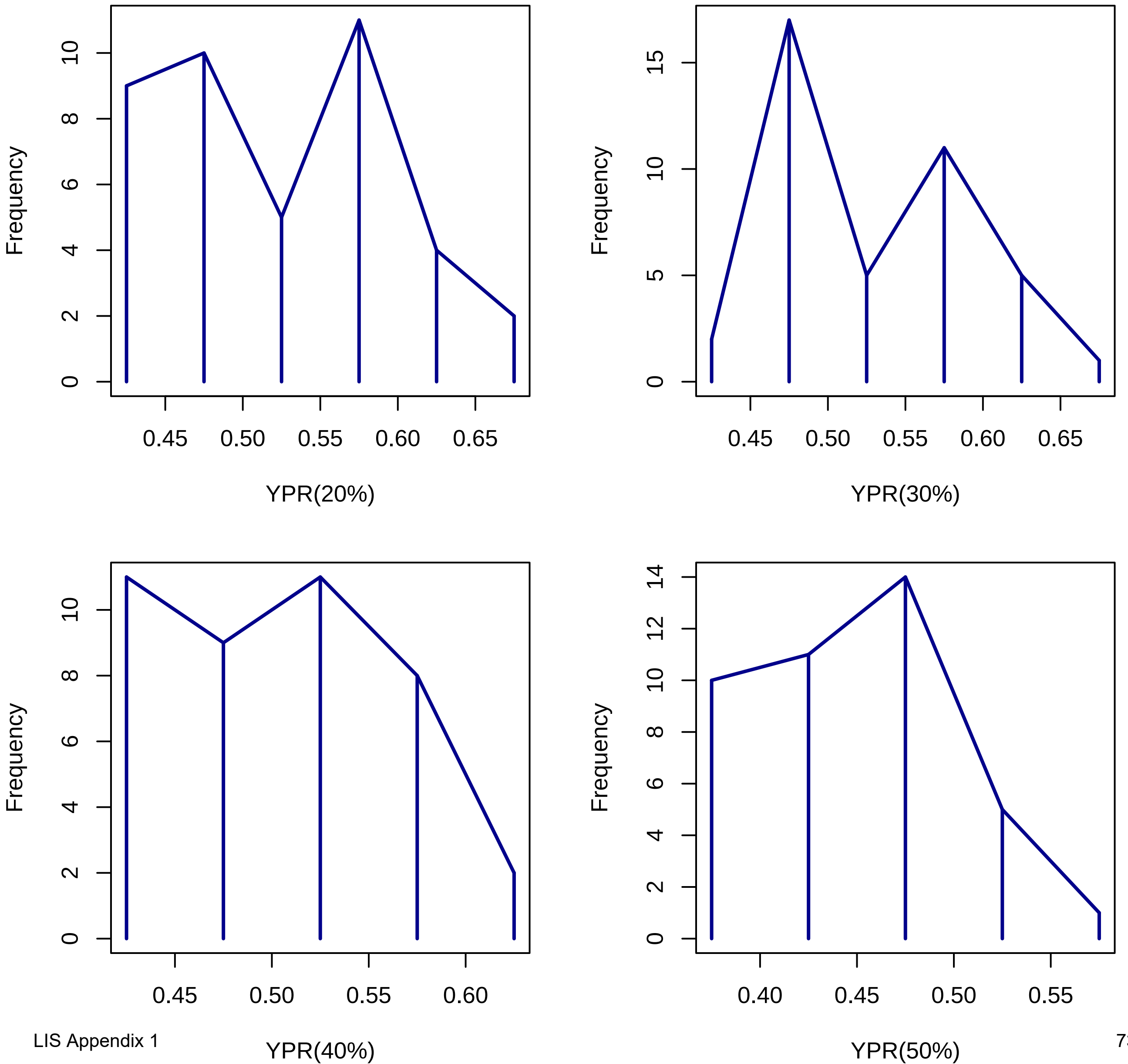

Annual F(%SPR) Reference Points
F20%
F30%
F40%
F50%
Full F (%SPR)
0.0
0.2
0.4
0.6
0.8
1.0
1990
2000
2010
2020
Year



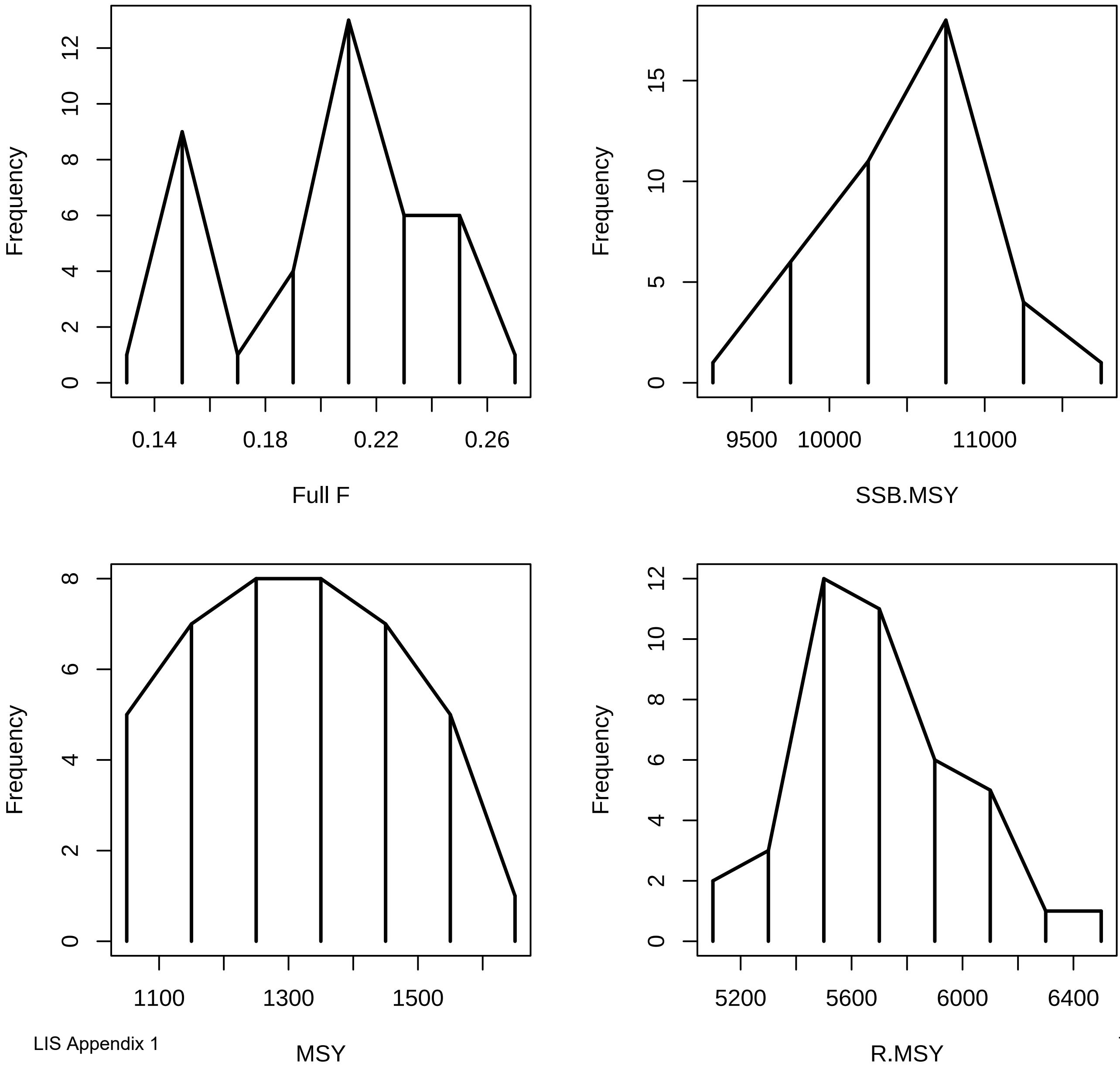
Annual YPR(%SPR) Reference Points
YPR20%
YPR30%
YPR40%
YPR50%
YPR (%SPR)
0.0
0.2
0.4
0.6
0.8
1990
2000
2010
2020
Year


Annual F (%SPR) Reference Points
Frequency
0
5
10
15
0.4
0.5
0.6
0.7
0.8
Full F20%
Frequency
0
5
10
15
0.25
0.30
0.35
0.40
Full F30%
Frequency
0
5
10
15
0.18
0.20
0.22
0.24
Full F40%
Frequency
0
5
10
15
0.12
0.13
0.14
0.15
Full F50%

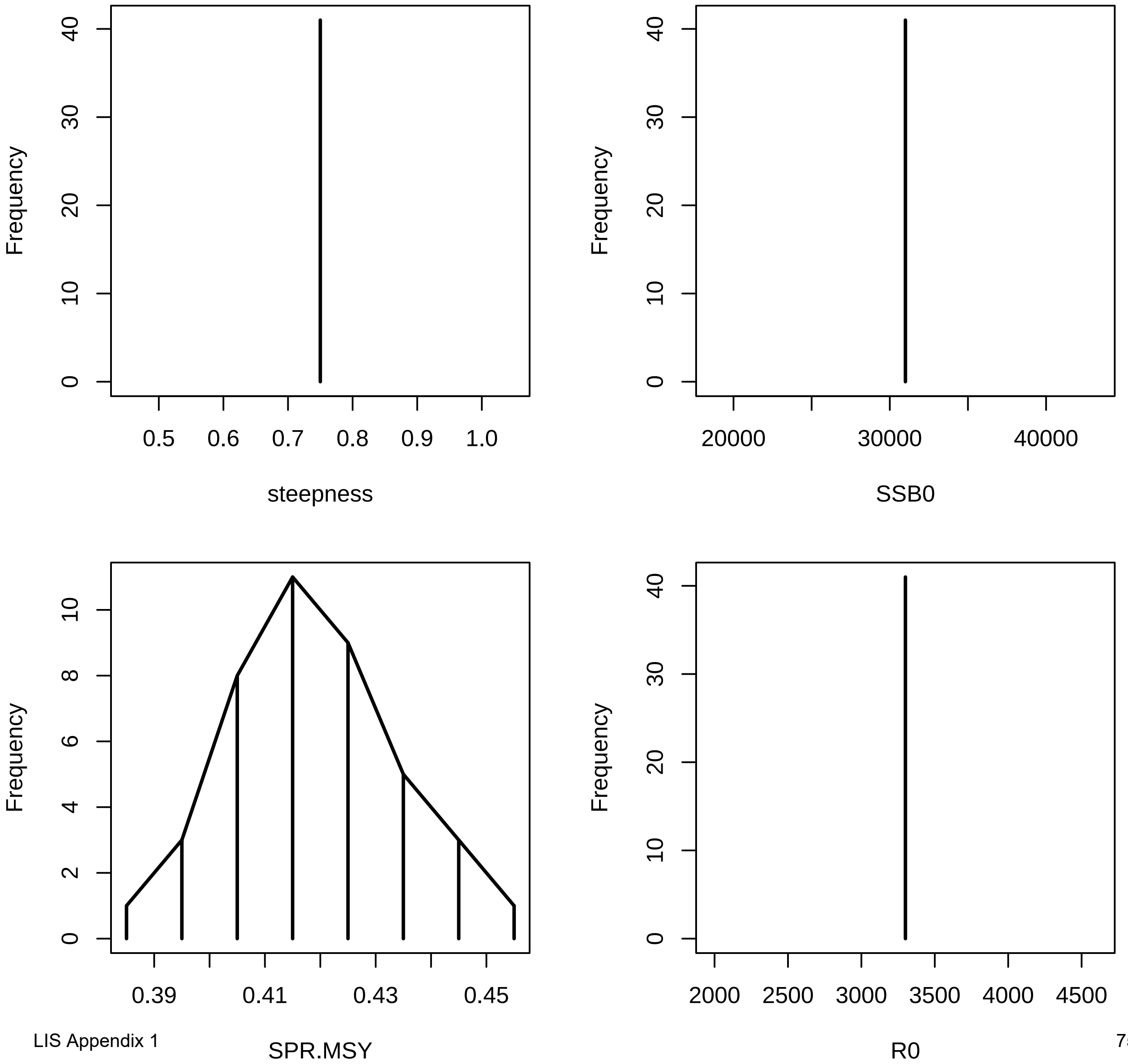
Annual YPR (%SPR) Reference Points

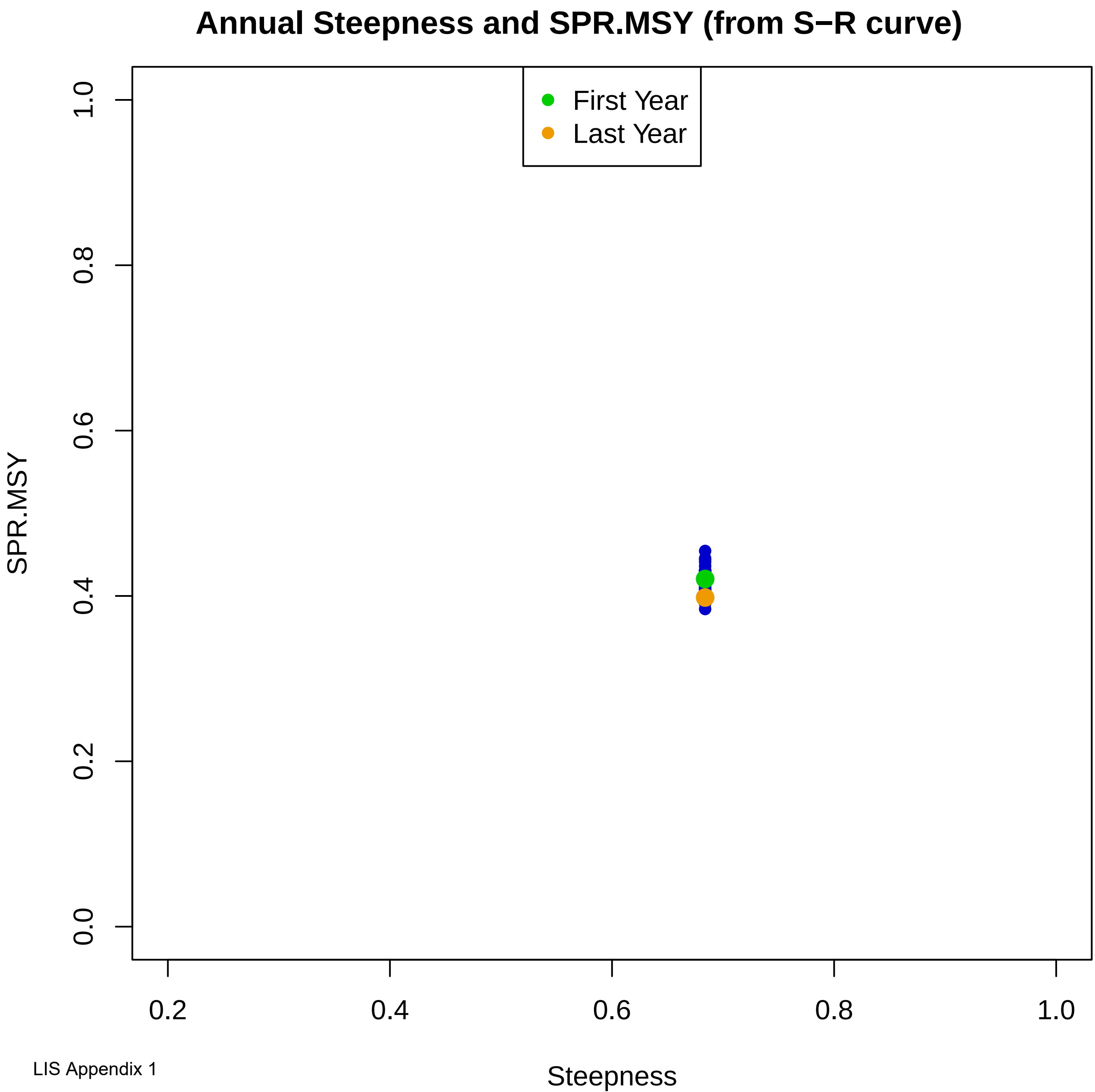


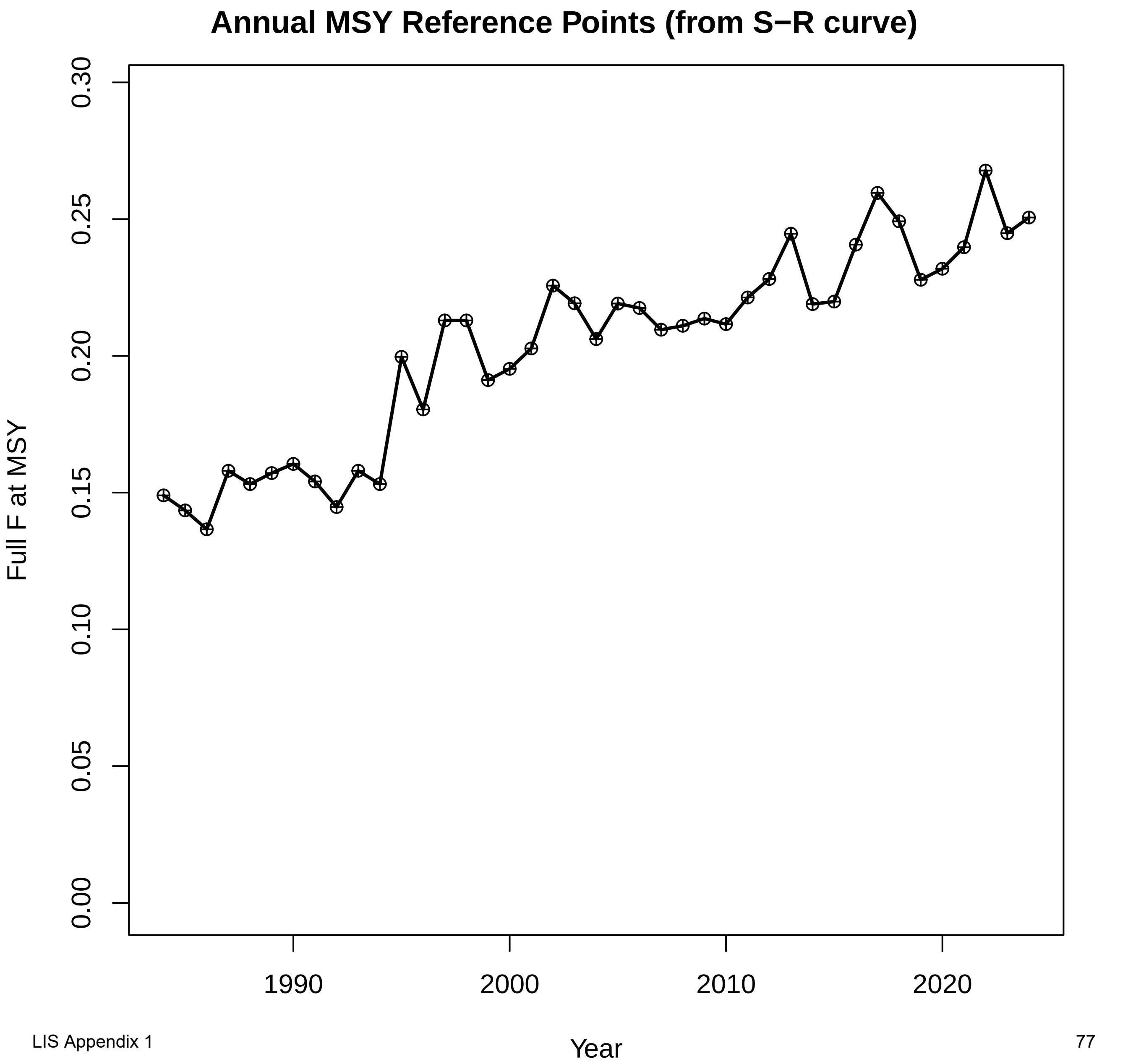
Annual MSY Reference Points (from S−R curve)

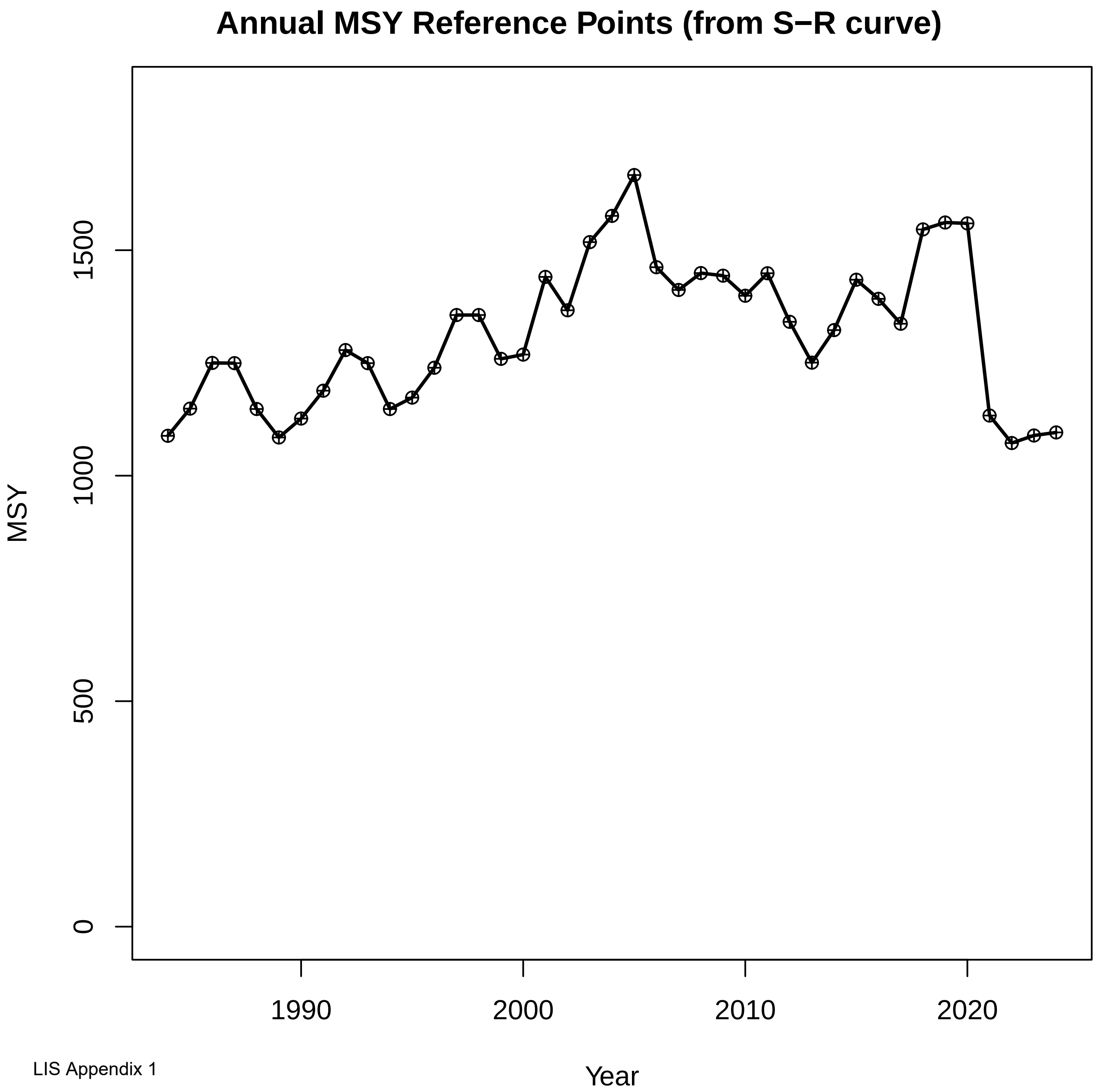


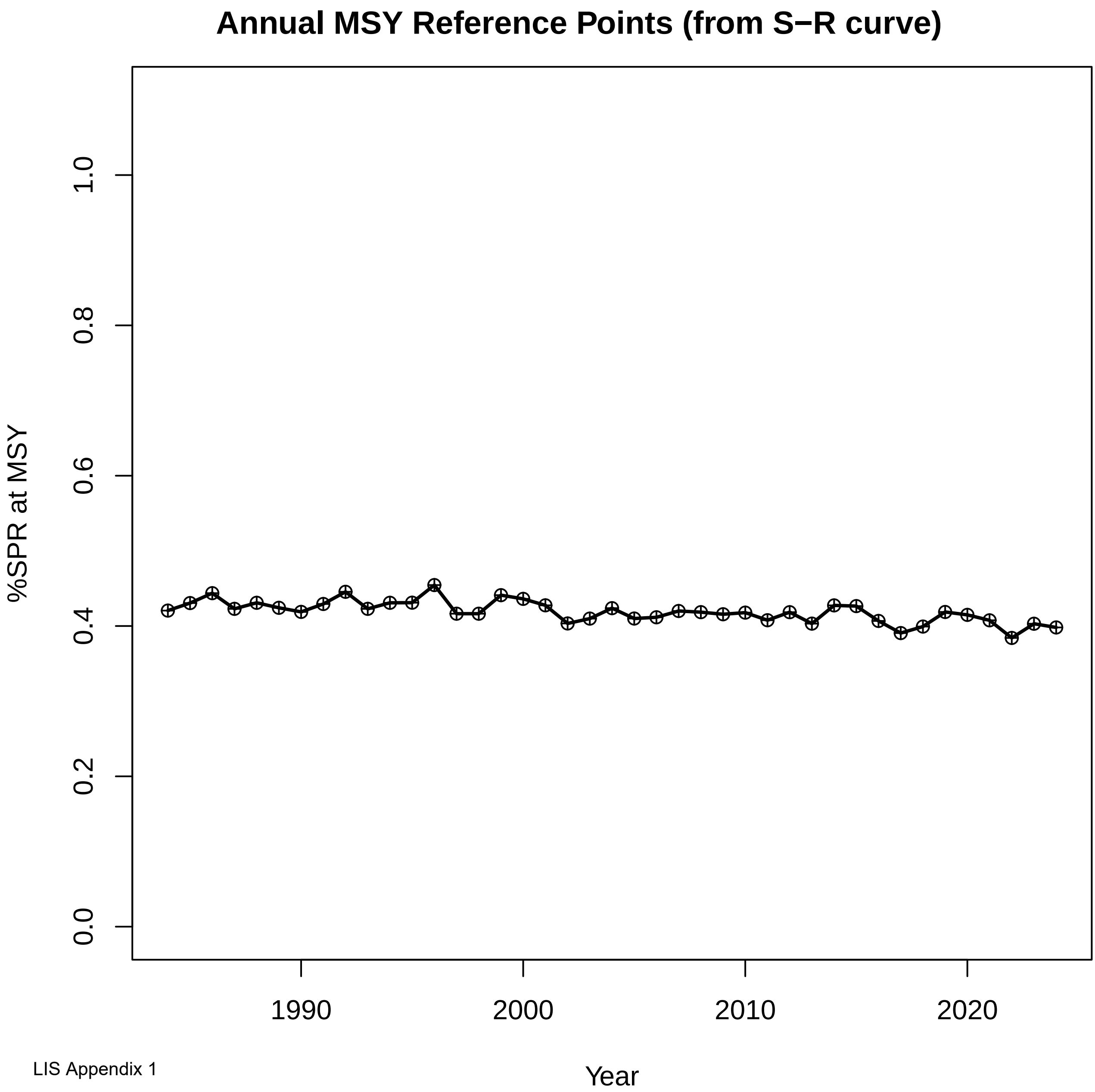
Annual MSY Reference Points (from S−R curve)

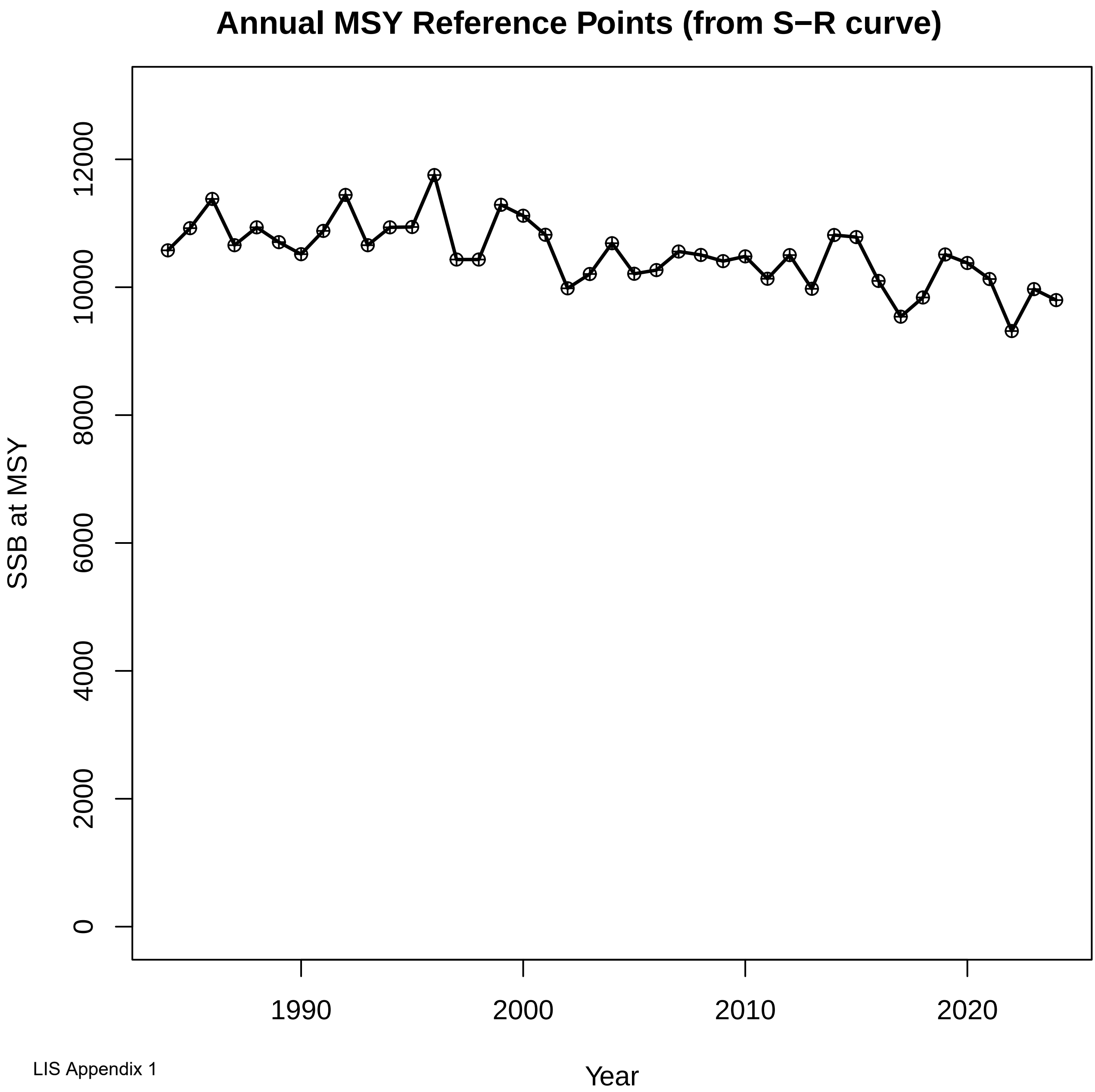


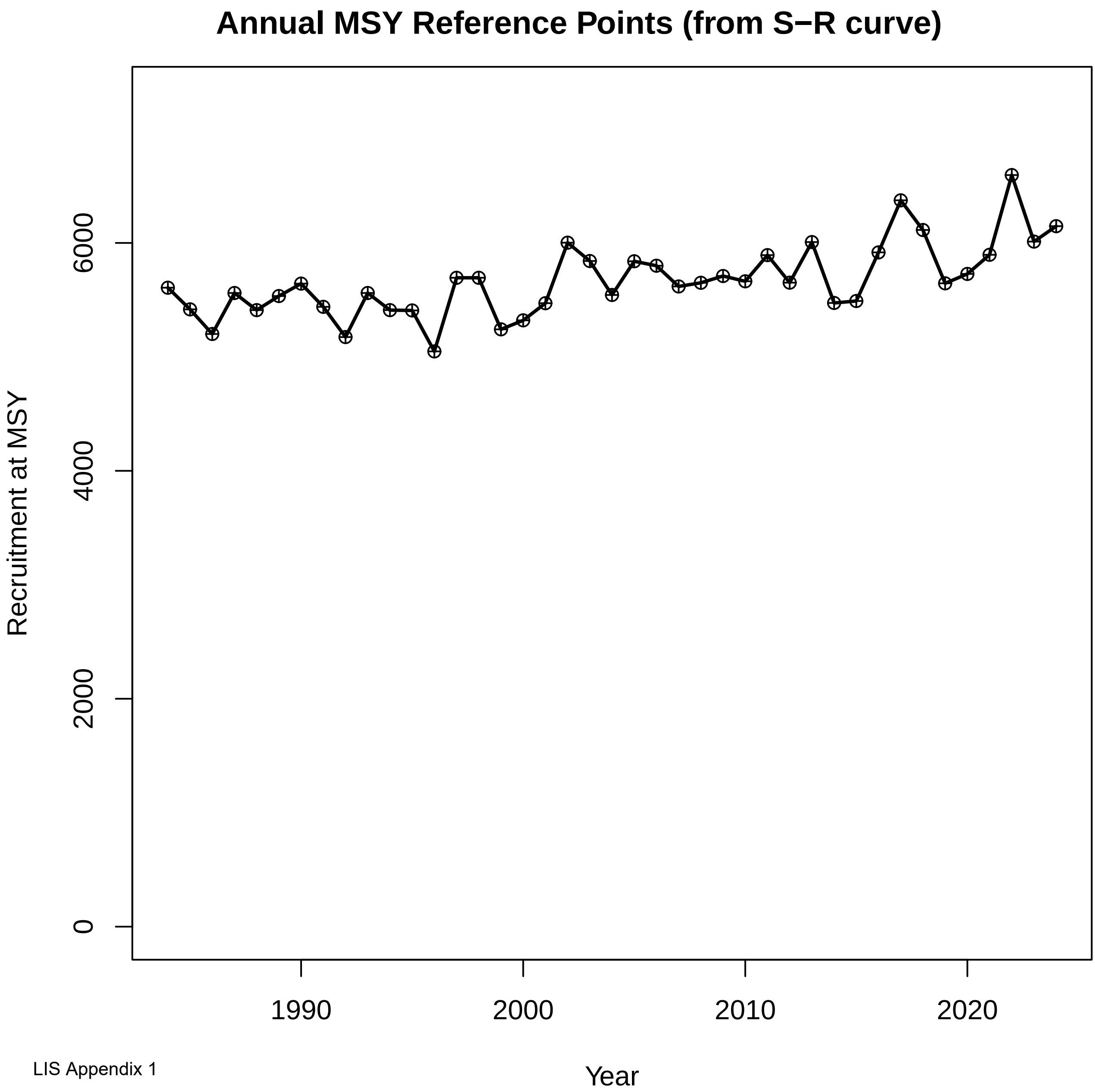

Annual Steepness and SPR.MSY (from S−R curve)
First Year
Last Year
SPR.MSY
0.0
0.2
0.4
0.6
0.8
1.0
0.2
0.4
0.6
0.8
1.0
Steepness


Annual MSY Reference Points (from S−R curve)
Full F at MSY
0.00
0.05
0.10
0.15
0.20
0.25
0.30
1990
2000
2010
2020
Year

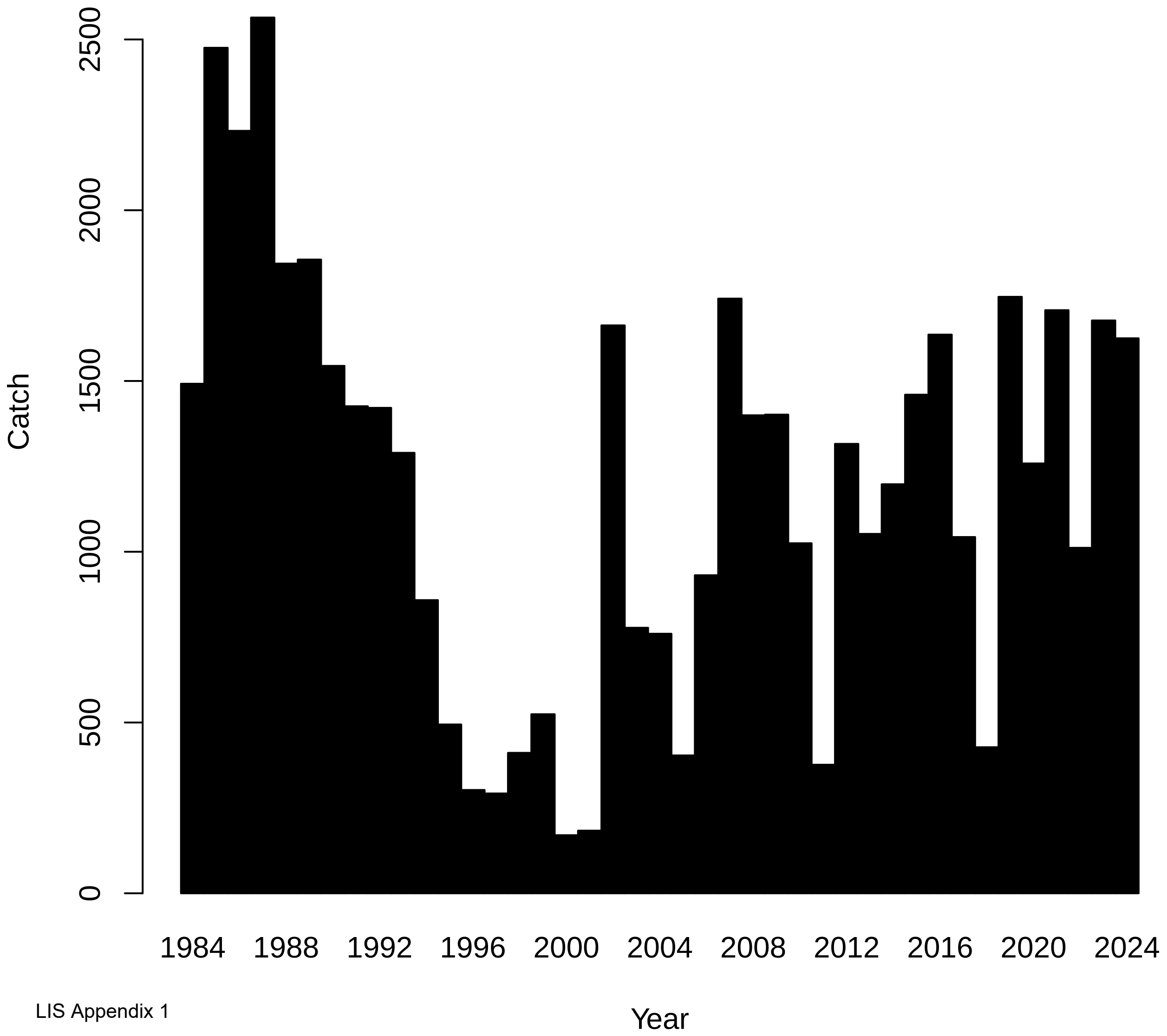

Annual MSY Reference Points (from S−R curve)
MSY
0
500
1000
1500
1990
2000
2010
2020
Year


Annual MSY Reference Points (from S−R curve)
%SPR at MSY
0.0
0.2
0.4
0.6
0.8
1.0
1990
2000
2010
2020
Year

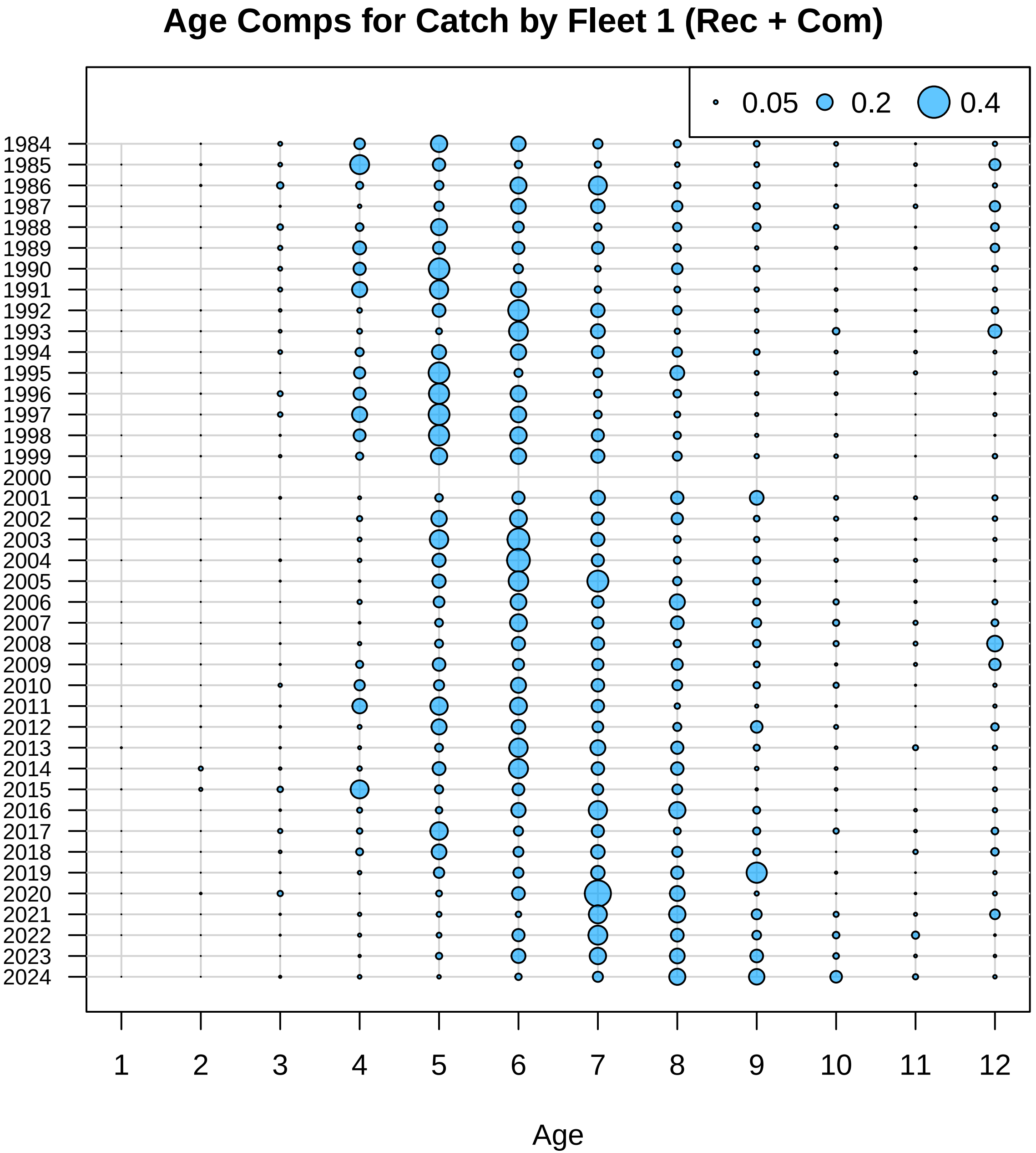

Annual MSY Reference Points (from S−R curve)
SSB at MSY
0
2000
4000
6000
8000
10000
12000
1990
2000
2010
2020
Year

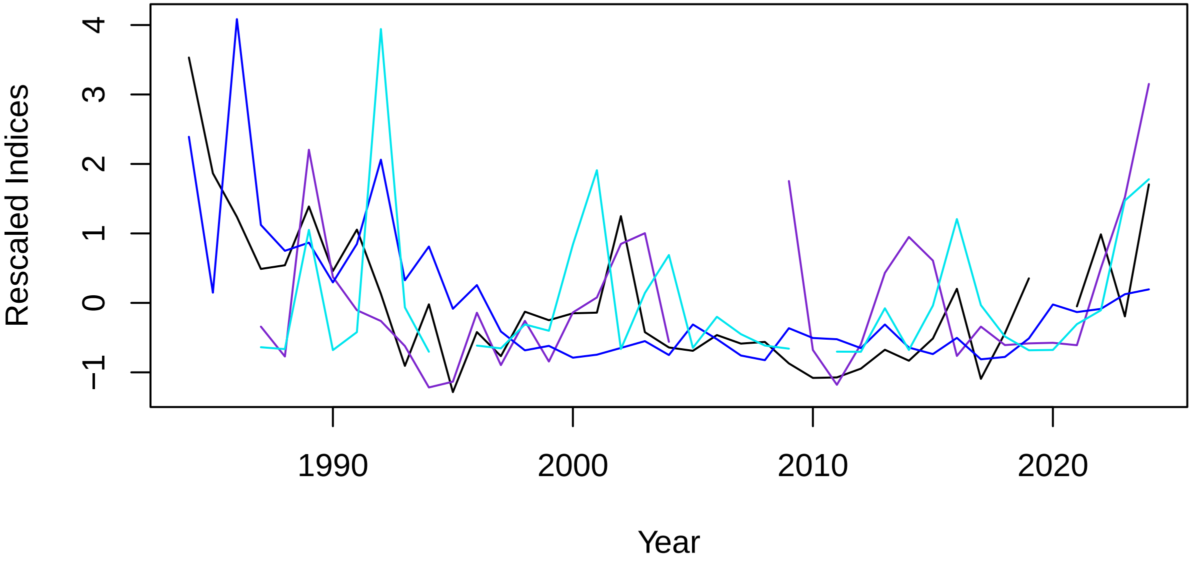


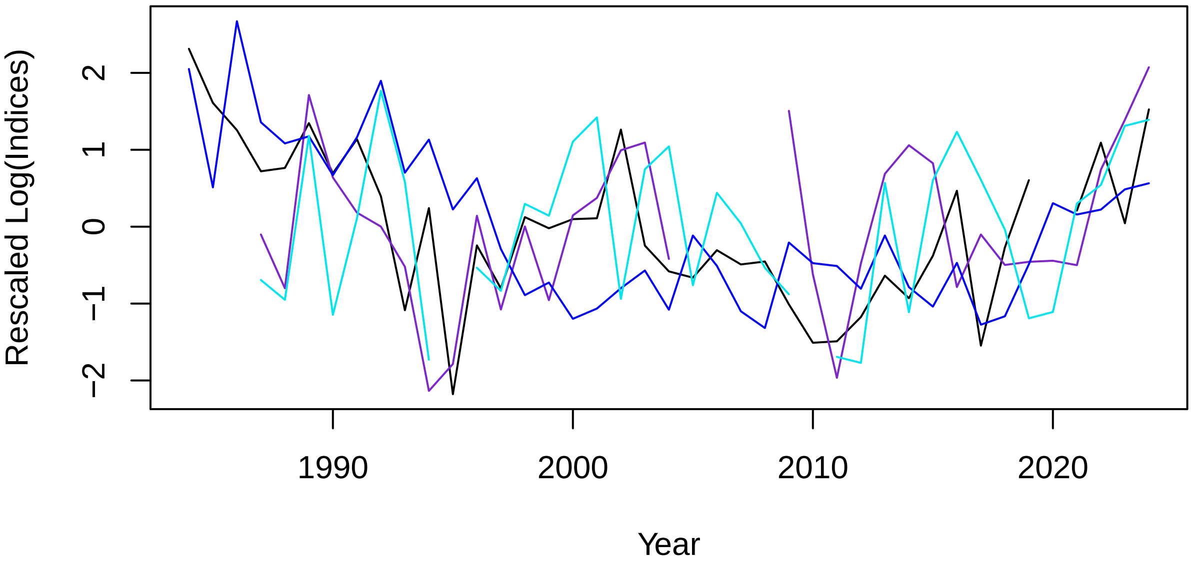
Annual MSY Reference Points (from S−R curve)
Recruitment at MSY
0
2000
4000
6000
1990
2000
2010
2020
Year

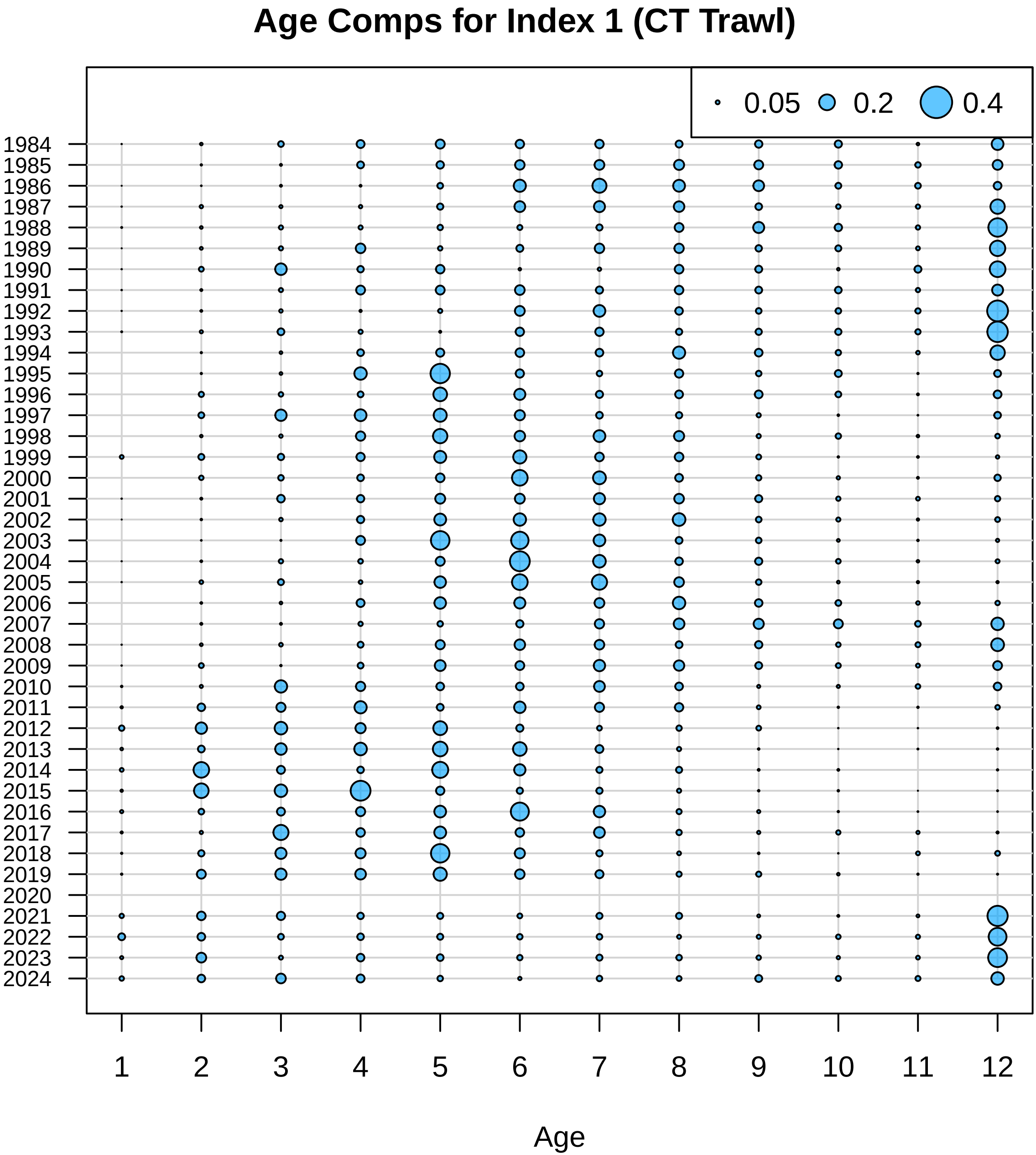


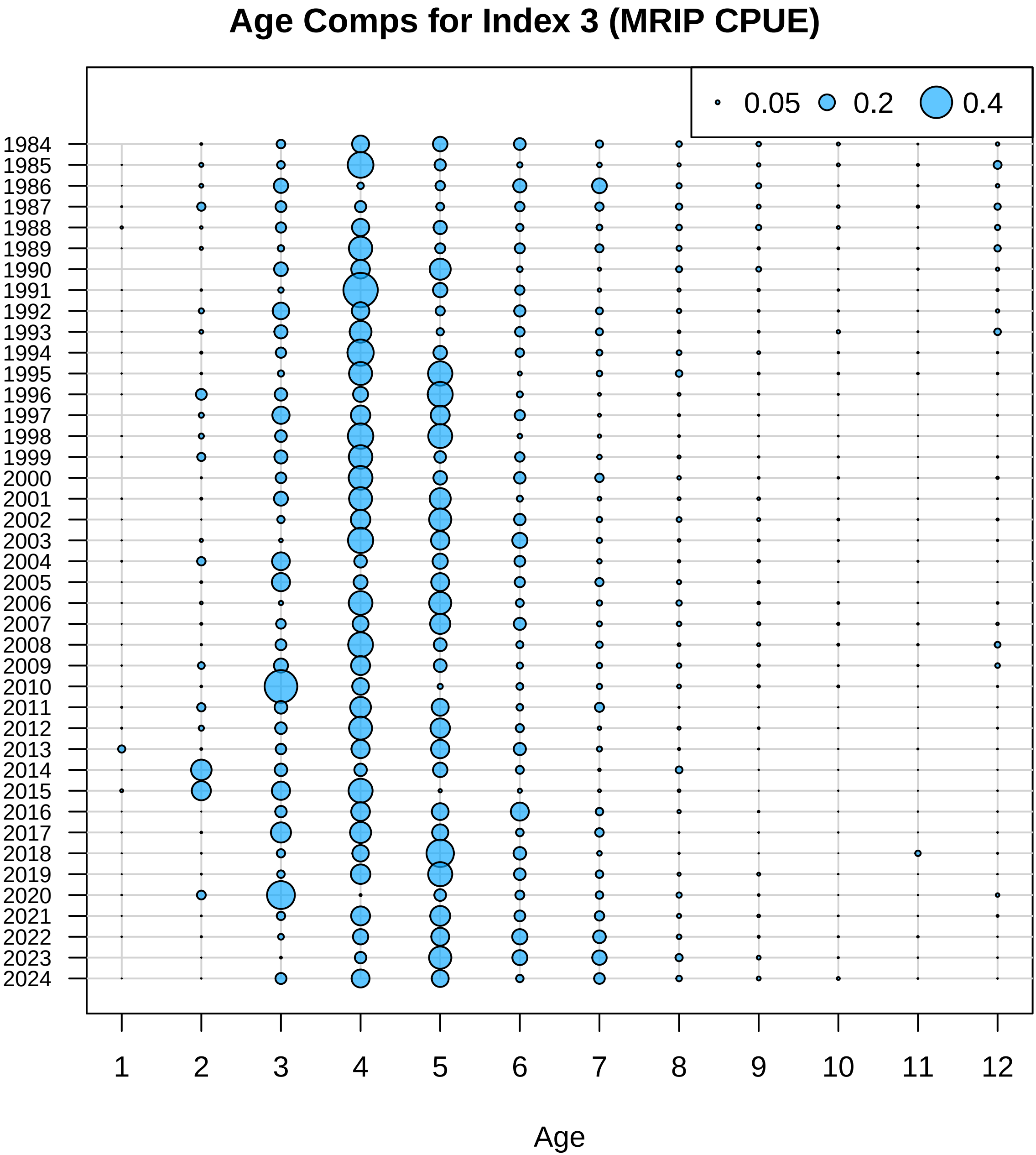
Catch
0
500
1000
1500
2000
2500
1984
1988
1992
1996
2000
2004
2008
2012
2016
2020
2024
Year


Age Comps for Catch by Fleet 1 (Rec + Com)
0.05
0.2
0.4
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
1
2
3
4
5
6
7
8
9
10
11
12
Age

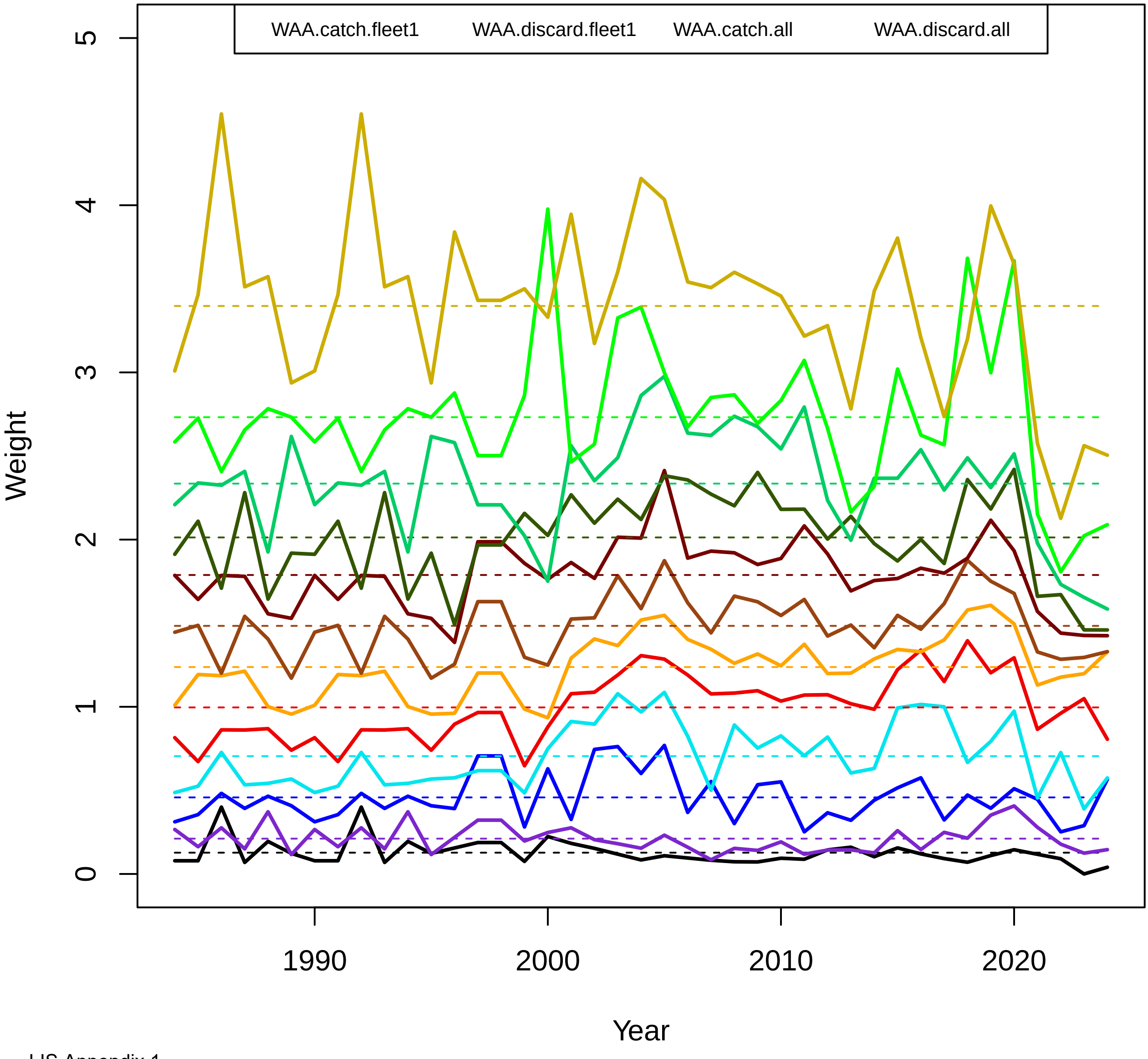

Rescaled Indices
4
3
2
1
0
−1
1990
2000
2010
2020
Year


Rescaled Log(Indices)
2
1
0
−1
−2
1990
2000
2010
2020
Year

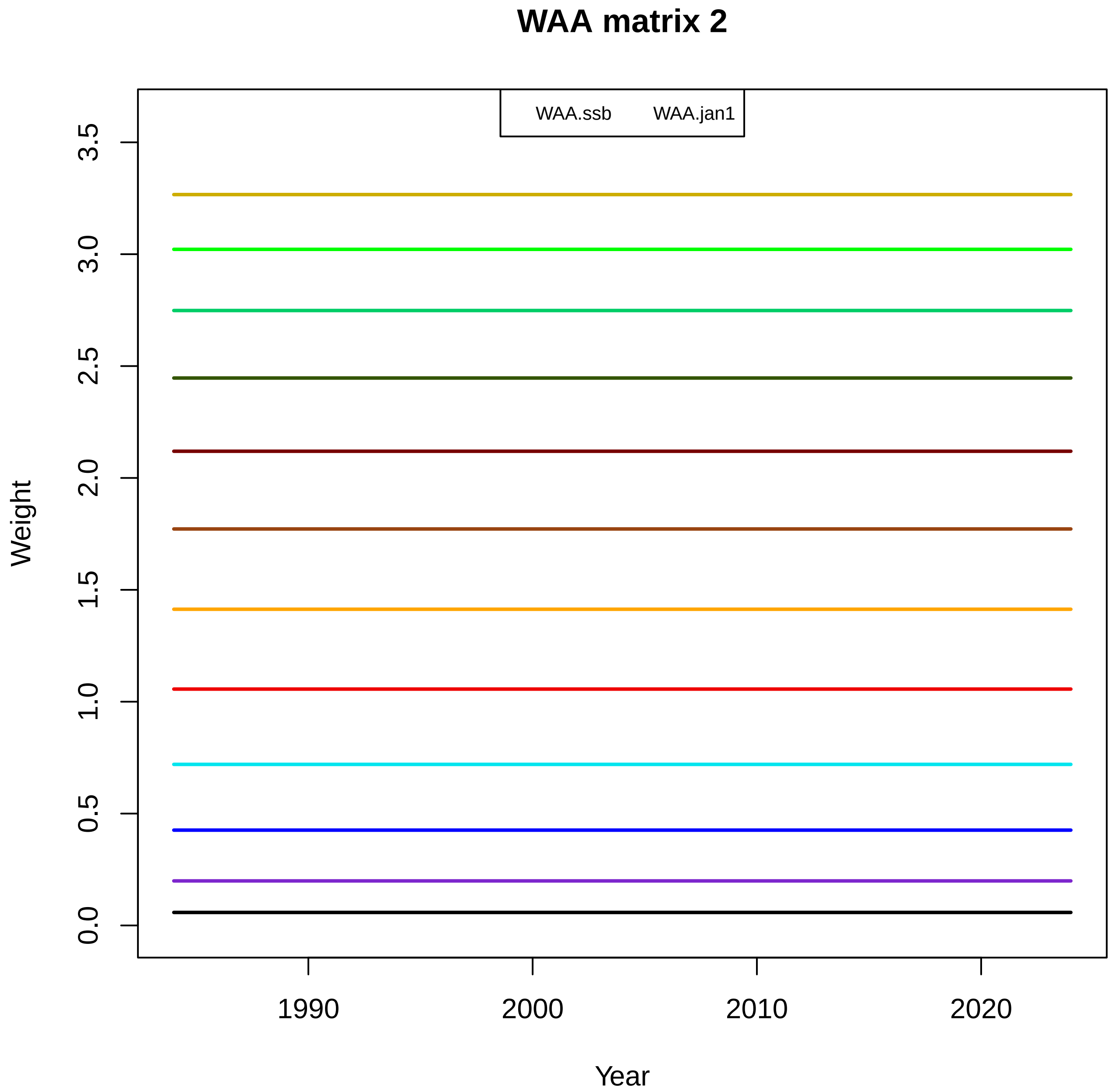

Age Comps for Index 1 (CT Trawl)
0.05
0.2
0.4
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
1
2
3
4
5
6
7
8
9
10
11
12
Age

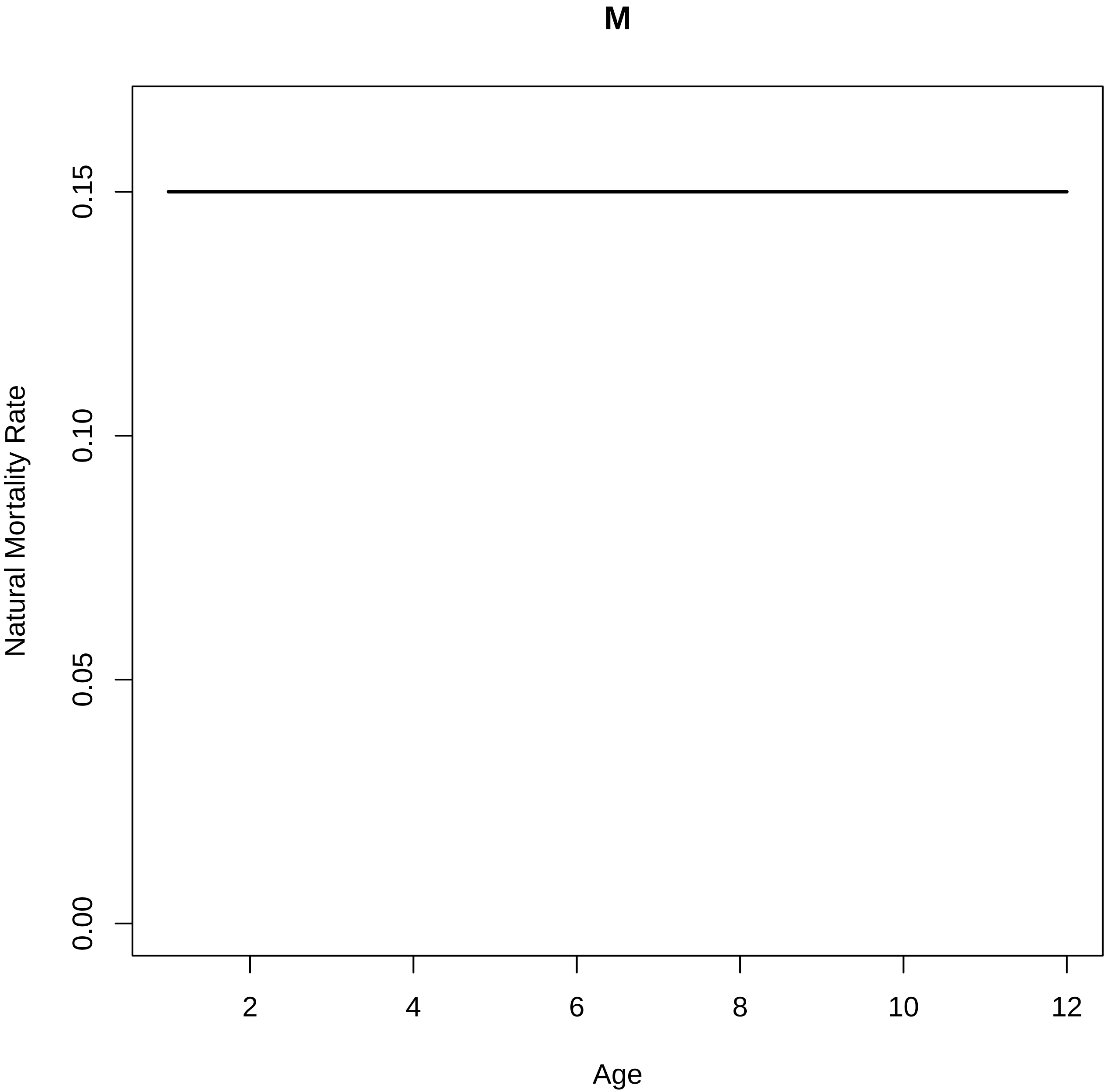

Age Comps for Index 3 (MRIP CPUE)
0.05
0.2
0.4
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
1
2
3
4
5
6
7
8
9
10
11
12
Age

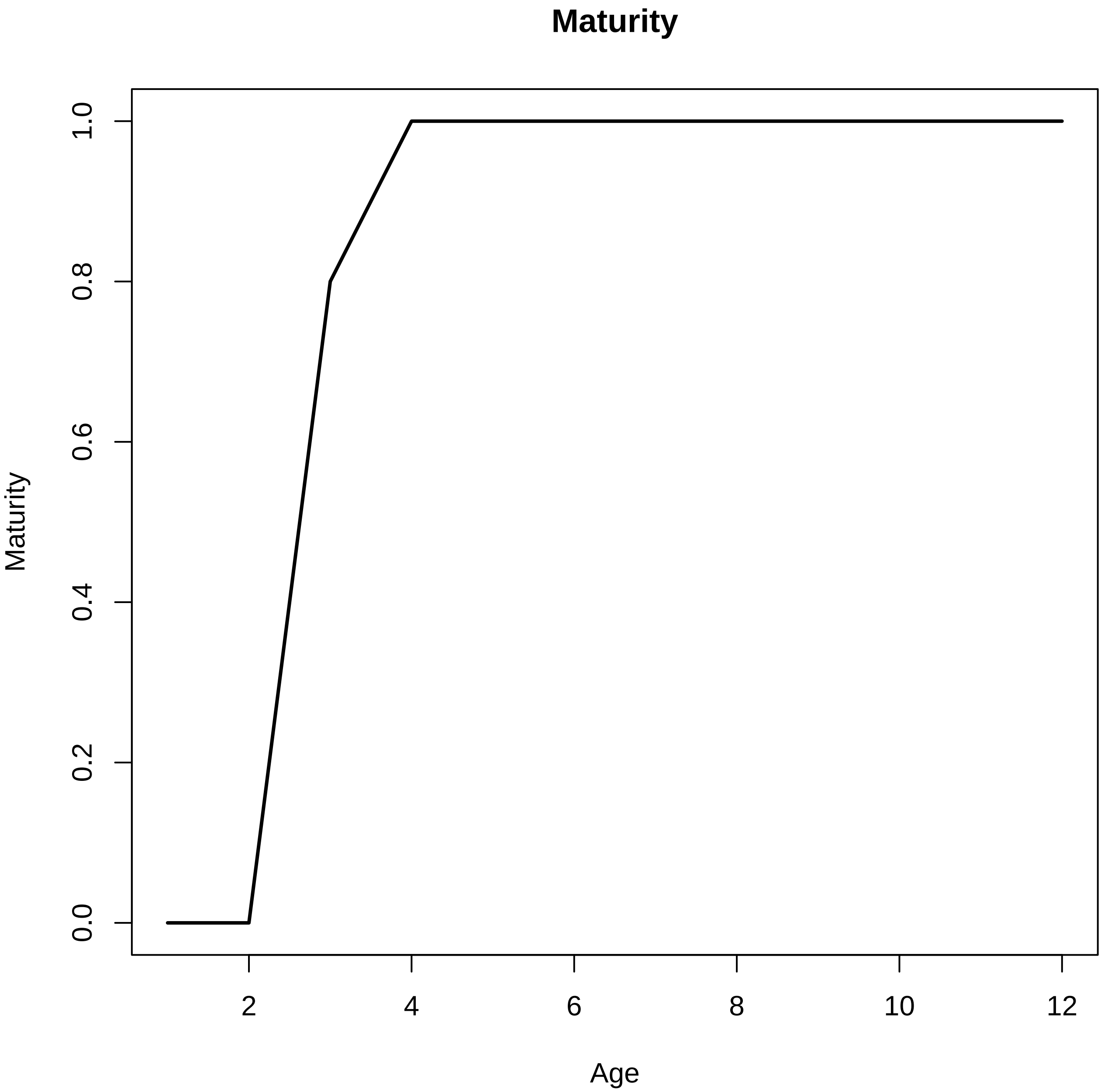
WAA matrix 1



WAA.catch.fleet1
WAA.discard.fleet1
WAA.catch.all
WAA.discard.all
Weight
0
1
2
3
4
5
1990
2000
2010
2020
Year


WAA matrix 2
WAA.ssb
WAA.jan1
Weight
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
1990
2000
2010
2020
Year


M
Natural Mortality Rate
0.00
0.05
0.10
0.15
2
4
6
8
10
12
Age


Maturity
Maturity
0.0
0.2
0.4
0.6
0.8
1.0
2
4
6
8
10
12
Age

LIS Appendix 2: Retrospective Adjustment and Sensitivity Runs

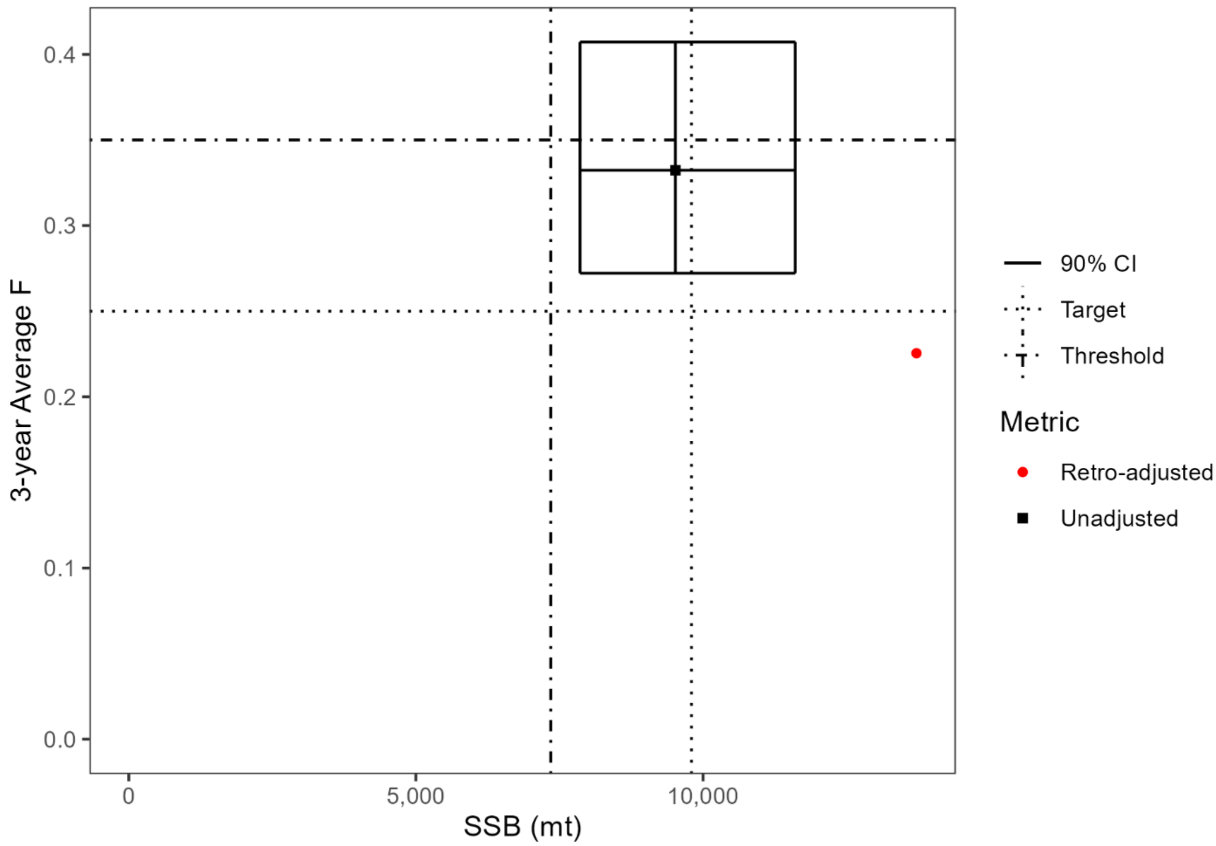


Figure A2.1. Comparison of retrospective adjusted status in 2024 with the base model status. Solid black lines indicate the 90% confidence intervals of the estimates of SSB and F in the terminal year.

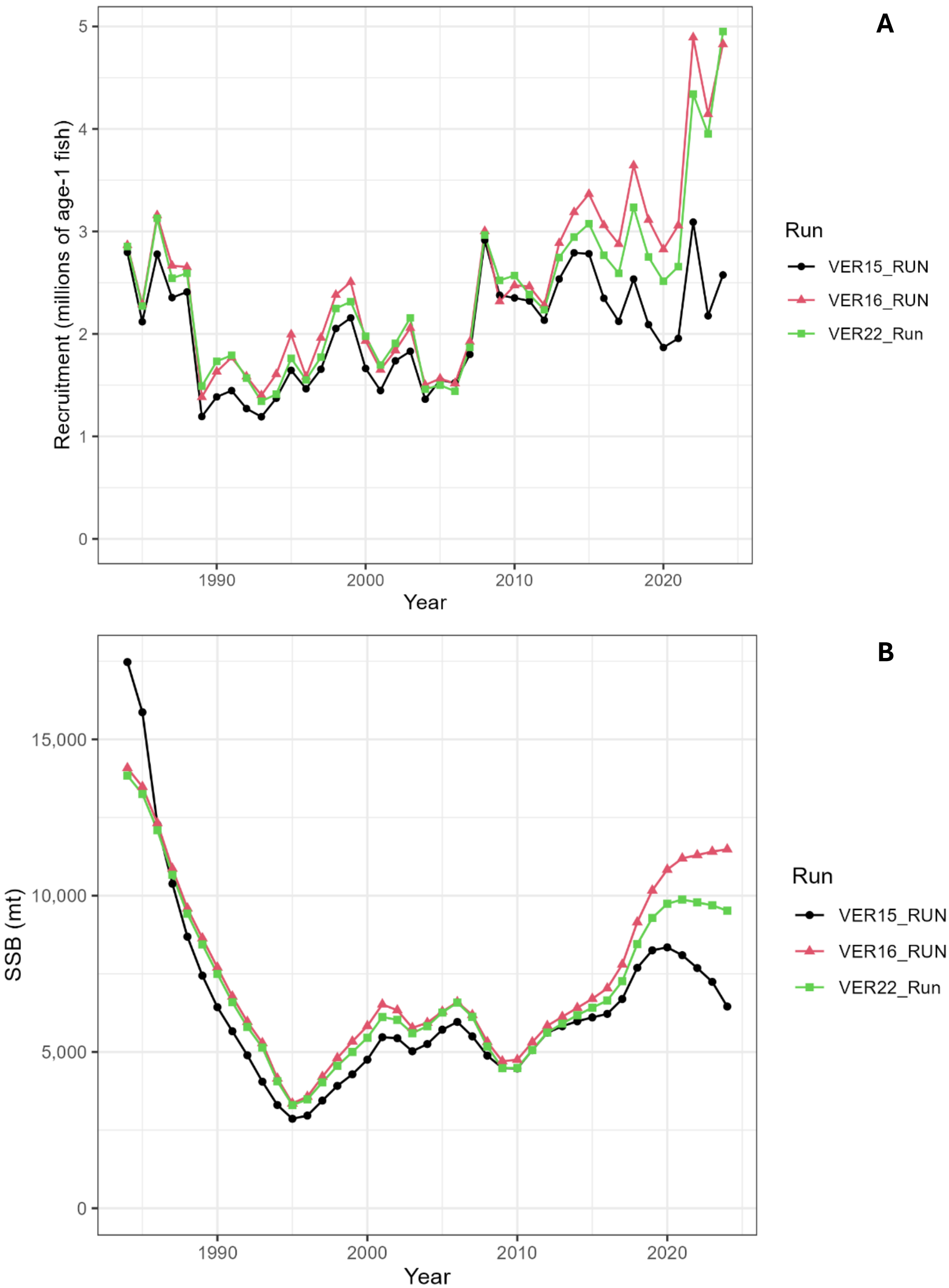


Figure A2.2. Results from the sensitivity runs for Recruitment (A) and SSB (B). VER15 excluded the NY Seine Survey, VER16 excluded the NY Trawl Survey from the model and VER22 is the final model presented in this report.

NJ-NYB Appendix 1: ASAP Input and Diagnostic Plots for the Base Run

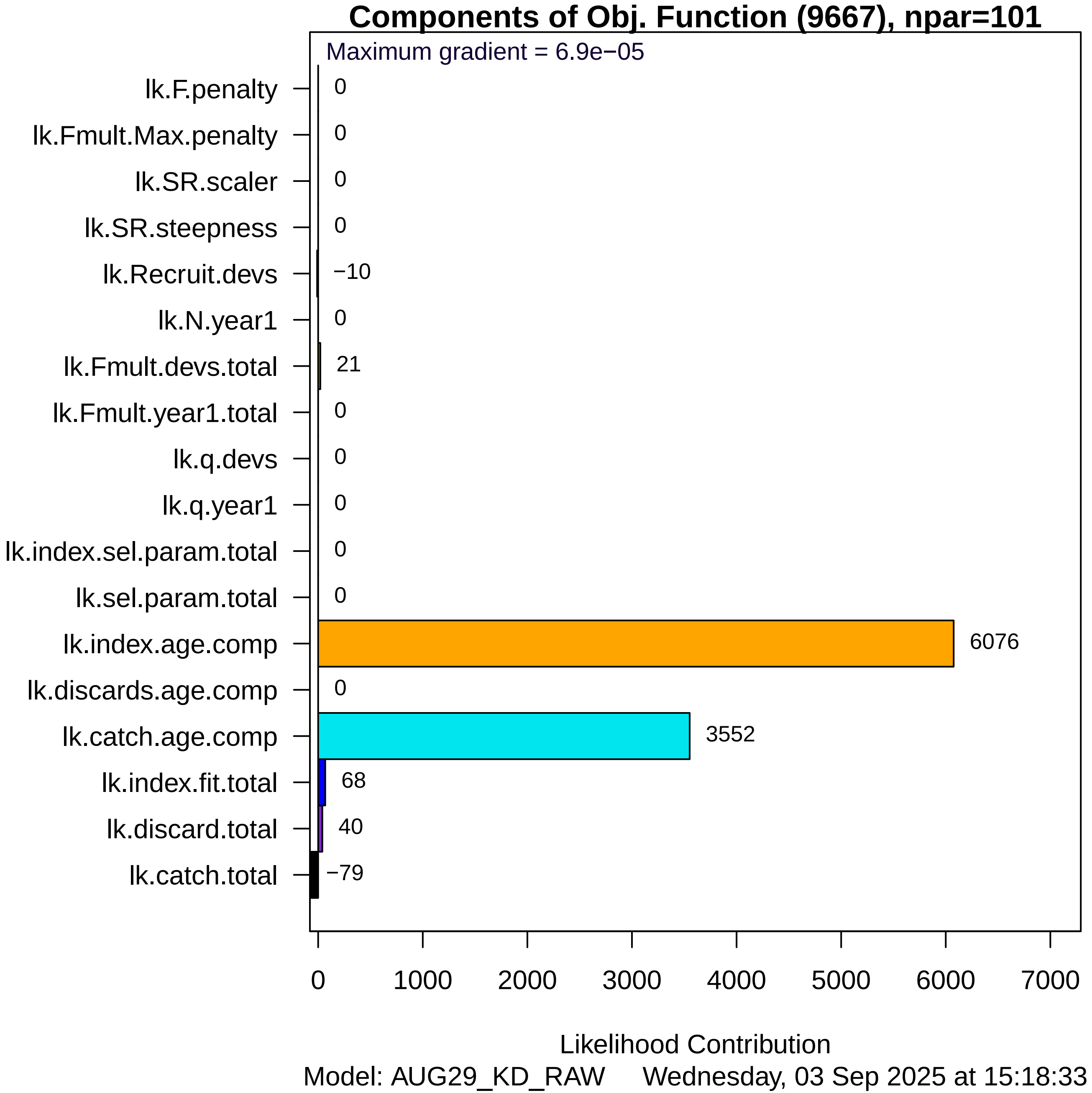
File = AUG29_KD_RAW.dat

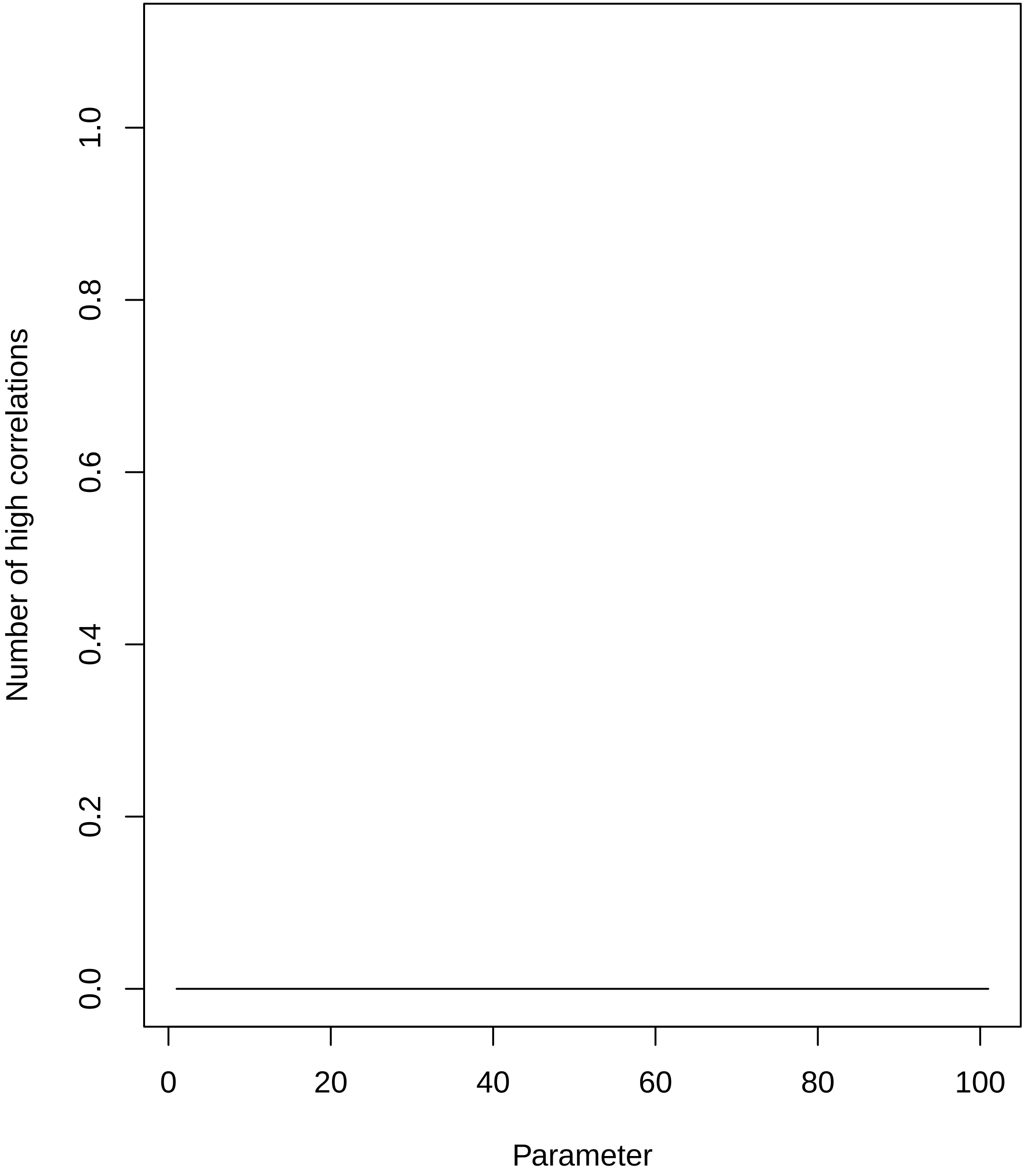
ASAP3 run on Wednesday, 03 Sep 2025 at 15:18:33

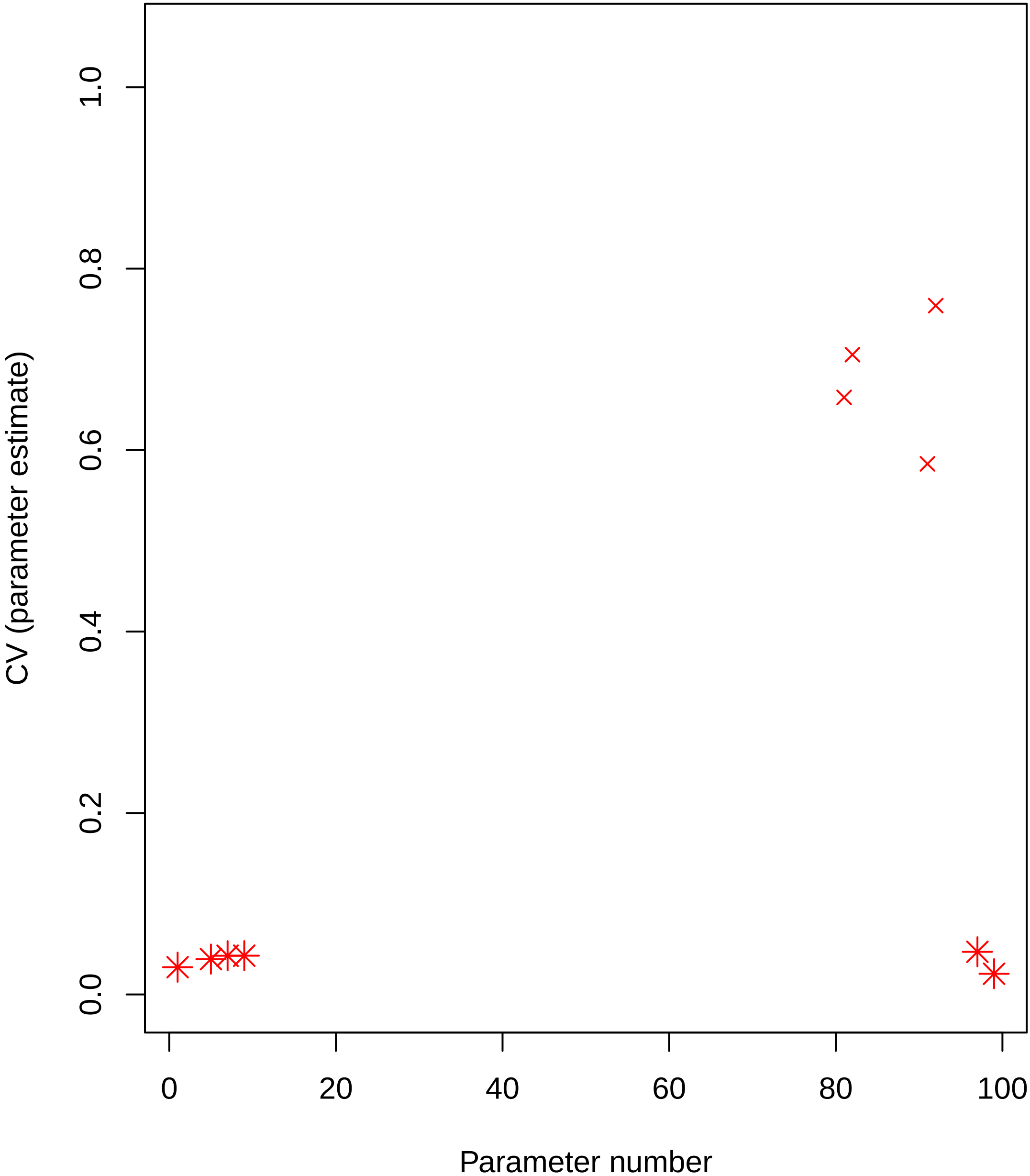
dir = base

ASAPplots version = 0.2.18

npar = 101, maximum gradient = 6.86743e−005

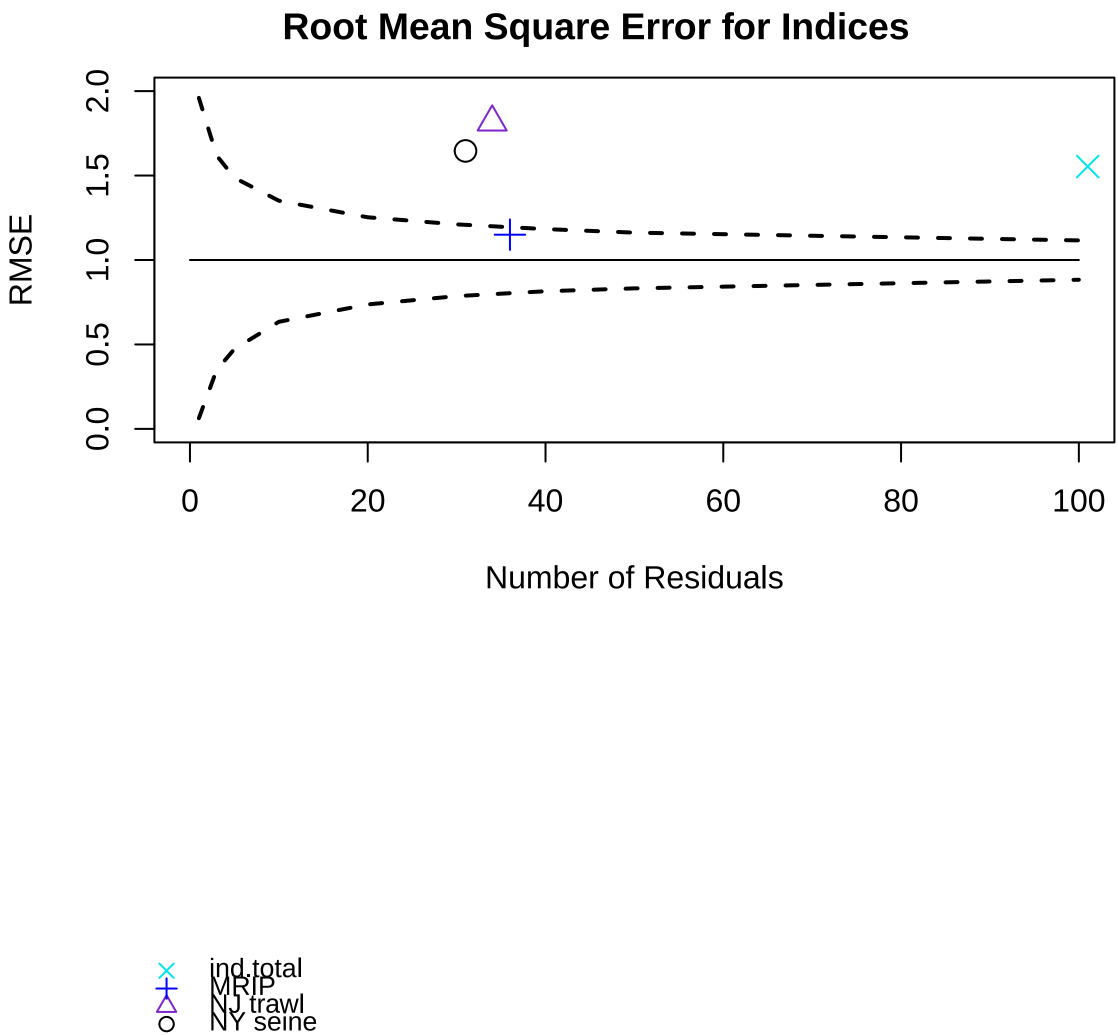

Components of Obj. Function (9667), npar=101
Maximum gradient = 6.9e−05
lk.F.penalty
lk.Fmult.Max.penalty
lk.SR.scaler
lk.SR.steepness
lk.Recruit.devs
lk.N.year1
lk.Fmult.devs.total
lk.Fmult.year1.total
lk.q.devs
lk.q.year1
lk.index.sel.param.total
lk.sel.param.total
lk.index.age.comp
lk.discards.age.comp
lk.catch.age.comp
lk.index.fit.total
lk.discard.total
lk.catch.total
0
0
0
0
−10
0
21
0
0
0
0
0
6076
0
3552
68
40
−79
0
1000
2000
3000
4000
5000
6000
7000
Likelihood Contribution
Model: AUG29_KD_RAW Wednesday, 03 Sep 2025 at 15:18:33


Number of high correlations
1.0
0.8
0.6
0.4
0.2
0.0
0
20
40
60
80
100
Parameter

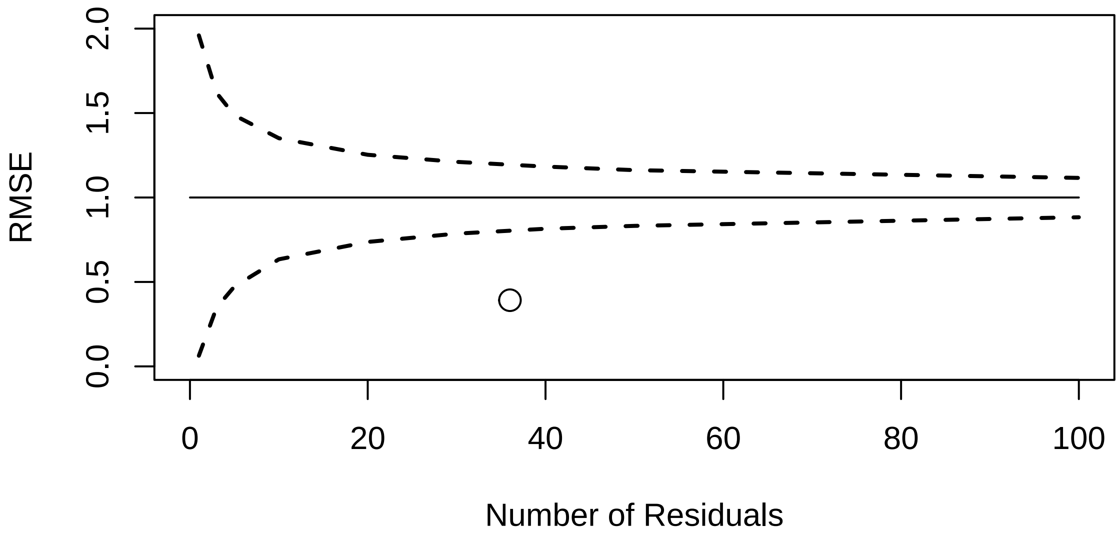

CV (parameter estimate)
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Parameter number

Root Mean Square Error computed from Standardized Residuals

Component	# resids	RMSE
catch.tot	36	0.392
discard.tot	0	0
ind01	31	1.65
ind02	34	1.82
ind03	36	1.15
ind.total	101	1.55
N.year1	0	0
Fmult.year1	0	0
Fmult.devs.total	35	1.53
recruit.devs	36	0.62
fleet.sel.params	0	0
index.sel.params	0	0
q.year1	0	0
q.devs	0	0
SR.steepness	0	0
SR.scaler	0	0

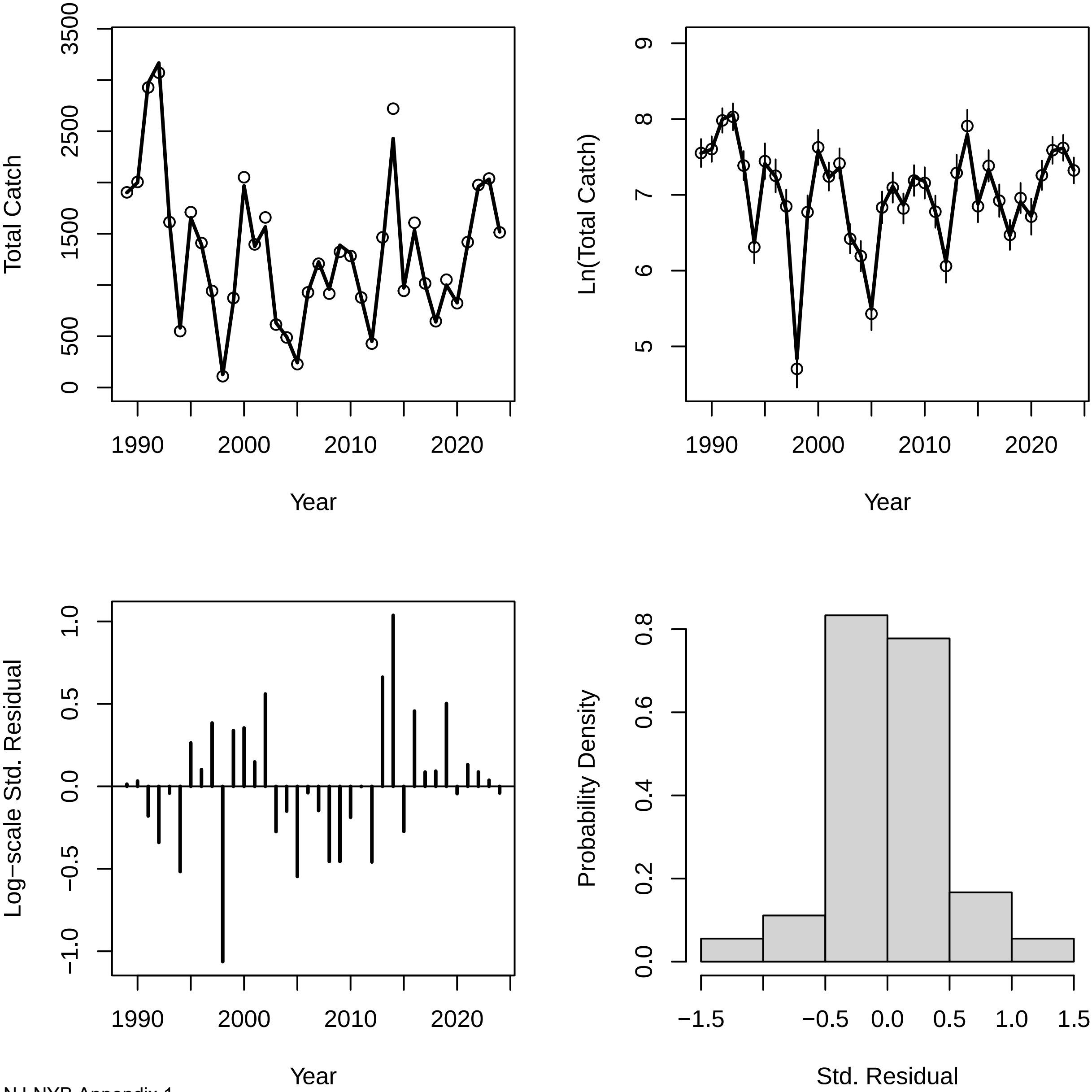

Root Mean Square Error for Indices
RMSE
0.0
0.5
1.0
1.5
2.0
0
20
40
60
80
100
Number of Residuals
ind.total
MRIP
NJ trawl
NY seine

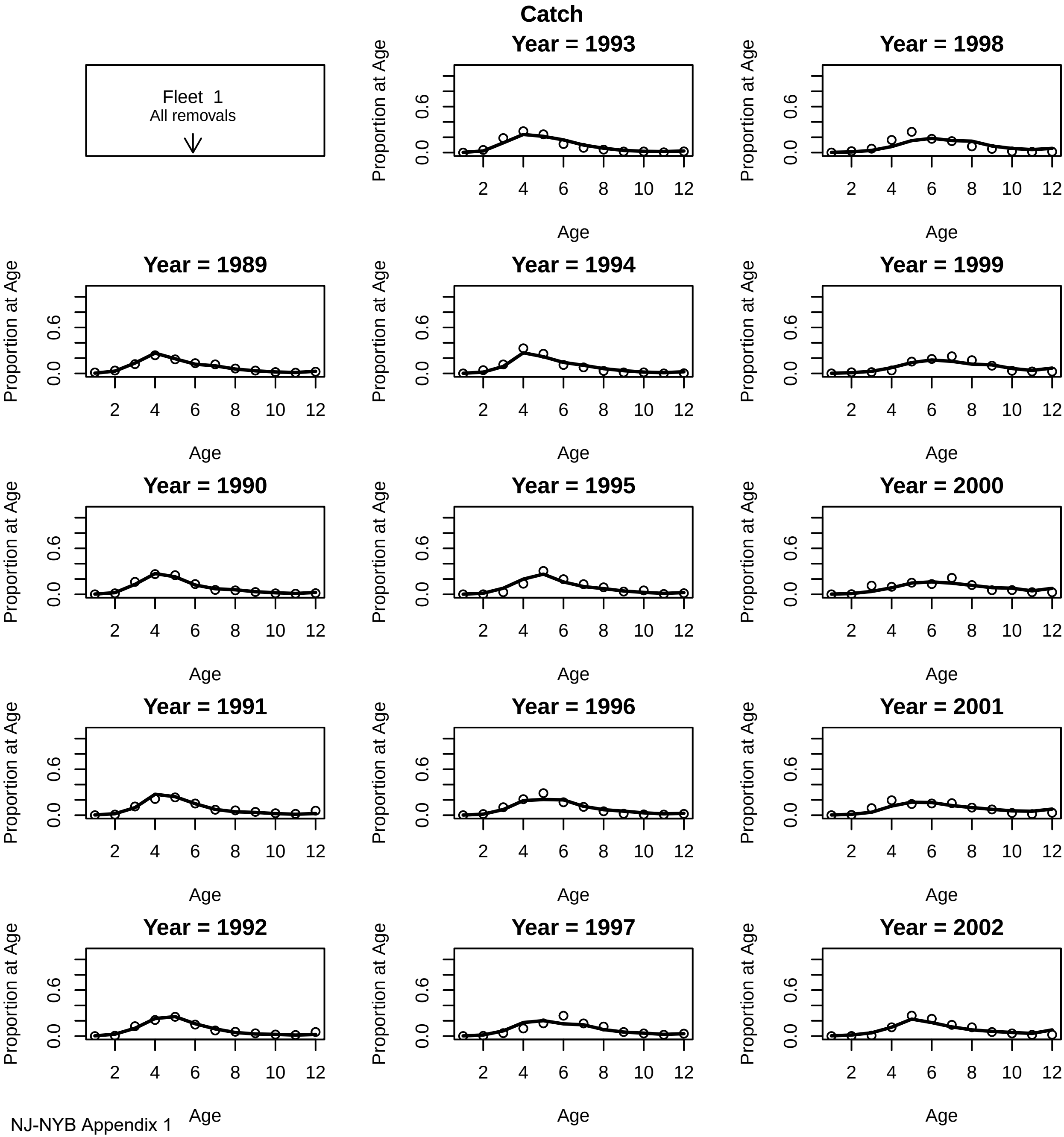
Root Mean Square Error for Catch

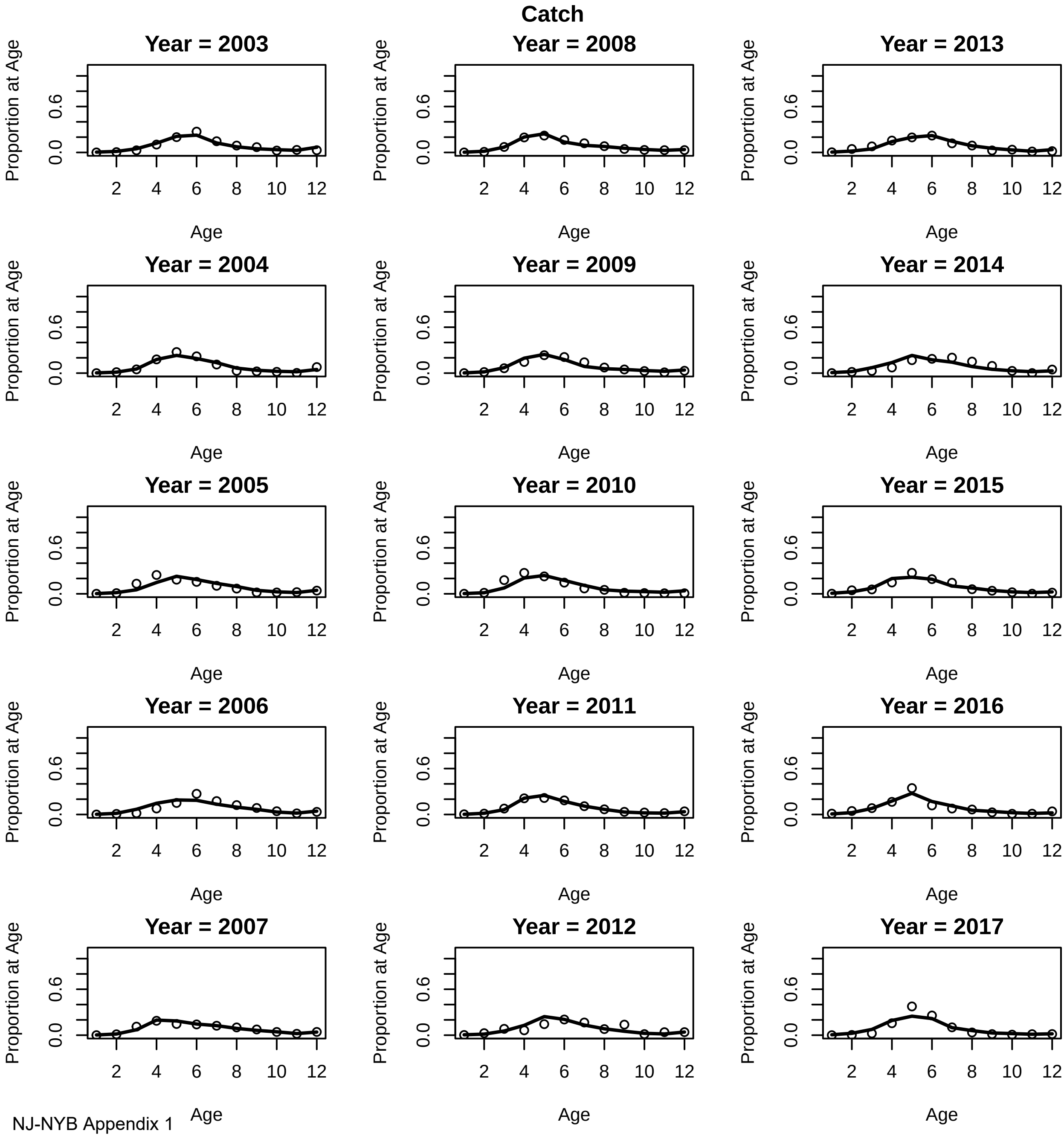


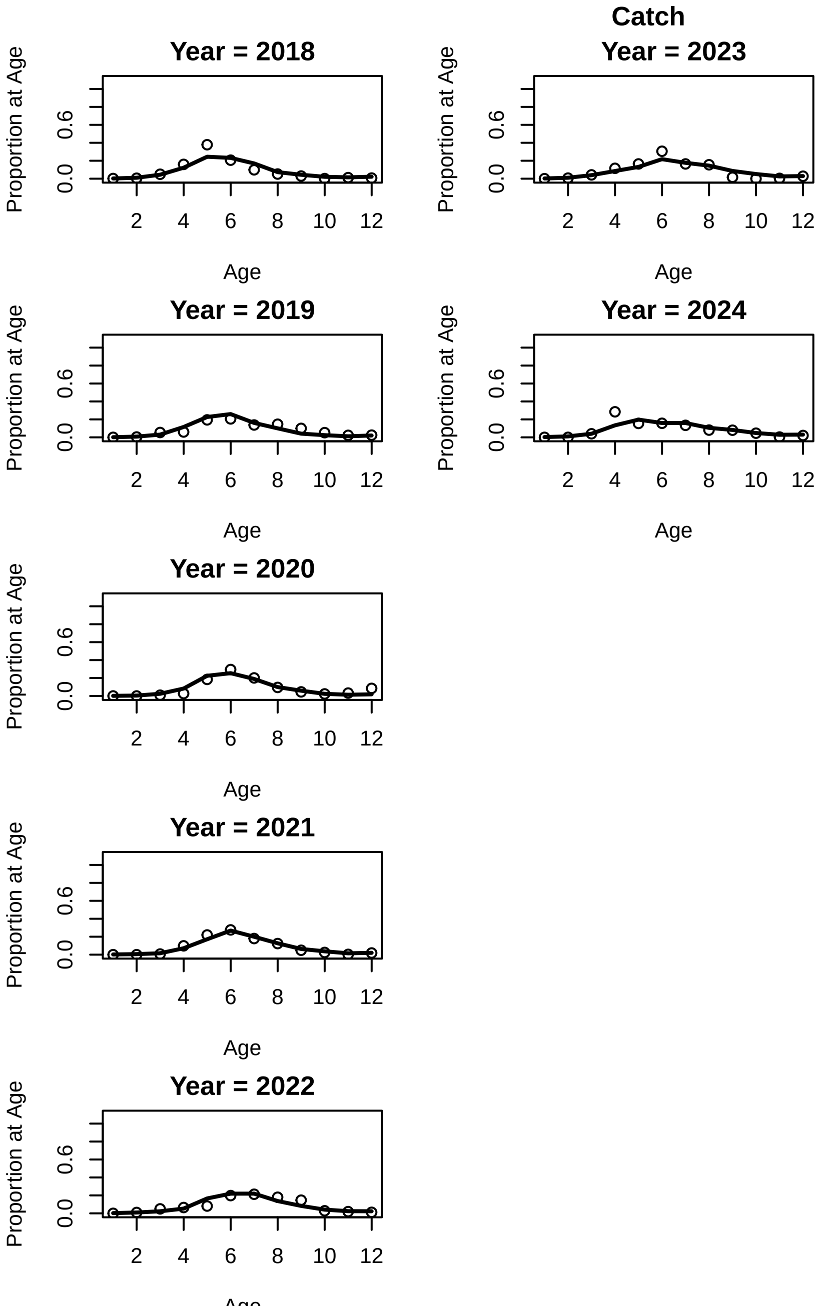
○ catch.tot

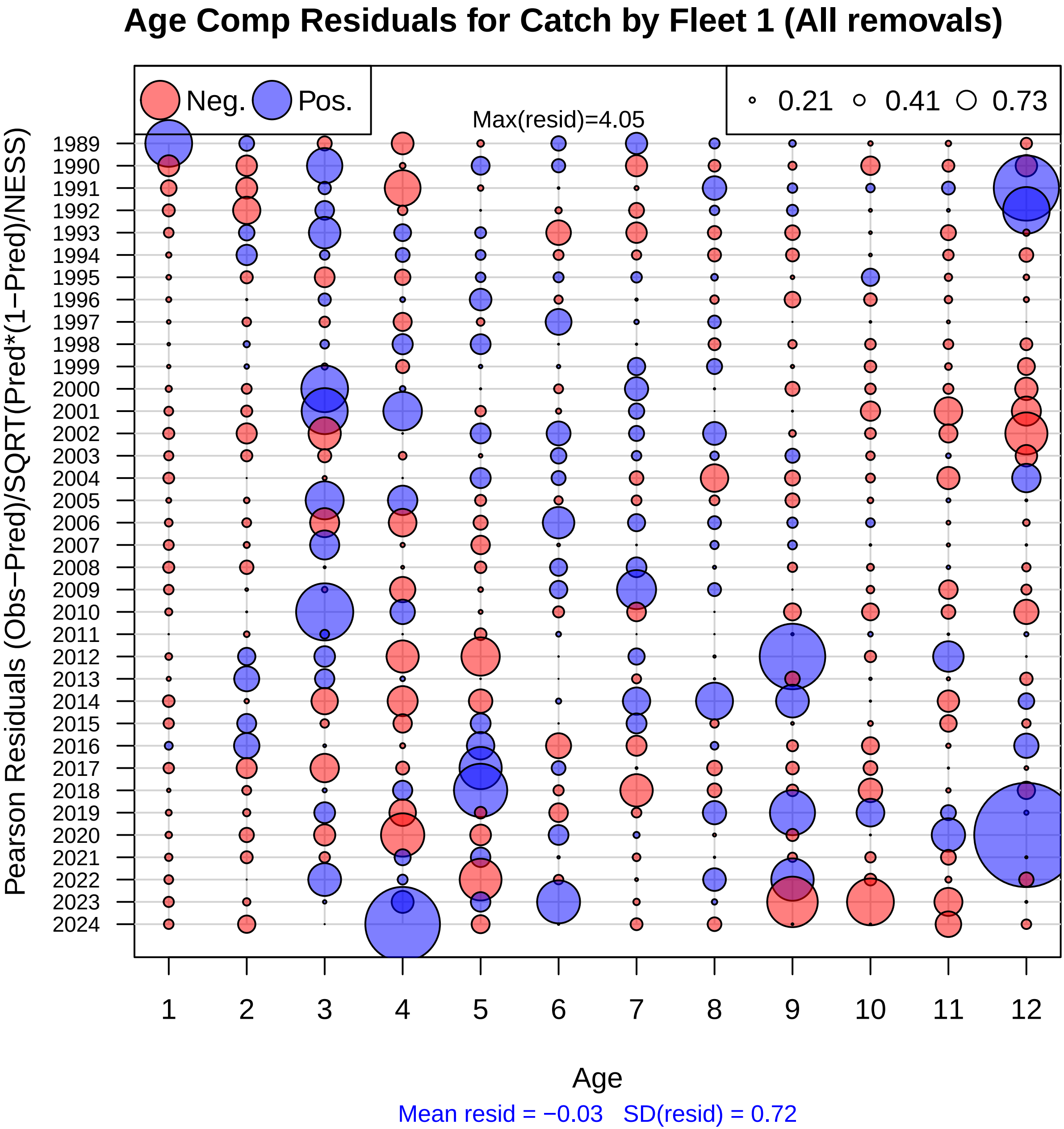
Fleet 1 Catch (All removals)

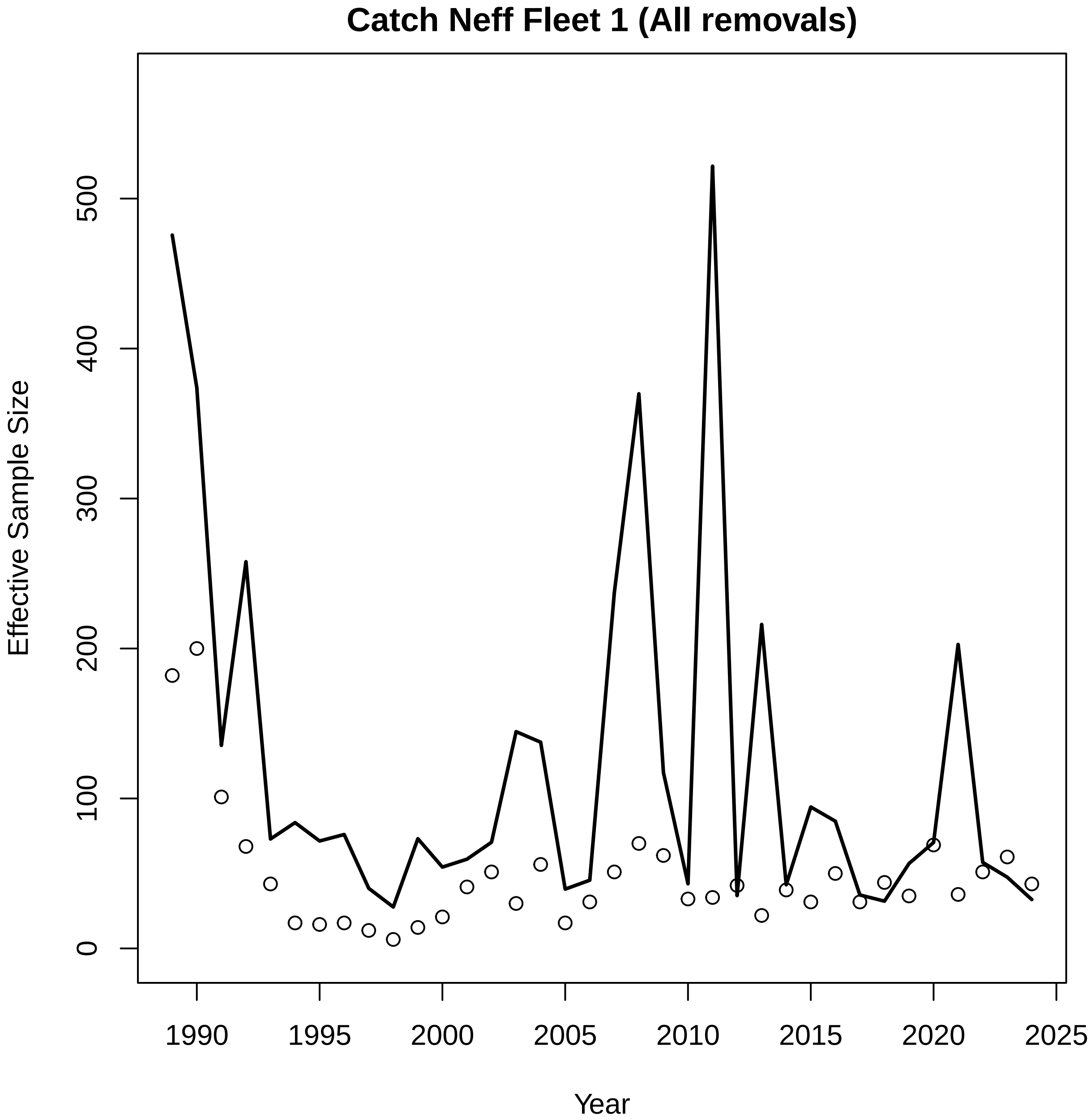


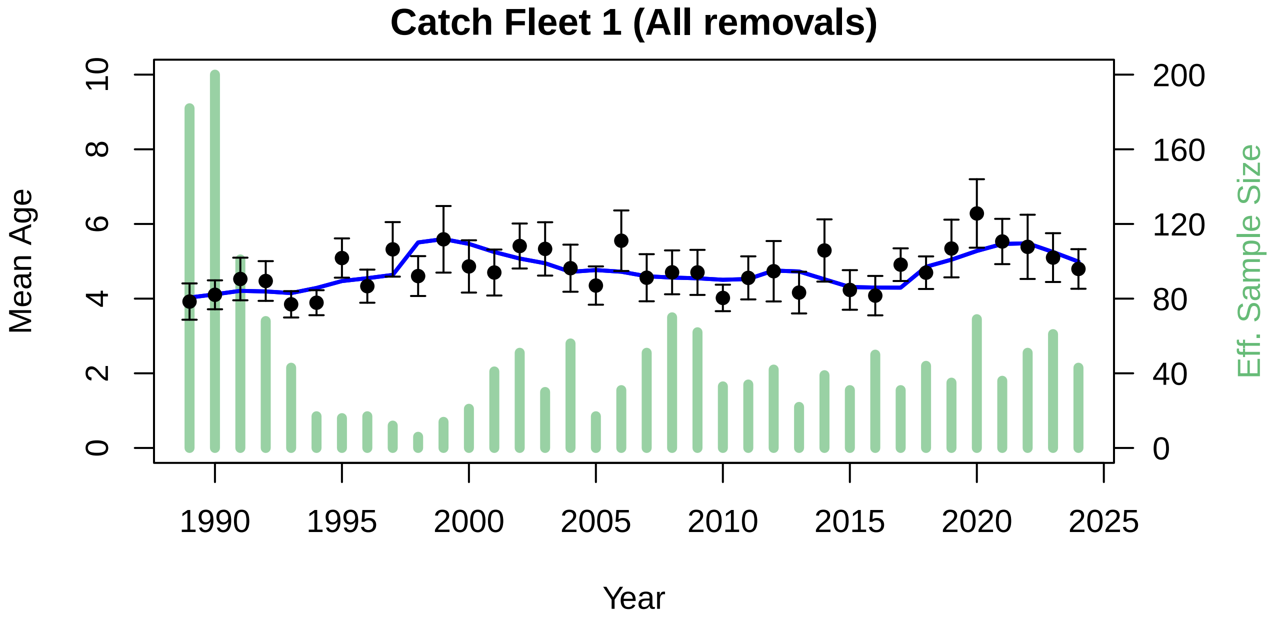

Catch
Fleet 1
All removals
Year = 1989
Year = 1990
Year = 1991
Year = 1992
Year = 1993
Year = 1994
Year = 1995
Year = 1996
Year = 1997
Year = 1998
Year = 1999
Year = 2000
Year = 2001
Year = 2002
Proportion at Age
0.0
0.6
Age
2
4
6
8
10
12

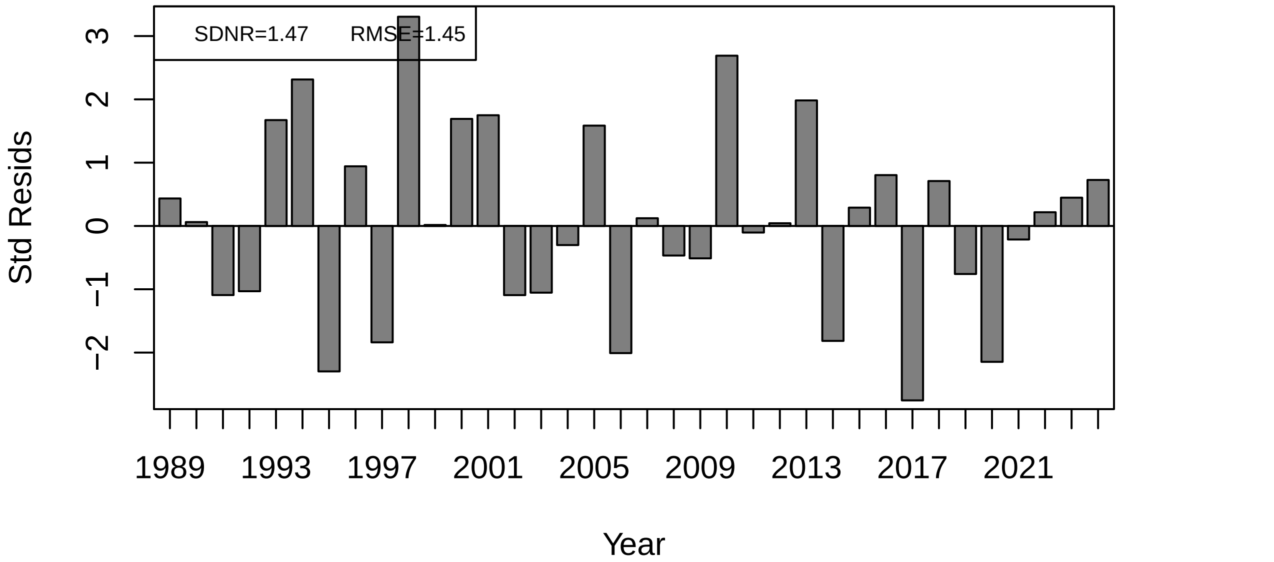

Catch
Year = 2003
Year = 2008
Year = 2013
Year = 2004
Year = 2009
Year = 2014
Year = 2005
Year = 2010
Year = 2015
Year = 2006
Year = 2011
Year = 2016
Year = 2007
Year = 2012
Year = 2017
Proportion at Age
Age
0.0
0.6
2
4
6
8
10
12

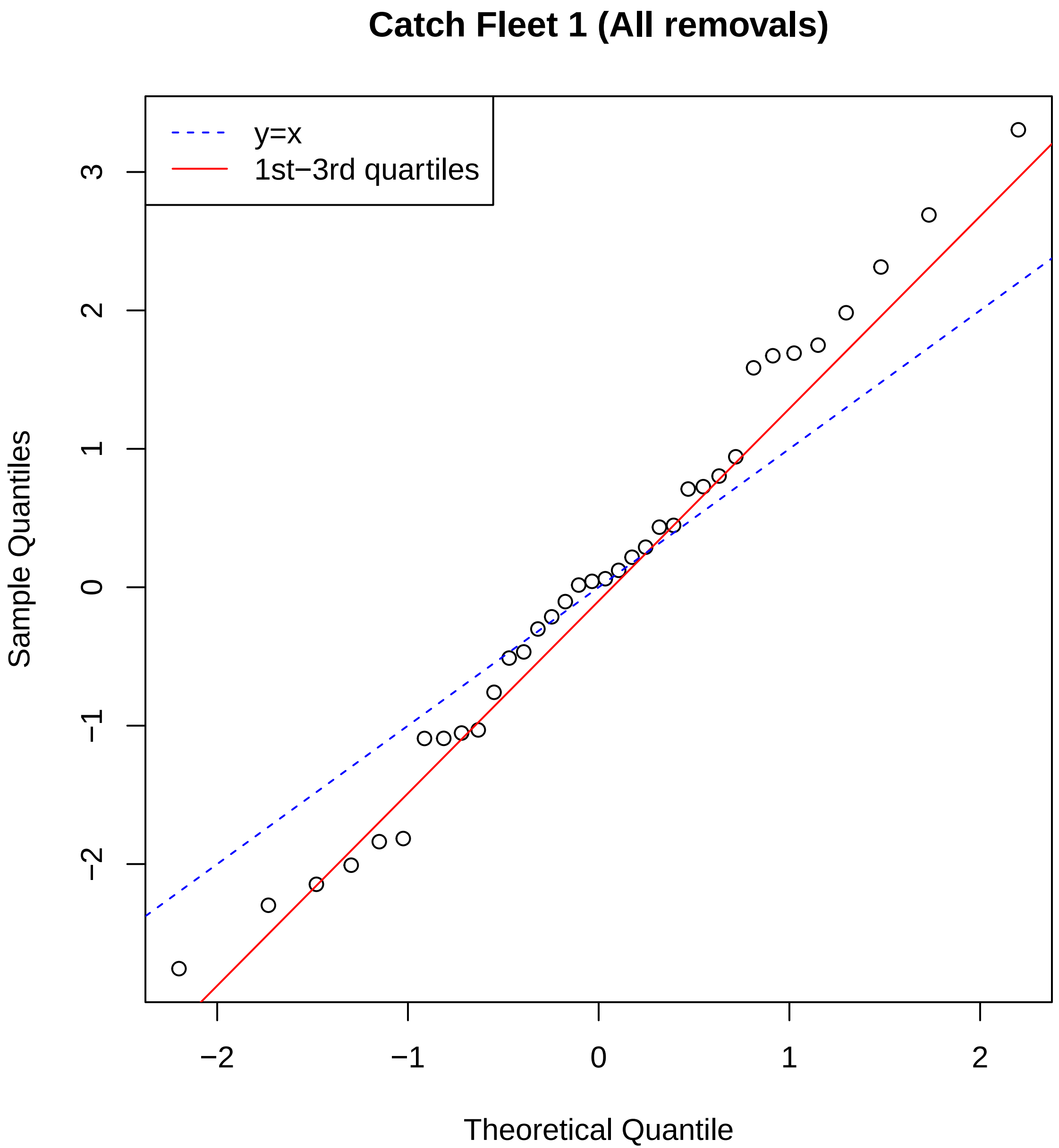

Catch
Year = 2018
Year = 2019
Year = 2020
Year = 2021
Year = 2022
Year = 2023
Year = 2024
Proportion at Age
0.0
0.6
Age
2
4
6
8
10
12


Age Comp Residuals for Catch by Fleet 1 (All removals)
Neg.
Pos.
0.21
0.41
0.73
Max(resid)=4.05
Pearson Residuals (Obs−Pred)/SQRT(Pred*(1−Pred)/NESS)
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
1
2
3
4
5
6
7
8
9
10
11
12
Age
Mean resid = −0.03   SD(resid) = 0.72

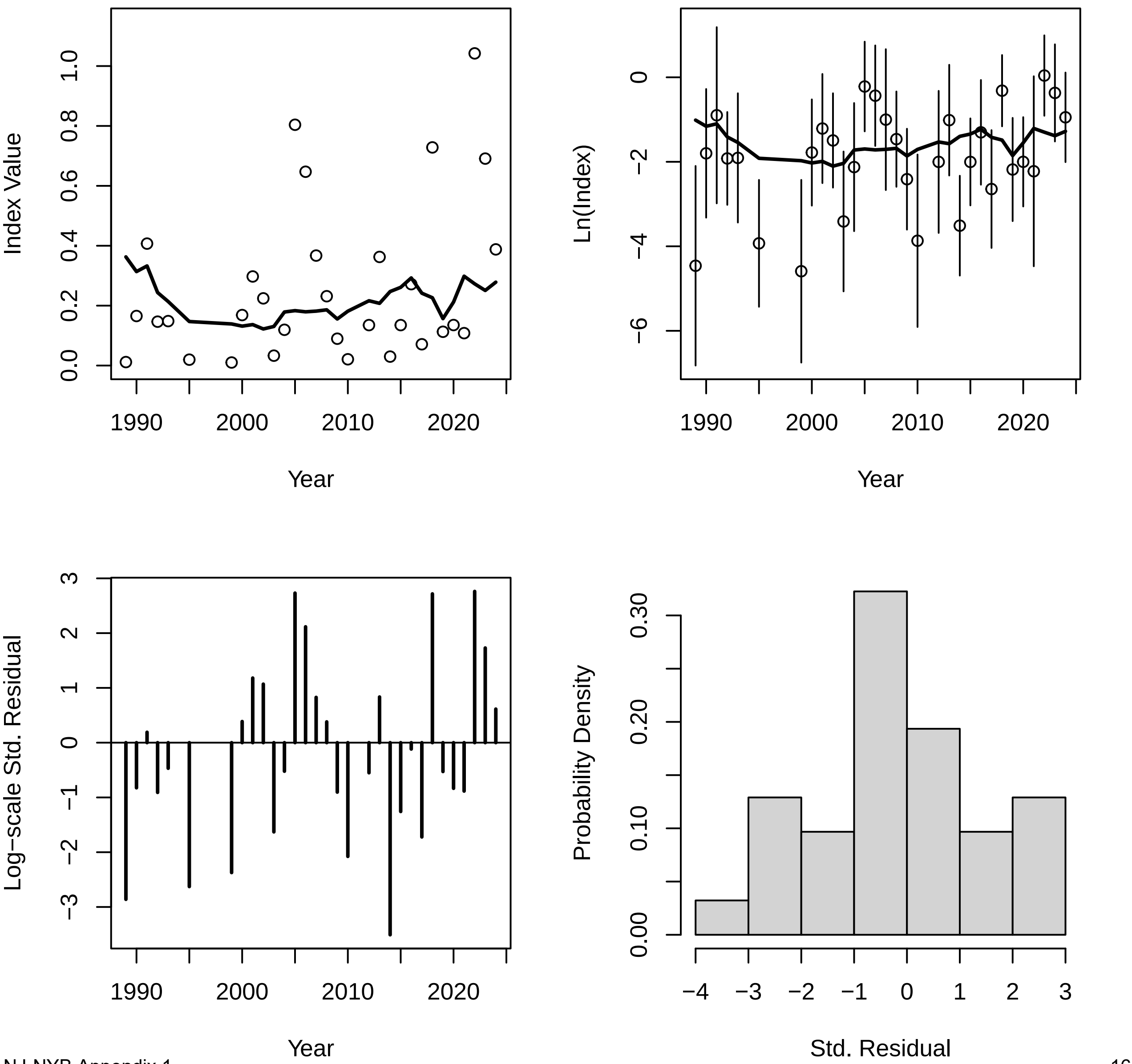

Catch Neff Fleet 1 (All removals)
Effective Sample Size
0
100
200
300
400
500
1990
1995
2000
2005
2010
2015
2020
2025
Year


Catch Fleet 1 (All removals)
Mean Age
Eff. Sample Size
Year
0
2
4
6
8
10
0
40
80
120
160
200
1990
1995
2000
2005
2010
2015
2020
2025

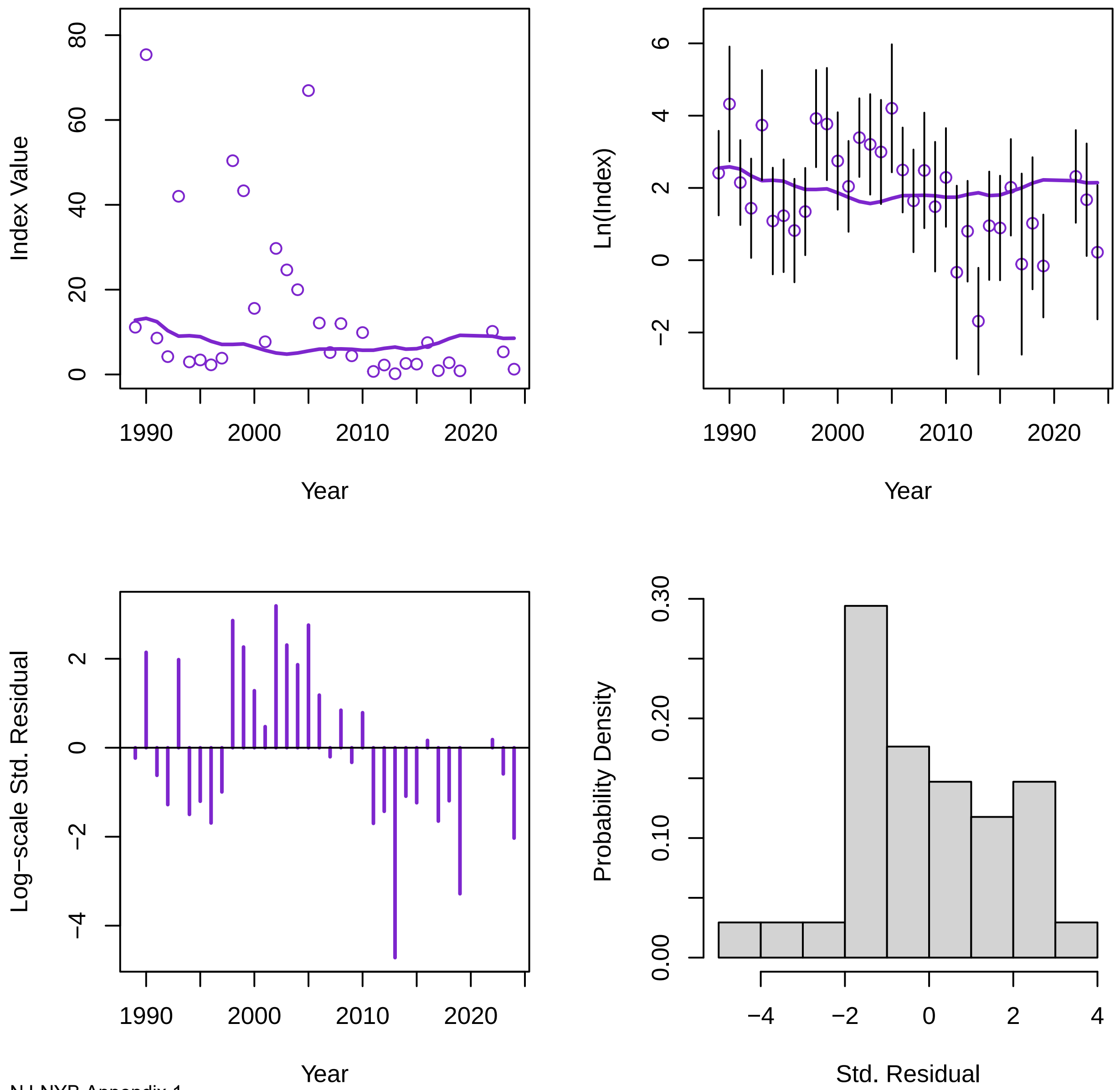

SDNR=1.47
RMSE=1.45
Std Resids
Year
−2
−1
0
1
2
3
1989
1993
1997
2001
2005
2009
2013
2017
2021


Catch Fleet 1 (All removals)
y=x
1st−3rd quartiles
Sample Quantiles
Theoretical Quantile
−2
−1
0
1
2
3

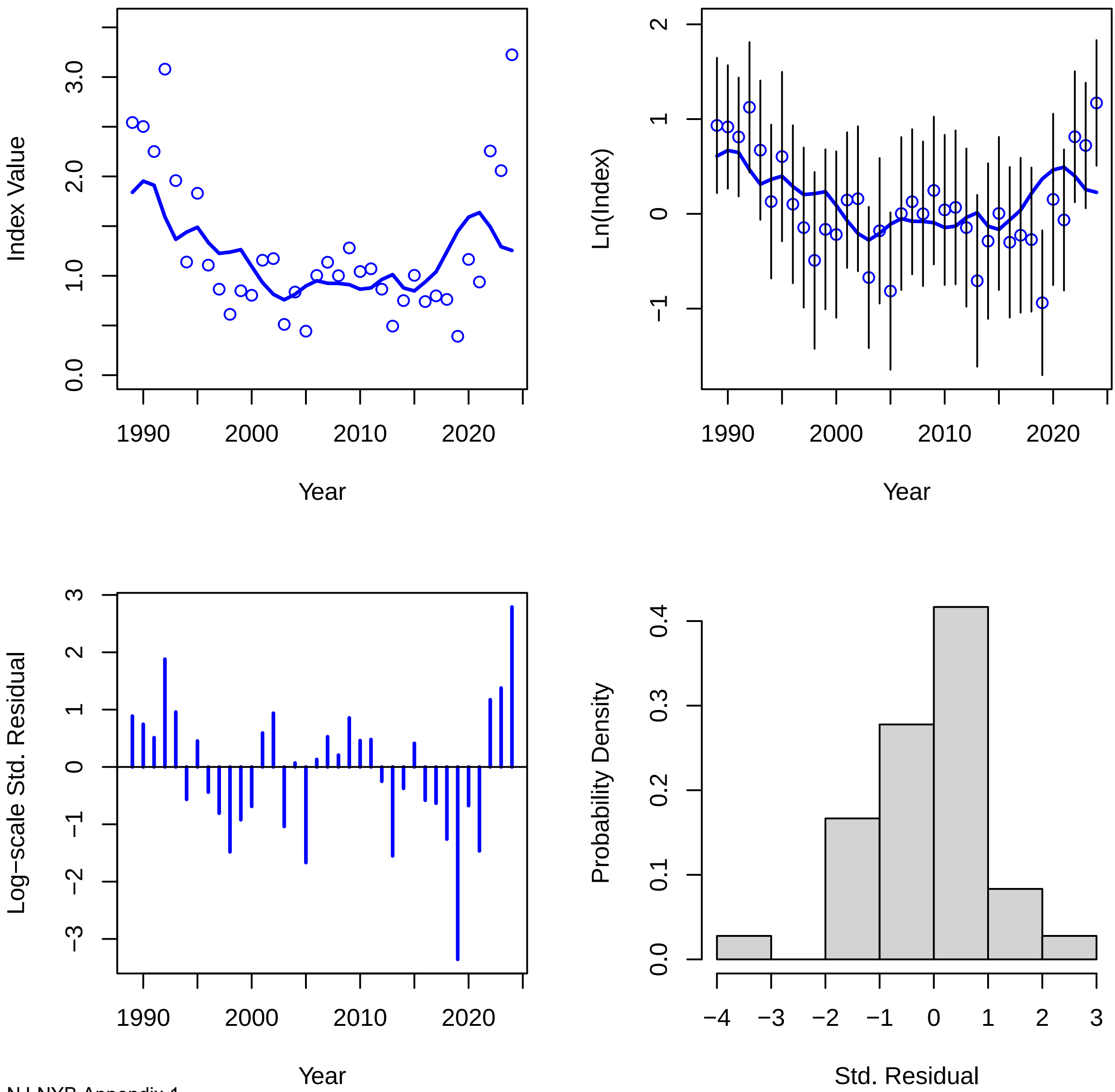
Index 1 (NY seine)

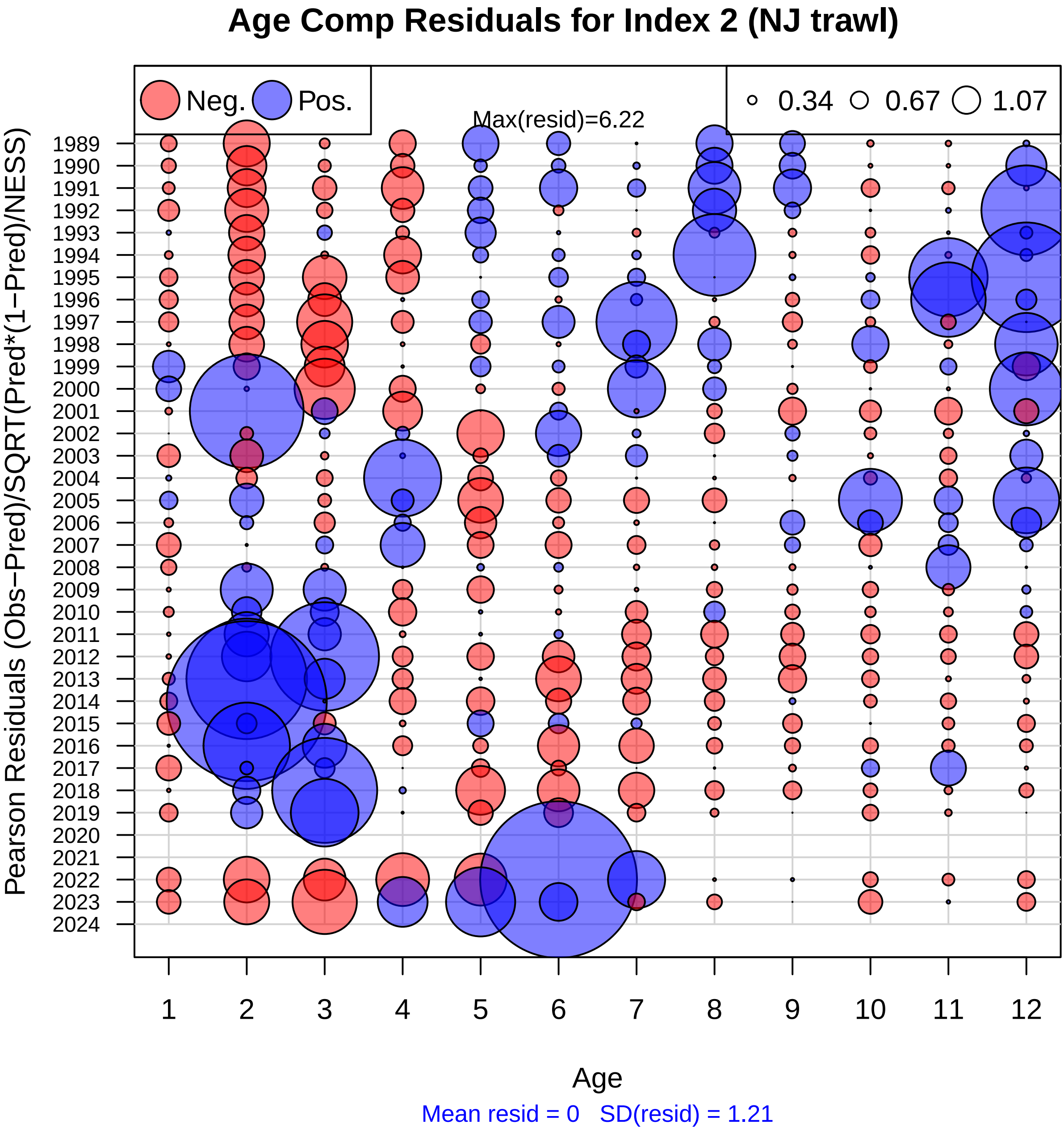


Index 2 (NJ trawl)

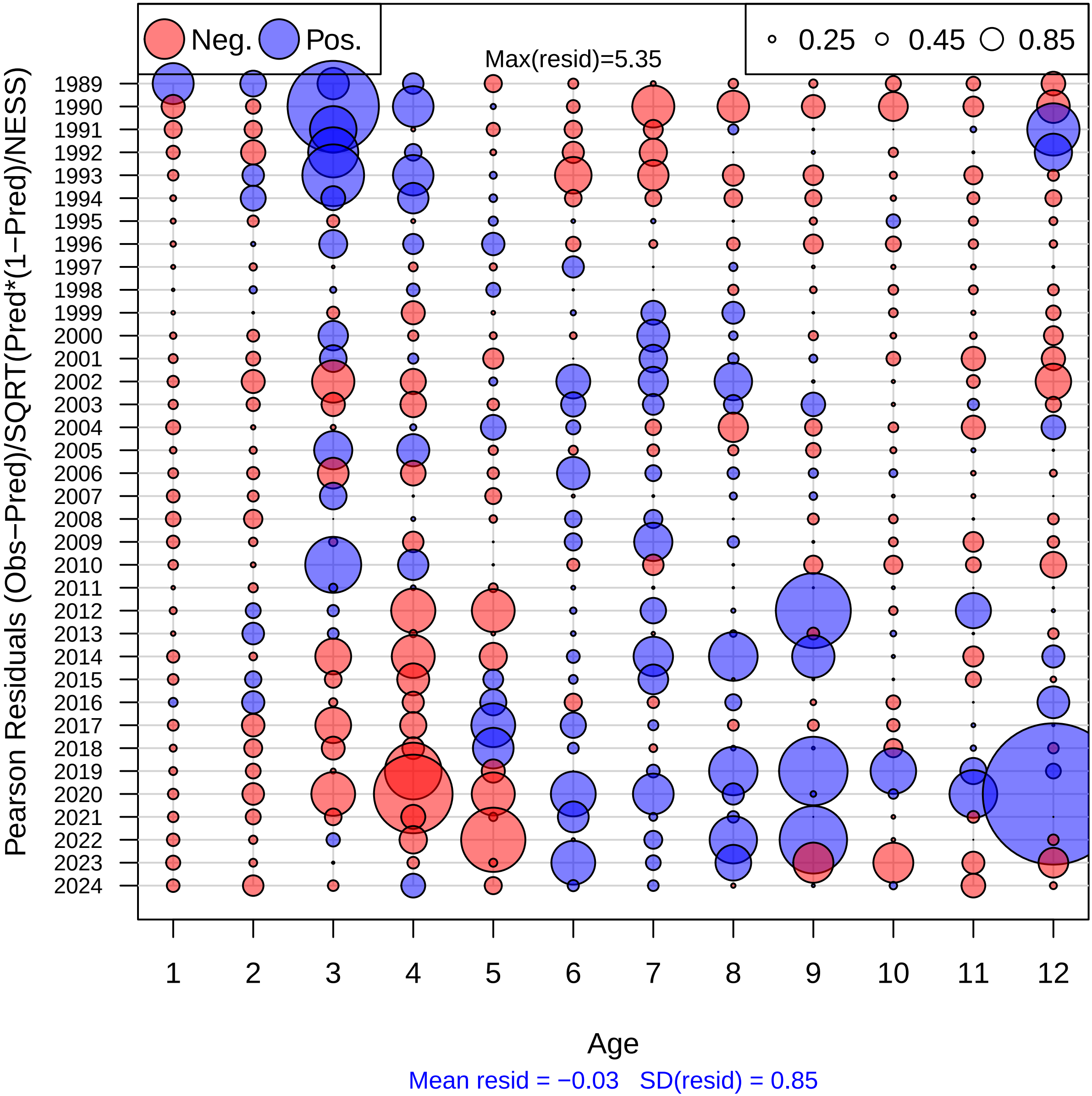


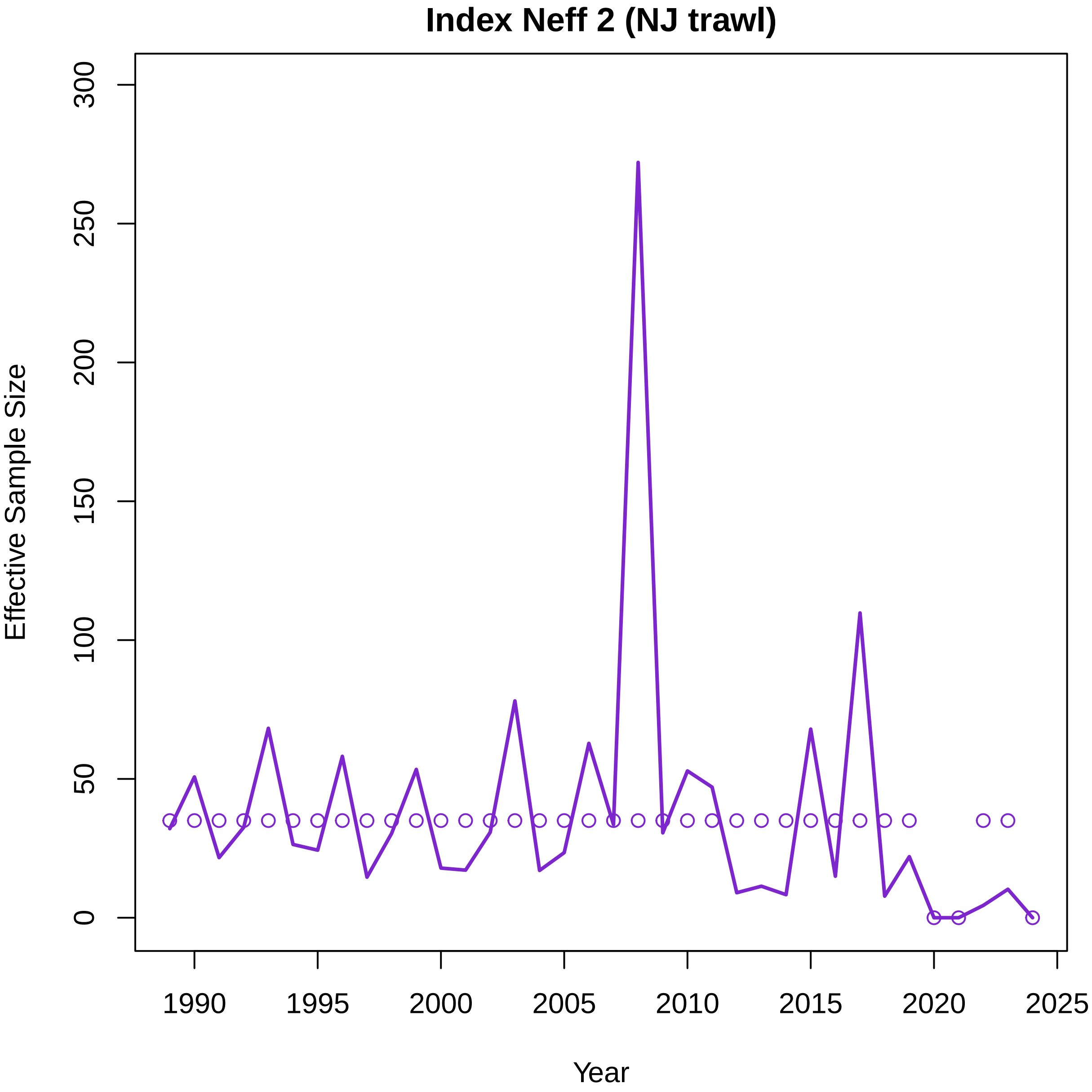
Index 3 (MRIP)

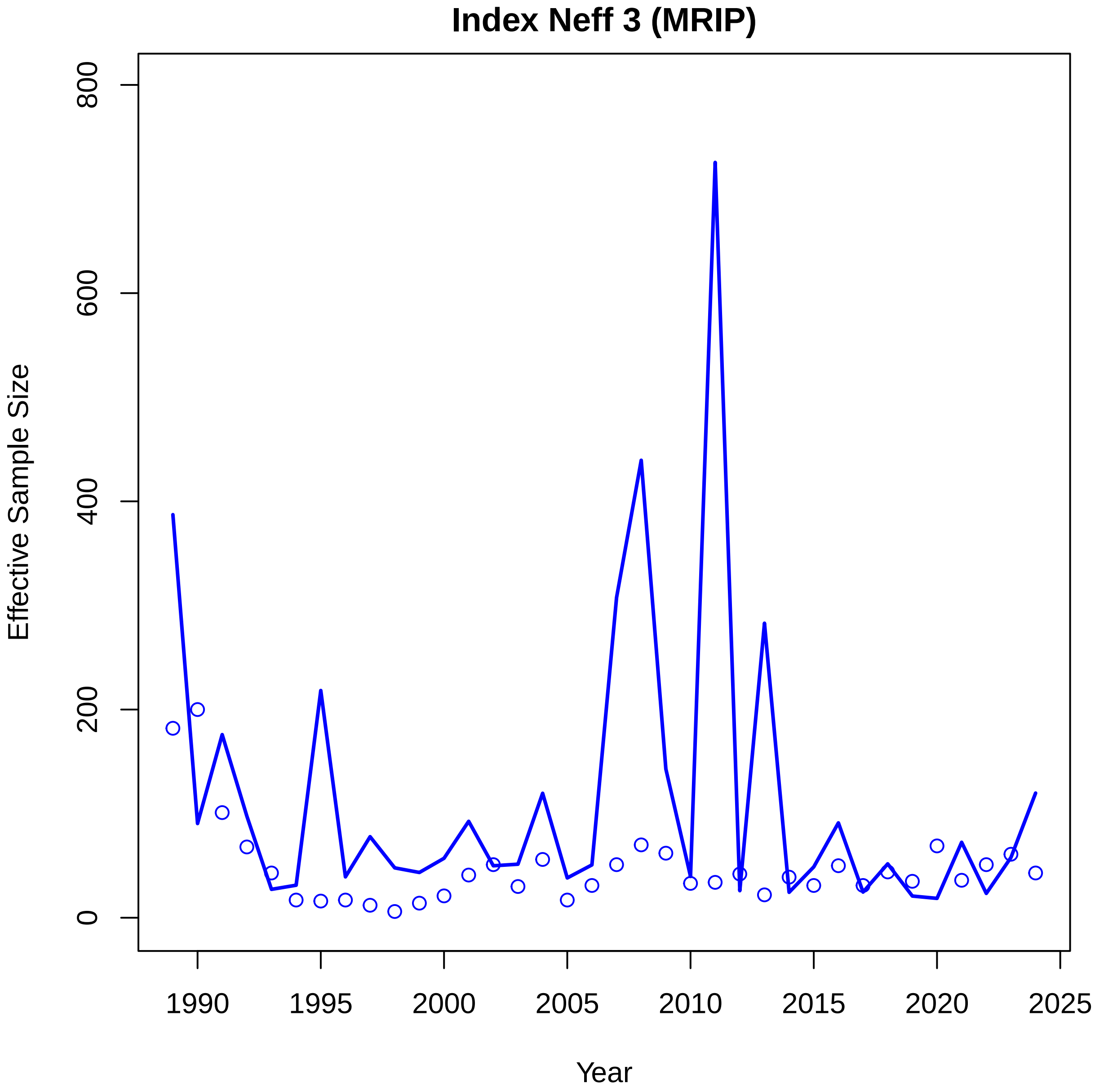

Index Value
0.0
1.0
2.0
3.0
1990
2000
2010
2020
Year
Ln(Index)
−1
0
1
2
1990
2000
2010
2020
Year
Log−scale Std. Residual
−3
−2
−1
0
1
2
3
1990
2000
2010
2020
Year
Probability Density
0.0
0.1
0.2
0.3
0.4
−4
−3
−2
−1
0
1
2
3
Std. Residual

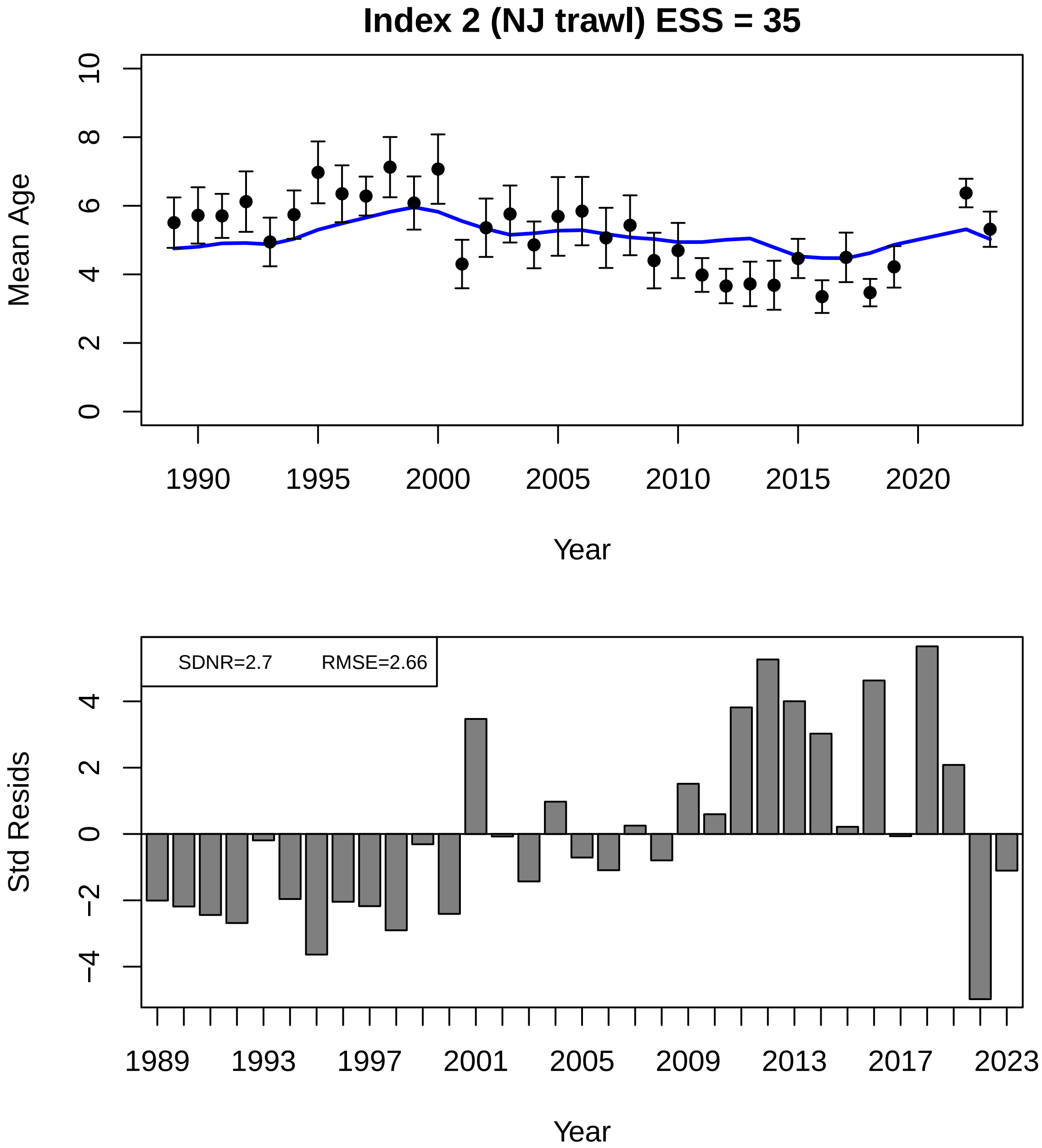

Age Comp Residuals for Index 2 (NJ trawl)
Neg.
Pos.
0.34
0.67
1.07
Max(resid)=6.22
Pearson Residuals (Obs−Pred)/SQRT(Pred*(1−Pred)/NESS)
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
1 2 3 4 5 6 7 8 9 10 11 12
Age
Mean resid = 0 SD(resid) = 1.21

Age Comp Residuals for Index 3 (MRIP)

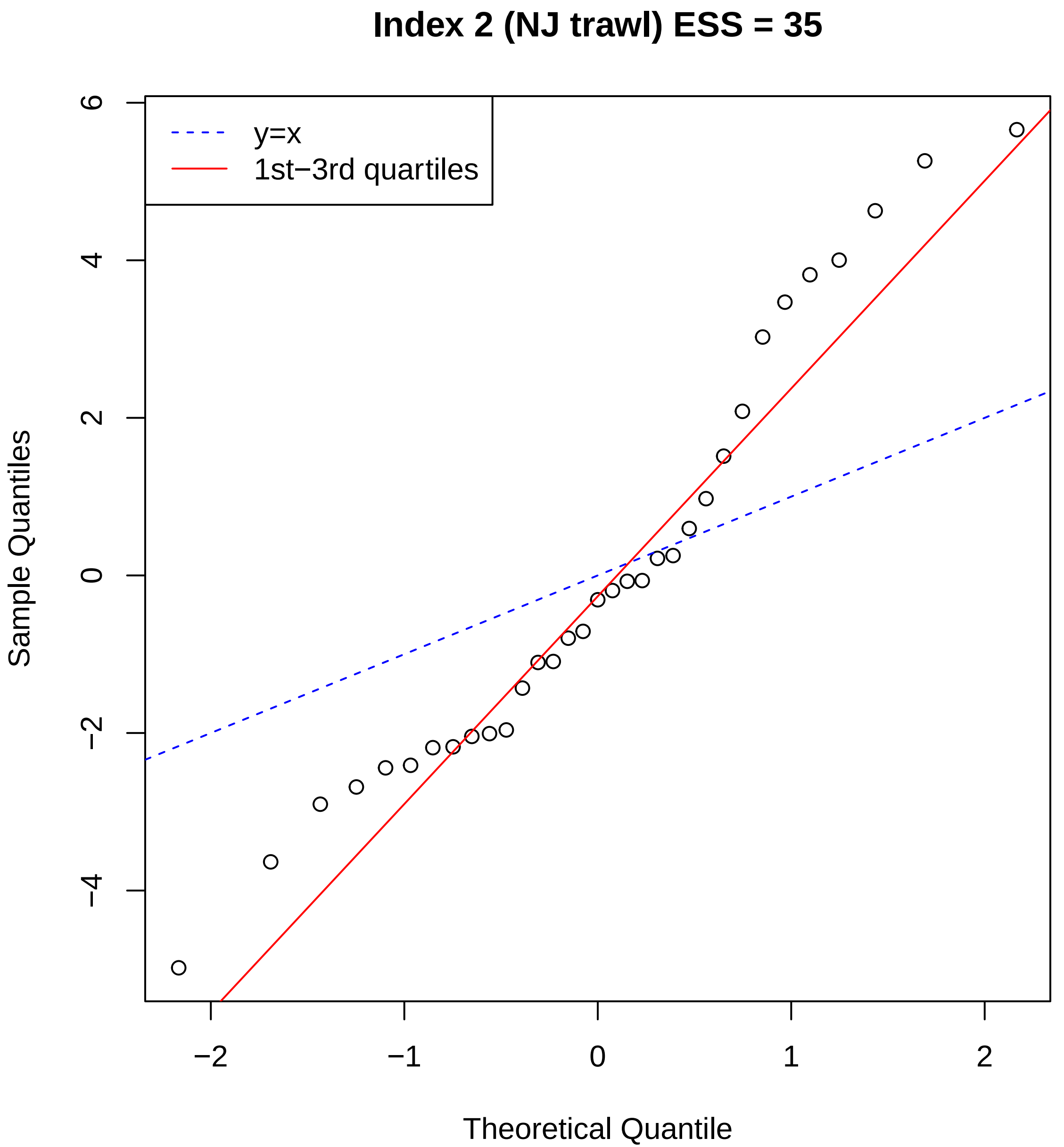


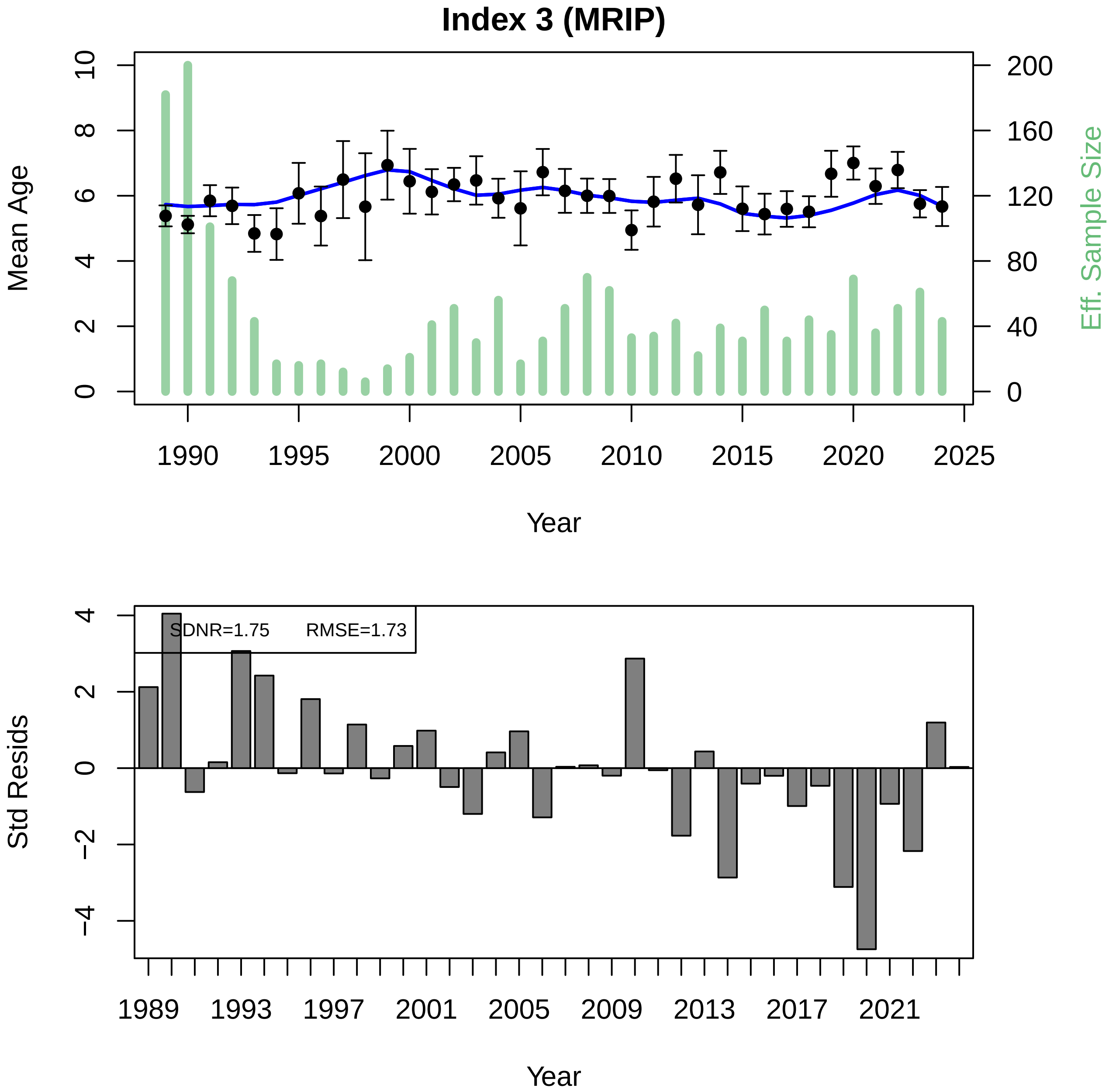

Index Neff 2 (NJ trawl)
Effective Sample Size
0
50
100
150
200
250
300
1990
1995
2000
2005
2010
2015
2020
2025
Year


Index Neff 3 (MRIP)
Effective Sample Size
Year
0
200
400
600
800
1990
1995
2000
2005
2010
2015
2020
2025

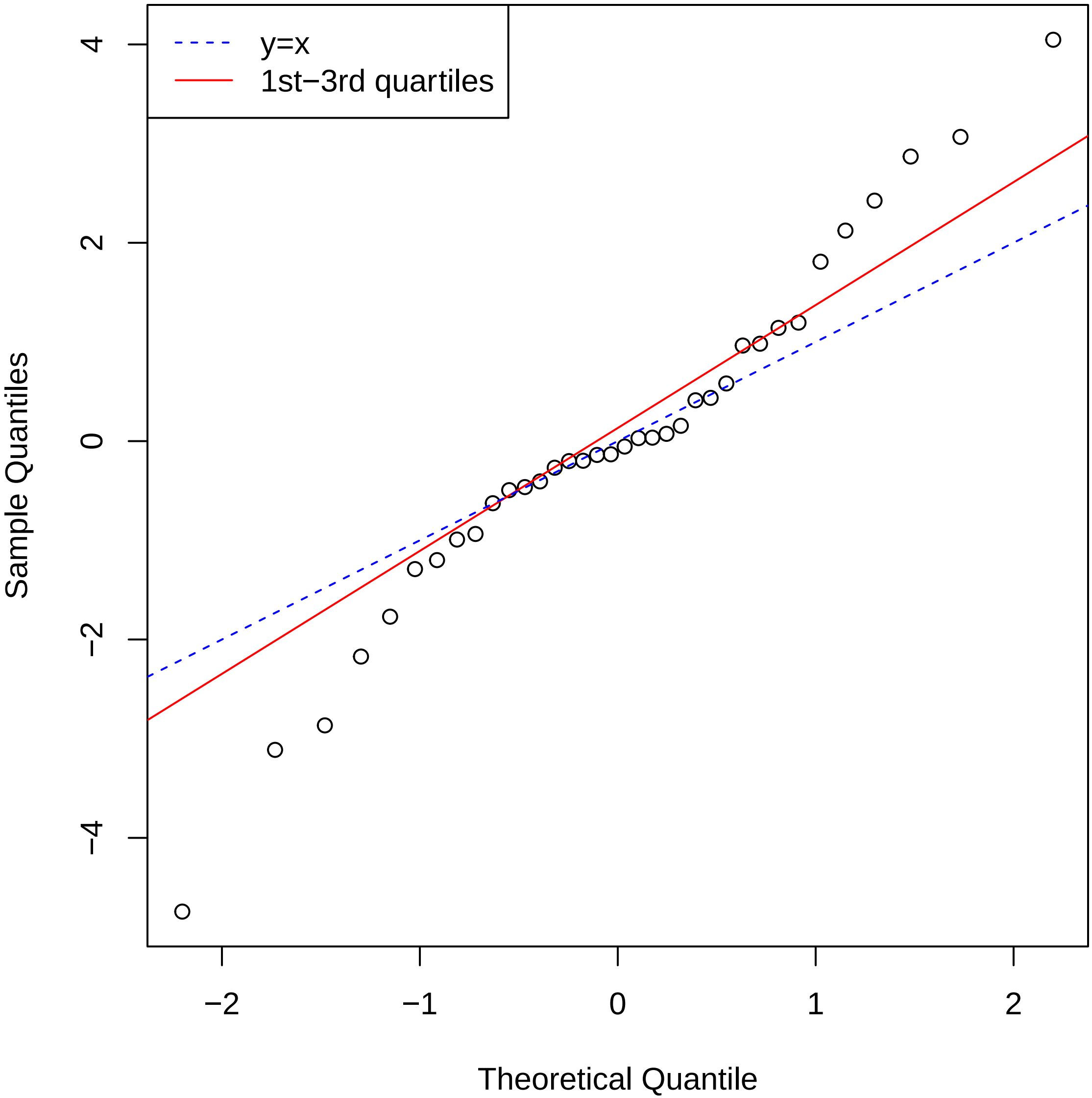


Index 2 (NJ trawl) ESS = 35
Mean Age
0
2
4
6
8
10
1990
1995
2000
2005
2010
2015
2020
Year
SDNR=2.7
RMSE=2.66
Std Resids
−4
−2
0
2
4
1989
1993
1997
2001
2005
2009
2013
2017
2023
Year

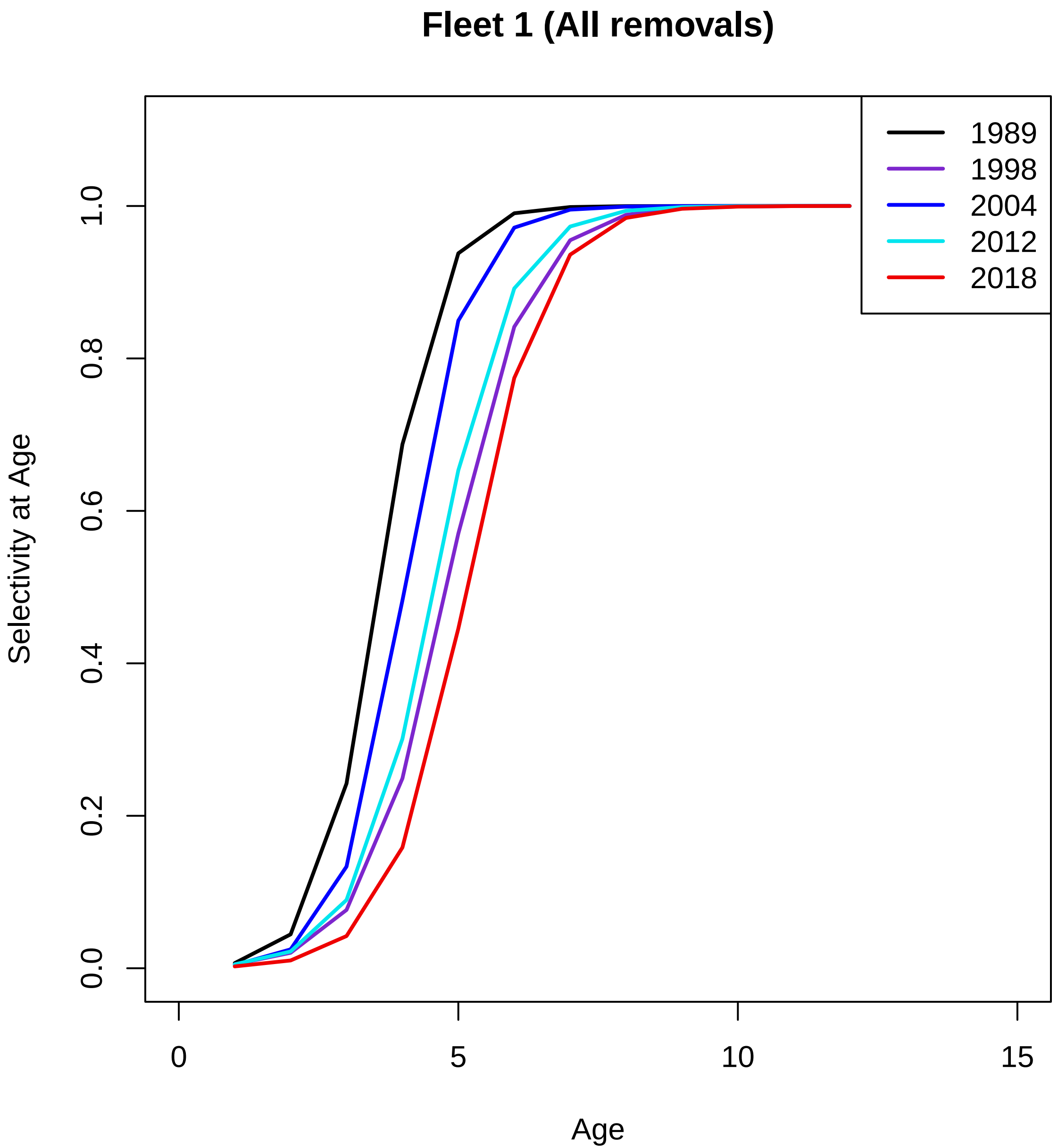

Index 2 (NJ trawl) ESS = 35
y=x
1st−3rd quartiles
Sample Quantiles
Theoretical Quantile
6
4
2
0
−2
−4
−2
−1
0
1
2


Index 3 (MRIP)
Mean Age
Eff. Sample Size
Year
SDNR=1.75
RMSE=1.73
Std Resids
Year

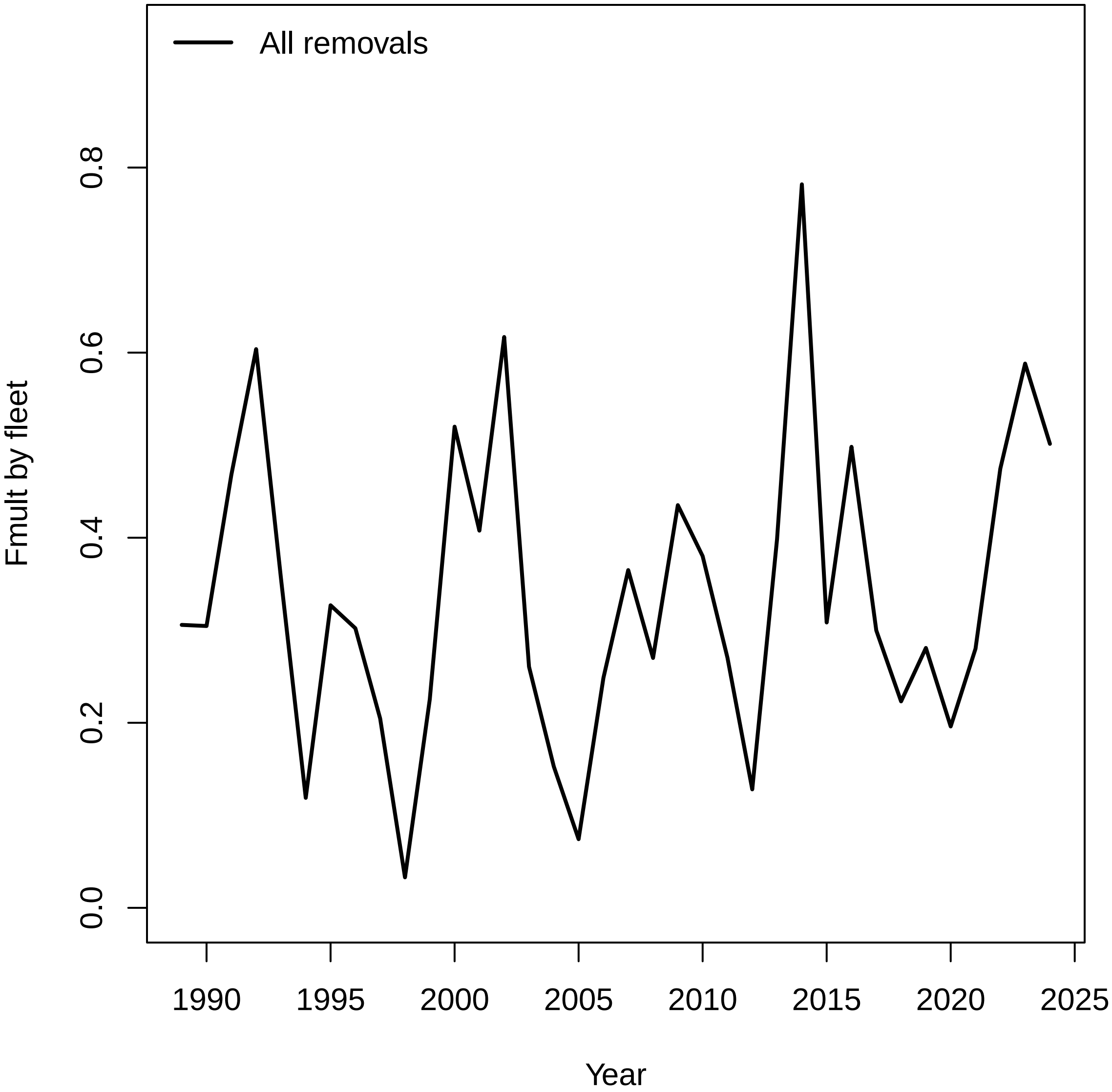
Index 3 (MRIP)

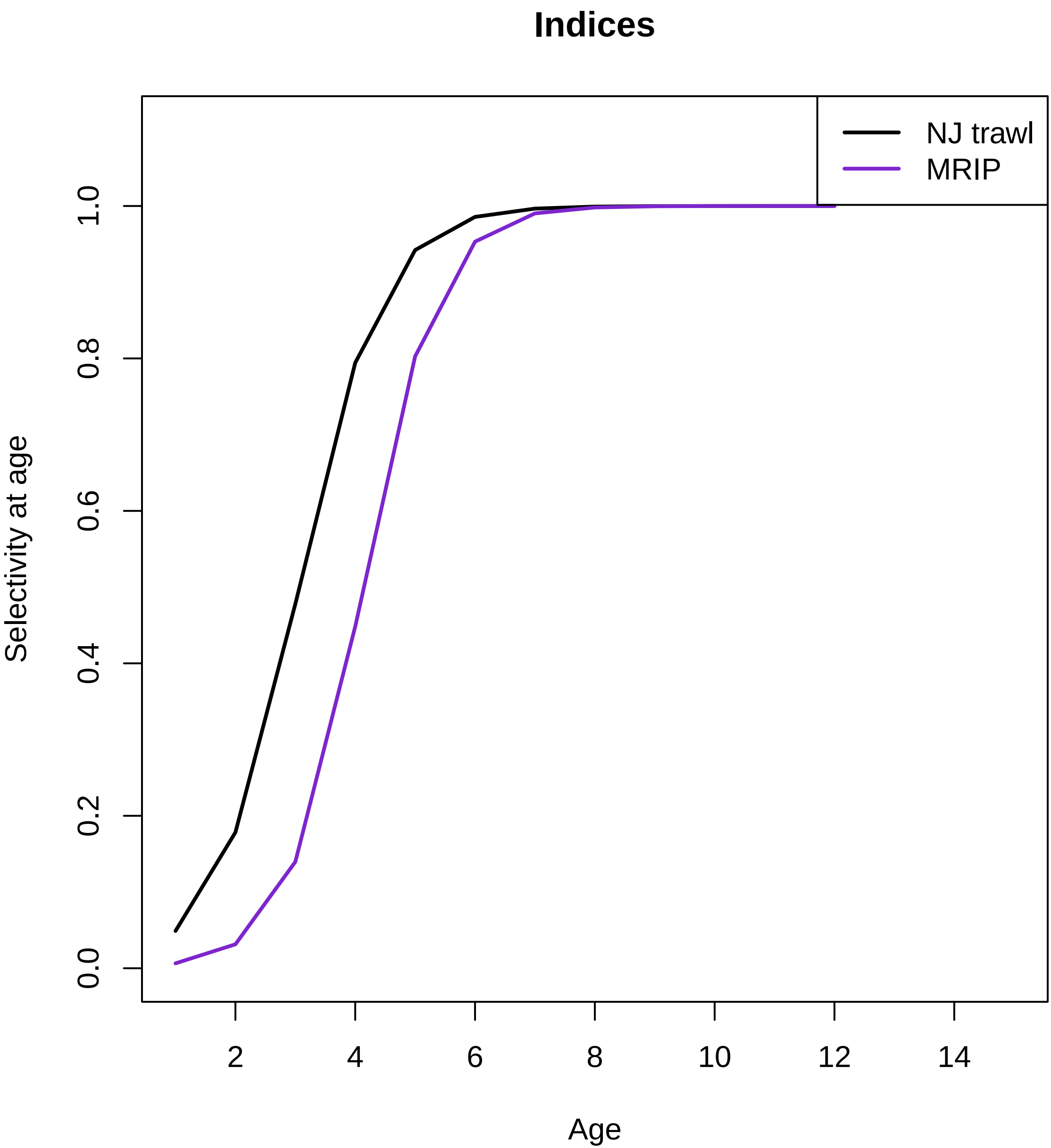


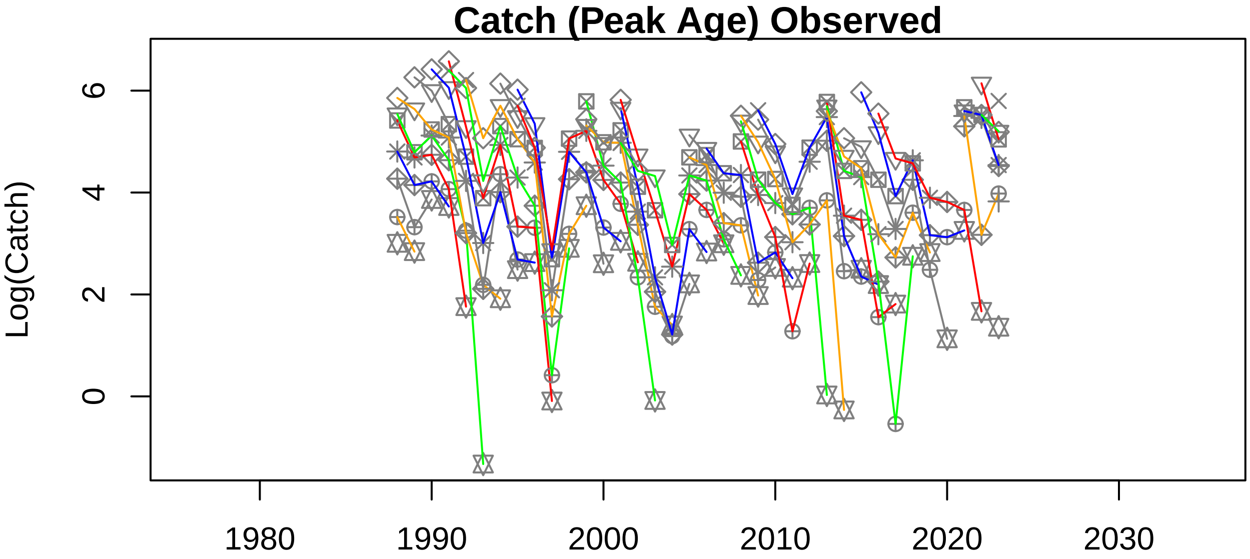
y=x
1st−3rd quartiles
Sample Quantiles
4
2
0
−2
−4
−2
−1
0
1
2
Theoretical Quantile

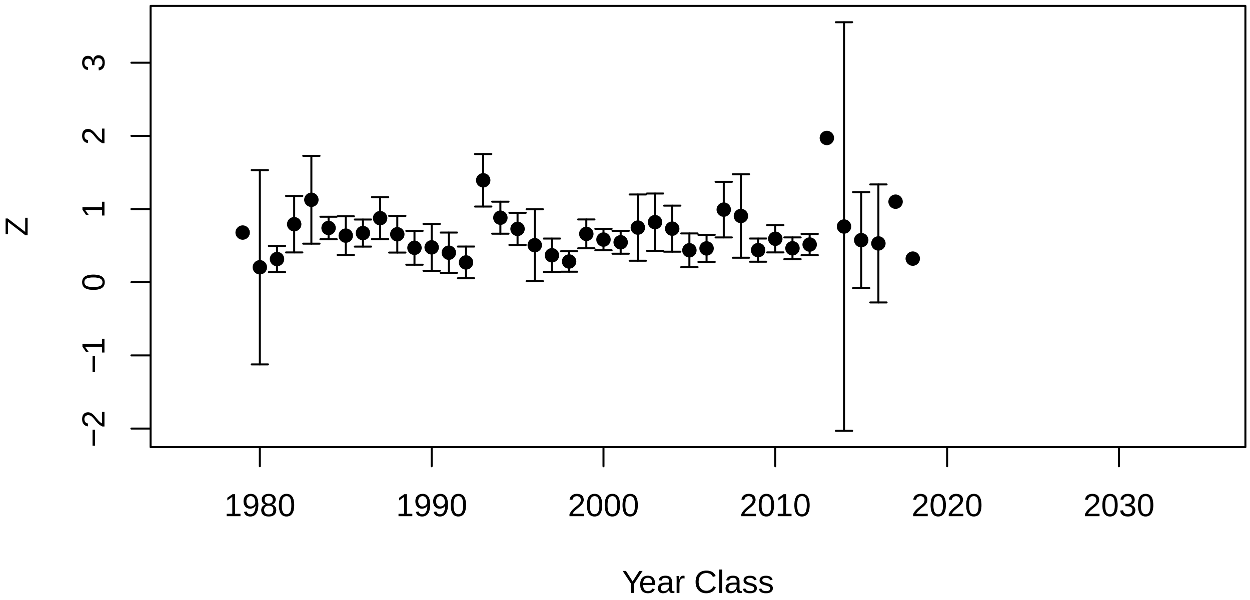


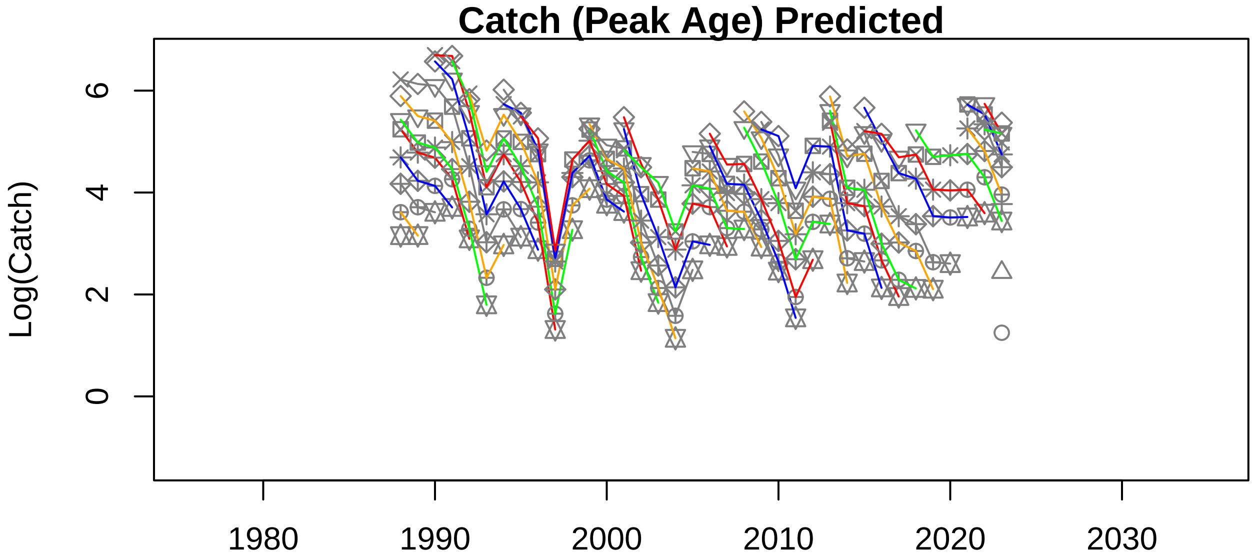
Fleet 1 (All removals)
1989
1998
2004
2012
2018
Selectivity at Age
0.0
0.2
0.4
0.6
0.8
1.0
0
5
10
15
Age


All removals
Fmult by fleet
0.0
0.2
0.4
0.6
0.8
1990
1995
2000
2005
2010
2015
2020
2025
Year

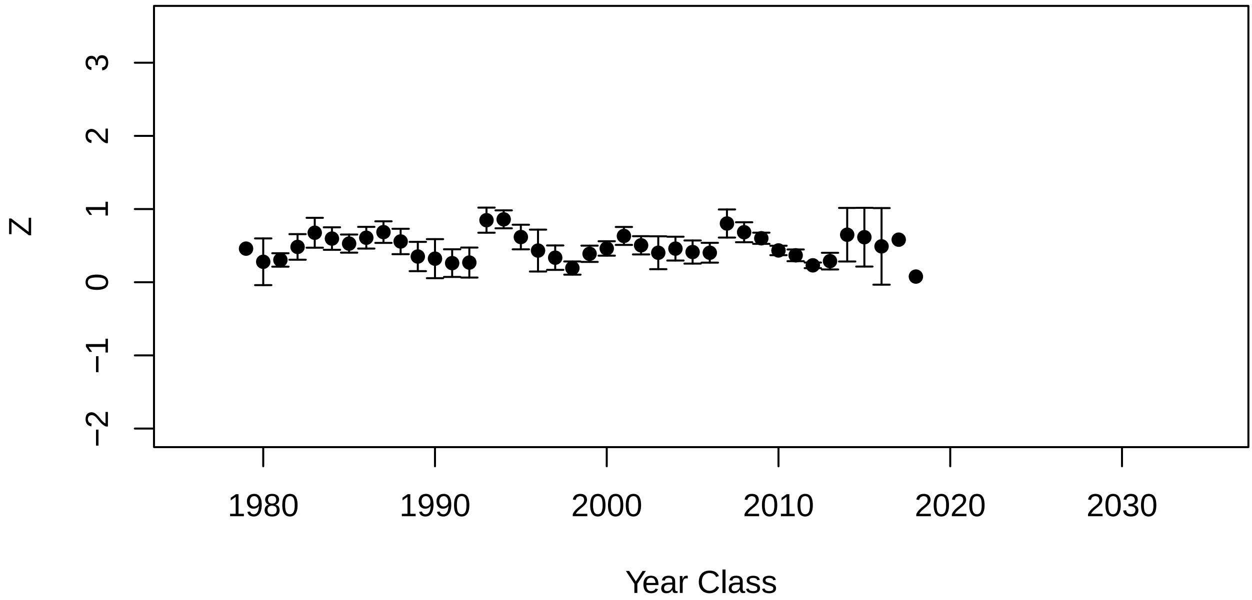

Indices
NJ trawl
MRIP
Selectivity at age
0.0
0.2
0.4
0.6
0.8
1.0
2
4
6
8
10
12
14
Age


Catch (Peak Age) Observed
Log(Catch)
0
2
4
6
1980
1990
2000
2010
2020
2030


Z
−2
−1
0
1
2
3
1980
1990
2000
2010
2020
2030
Year Class

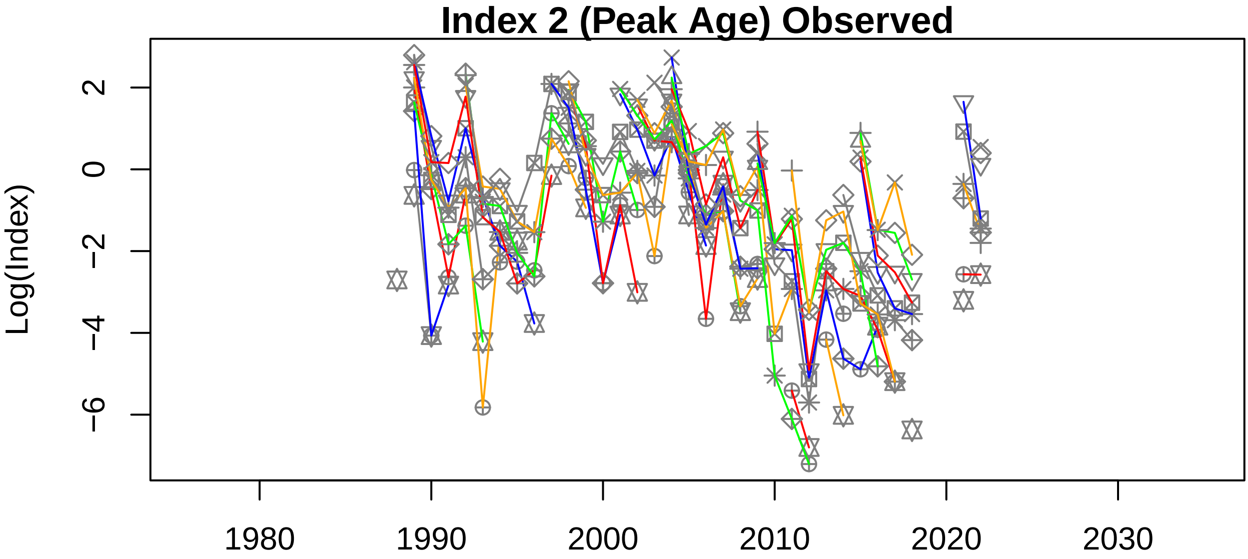


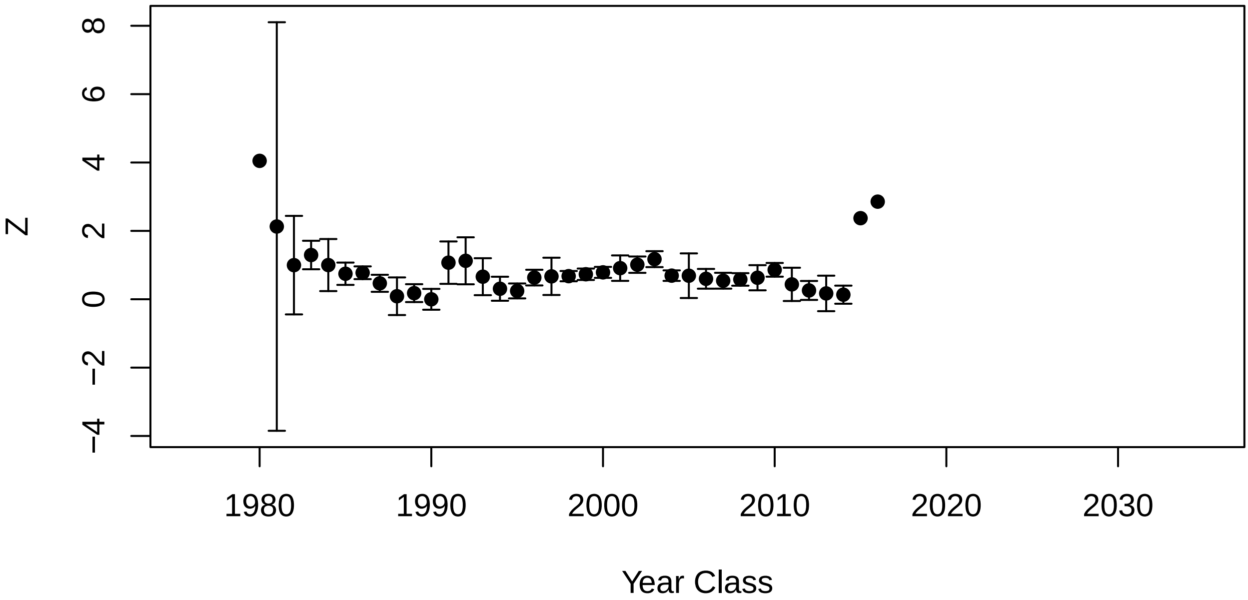
Catch (Peak Age) Predicted
Log(Catch)
0
2
4
6
1980
1990
2000
2010
2020
2030

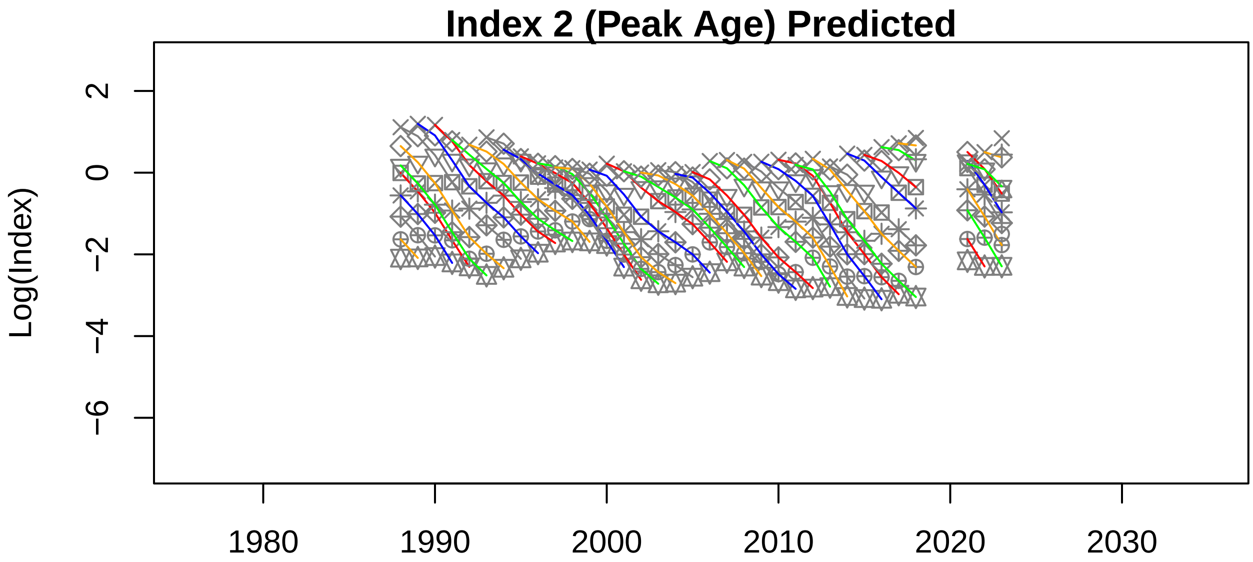


Z
−2
−1
0
1
2
3
1980
1990
2000
2010
2020
2030
Year Class

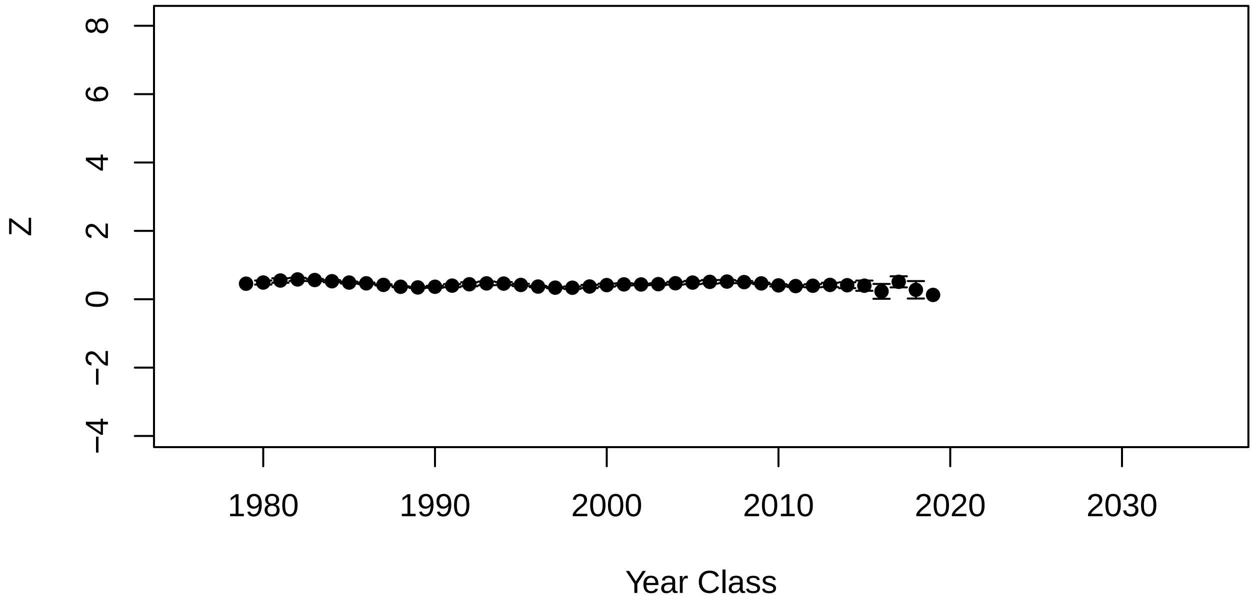
Index 2 (Peak Age) Observed



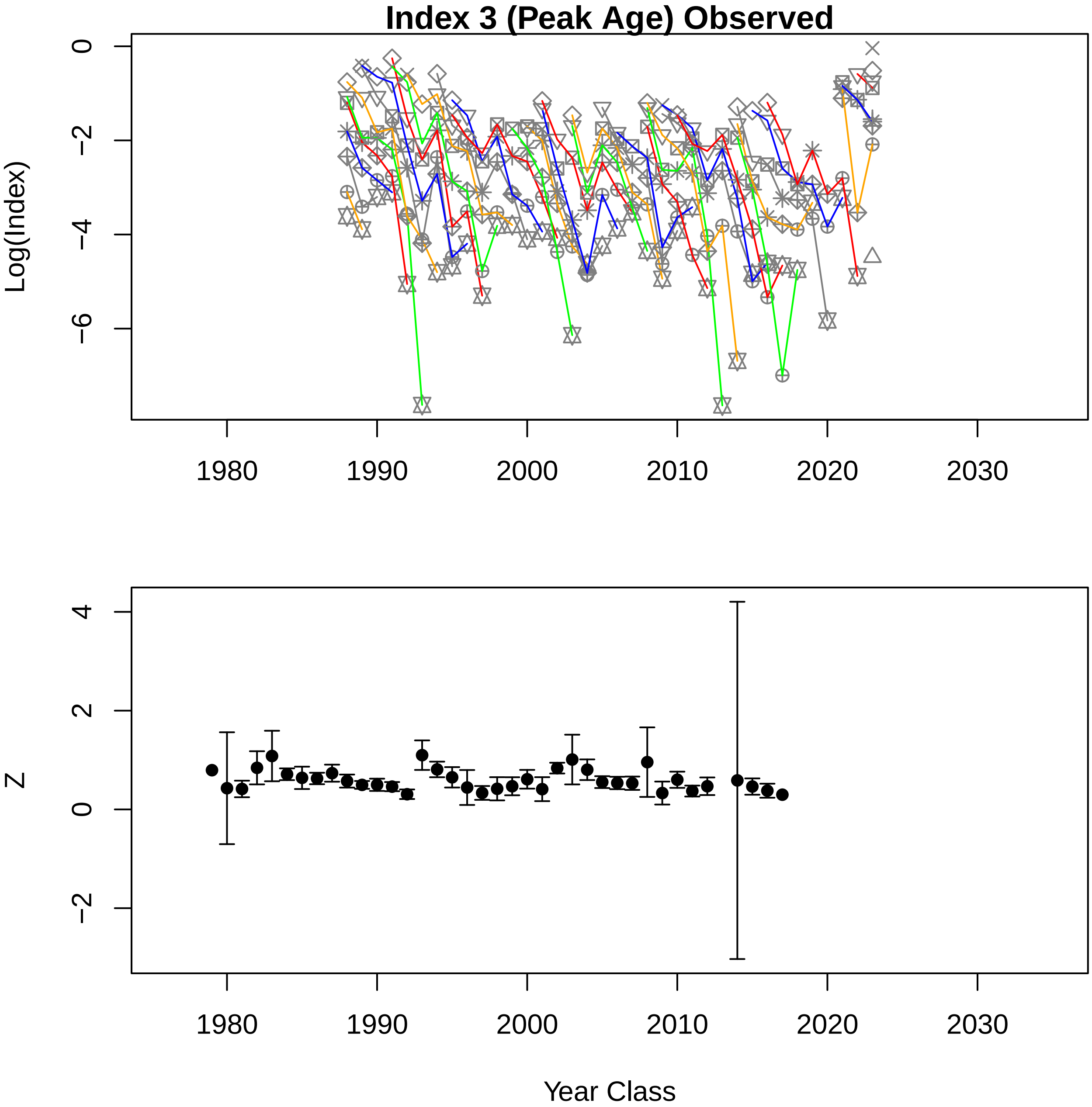


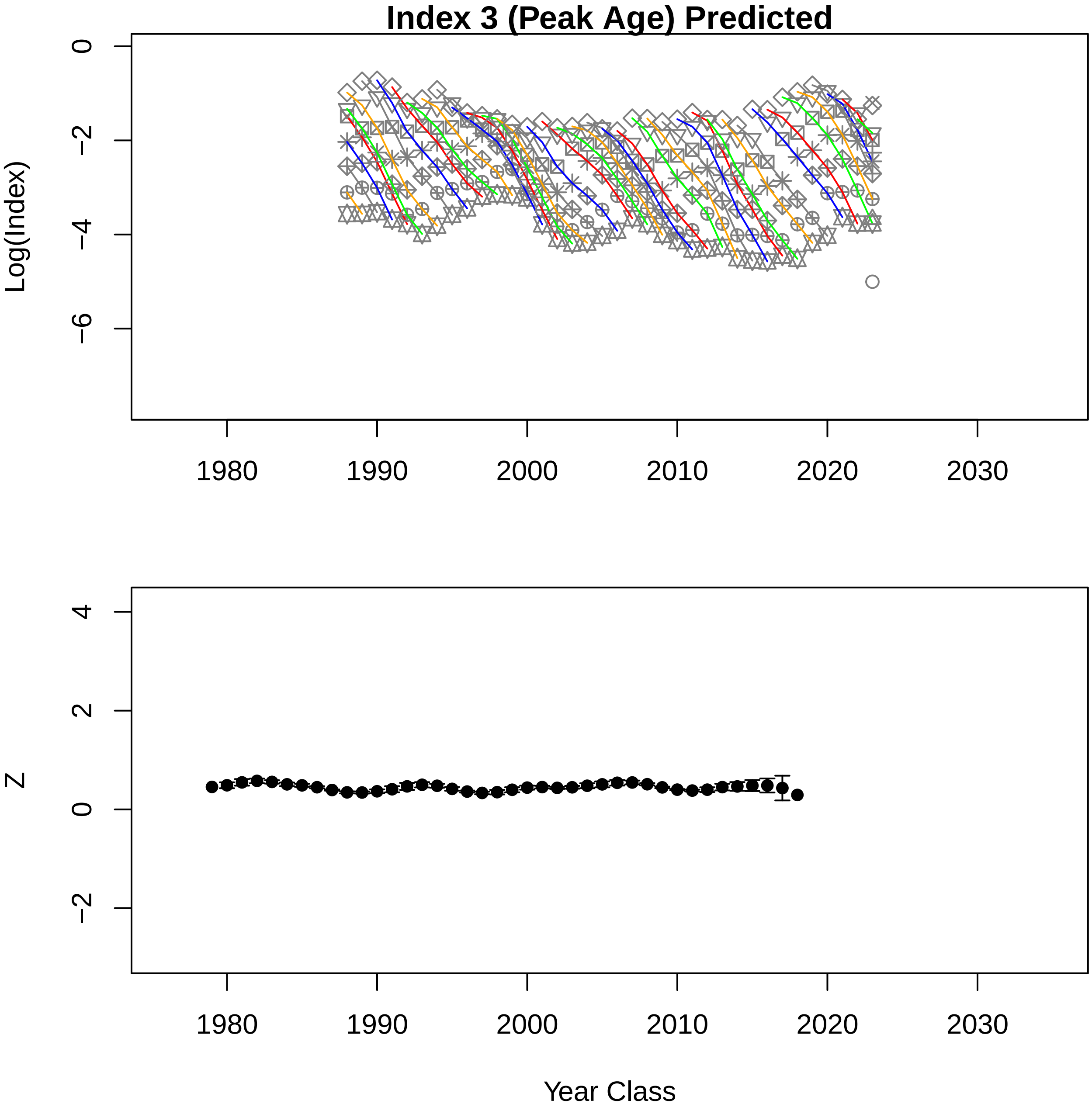


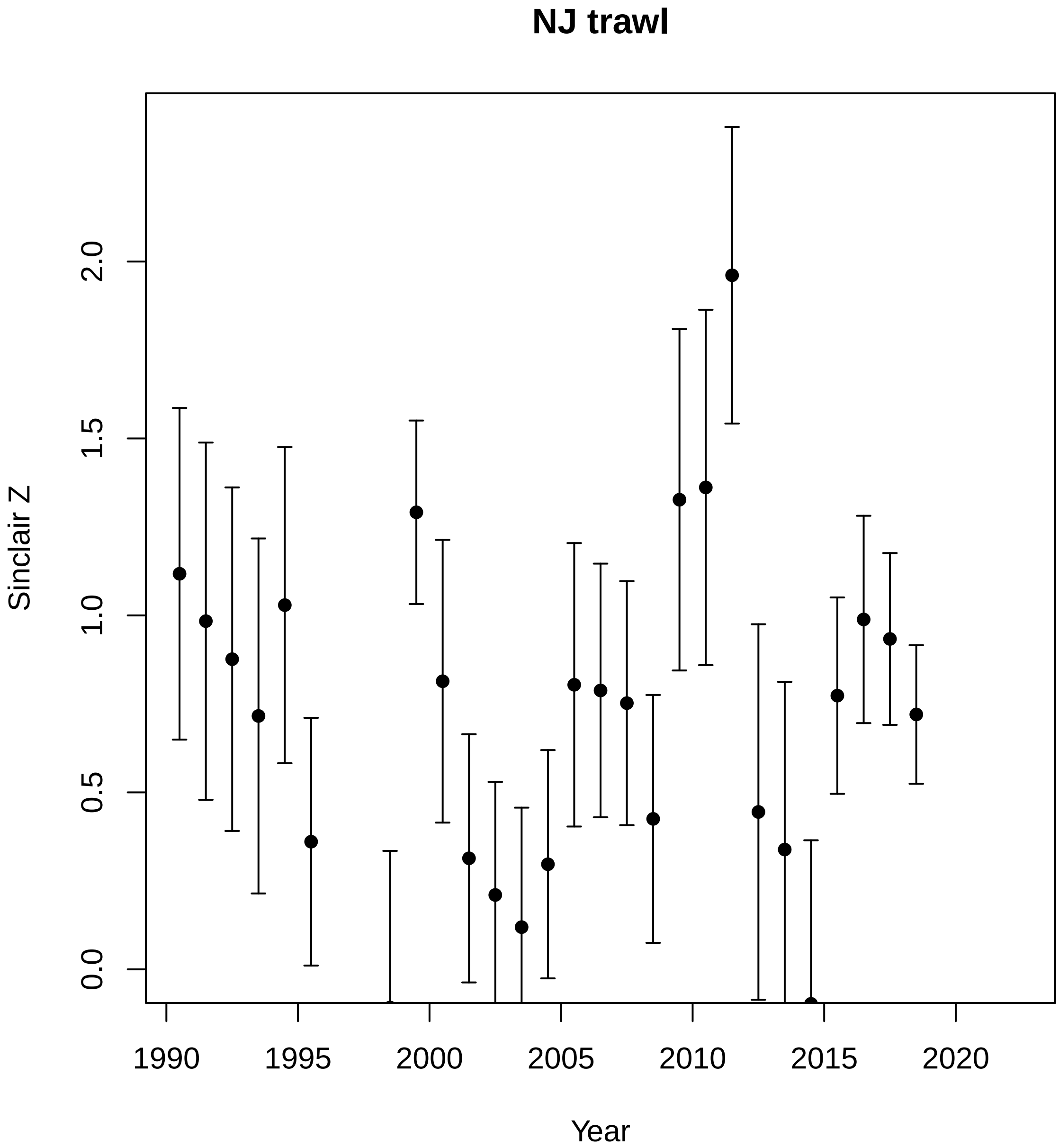
Index 2 (Peak Age) Predicted
Log(Index)
2
0
−2
−4
−6
1980
1990
2000
2010
2020
2030

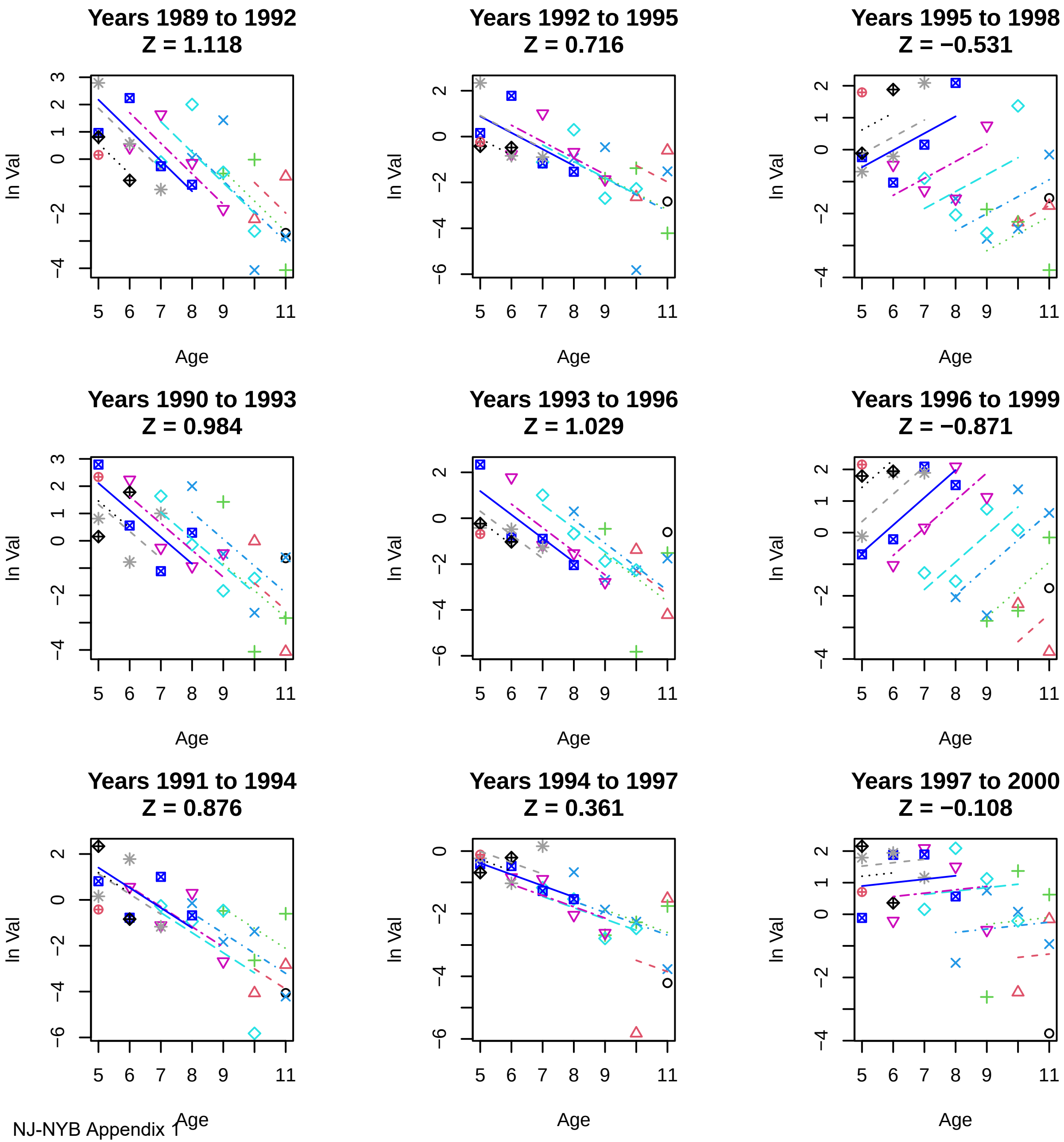


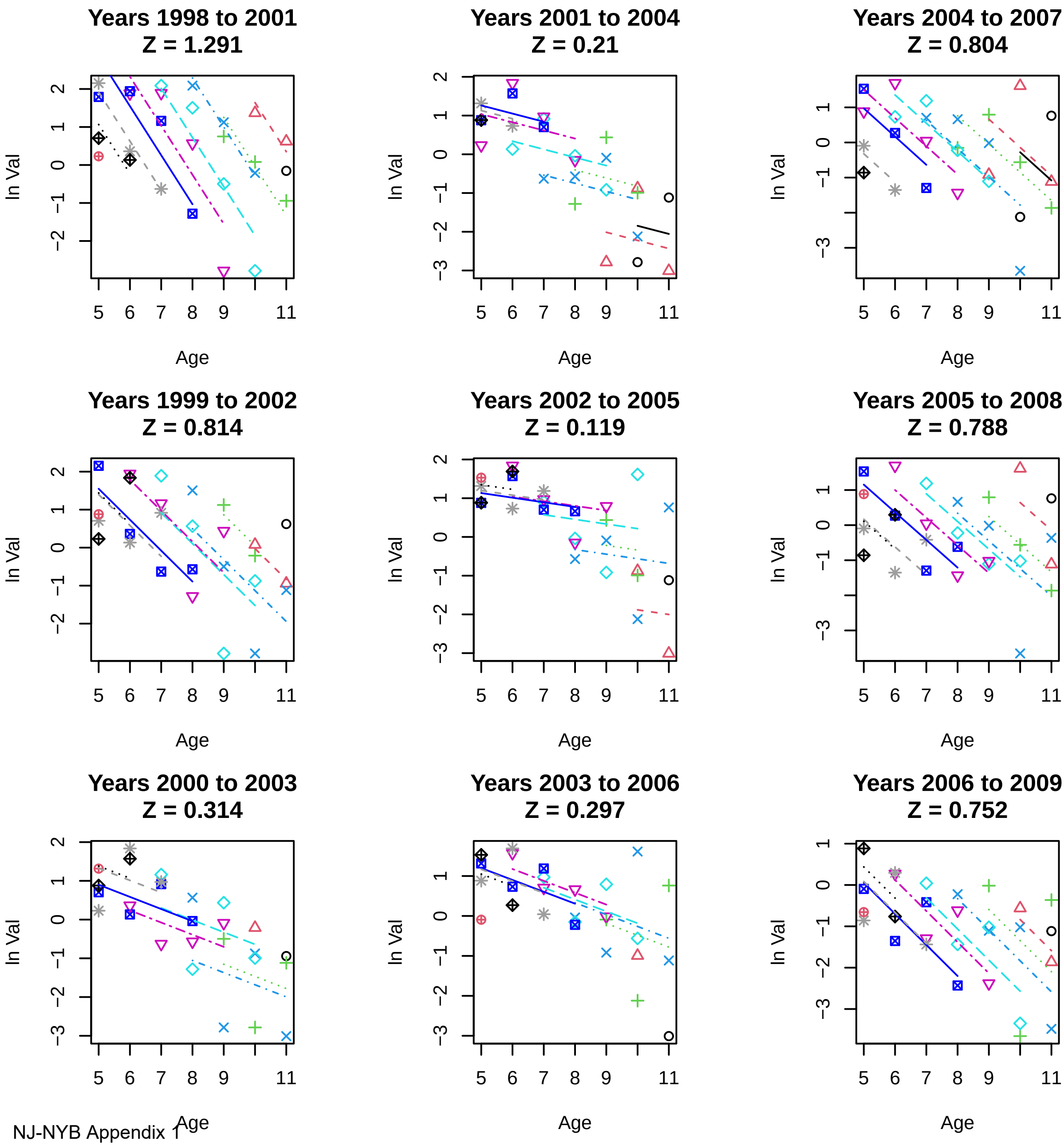
Z
8
6
4
2
0
−2
−4
1980
1990
2000
2010
2020
2030
Year Class

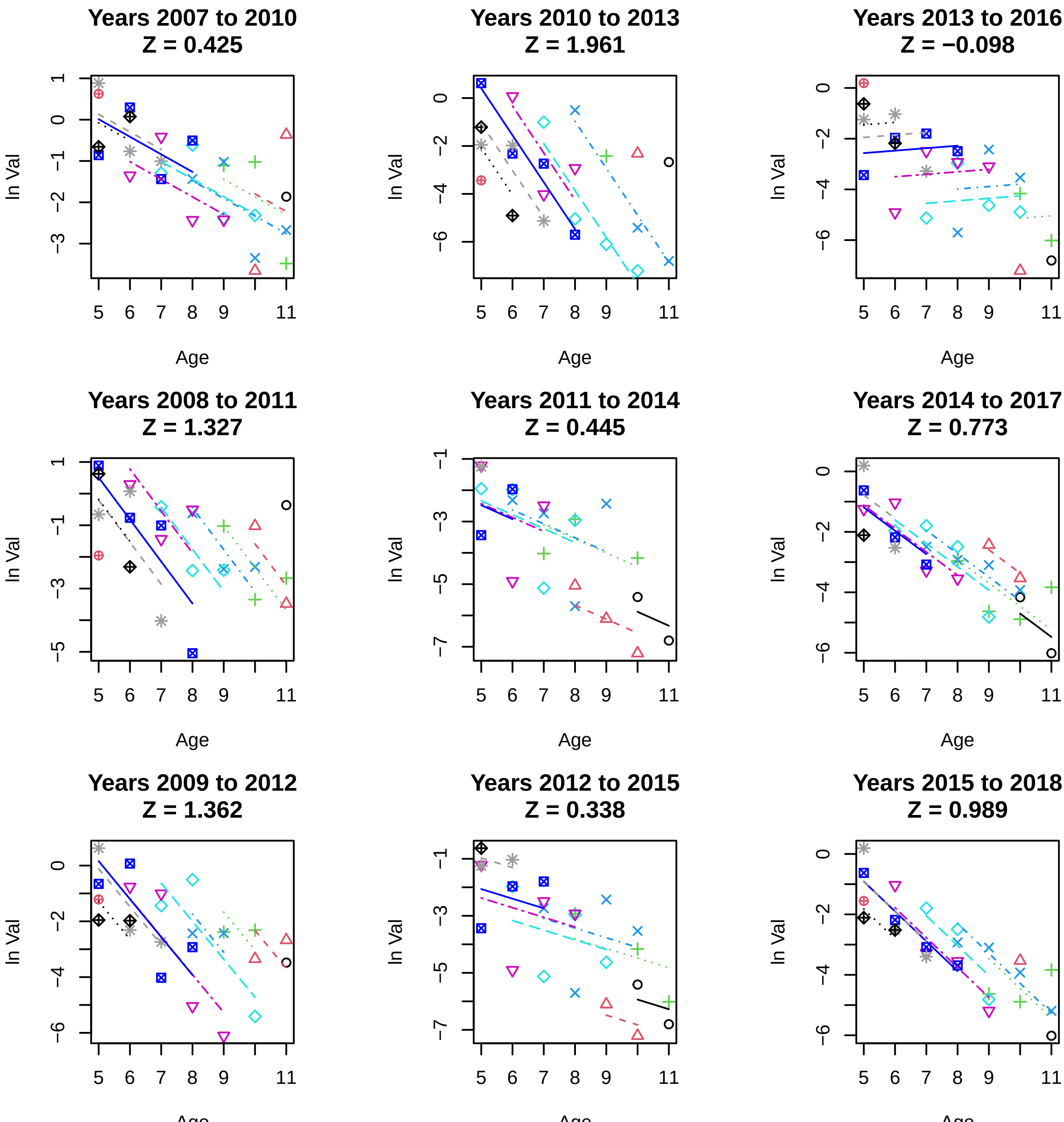

Index 3 (Peak Age) Observed
Log(Index)
0
−2
−4
−6
1980
1990
2000
2010
2020
2030
Z
4
2
0
−2
Year Class

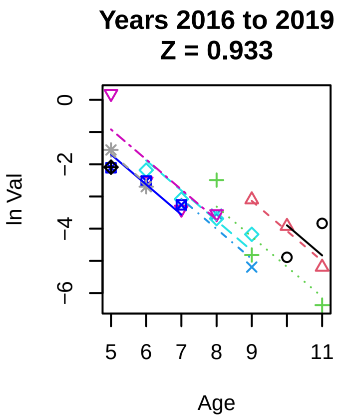

Index 3 (Peak Age) Predicted
Log(Index)
0
−2
−4
−6
1980
1990
2000
2010
2020
2030
Z
4
2
0
−2
1980
1990
2000
2010
2020
2030
Year Class

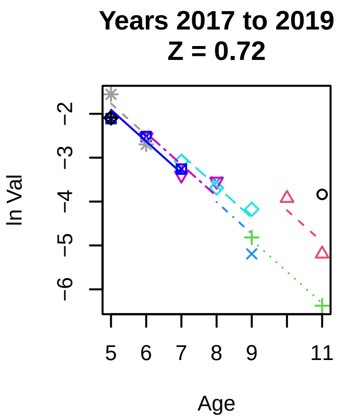

NJ trawl
Sinclair Z
0.0
0.5
1.0
1.5
2.0
1990
1995
2000
2005
2010
2015
2020
Year


Years 1989 to 1992
Z = 1.118
Years 1992 to 1995
Z = 0.716
Years 1995 to 1998
Z = −0.531
Years 1990 to 1993
Z = 0.984
Years 1993 to 1996
Z = 1.029
Years 1996 to 1999
Z = −0.871
Years 1991 to 1994
Z = 0.876
Years 1994 to 1997
Z = 0.361
Years 1997 to 2000
Z = −0.108
ln Val
Age

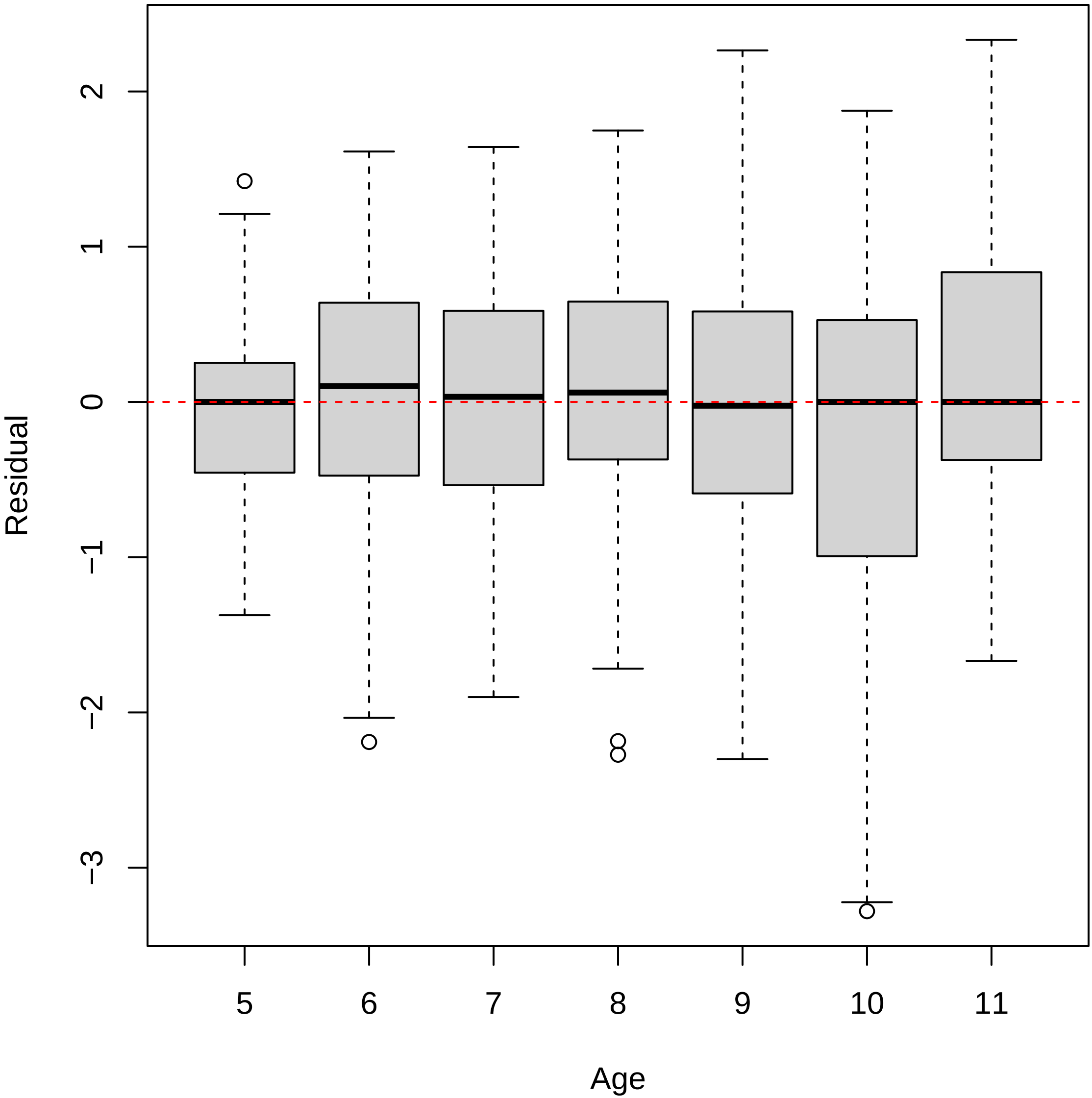

Years 1998 to 2001
Z = 1.291
Years 2001 to 2004
Z = 0.21
Years 2004 to 2007
Z = 0.804
Years 1999 to 2002
Z = 0.814
Years 2002 to 2005
Z = 0.119
Years 2005 to 2008
Z = 0.788
Years 2000 to 2003
Z = 0.314
Years 2003 to 2006
Z = 0.297
Years 2006 to 2009
Z = 0.752
ln Val
Age

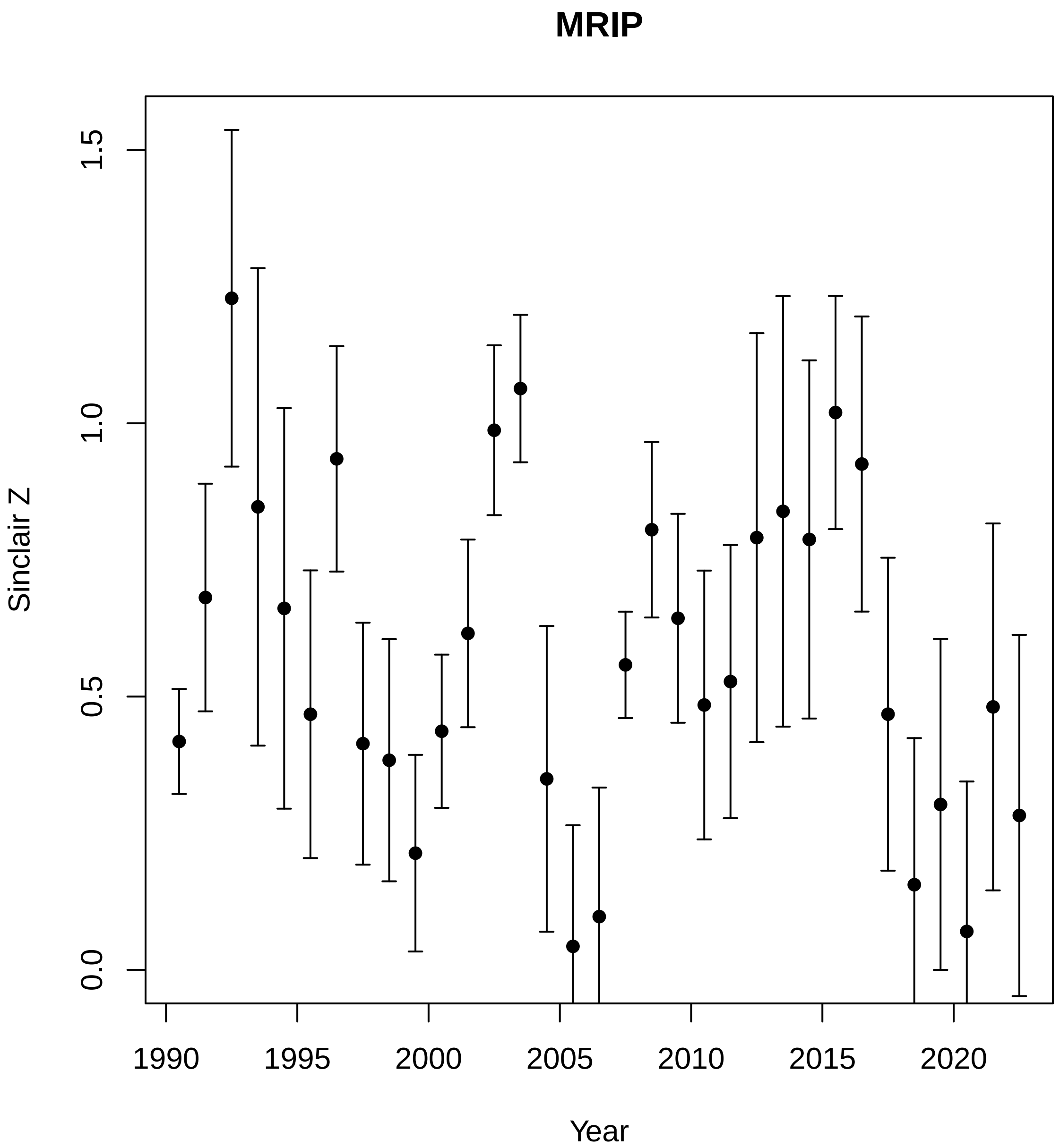

Years 2007 to 2010
Z = 0.425
Years 2010 to 2013
Z = 1.961
Years 2013 to 2016
Z = −0.098
Years 2008 to 2011
Z = 1.327
Years 2011 to 2014
Z = 0.445
Years 2014 to 2017
Z = 0.773
Years 2009 to 2012
Z = 1.362
Years 2012 to 2015
Z = 0.338
Years 2015 to 2018
Z = 0.989
ln Val
Age


Years 2016 to 2019
Z = 0.933
ln Val
0
−2
−4
−6
5
6
7
8
9
11
Age

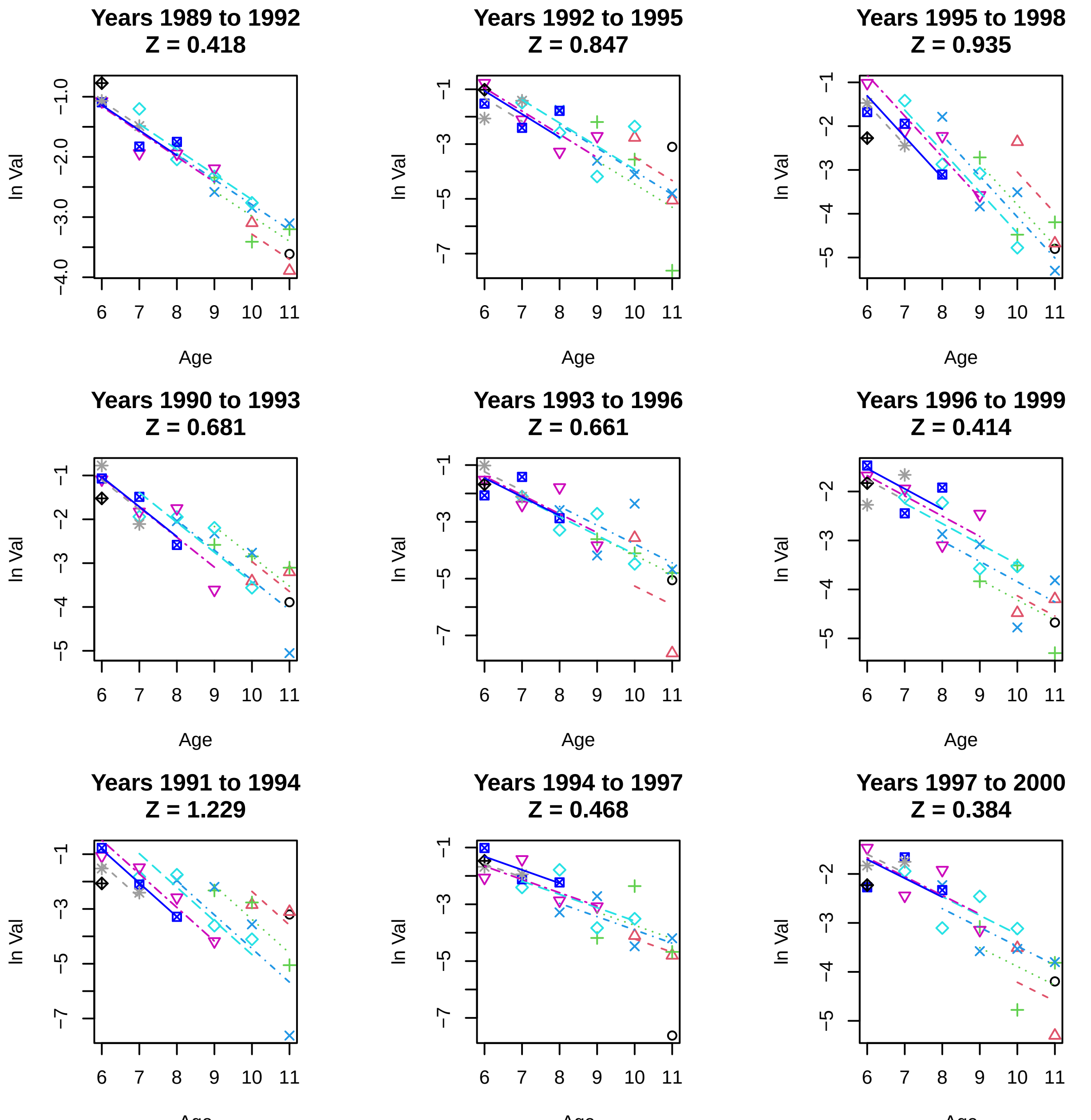

Years 2017 to 2019
Z = 0.72
ln Val
−2
−3
−4
−5
−6
5
6
7
8
9
11
Age

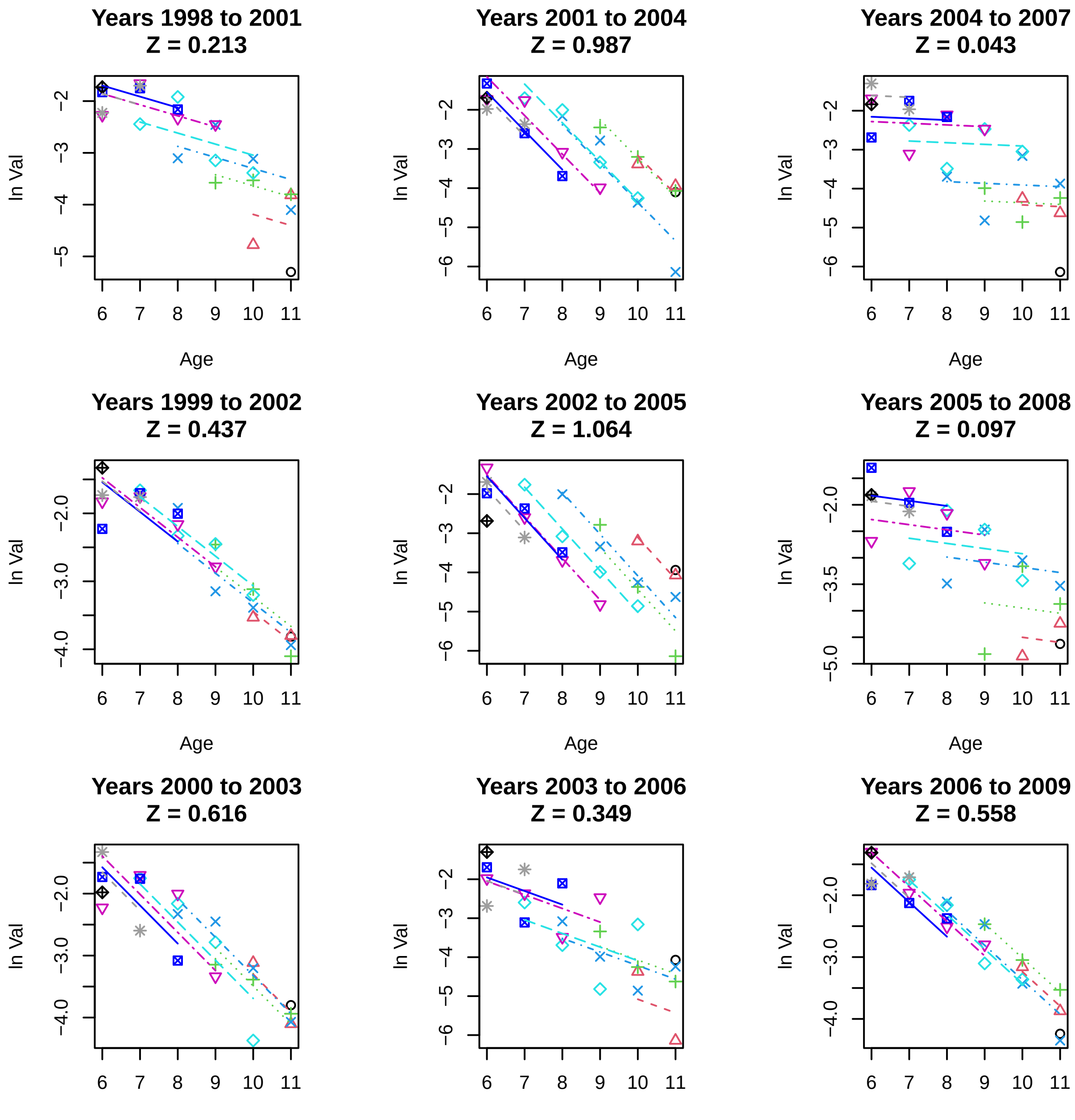
NJ trawl

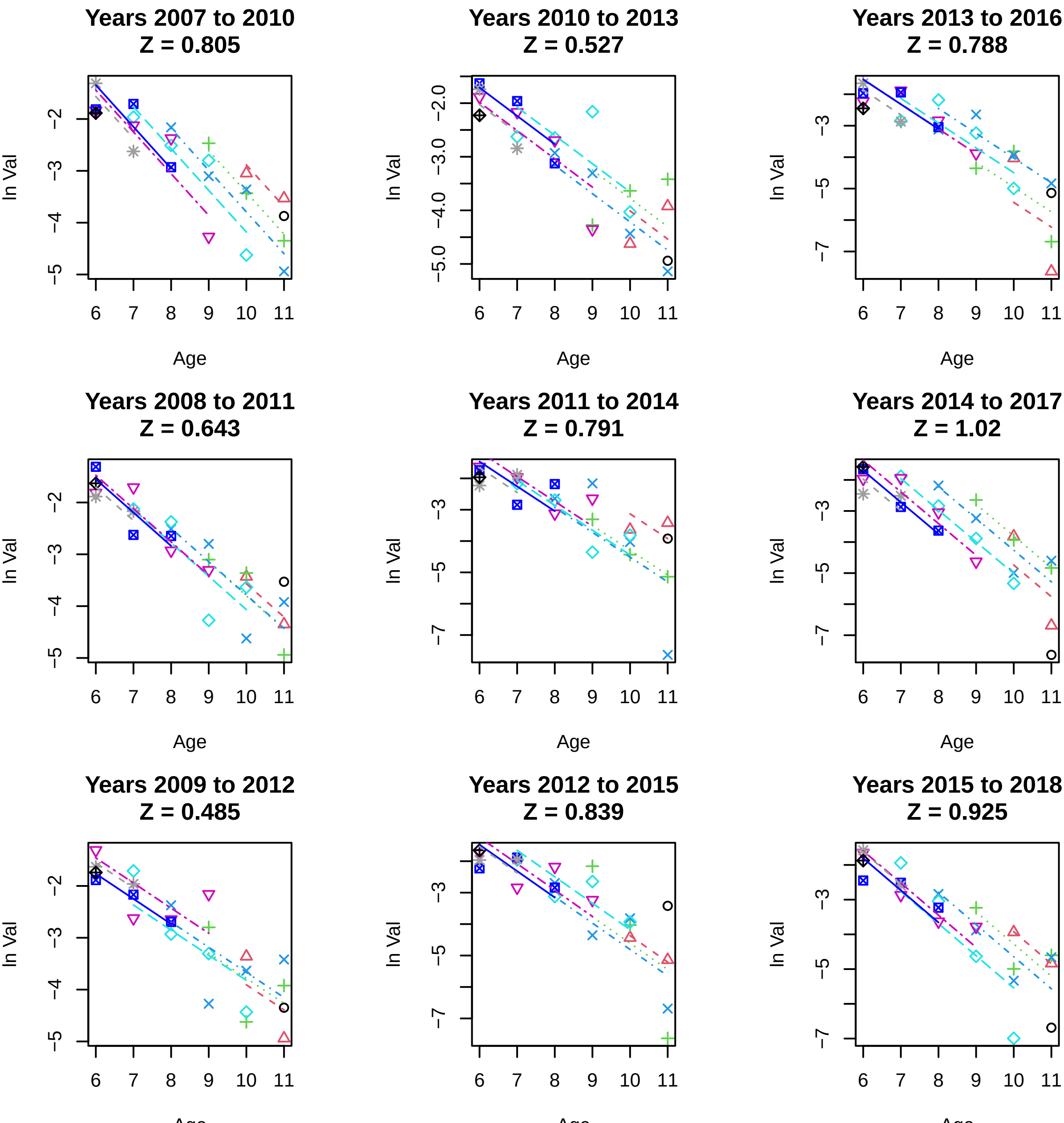


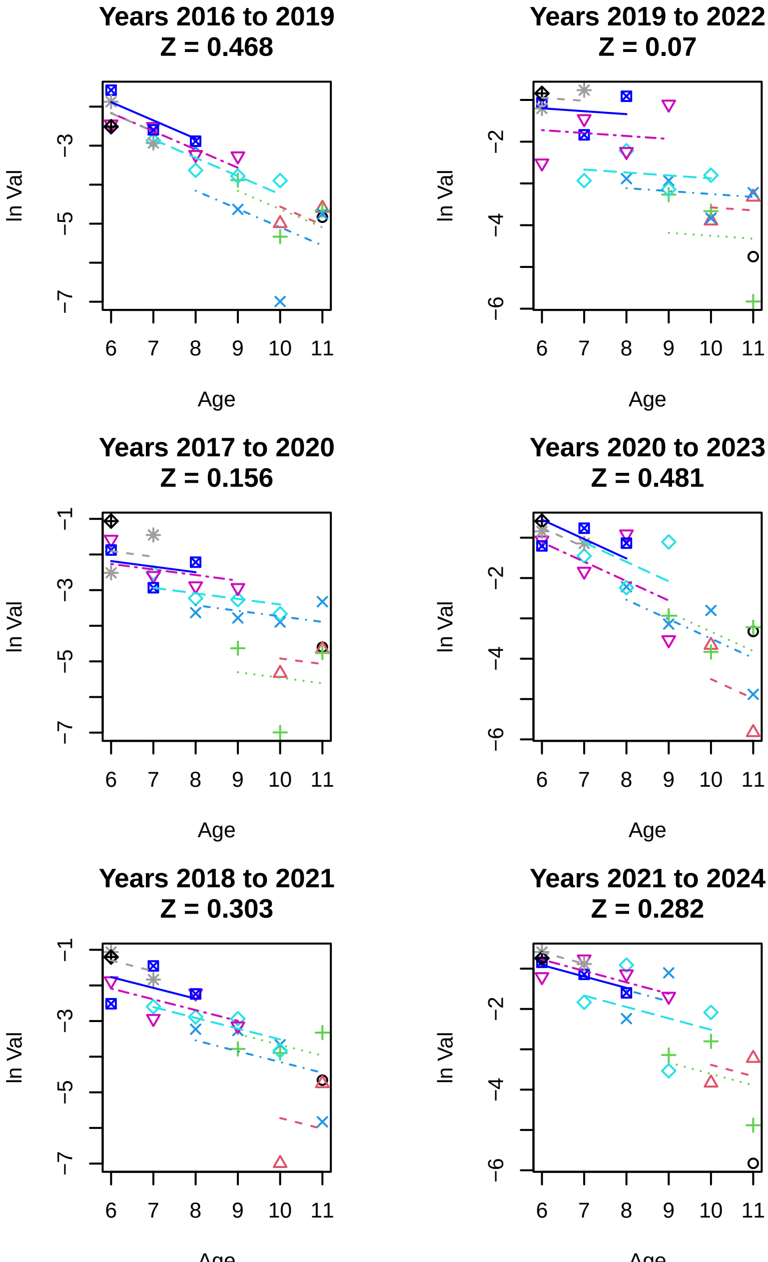


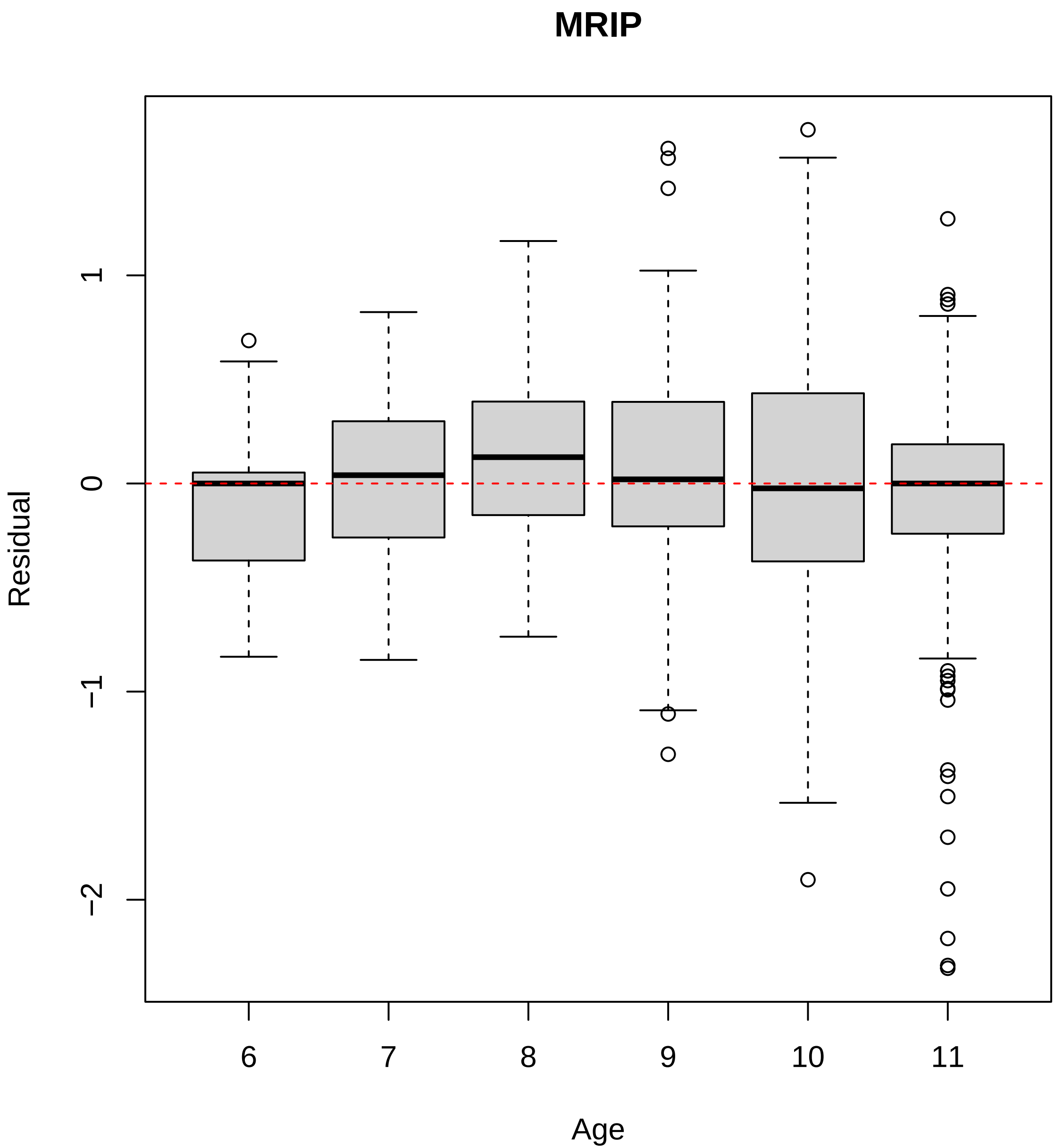
MRIP
Sinclair Z
0.0
0.5
1.0
1.5
1990
1995
2000
2005
2010
2015
2020
Year

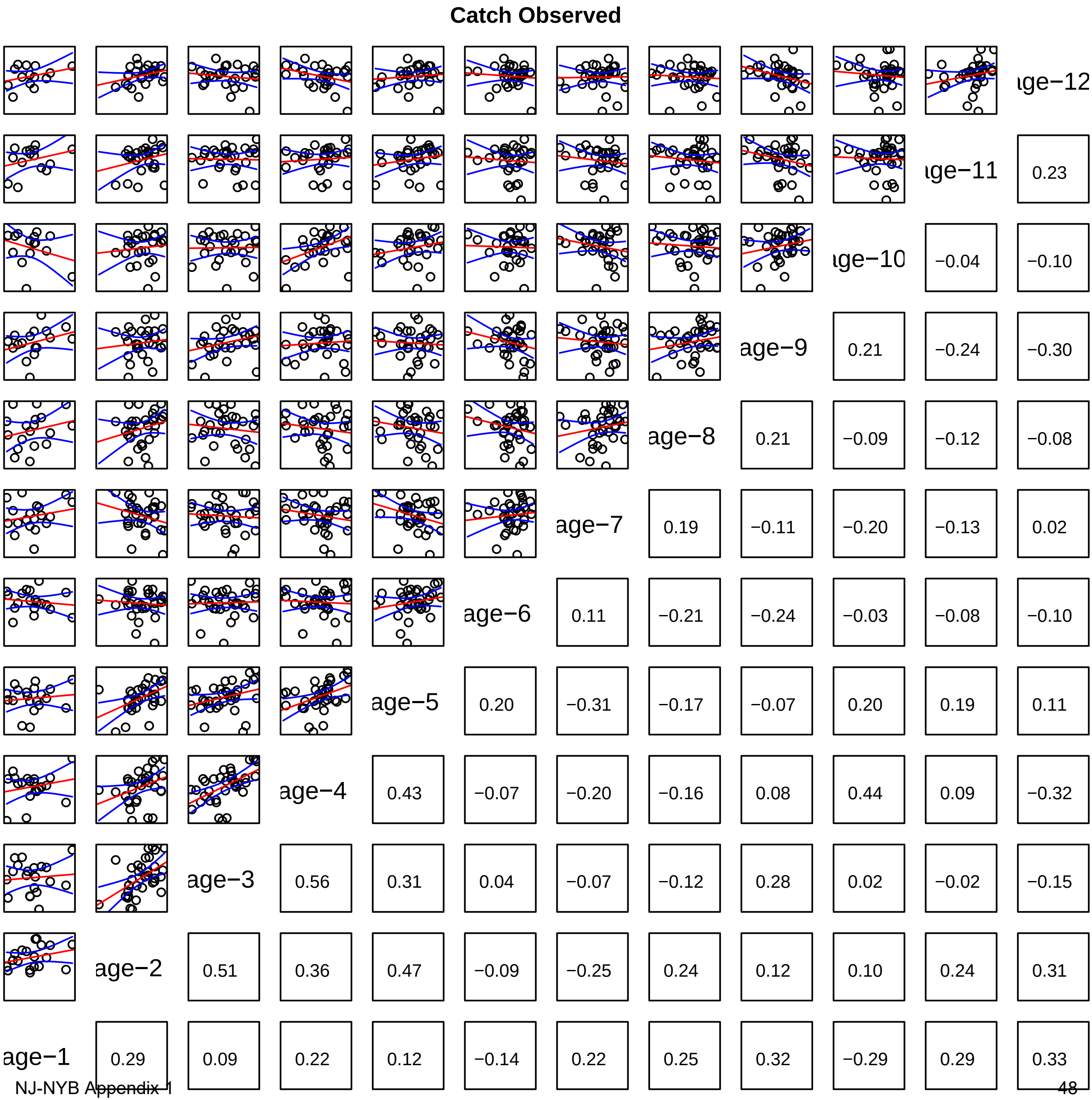

Years 1989 to 1992
Z = 0.418
Years 1992 to 1995
Z = 0.847
Years 1995 to 1998
Z = 0.935
Years 1990 to 1993
Z = 0.681
Years 1993 to 1996
Z = 0.661
Years 1996 to 1999
Z = 0.414
Years 1991 to 1994
Z = 1.229
Years 1994 to 1997
Z = 0.468
Years 1997 to 2000
Z = 0.384
ln Val
Age


Years 1998 to 2001
Z = 0.213
Years 2001 to 2004
Z = 0.987
Years 2004 to 2007
Z = 0.043
Years 1999 to 2002
Z = 0.437
Years 2002 to 2005
Z = 1.064
Years 2005 to 2008
Z = 0.097
Years 2000 to 2003
Z = 0.616
Years 2003 to 2006
Z = 0.349
Years 2006 to 2009
Z = 0.558
ln Val
Age

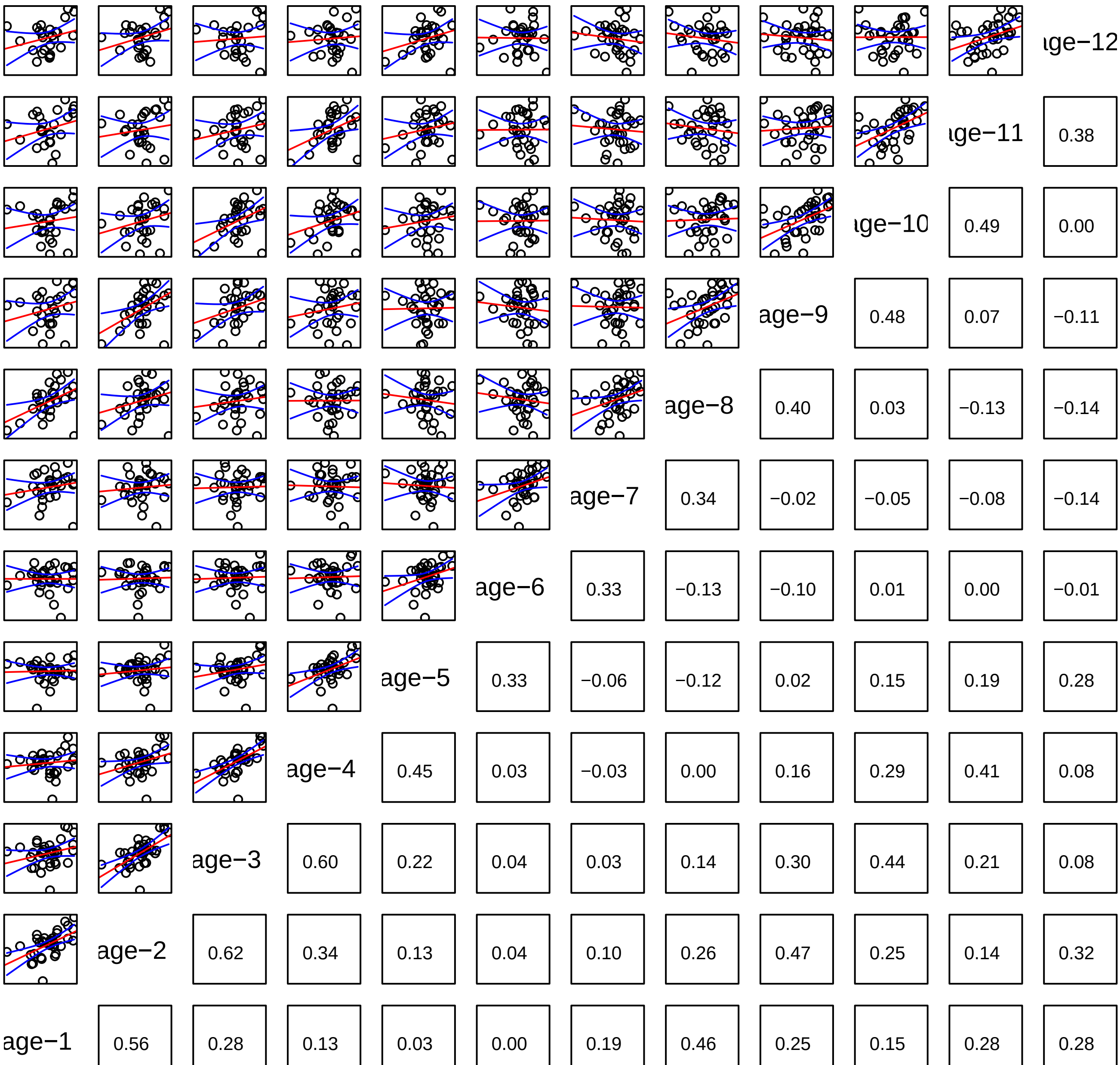

Years 2007 to 2010
Z = 0.805
Years 2010 to 2013
Z = 0.527
Years 2013 to 2016
Z = 0.788
Years 2008 to 2011
Z = 0.643
Years 2011 to 2014
Z = 0.791
Years 2014 to 2017
Z = 1.02
Years 2009 to 2012
Z = 0.485
Years 2012 to 2015
Z = 0.839
Years 2015 to 2018
Z = 0.925
ln Val
Age
6
7
8
9
10
11


Years 2016 to 2019
Z = 0.468
Years 2019 to 2022
Z = 0.07
Years 2017 to 2020
Z = 0.156
Years 2020 to 2023
Z = 0.481
Years 2018 to 2021
Z = 0.303
Years 2021 to 2024
Z = 0.282
ln Val
Age

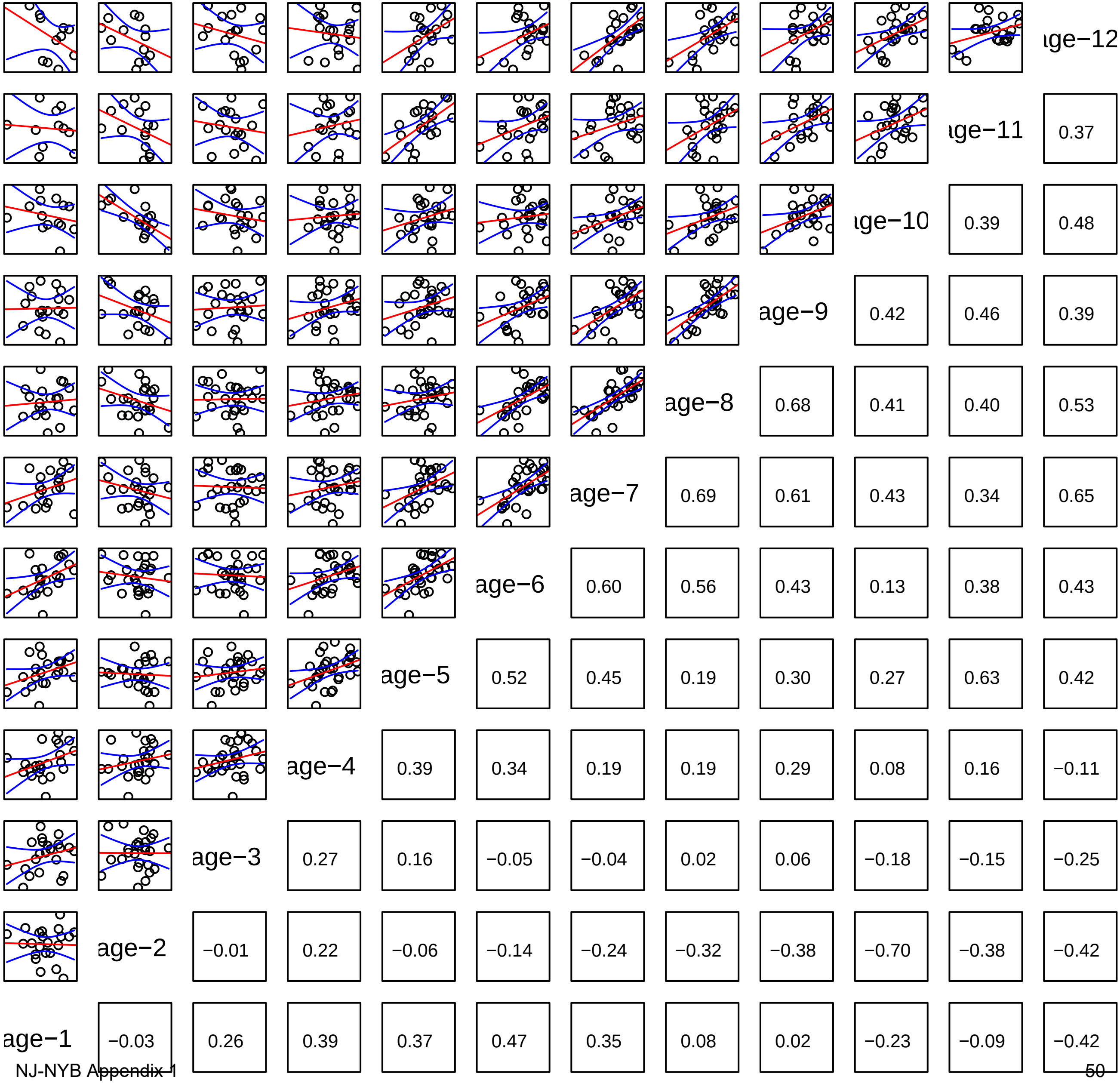

MRIP
Residual
1
0
−1
−2
6
7
8
9
10
11
Age


Catch Observed
ıge−12
ıge−11
0.23
ıge−10
−0.04
−0.10
age−9
0.21
−0.24
−0.30
age−8
0.21
−0.09
−0.12
−0.08
age−7
0.19
−0.11
−0.20
−0.13
0.02
age−6
0.11
−0.21
−0.24
−0.03
−0.08
−0.10
age−5
0.20
−0.31
−0.17
−0.07
0.20
0.19
0.11
age−4
0.43
−0.07
−0.20
−0.16
0.08
0.44
0.09
−0.32
age−3
0.56
0.31
0.04
−0.07
−0.12
0.28
0.02
−0.02
−0.15
age−2
0.51
0.36
0.47
−0.09
−0.25
0.24
0.12
0.10
0.24
0.31
age−1
0.29
0.09
0.22
0.12
−0.14
0.22
0.25
0.32
−0.29
0.29
0.33

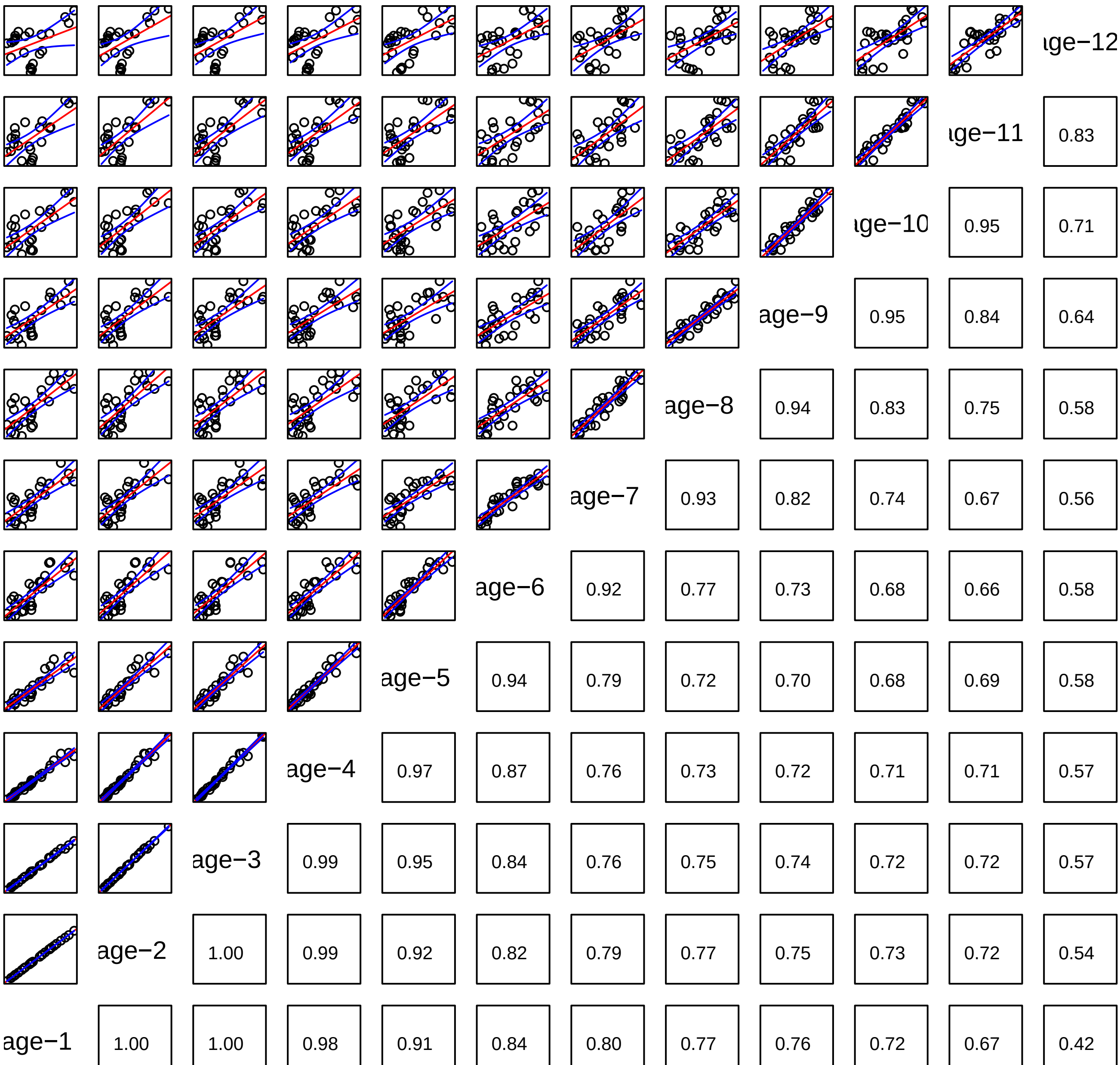
Catch Predicted



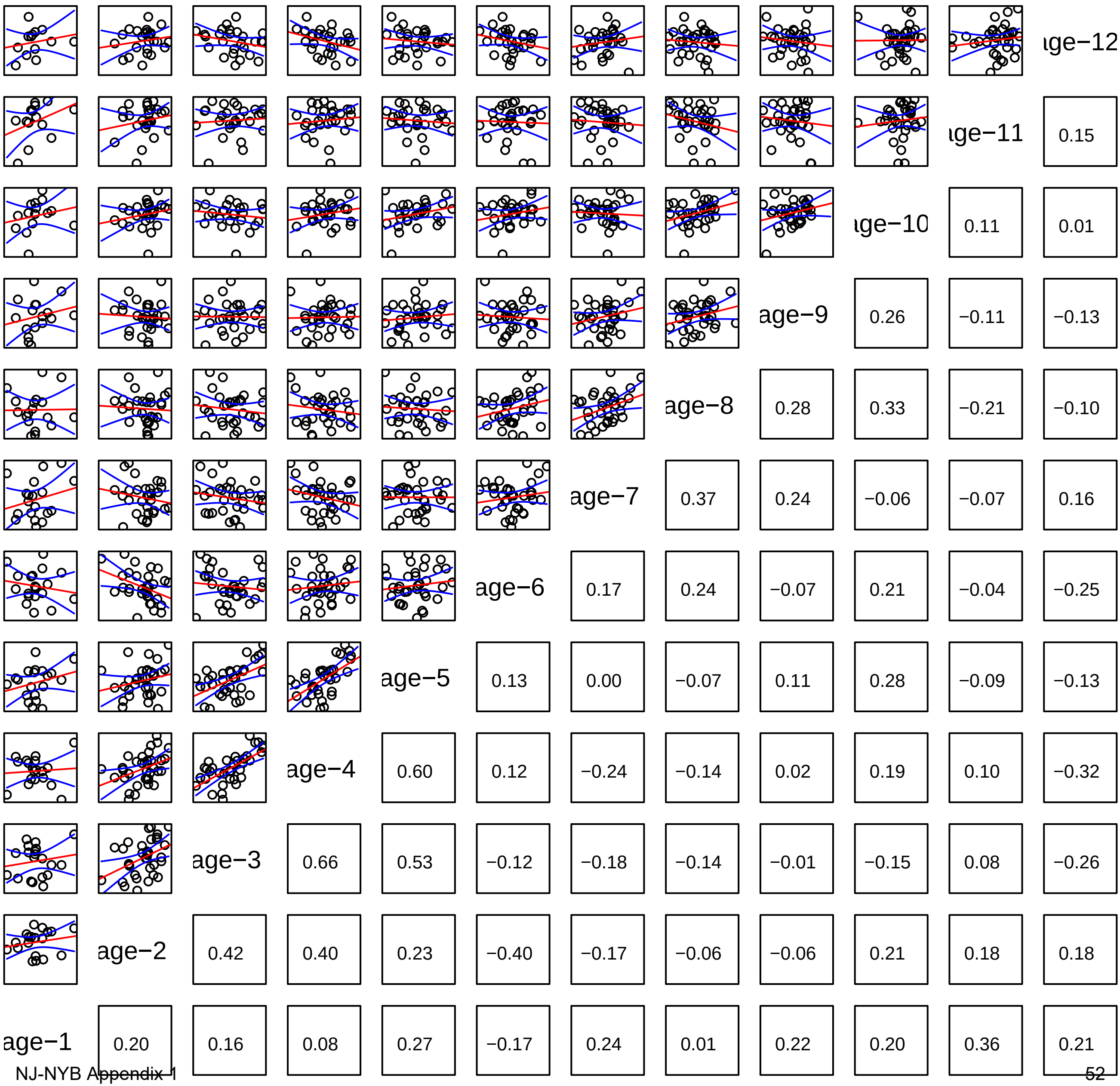
Index 2 (NJ trawl) Observed



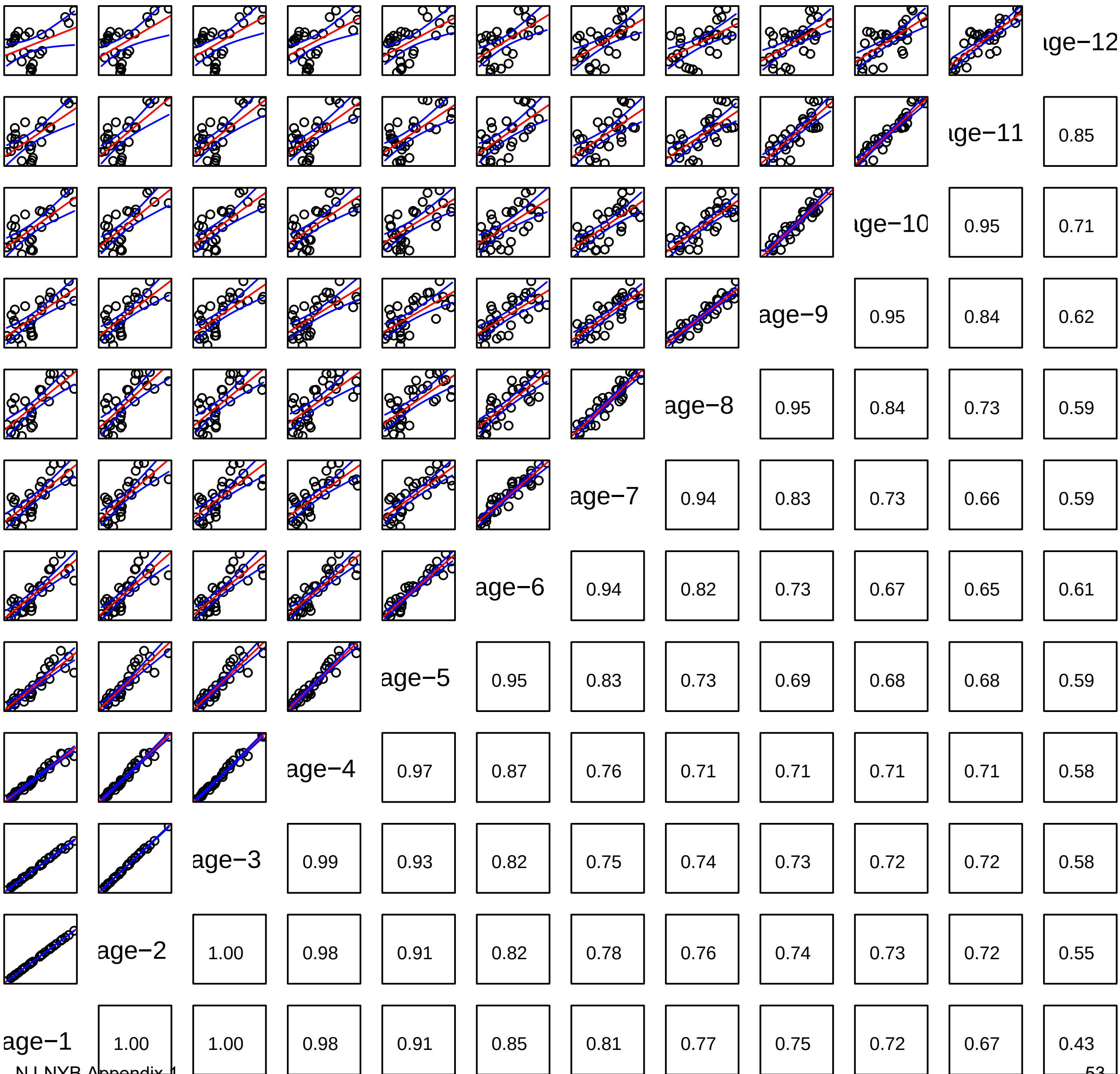
Index 2 (NJ trawl) Predicted

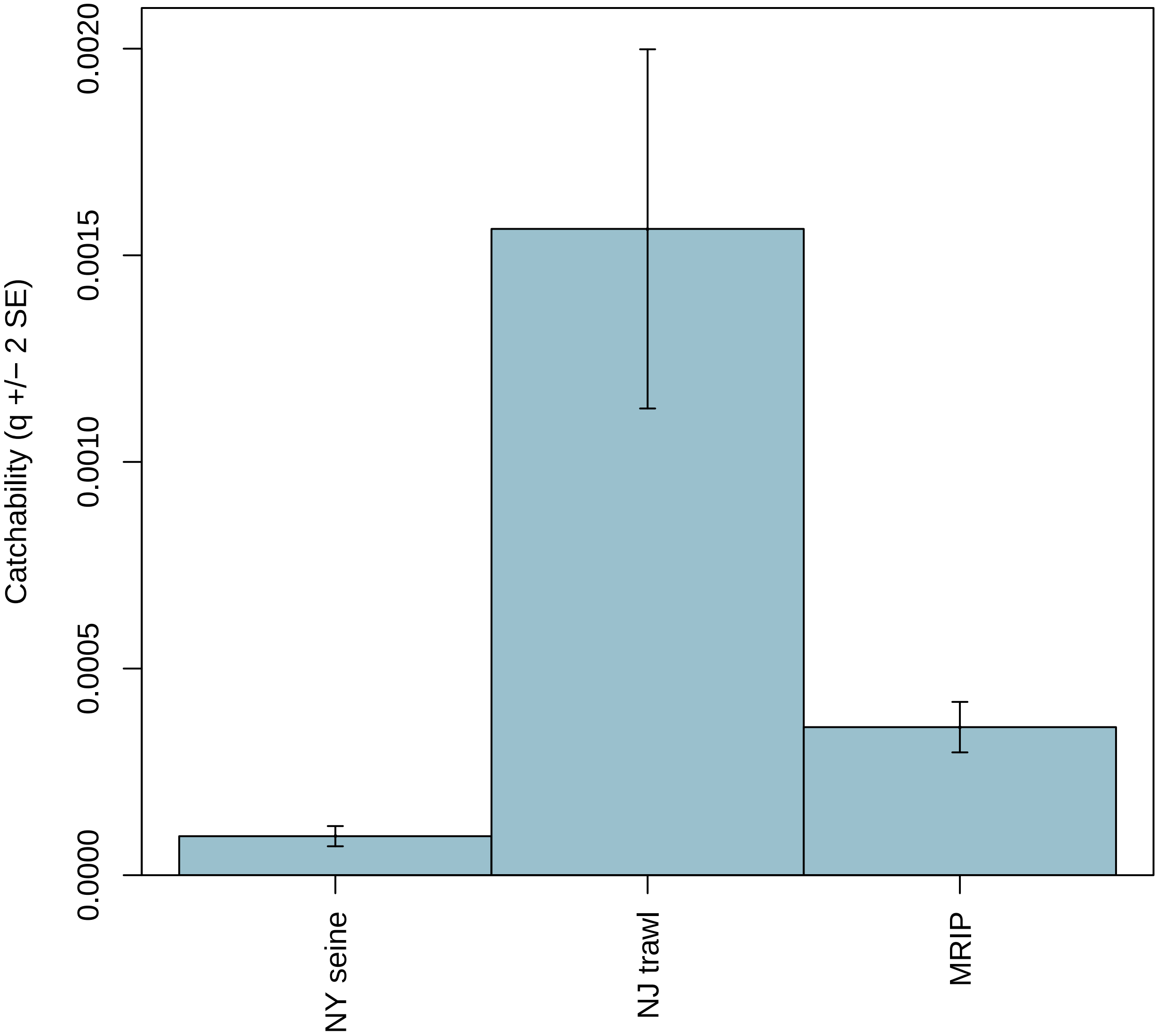


Index 3 (MRIP) Observed

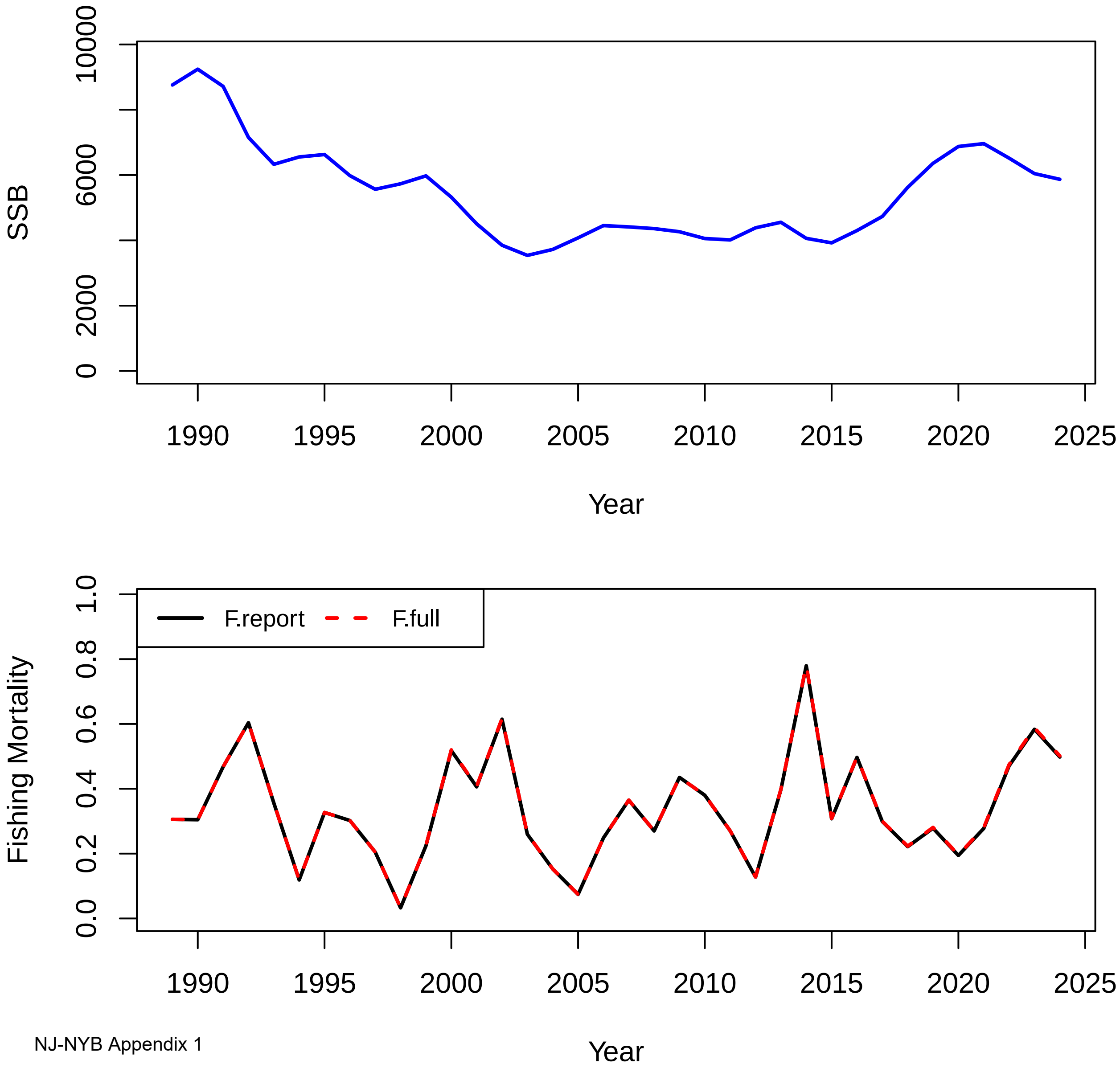


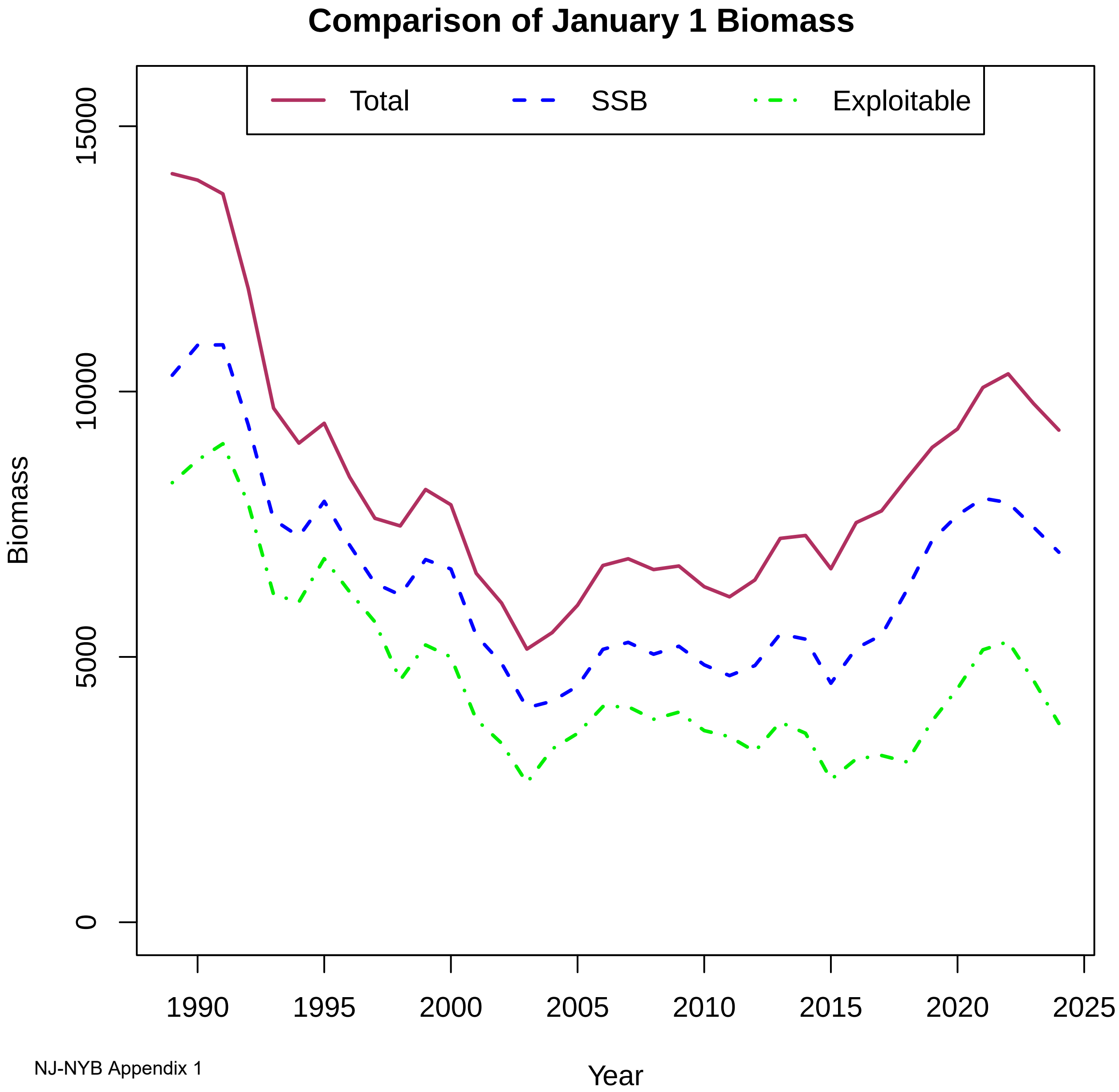
Index 3 (MRIP) Predicted

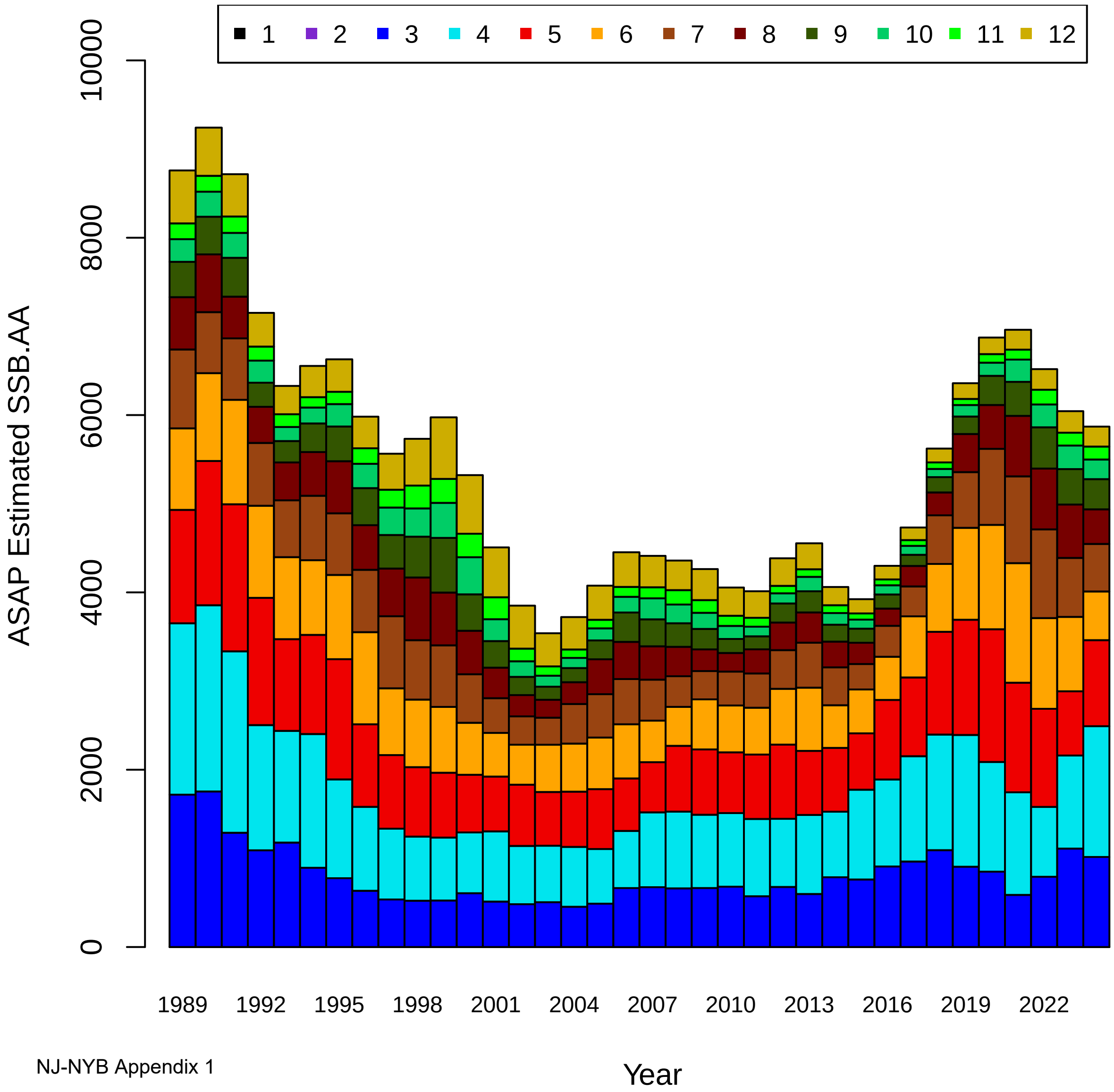




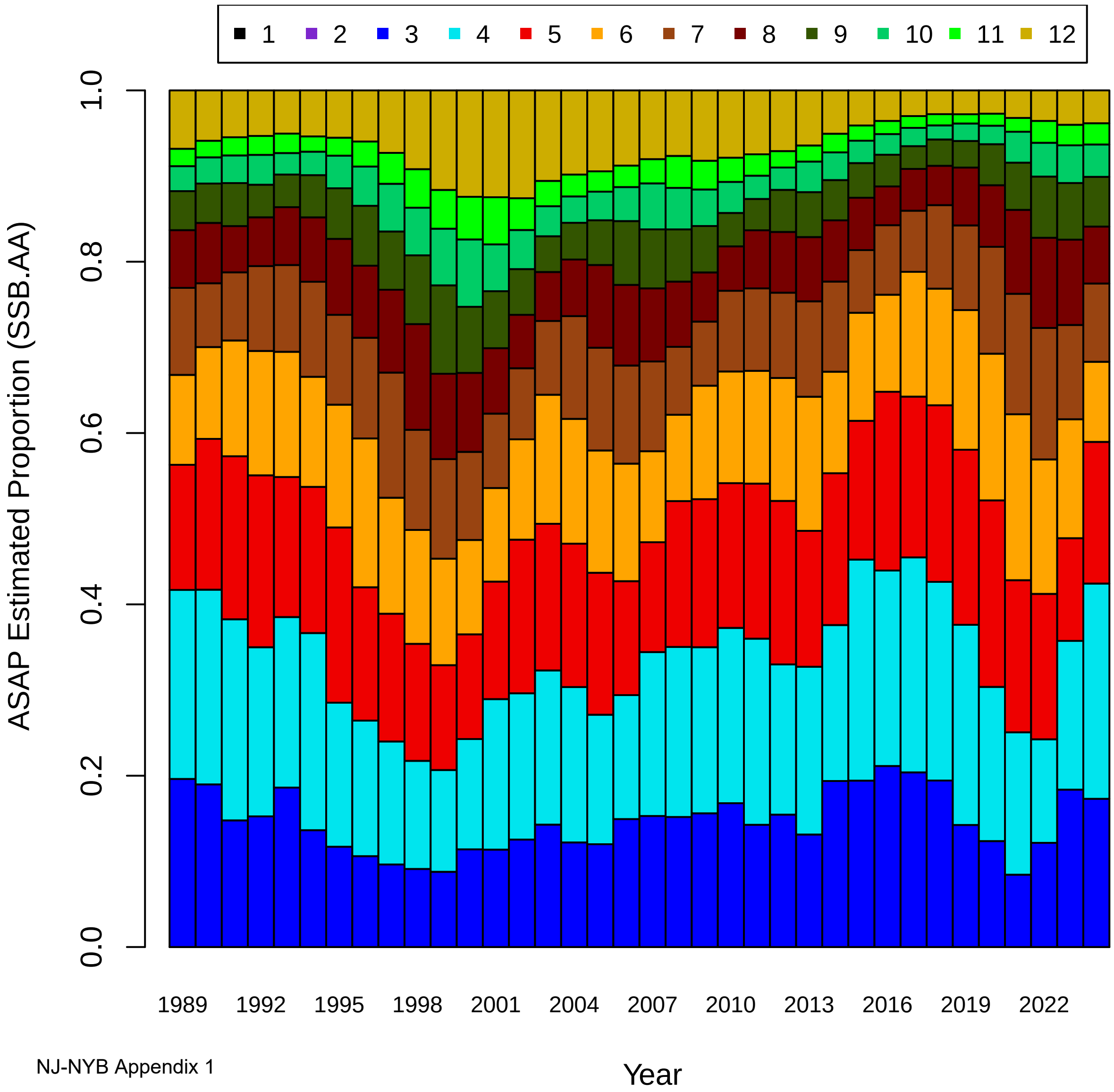
Catchability (q +/− 2 SE)
0.0000
0.0005
0.0010
0.0015
0.0020
NY seine
NJ trawl
MRIP


SSB
10000
6000
2000
0
1990
1995
2000
2005
2010
2015
2020
2025
Year
Fishing Mortality
1.0
0.8
0.6
0.4
0.2
0.0
F.report
F.full
1990
1995
2000
2005
2010
2015
2020
2025
Year

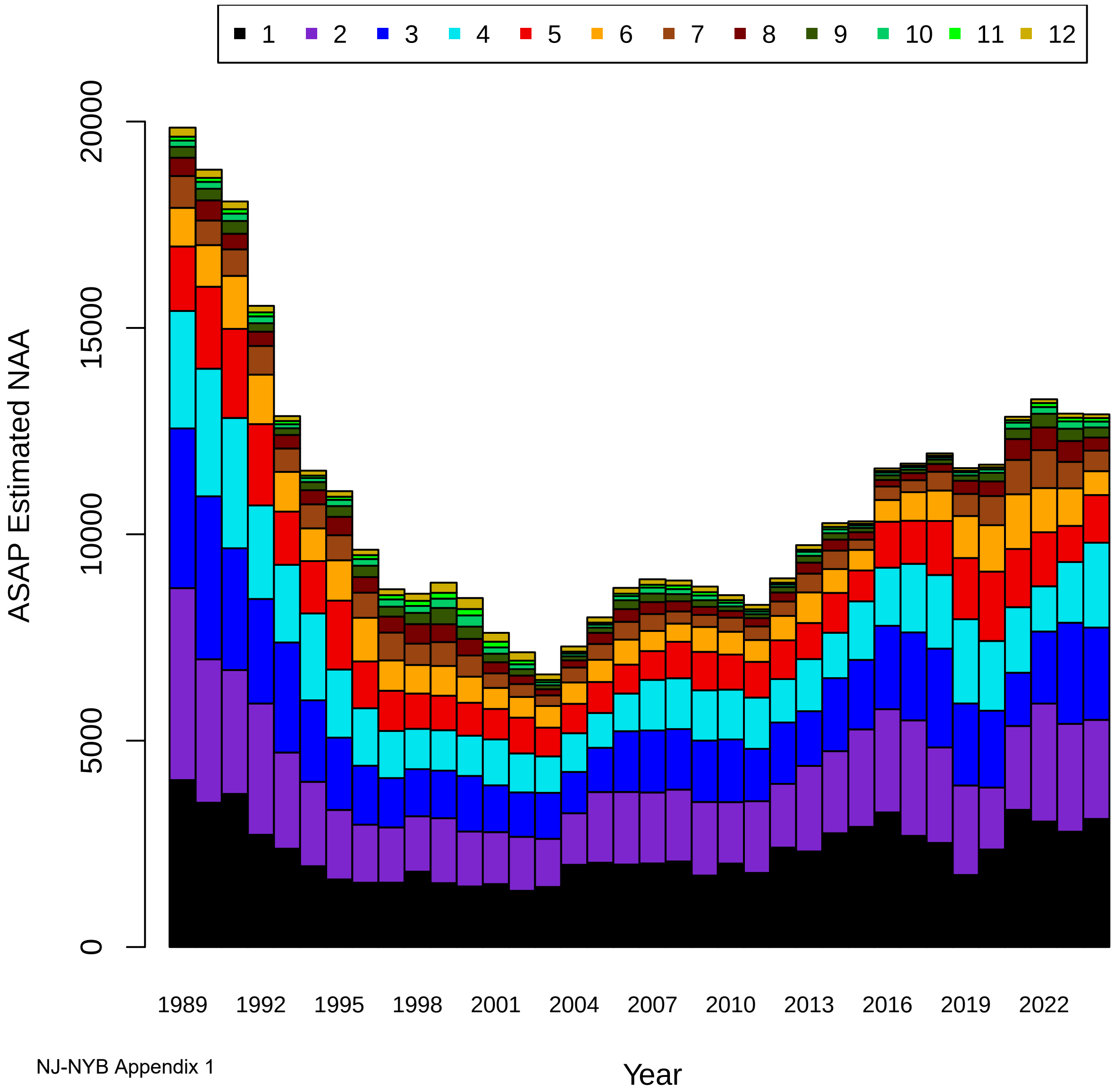

Comparison of January 1 Biomass
Total
SSB
Exploitable
Biomass
0
5000
10000
15000
1990
1995
2000
2005
2010
2015
2020
2025
Year



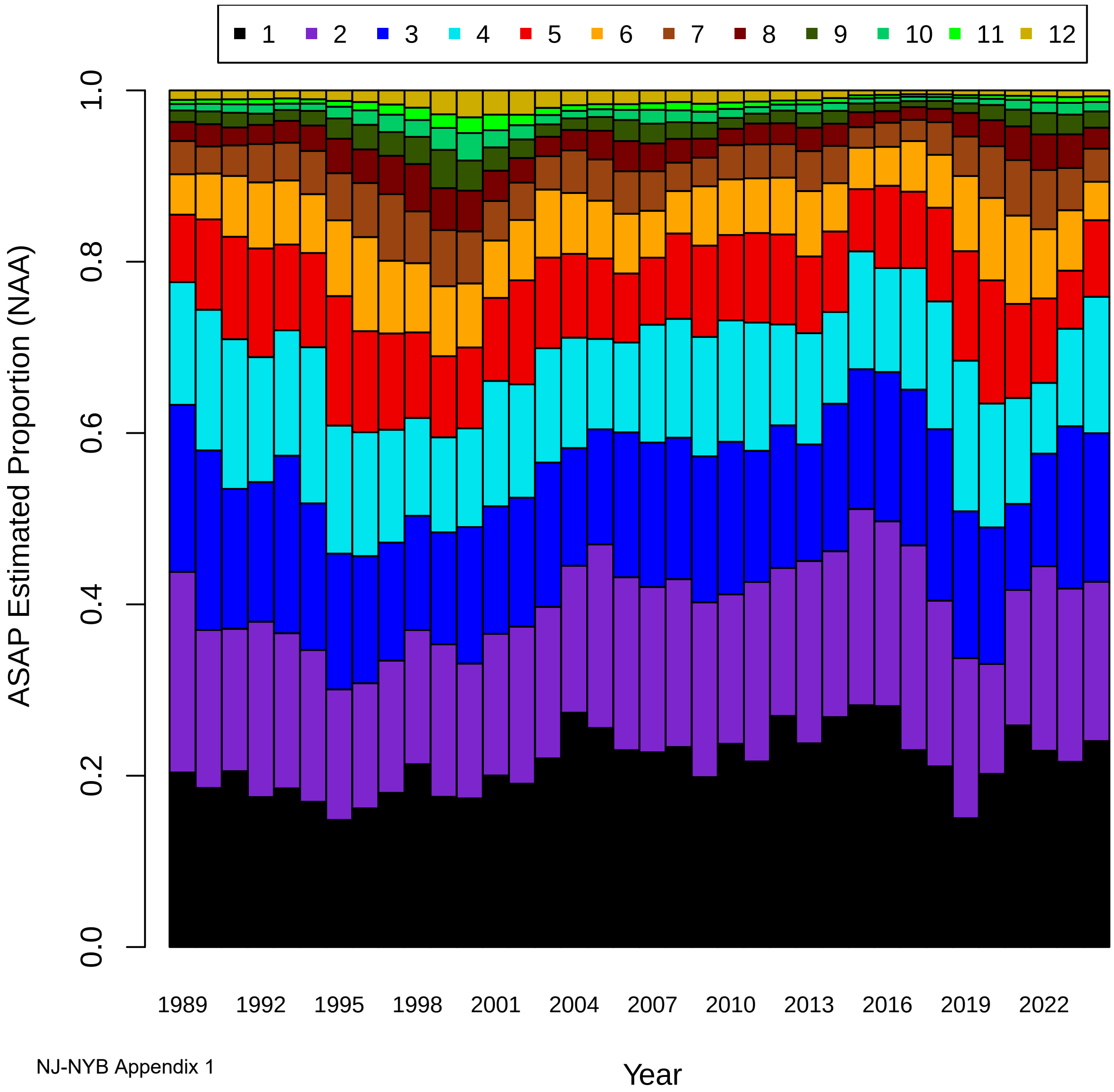
1
2
3
4
5
6
7
8
9
10
11
12
ASAP Estimated SSB.AA
0
2000
4000
6000
8000
10000
1989
1992
1995
1998
2001
2004
2007
2010
2013
2016
2019
2022
Year



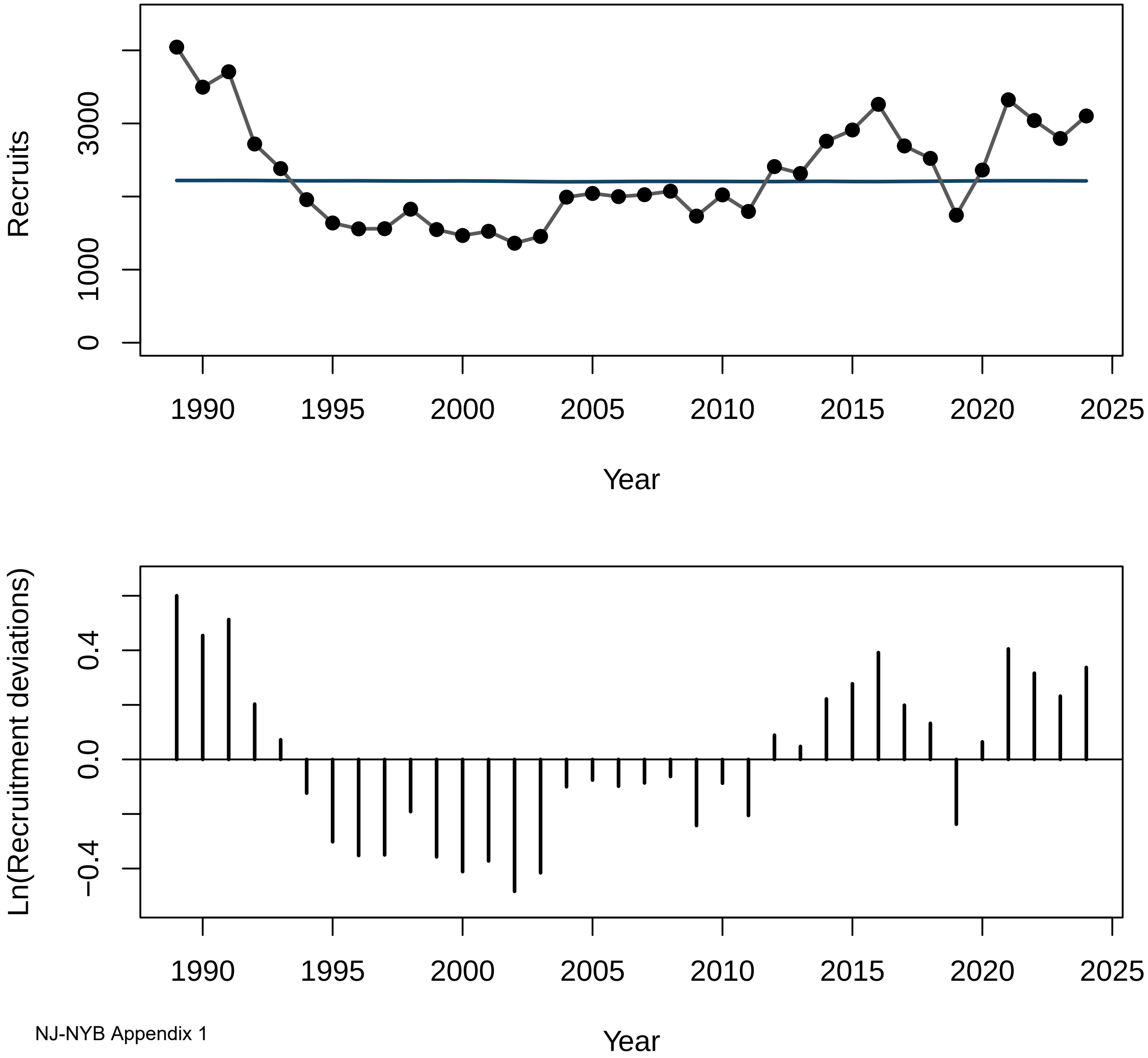
1 2 3 4 5 6 7 8 9 10 11 12
ASAP Estimated Proportion (SSB.AA)
0.0
0.2
0.4
0.6
0.8
1.0
1989
1992
1995
1998
2001
2004
2007
2010
2013
2016
2019
2022
Year

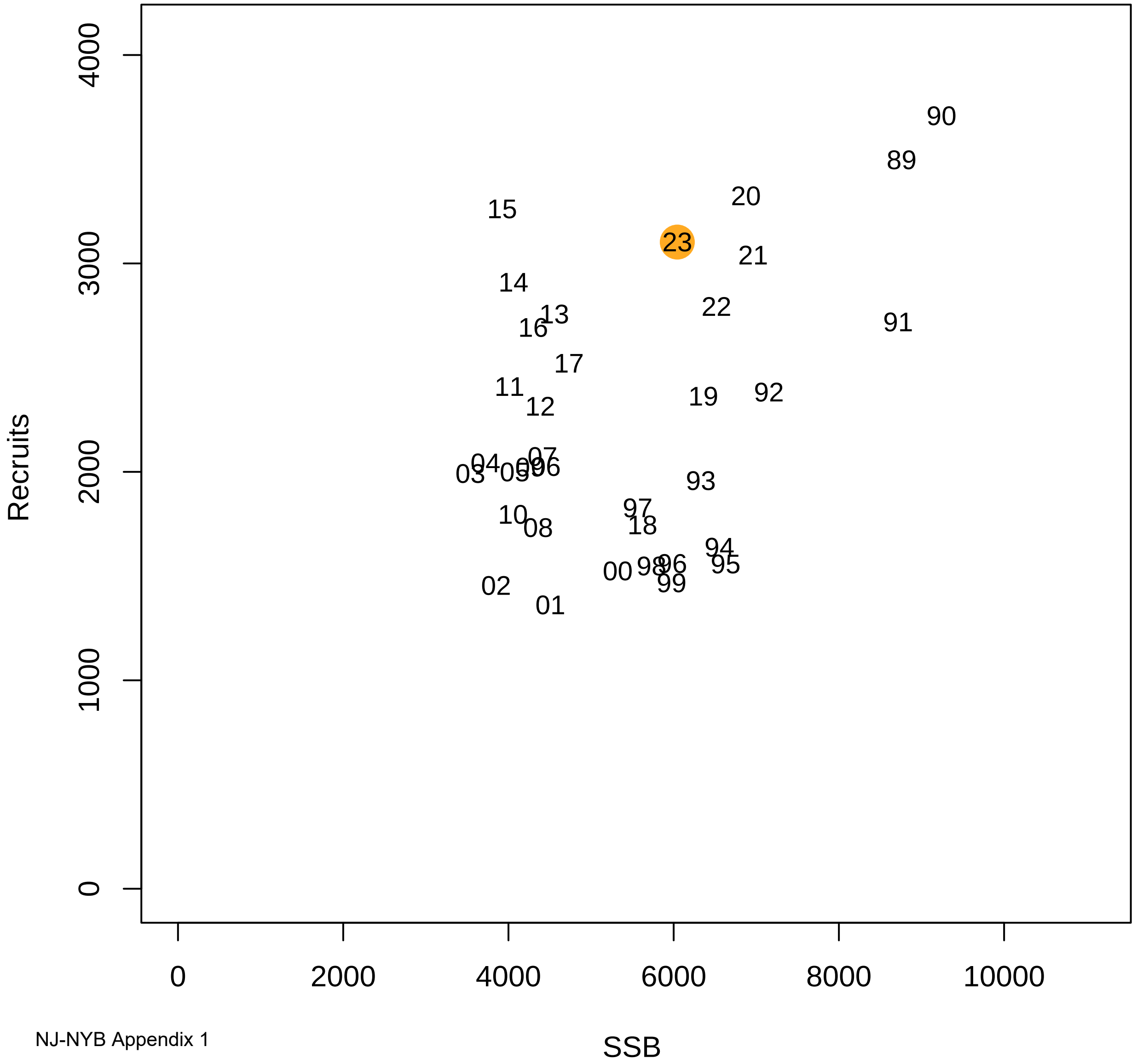


1
2
3
4
5
6
7
8
9
10
11
12
ASAP Estimated NAA
0
5000
10000
15000
20000
1989
1992
1995
1998
2001
2004
2007
2010
2013
2016
2019
2022
Year

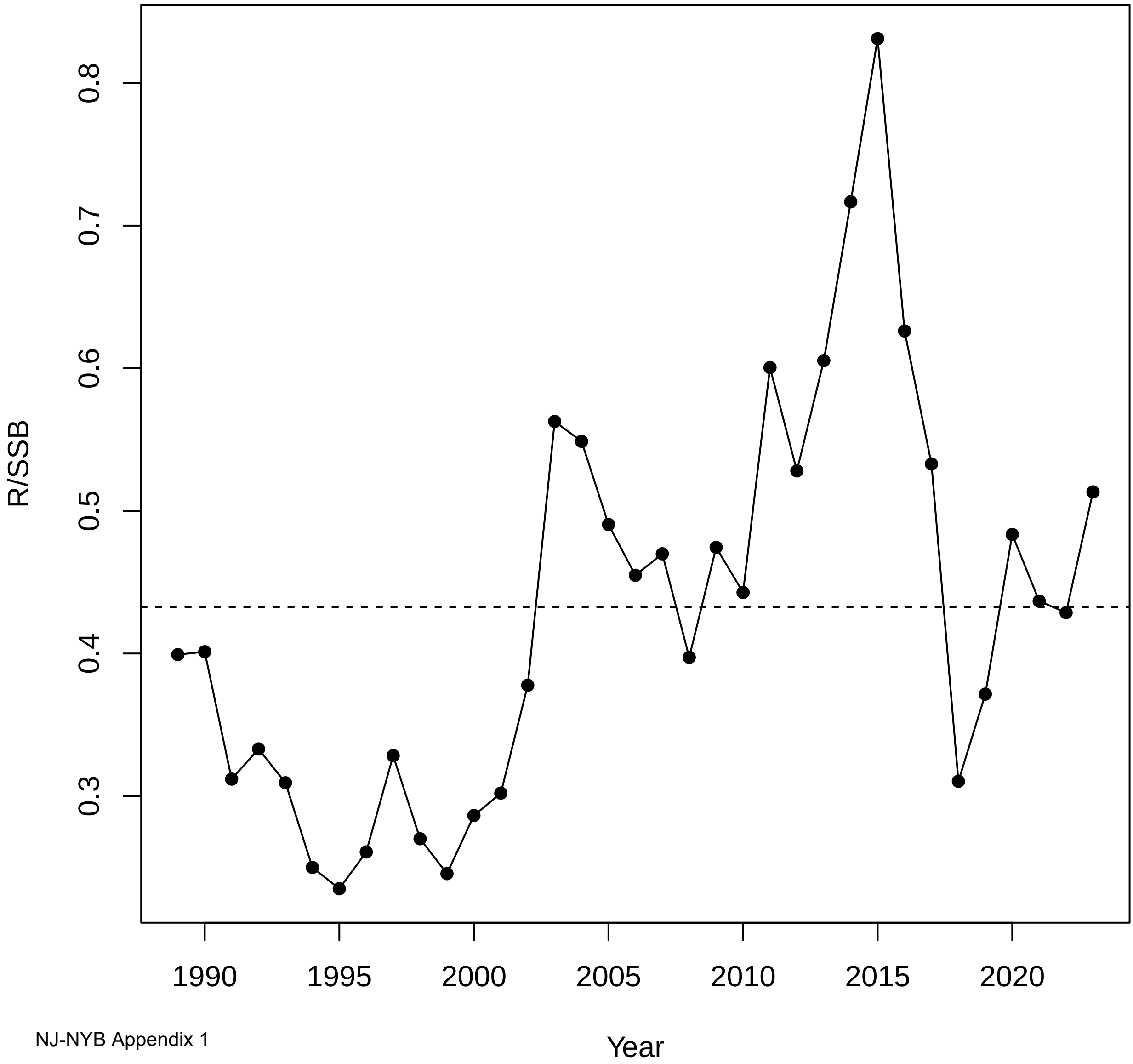


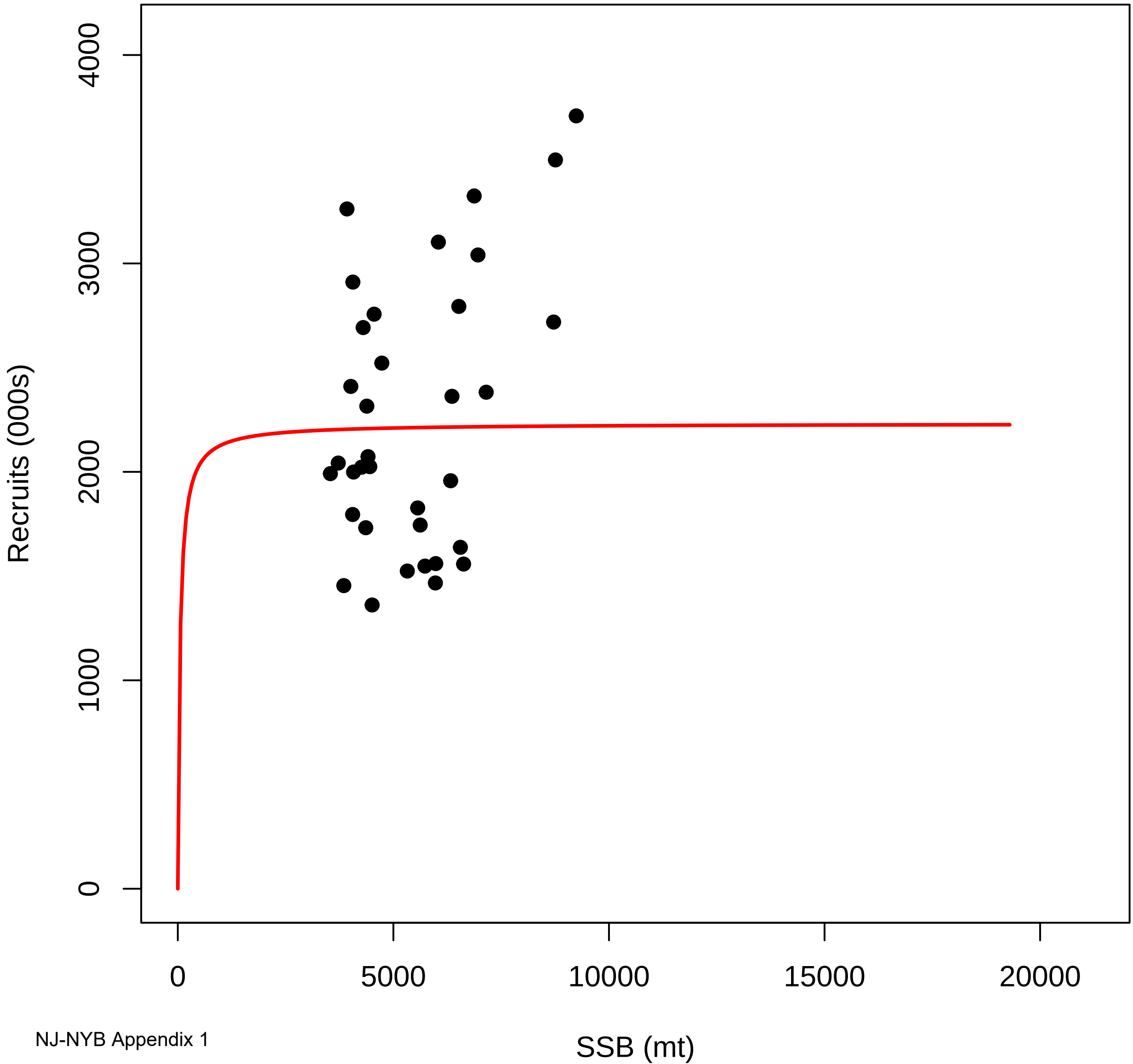
1
2
3
4
5
6
7
8
9
10
11
12
ASAP Estimated Proportion (NAA)
0.0
0.2
0.4
0.6
0.8
1.0
1989
1992
1995
1998
2001
2004
2007
2010
2013
2016
2019
2022
Year

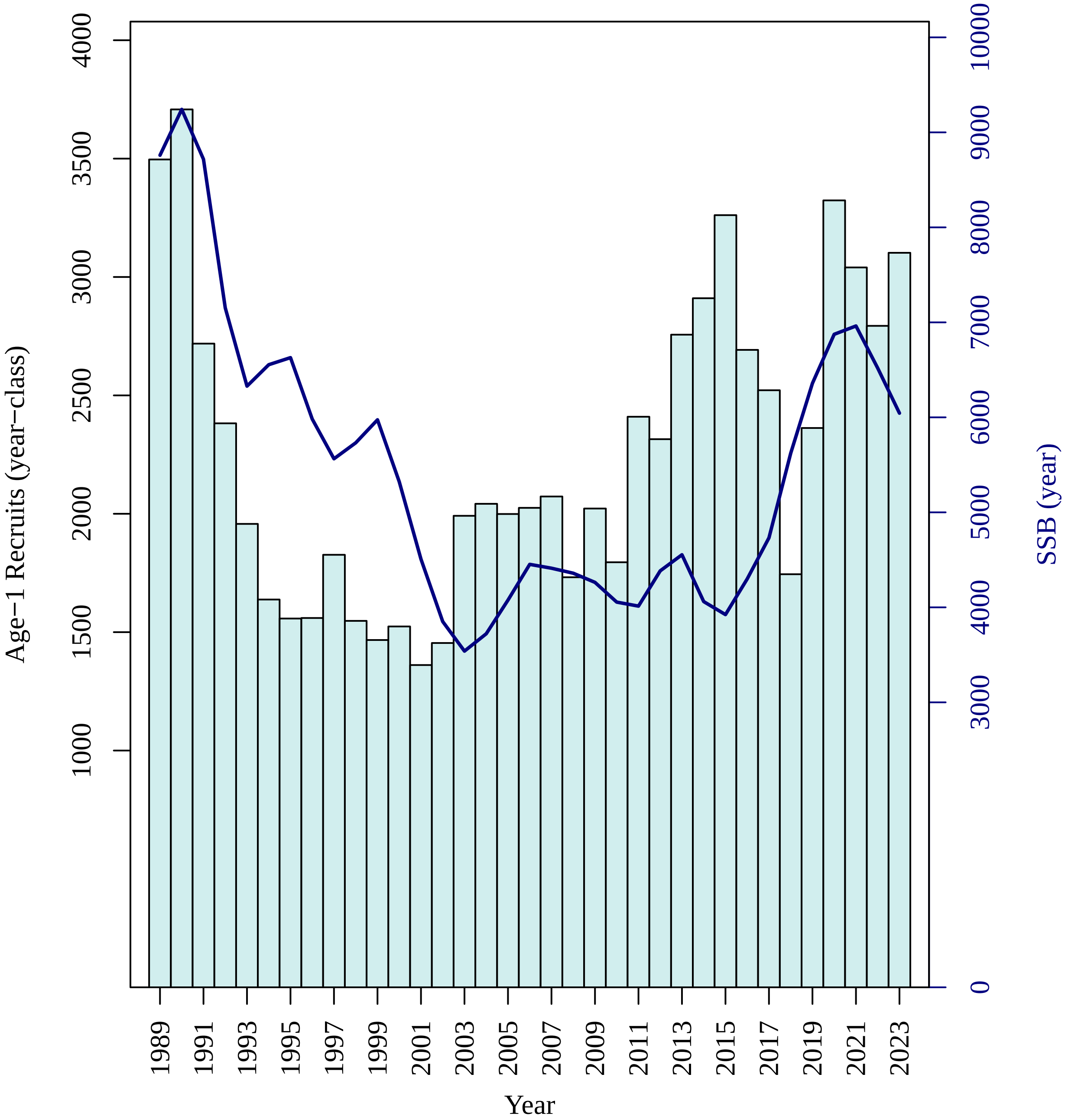

Recruits
0
1000
3000
1990
1995
2000
2005
2010
2015
2020
2025
Year
Ln(Recruitment deviations)
−0.4
0.0
0.4
1990
1995
2000
2005
2010
2015
2020
2025
Year

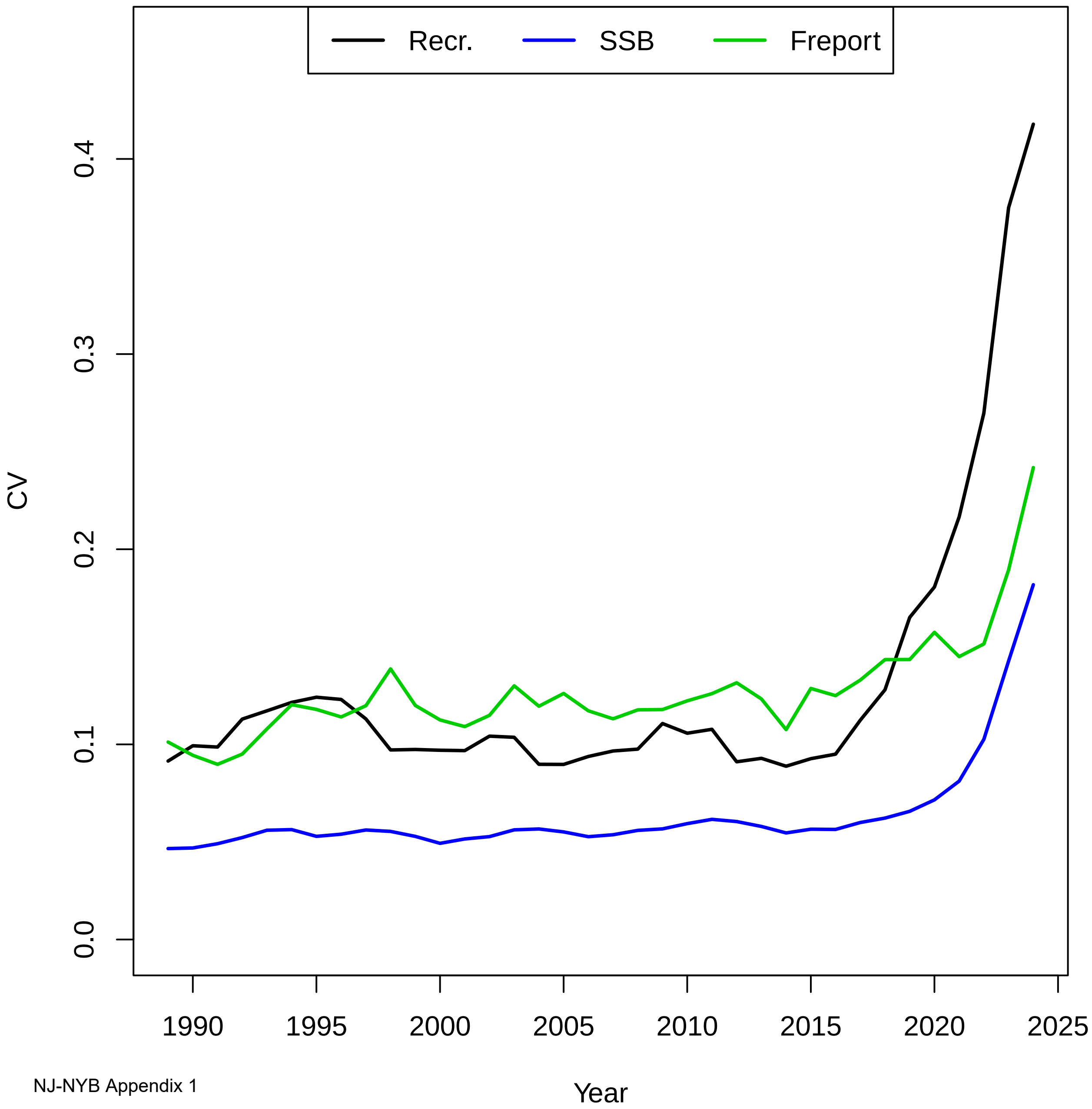


90
89
20
15
23
21
14
22
13
16
91
17
11
19
92
12
07
04
03
05
09
06
93
97
10
18
08
94
96
98
95
00
99
02
01
Recruits
0
1000
2000
3000
4000
0
2000
4000
6000
8000
10000
SSB

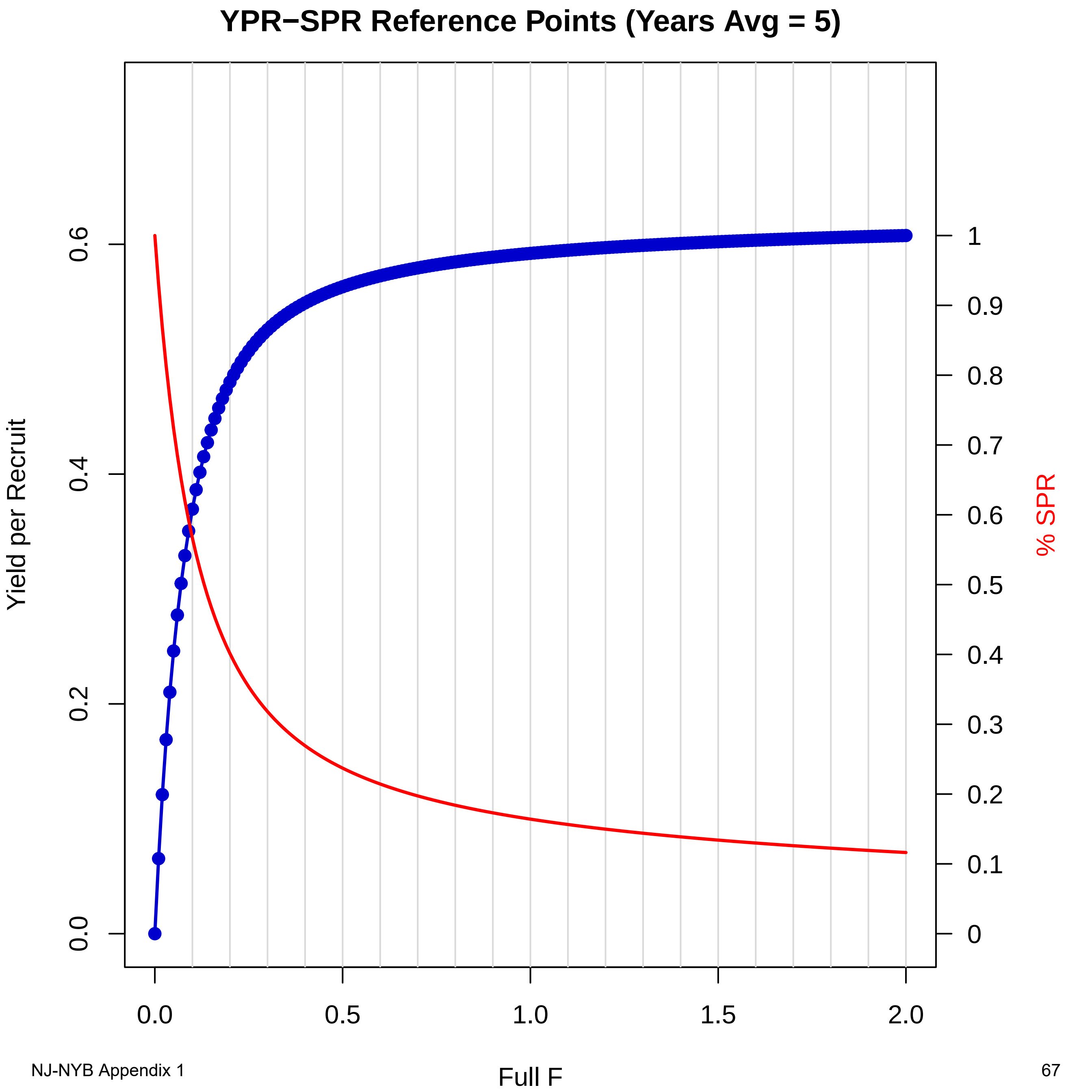

R/SSB
0.3
0.4
0.5
0.6
0.7
0.8
1990
1995
2000
2005
2010
2015
2020
Year


Recruits (000s)
0
1000
2000
3000
4000
0
5000
10000
15000
20000
SSB (mt)


Age−1 Recruits (year−class)
SSB (year)
Year
1000
1500
2000
2500
3000
3500
4000
0
3000
4000
5000
6000
7000
8000
9000
10000
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
2023

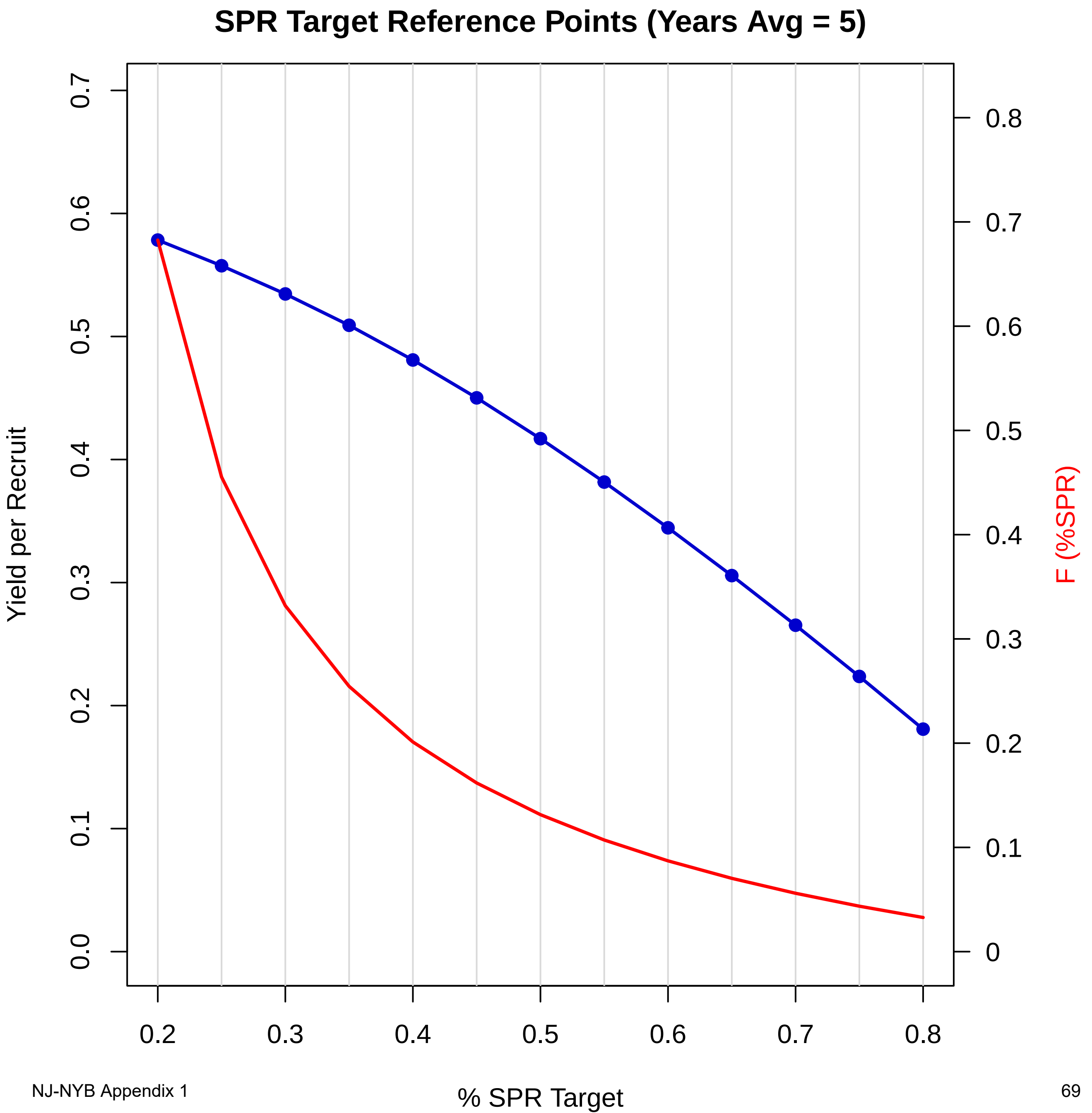


Recr.
SSB
Freport
CV
0.0
0.1
0.2
0.3
0.4
1990
1995
2000
2005
2010
2015
2020
2025
Year


YPR−SPR Reference Points (Years Avg = 5)
Yield per Recruit
0.0
0.2
0.4
0.6
% SPR
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0.0
0.5
1.0
1.5
2.0
Full F

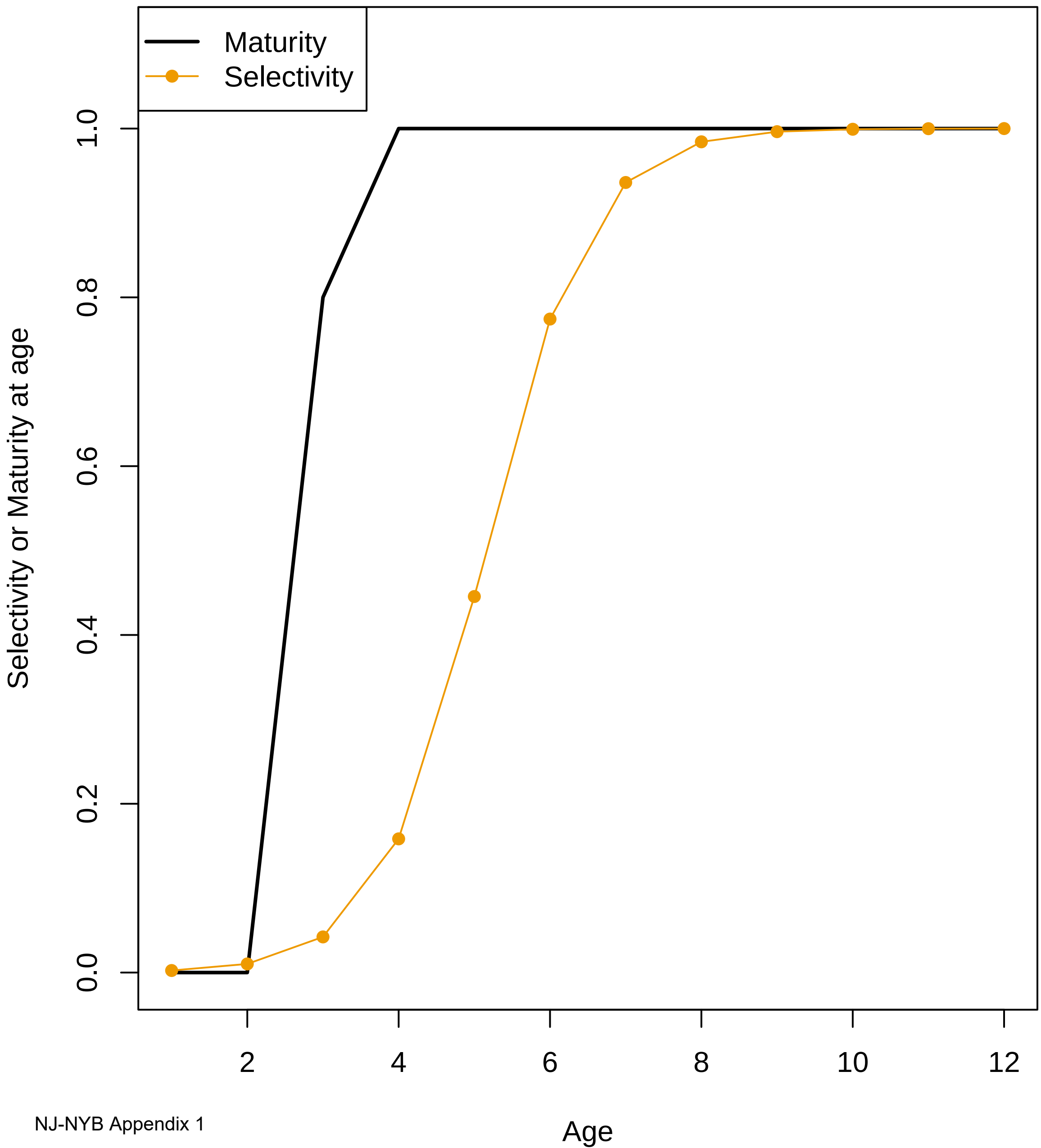
YPR−SPR Reference Points (Years Avg = 5)

F	YPR	SPR	F	YPR	SPR	F	YPR	SPR
0	0	1	0.35	0.5389	0.2909	0.7	0.5794	0.1973
0.01	0.0653	0.9295	0.36	0.5412	0.2861	0.71	0.58	0.1959
0.02	0.121	0.8679	0.37	0.5433	0.2816	0.72	0.5806	0.1944
0.03	0.1689	0.8138	0.38	0.5453	0.2773	0.73	0.5811	0.193
0.04	0.2102	0.7659	0.39	0.5472	0.2732	0.74	0.5817	0.1916
0.05	0.246	0.7233	0.4	0.549	0.2692	0.75	0.5822	0.1903
0.06	0.2774	0.6853	0.41	0.5507	0.2654	0.76	0.5827	0.189
0.07	0.3048	0.651	0.42	0.5523	0.2618	0.77	0.5832	0.1877
0.08	0.329	0.6201	0.43	0.5539	0.2583	0.78	0.5837	0.1864
0.09	0.3504	0.5921	0.44	0.5553	0.2549	0.79	0.5842	0.1852
0.1	0.3695	0.5667	0.45	0.5568	0.2517	0.8	0.5847	0.184
0.11	0.3864	0.5434	0.46	0.5581	0.2485	0.81	0.5851	0.1828
0.12	0.4016	0.5222	0.47	0.5594	0.2455	0.82	0.5856	0.1816
0.13	0.4151	0.5026	0.48	0.5607	0.2426	0.83	0.586	0.1805
0.14	0.4274	0.4846	0.49	0.5619	0.2398	0.84	0.5864	0.1794
0.15	0.4384	0.468	0.5	0.563	0.2371	0.85	0.5868	0.1783
0.16	0.4484	0.4527	0.51	0.5642	0.2345	0.86	0.5872	0.1772
0.17	0.4575	0.4384	0.52	0.5652	0.232	0.87	0.5876	0.1761
0.18	0.4657	0.4252	0.53	0.5663	0.2295	0.88	0.588	0.1751
0.19	0.4733	0.4128	0.54	0.5672	0.2272	0.89	0.5884	0.1741
0.2	0.4802	0.4013	0.55	0.5682	0.2249	0.9	0.5888	0.1731
0.21	0.4865	0.3905	0.56	0.5691	0.2227	0.91	0.5891	0.1721
0.22	0.4923	0.3804	0.57	0.57	0.2205	0.92	0.5895	0.1712
0.23	0.4976	0.3709	0.58	0.5709	0.2184	0.93	0.5898	0.1702
0.24	0.5026	0.362	0.59	0.5717	0.2164	0.94	0.5902	0.1693
0.25	0.5071	0.3536	0.6	0.5725	0.2144	0.95	0.5905	0.1684
0.26	0.5114	0.3457	0.61	0.5733	0.2125	0.96	0.5908	0.1675
0.27	0.5153	0.3383	0.62	0.5741	0.2106	0.97	0.5912	0.1666
0.28	0.519	0.3312	0.63	0.5748	0.2088	0.98	0.5915	0.1658
0.29	0.5224	0.3245	0.64	0.5755	0.207	0.99	0.5918	0.1649
0.3	0.5256	0.3182	0.65	0.5762	0.2053	1	0.5921	0.1641
0.31	0.5286	0.3121	0.66	0.5769	0.2036	1.01	0.5924	0.1632
0.32	0.5315	0.3064	0.67	0.5776	0.202	1.02	0.5927	0.1624
0.33	0.5341	0.301	0.68	0.5782	0.2004	1.03	0.593	0.1616
0.34	0.5366	0.2958	0.69	0.5788	0.1989	1.04	0.5932	0.1608


SPR Target Reference Points (Years Avg = 5)
Yield per Recruit
F (%SPR)
% SPR Target
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.2
0.3
0.4
0.5
0.6
0.7
0.8

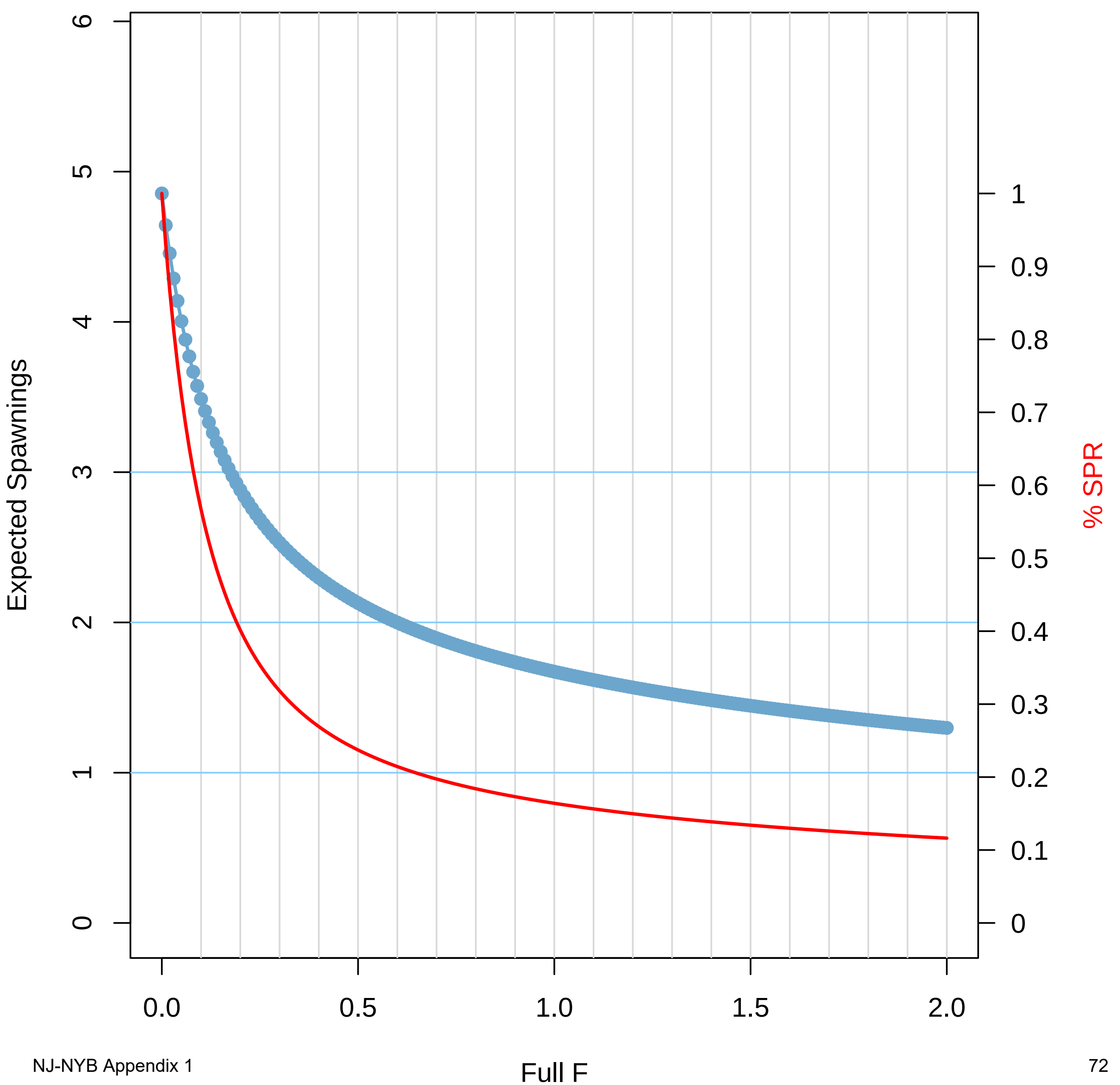
SPR Target Reference Points (Years Avg = 5)

% SPR	F(%SPR)	YPR
0.2	0.6826	0.5784
0.25	0.4553	0.5575
0.3	0.3319	0.5346
0.35	0.2545	0.5091
0.4	0.2012	0.4809
0.45	0.1618	0.4501
0.5	0.1314	0.417
0.55	0.1071	0.3817
0.6	0.0871	0.3445
0.65	0.0703	0.3056
0.7	0.056	0.2653
0.75	0.0436	0.2237
0.8	0.0328	0.1809



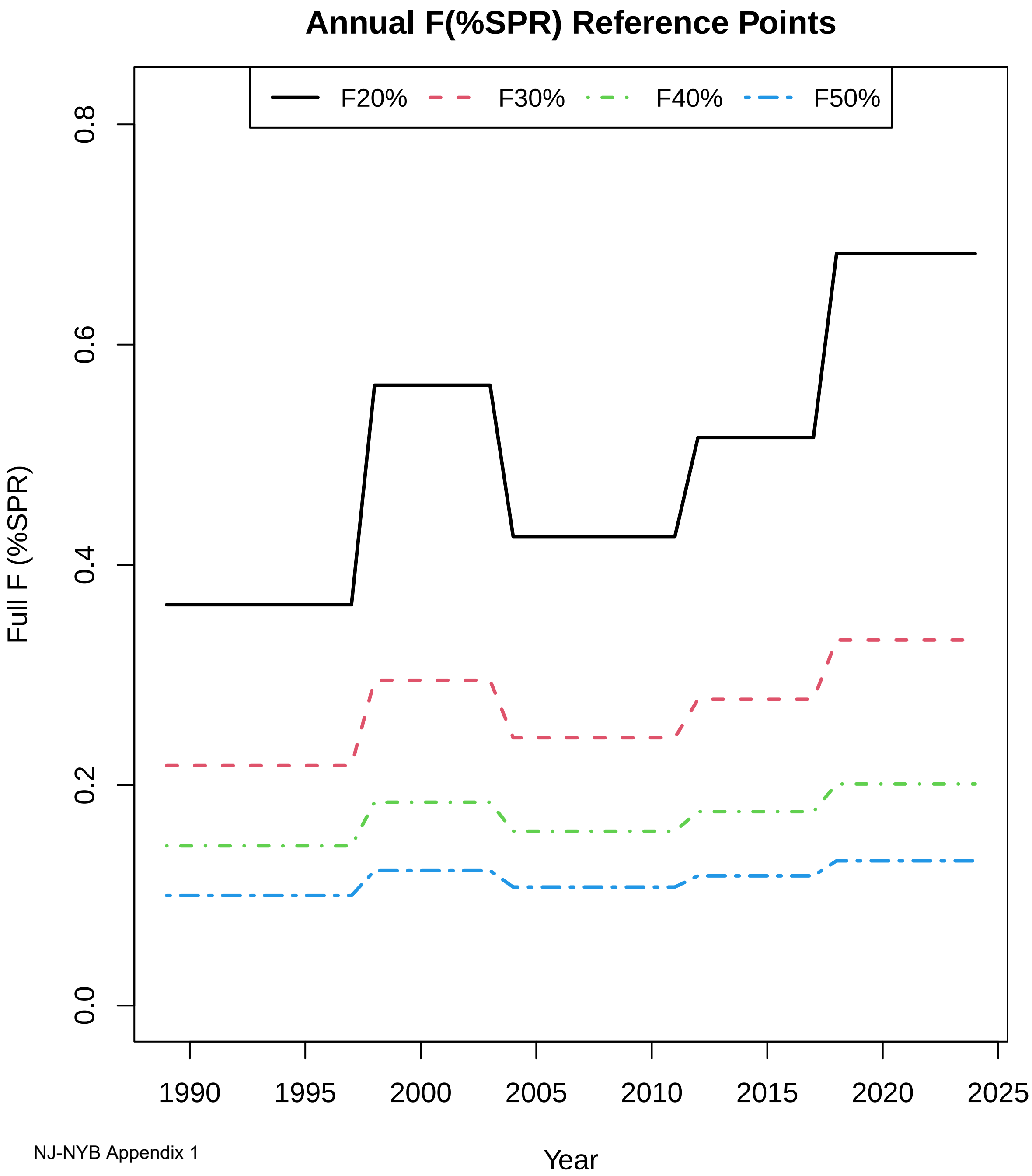
Maturity
Selectivity
Selectivity or Maturity at age
0.0
0.2
0.4
0.6
0.8
1.0
2
4
6
8
10
12
Age

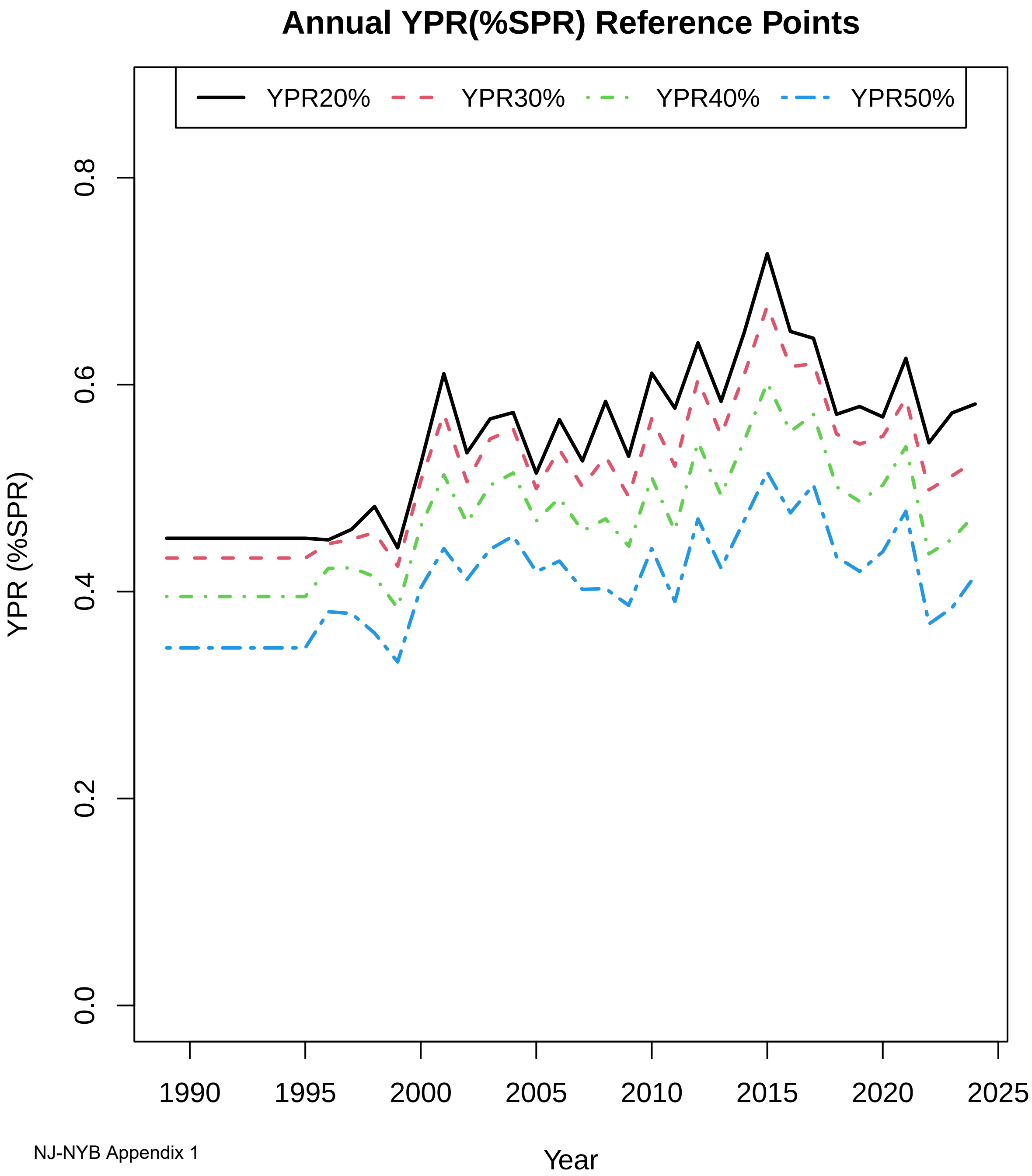
Expected Spawnings and SPR Reference Points (Years Avg = 5)

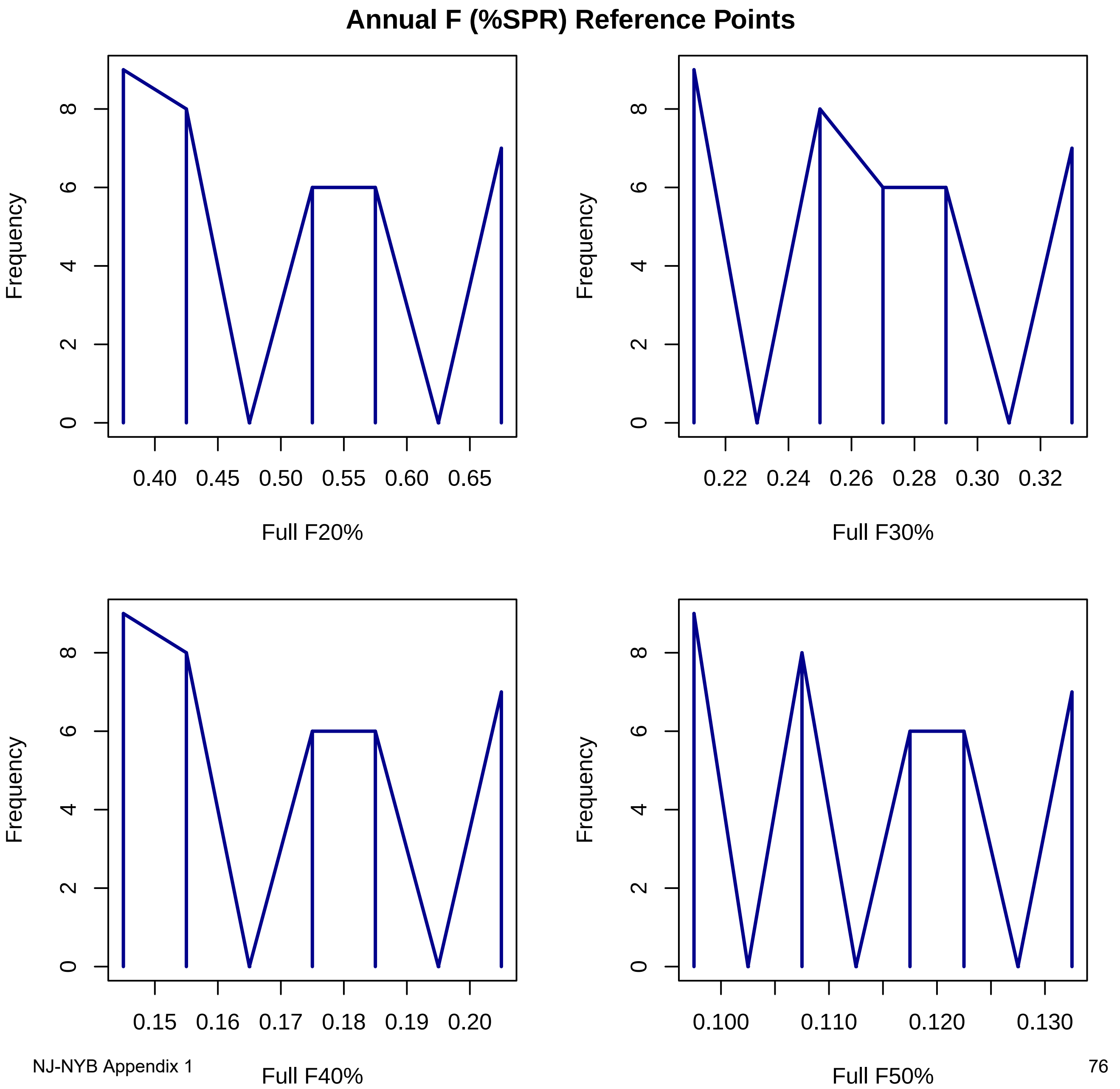


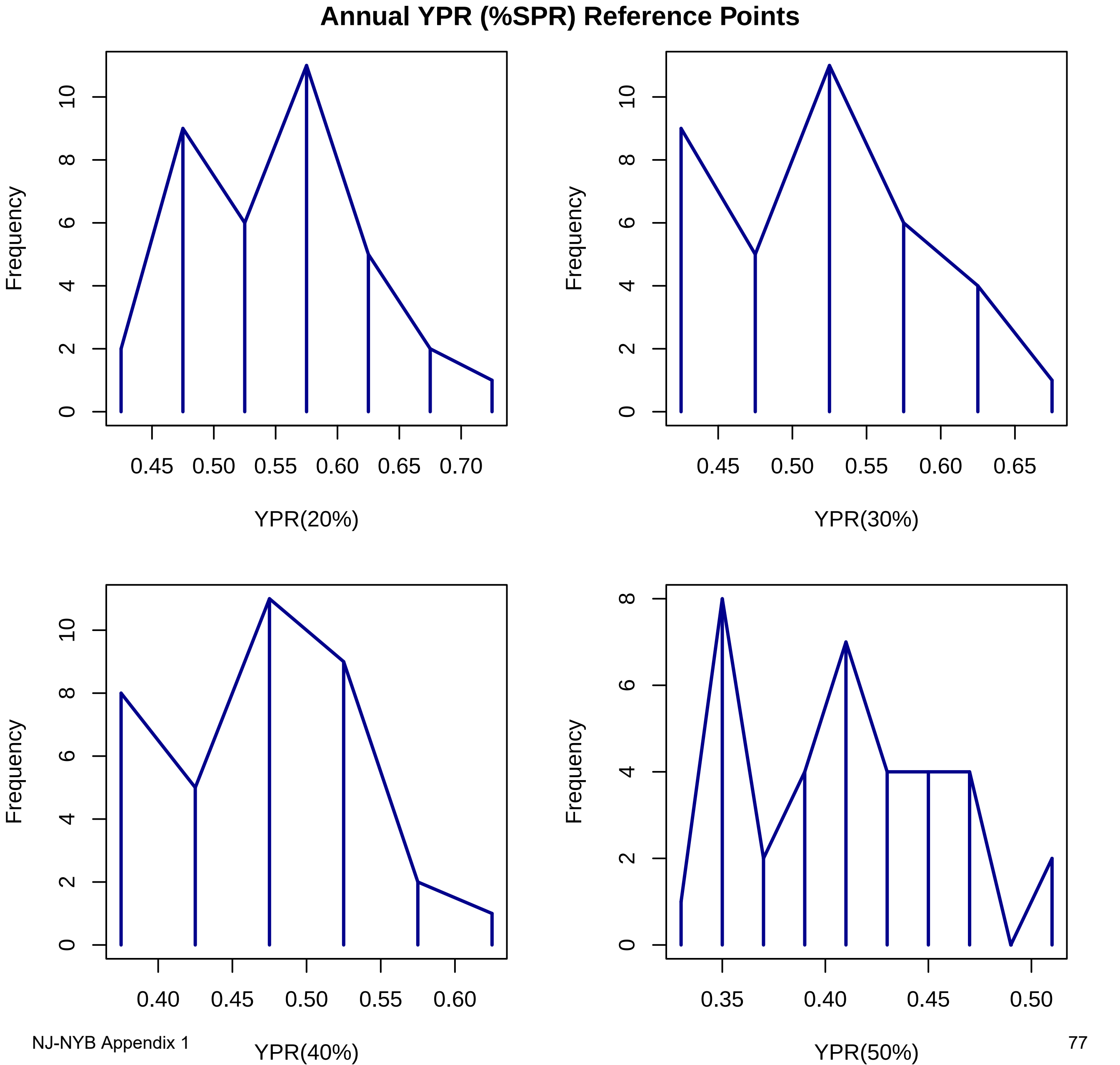
Expected Spawnings & SPR Reference Points (Years Avg = 5)

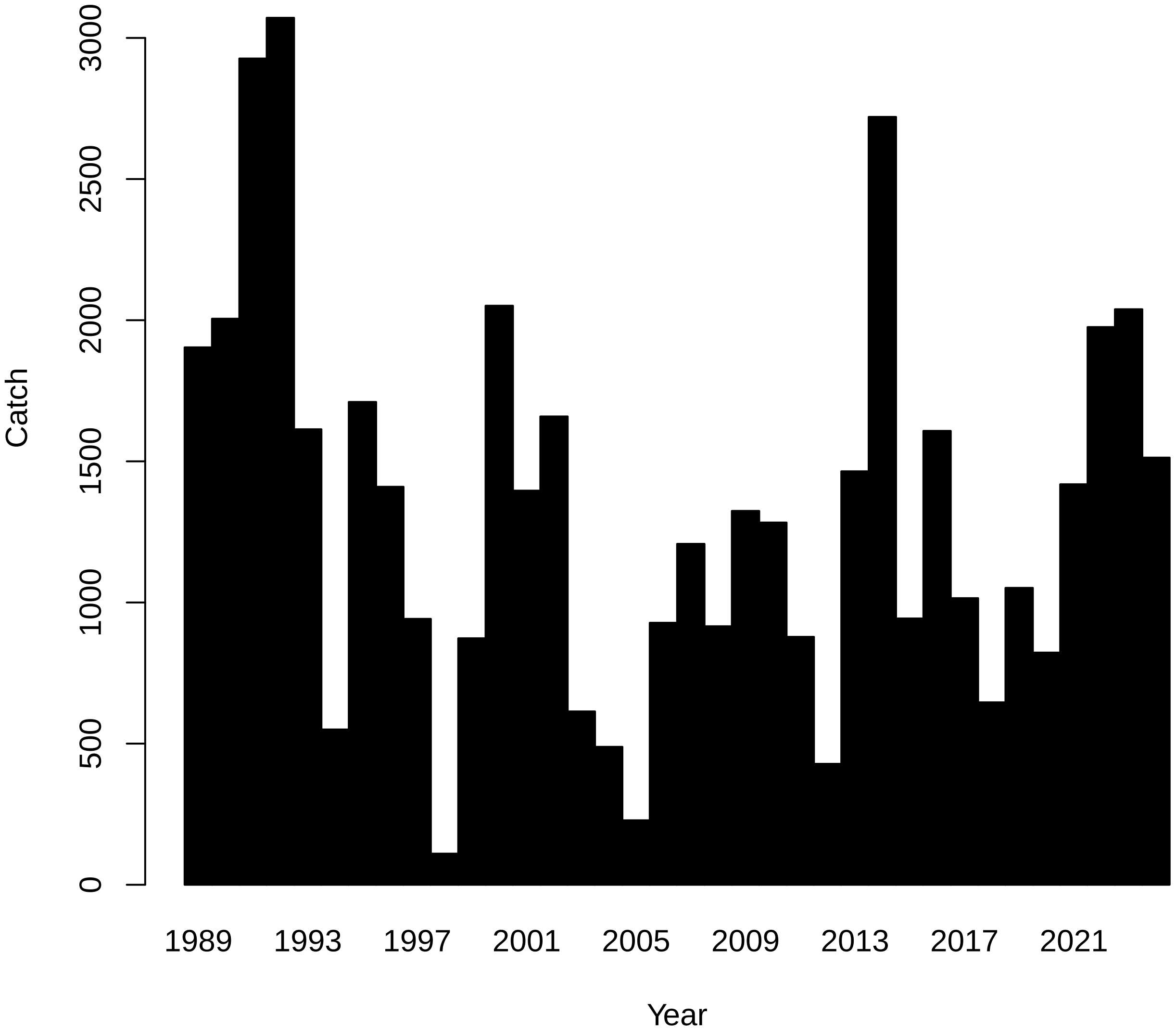
F	E[Sp]	SPR	F	E[Sp]	SPR	F	E[Sp]	SPR
0	4.8546	1	0.35	2.4042	0.2909	0.7	1.8952	0.1973
0.01	4.643	0.9295	0.36	2.3815	0.2861	0.71	1.8858	0.1959
0.02	4.4559	0.8679	0.37	2.3596	0.2816	0.72	1.8767	0.1944
0.03	4.2891	0.8138	0.38	2.3384	0.2773	0.73	1.8677	0.193
0.04	4.1395	0.7659	0.39	2.3179	0.2732	0.74	1.8588	0.1916
0.05	4.0045	0.7233	0.4	2.2981	0.2692	0.75	1.8501	0.1903
0.06	3.882	0.6853	0.41	2.2789	0.2654	0.76	1.8416	0.189
0.07	3.7703	0.651	0.42	2.2602	0.2618	0.77	1.8332	0.1877
0.08	3.6679	0.6201	0.43	2.2422	0.2583	0.78	1.825	0.1864
0.09	3.5739	0.5921	0.44	2.2246	0.2549	0.79	1.8169	0.1852
0.1	3.487	0.5667	0.45	2.2076	0.2517	0.8	1.8089	0.184
0.11	3.4066	0.5434	0.46	2.191	0.2485	0.81	1.8011	0.1828
0.12	3.3319	0.5222	0.47	2.1749	0.2455	0.82	1.7933	0.1816
0.13	3.2623	0.5026	0.48	2.1593	0.2426	0.83	1.7857	0.1805
0.14	3.1973	0.4846	0.49	2.144	0.2398	0.84	1.7783	0.1794
0.15	3.1363	0.468	0.5	2.1292	0.2371	0.85	1.7709	0.1783
0.16	3.0791	0.4527	0.51	2.1147	0.2345	0.86	1.7637	0.1772
0.17	3.0253	0.4384	0.52	2.1007	0.232	0.87	1.7565	0.1761
0.18	2.9746	0.4252	0.53	2.0869	0.2295	0.88	1.7495	0.1751
0.19	2.9266	0.4128	0.54	2.0735	0.2272	0.89	1.7426	0.1741
0.2	2.8812	0.4013	0.55	2.0604	0.2249	0.9	1.7357	0.1731
0.21	2.8382	0.3905	0.56	2.0476	0.2227	0.91	1.729	0.1721
0.22	2.7973	0.3804	0.57	2.0351	0.2205	0.92	1.7224	0.1712
0.23	2.7584	0.3709	0.58	2.0229	0.2184	0.93	1.7158	0.1702
0.24	2.7213	0.362	0.59	2.011	0.2164	0.94	1.7094	0.1693
0.25	2.686	0.3536	0.6	1.9993	0.2144	0.95	1.703	0.1684
0.26	2.6522	0.3457	0.61	1.9879	0.2125	0.96	1.6967	0.1675
0.27	2.62	0.3383	0.62	1.9768	0.2106	0.97	1.6905	0.1666
0.28	2.589	0.3312	0.63	1.9658	0.2088	0.98	1.6844	0.1658
0.29	2.5594	0.3245	0.64	1.9551	0.207	0.99	1.6784	0.1649
0.3	2.531	0.3182	0.65	1.9446	0.2053	1	1.6724	0.1641
0.31	2.5036	0.3121	0.66	1.9343	0.2036	1.01	1.6666	0.1632
0.32	2.4774	0.3064	0.67	1.9242	0.202	1.02	1.6608	0.1624
0.33	2.4521	0.301	0.68	1.9144	0.2004	1.03	1.655	0.1616
0.34	2.4277	0.2958	0.69	1.9047	0.1989	1.04	1.6494	0.1608


Annual F(%SPR) Reference Points
F20%
F30%
F40%
F50%
Full F (%SPR)
0.0
0.2
0.4
0.6
0.8
1990
1995
2000
2005
2010
2015
2020
2025
Year


Annual YPR(%SPR) Reference Points
YPR20%
YPR30%
YPR40%
YPR50%
YPR (%SPR)
0.0
0.2
0.4
0.6
0.8
1990
1995
2000
2005
2010
2015
2020
2025
Year

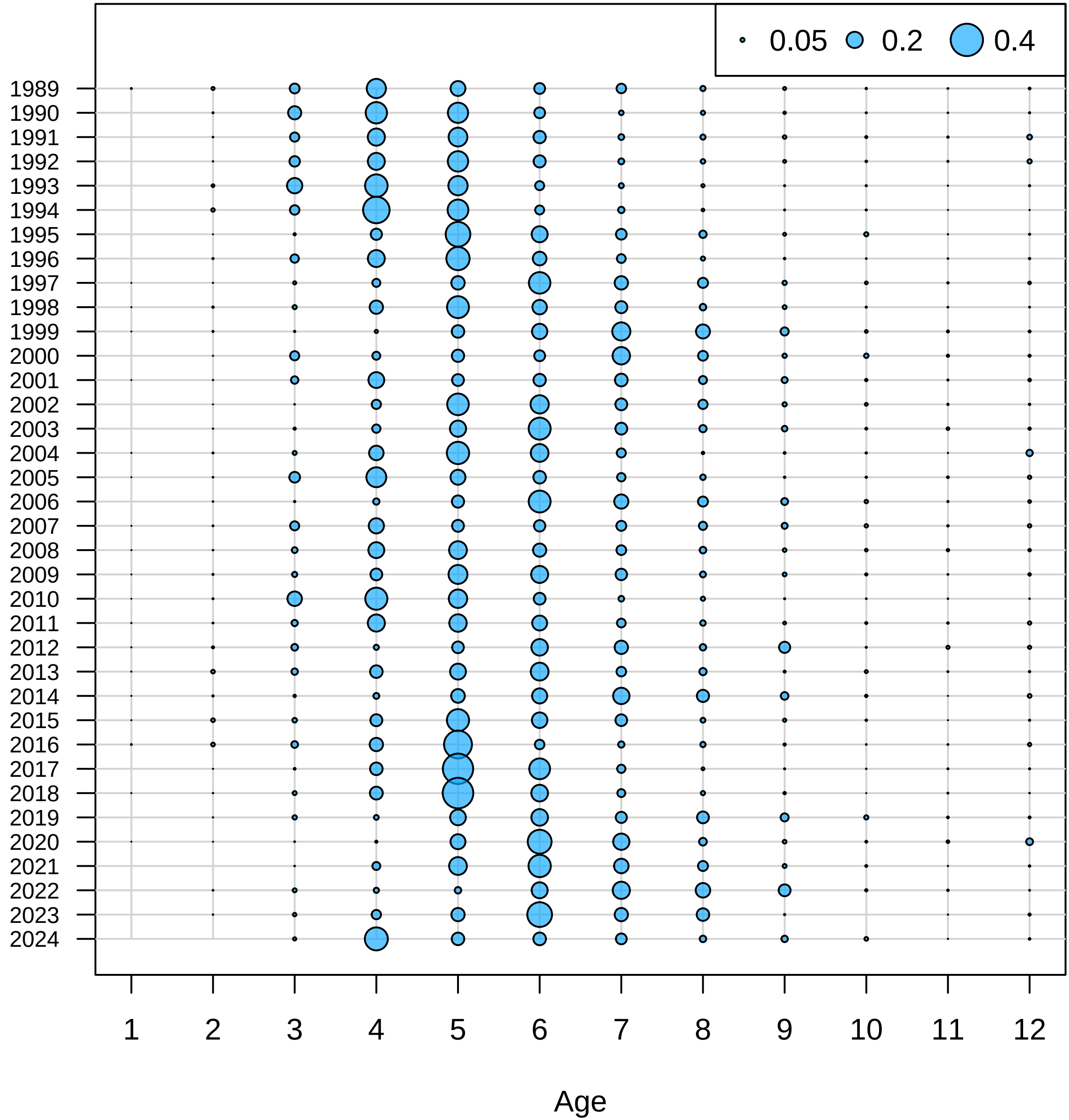

Annual F (%SPR) Reference Points
Frequency
0
2
4
6
8
0.40
0.45
0.50
0.55
0.60
0.65
Full F20%
0.22
0.24
0.26
0.28
0.30
0.32
Full F30%
0.15
0.16
0.17
0.18
0.19
0.20
Full F40%
0.100
0.110
0.120
0.130
Full F50%

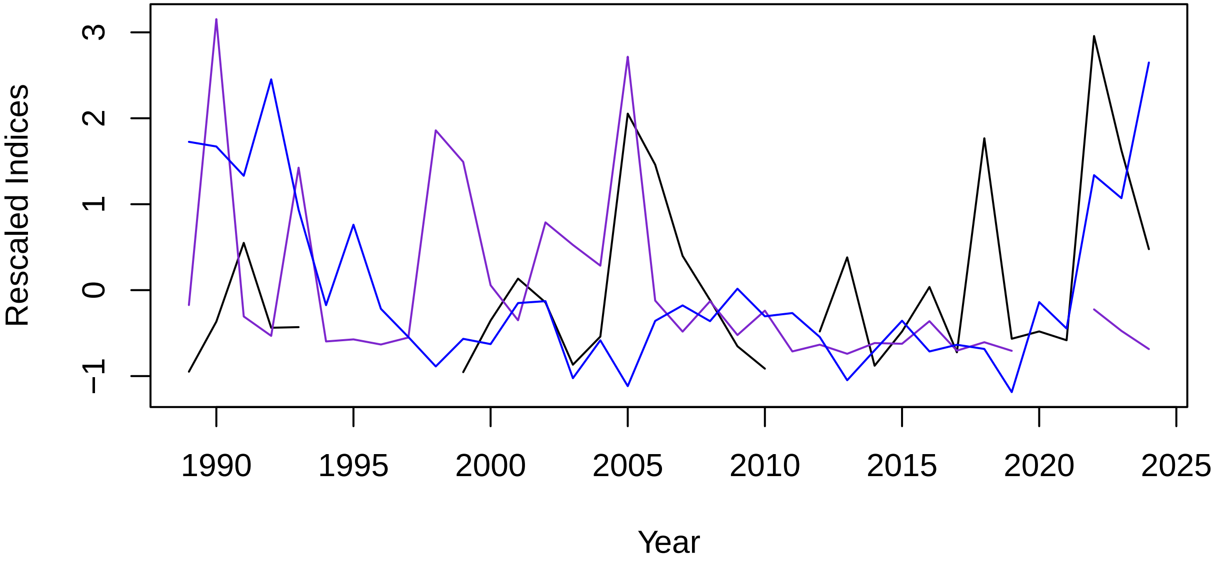

Annual YPR (%SPR) Reference Points
Frequency
YPR(20%)
YPR(30%)
YPR(40%)
YPR(50%)
0.45
0.50
0.55
0.60
0.65
0.70
0.40
0.35
0
2
4
6
8
10

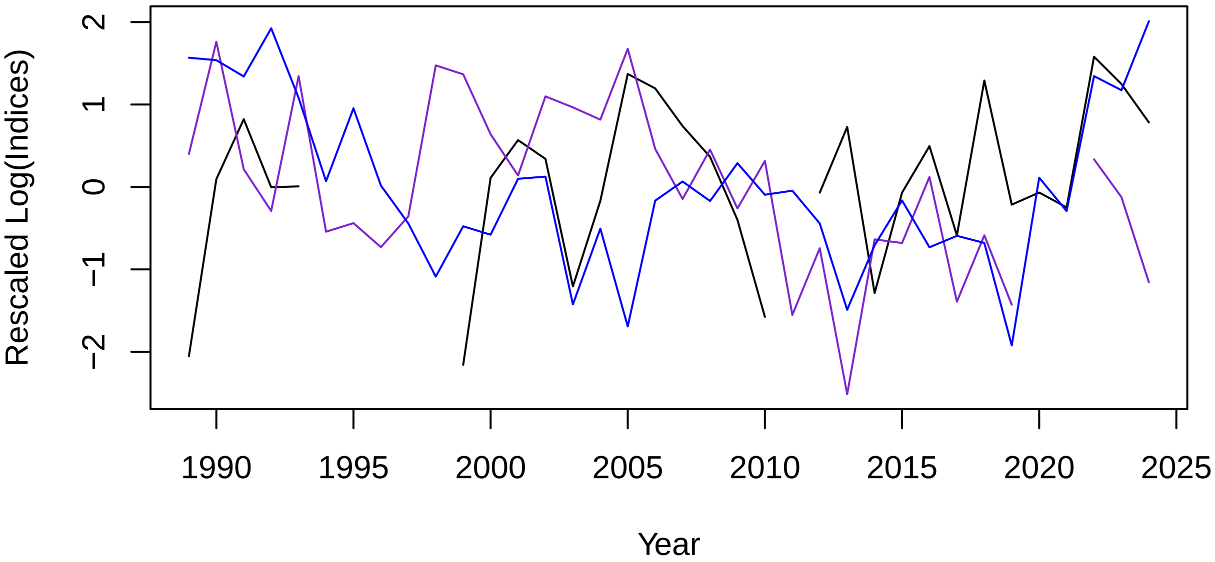


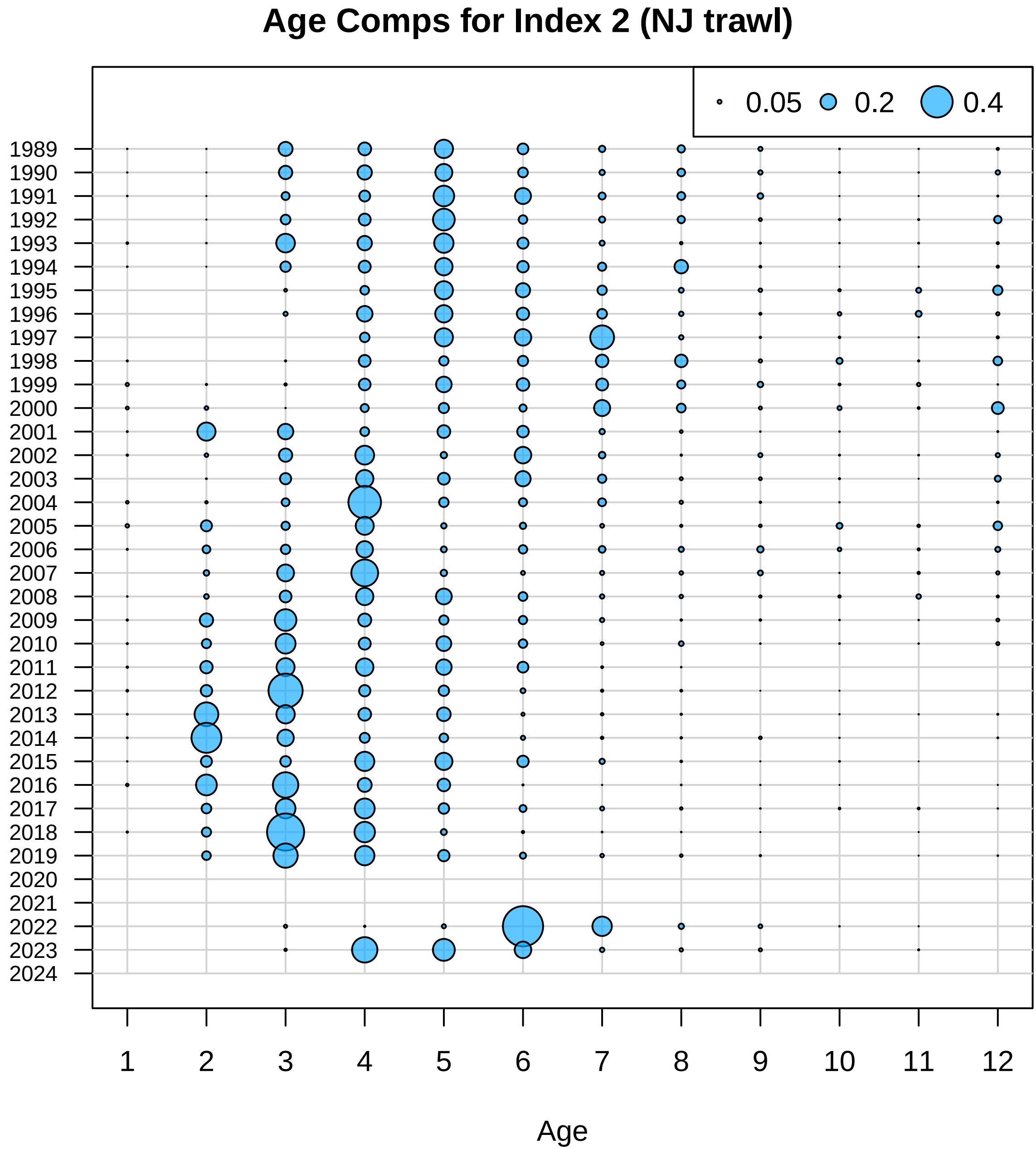
Catch
0
500
1000
1500
2000
2500
3000
1989
1993
1997
2001
2005
2009
2013
2017
2021
Year

Age Comps for Catch by Fleet 1 (All removals)

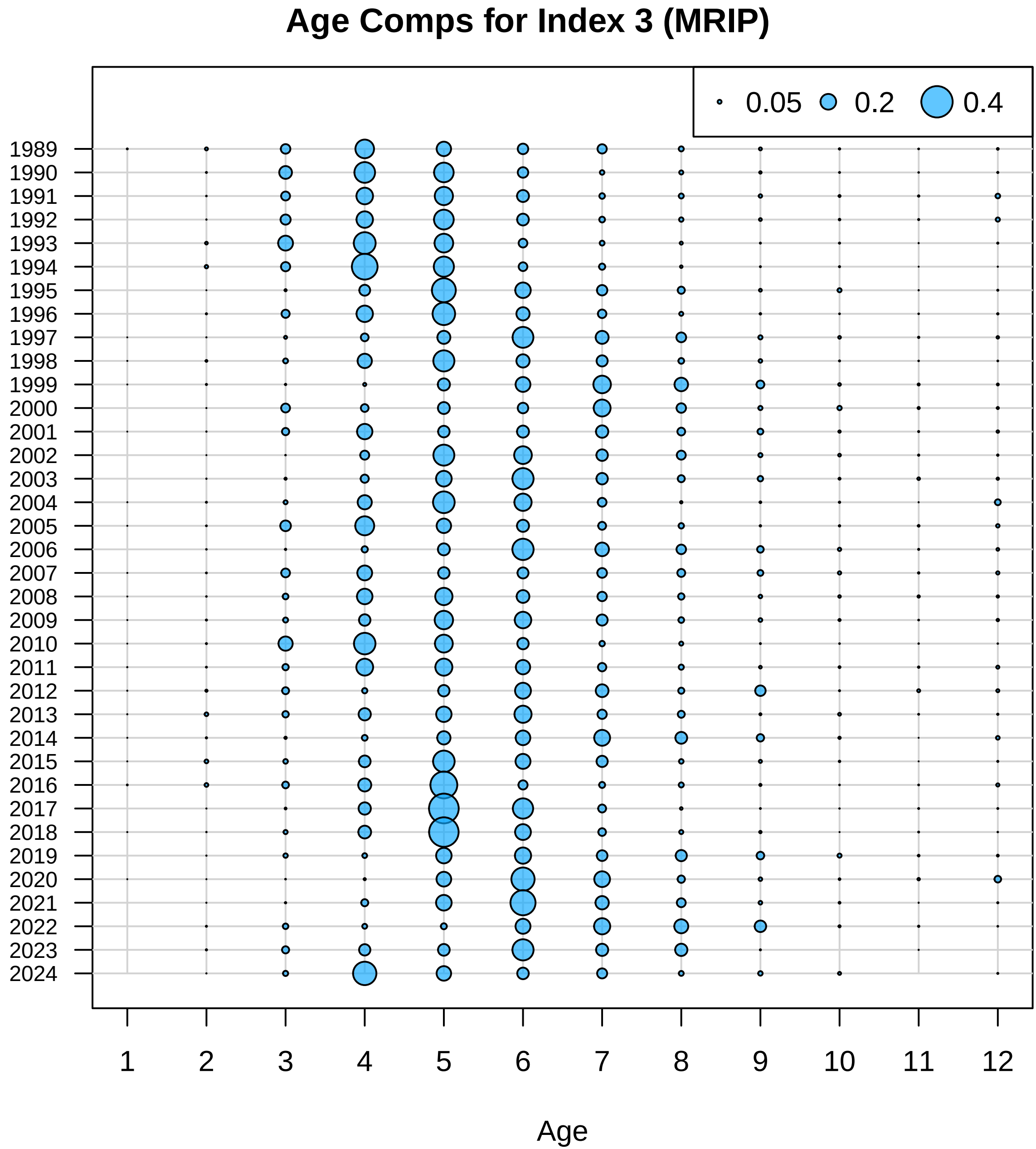



Rescaled Indices
3
2
1
0
−1
1990
1995
2000
2005
2010
2015
2020
2025
Year

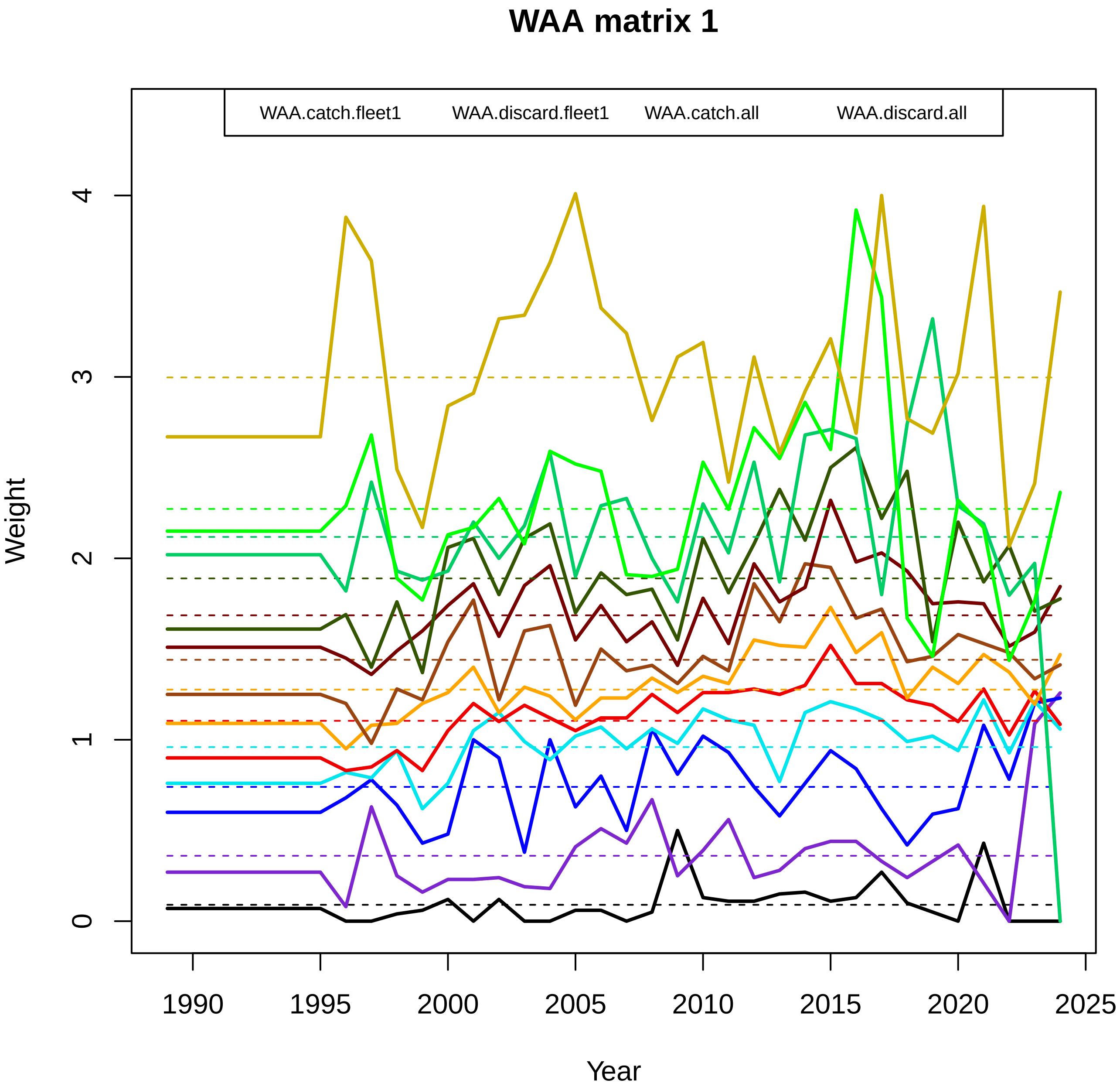

Rescaled Log(Indices)
2
1
0
−1
−2
1990
1995
2000
2005
2010
2015
2020
2025
Year



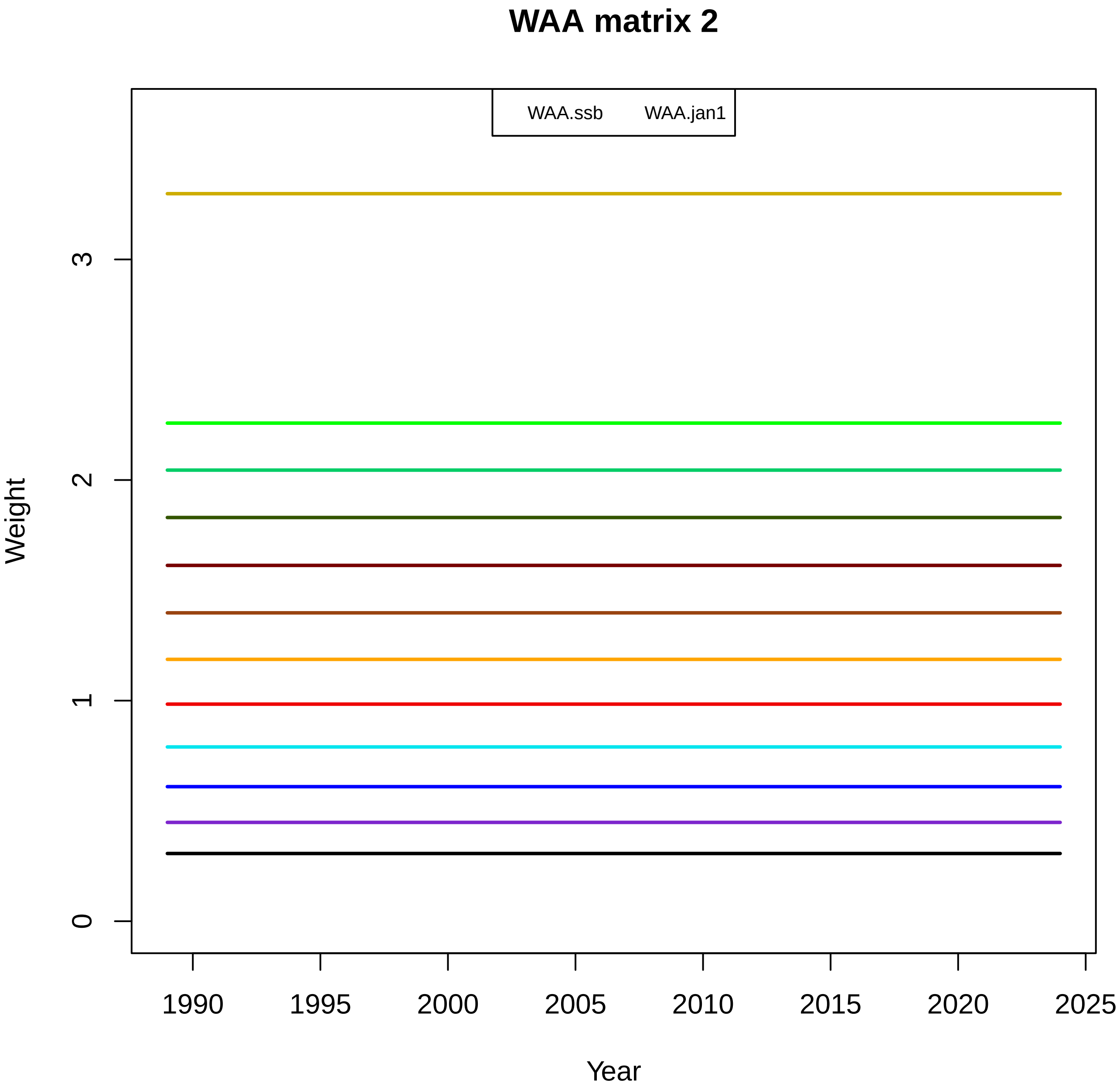
Age Comps for Index 2 (NJ trawl)
0.05
0.2
0.4
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
1
2
3
4
5
6
7
8
9
10
11
12
Age

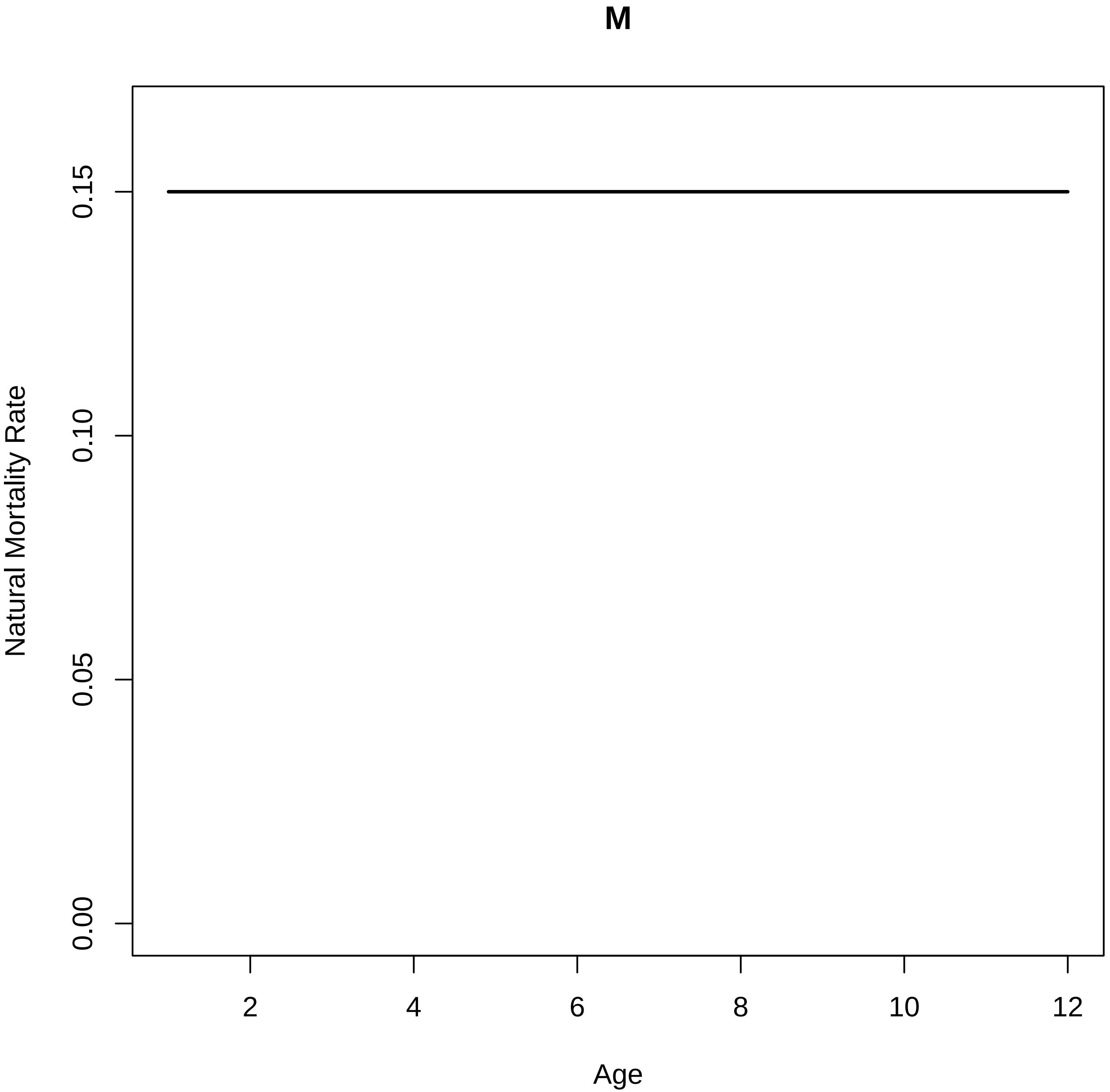


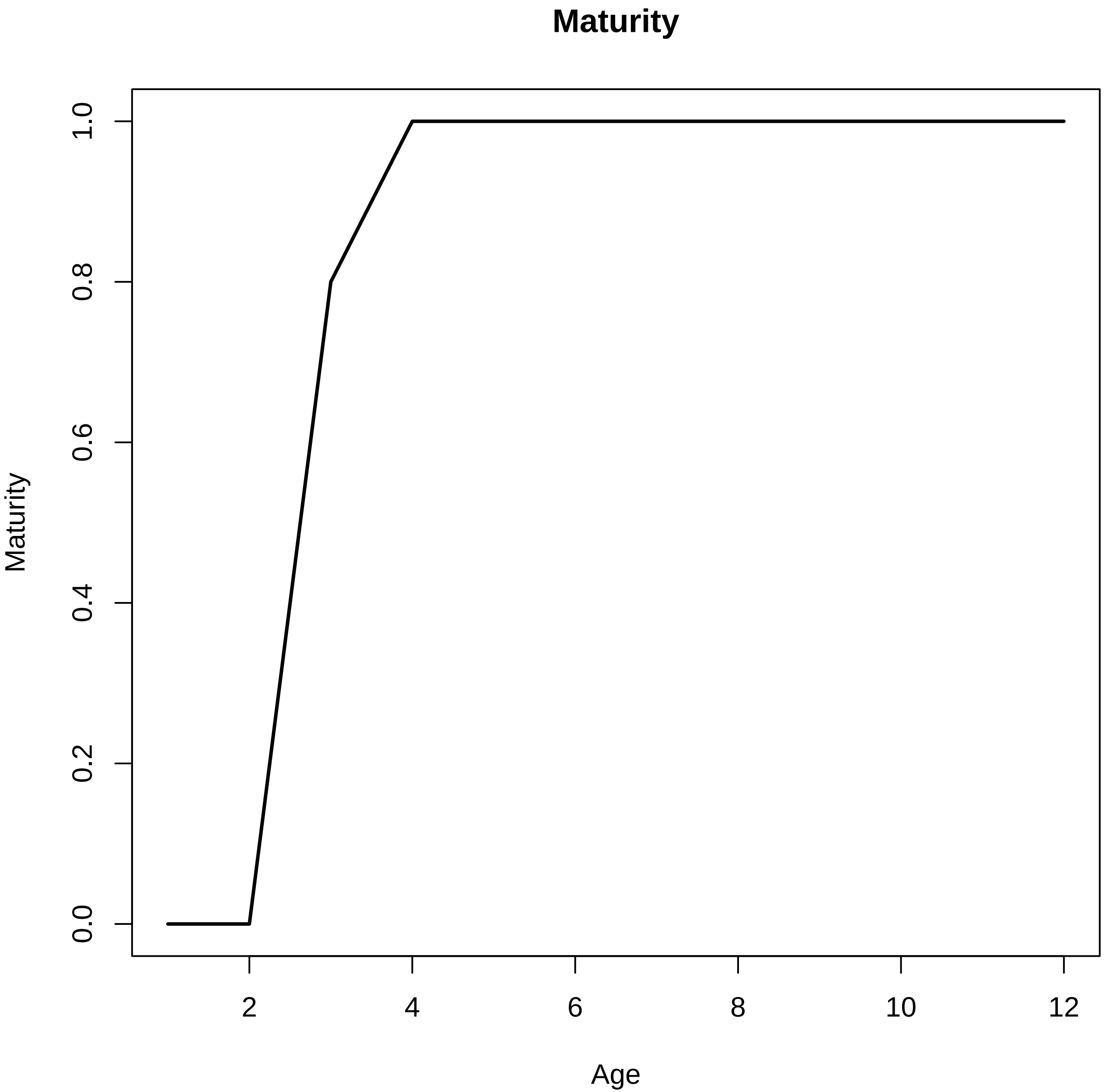
Age Comps for Index 3 (MRIP)
0.05
0.2
0.4
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
1
2
3
4
5
6
7
8
9
10
11
12
Age



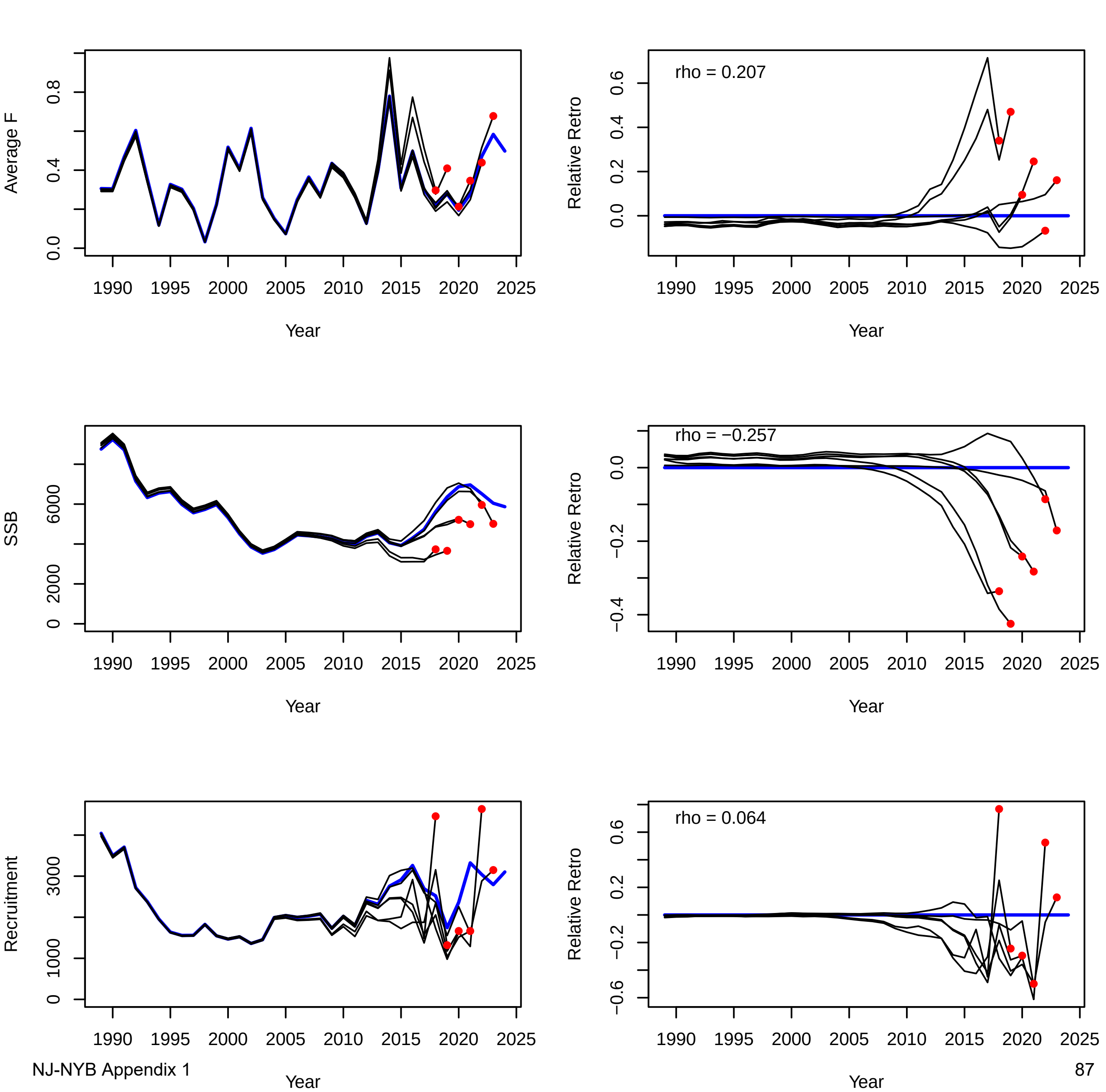
WAA matrix 1
WAA.catch.fleet1
WAA.discard.fleet1
WAA.catch.all
WAA.discard.all
Weight
0
1
2
3
4
Year
1990
1995
2000
2005
2010
2015
2020
2025


WAA matrix 2
WAA.ssb
WAA.jan1
Weight
0
1
2
3
1990
1995
2000
2005
2010
2015
2020
2025
Year


M
Natural Mortality Rate
0.00
0.05
0.10
0.15
2
4
6
8
10
12
Age

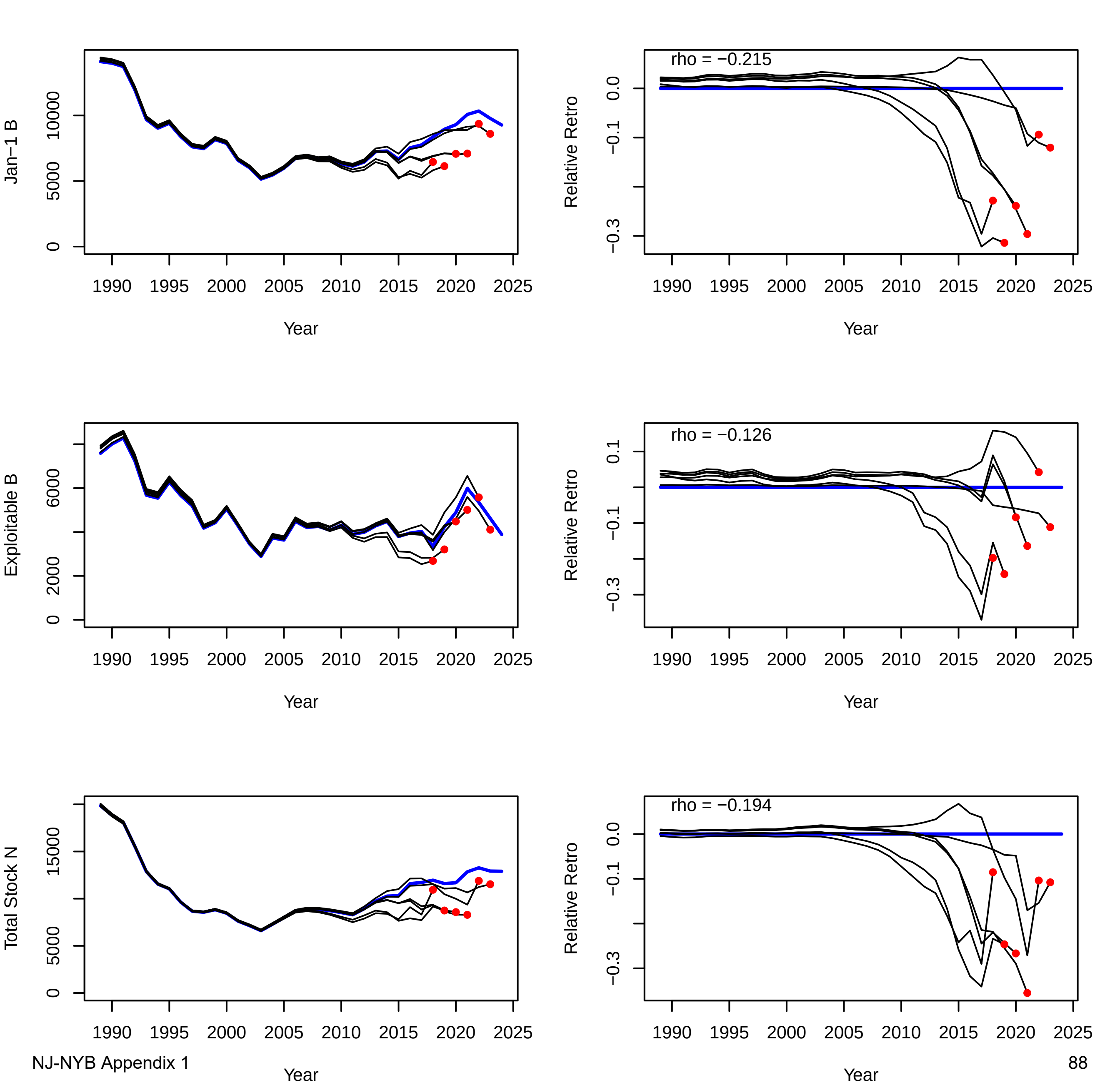

Maturity
Maturity
Age
0.0
0.2
0.4
0.6
0.8
1.0
2
4
6
8
10
12

F, SSB, R

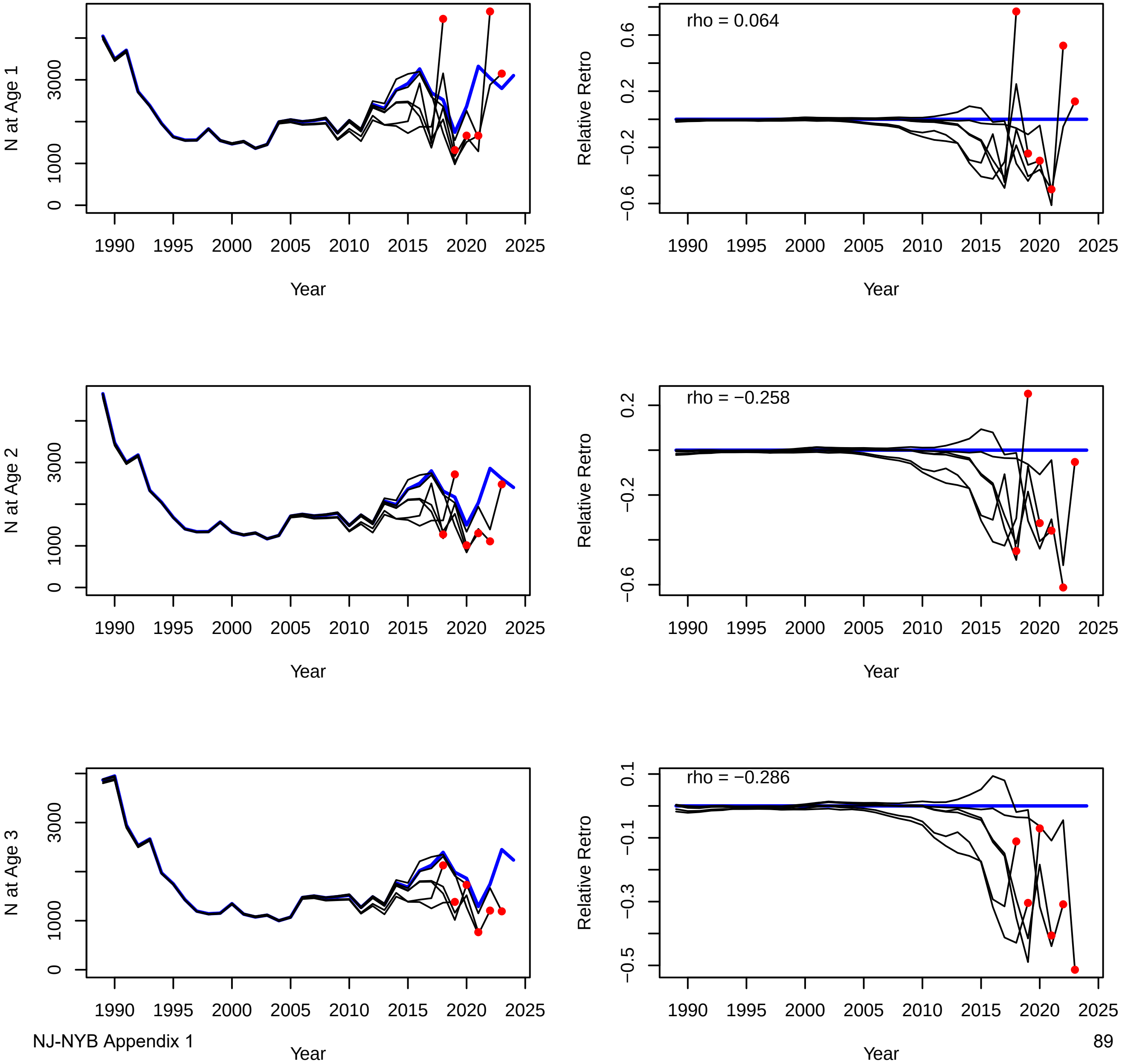


Average F
SSB
Recruitment
Relative Retro
Year
rho = 0.207
rho = −0.257
rho = 0.064

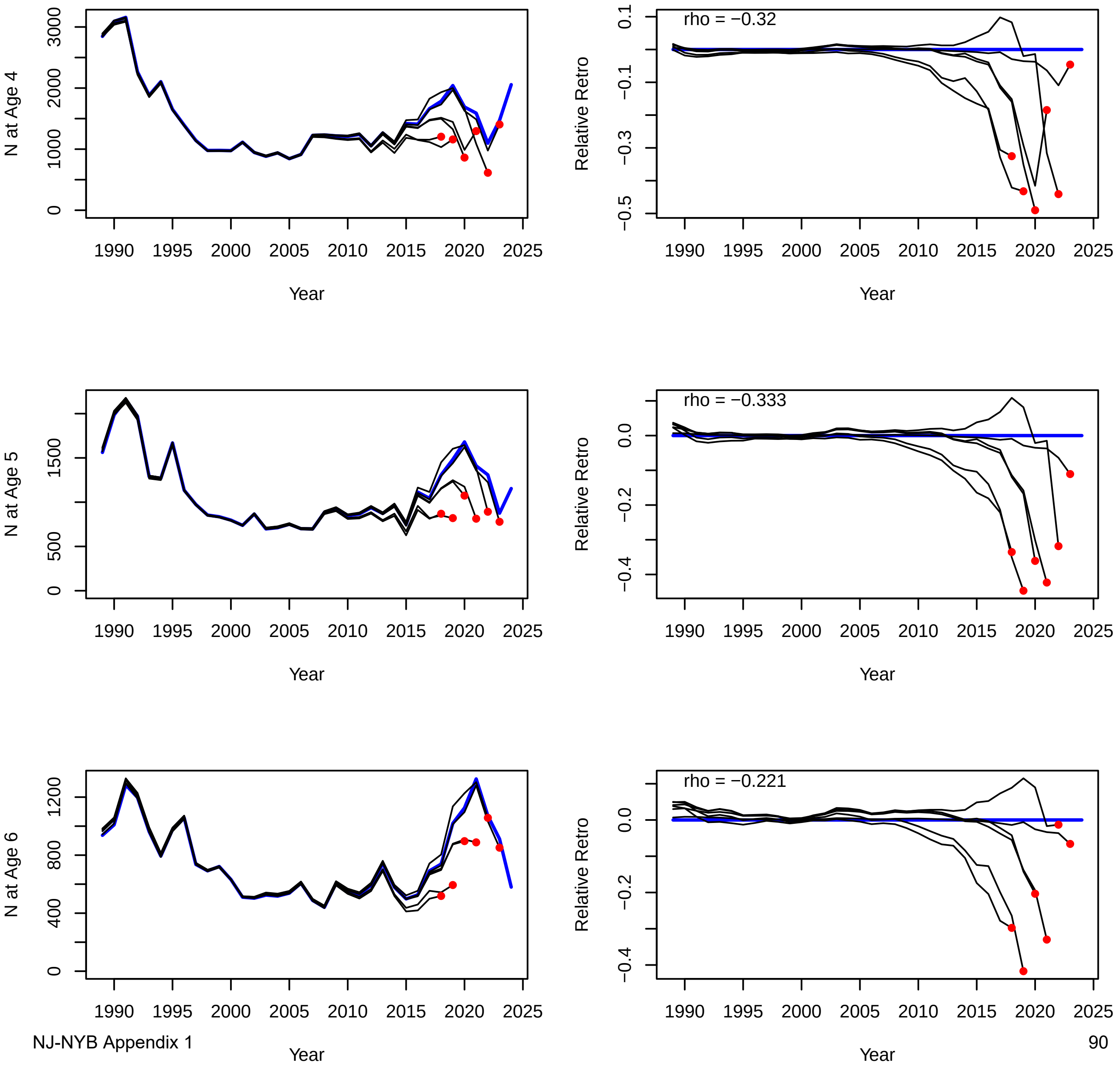
Jan−1 B, Exploitable B, Total Stock N



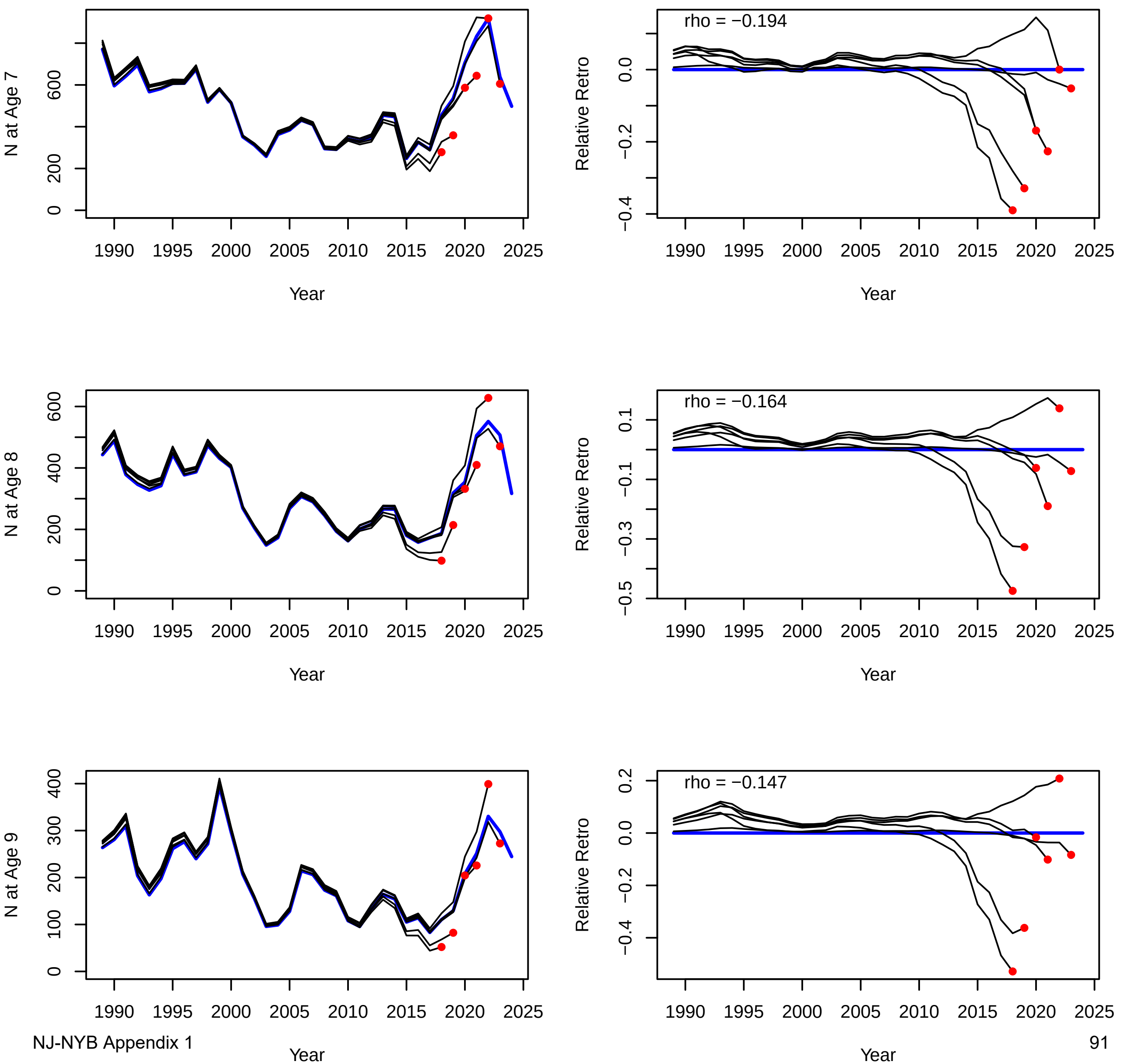
Stock Numbers at Age



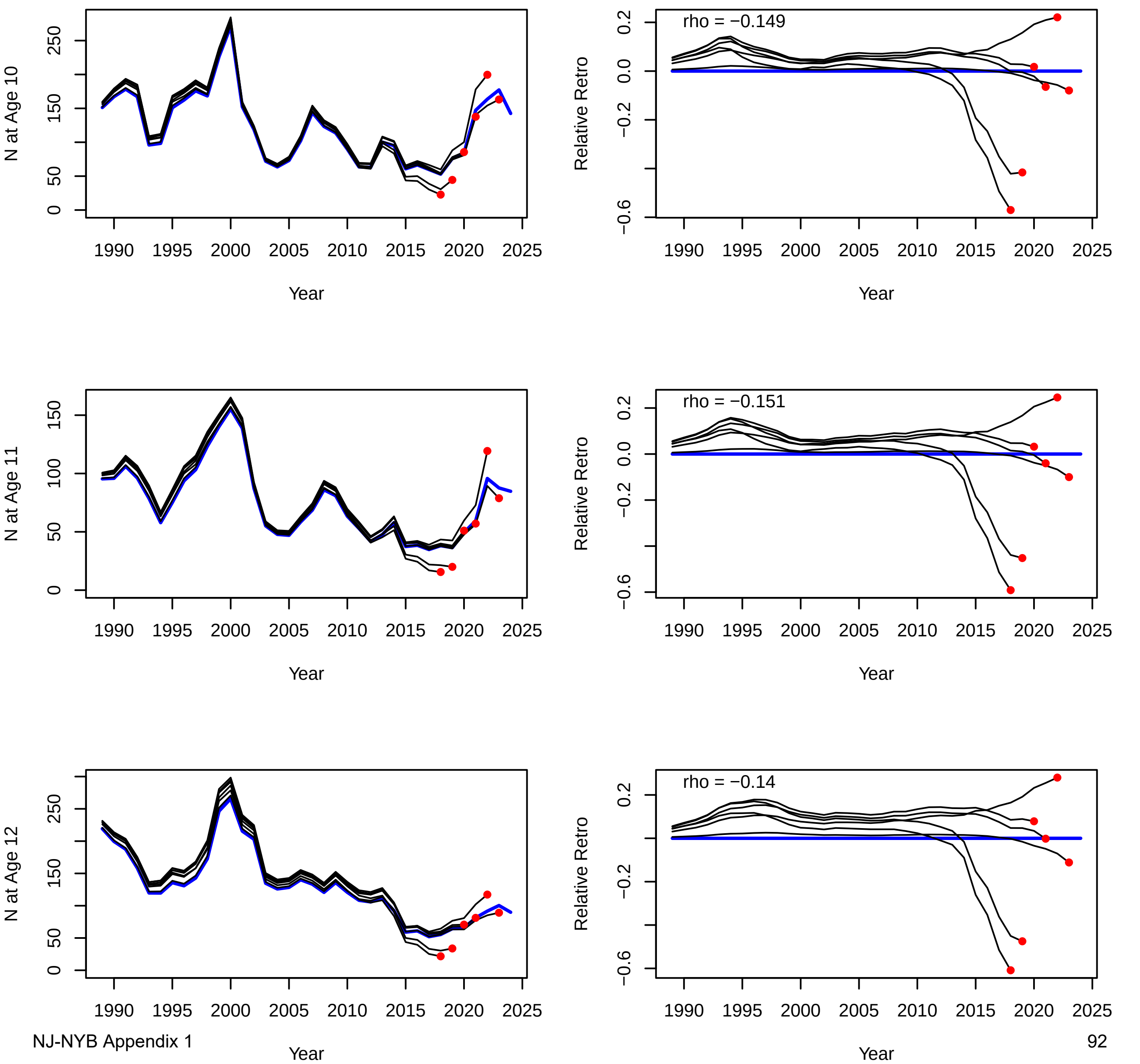
Stock Numbers at Age



Stock Numbers at Age



Stock Numbers at Age



NJ-NYB Appendix 2: Retrospective Adjustment and Sensitivity Runs

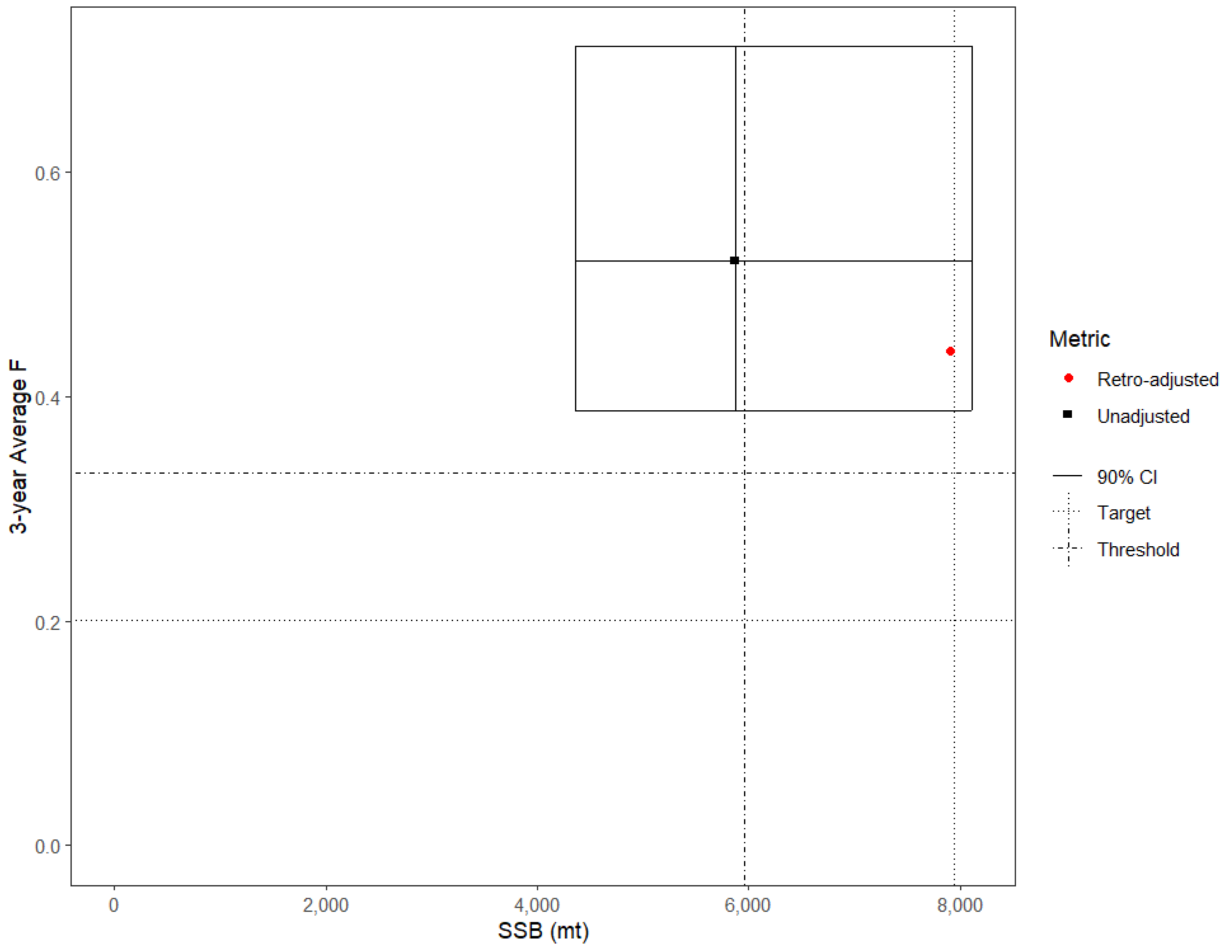


Figure A2.1. Comparison of retrospective adjusted status with the base model status. Solid black lines indicate the 90% confidence intervals of the estimates of SSB and F.

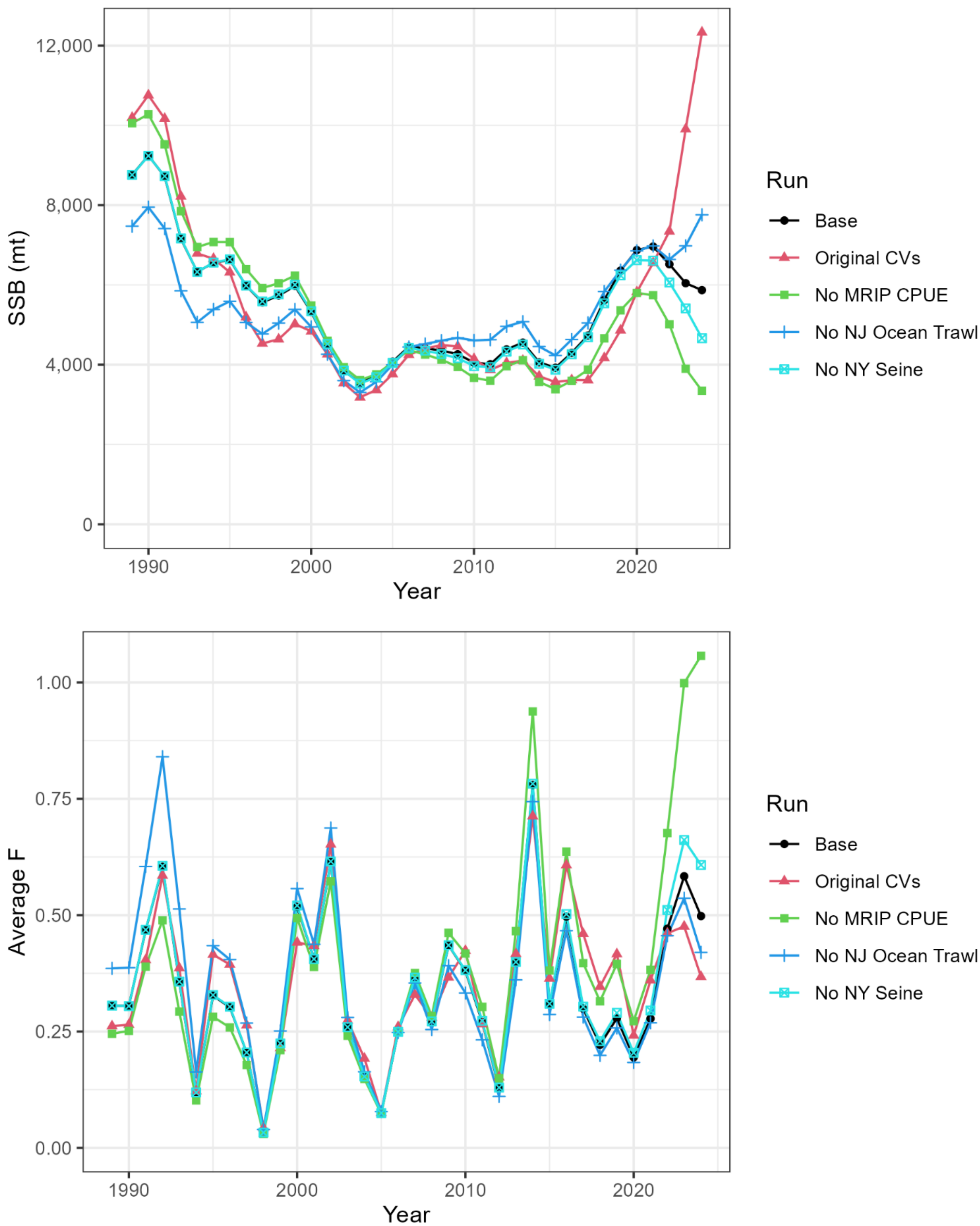
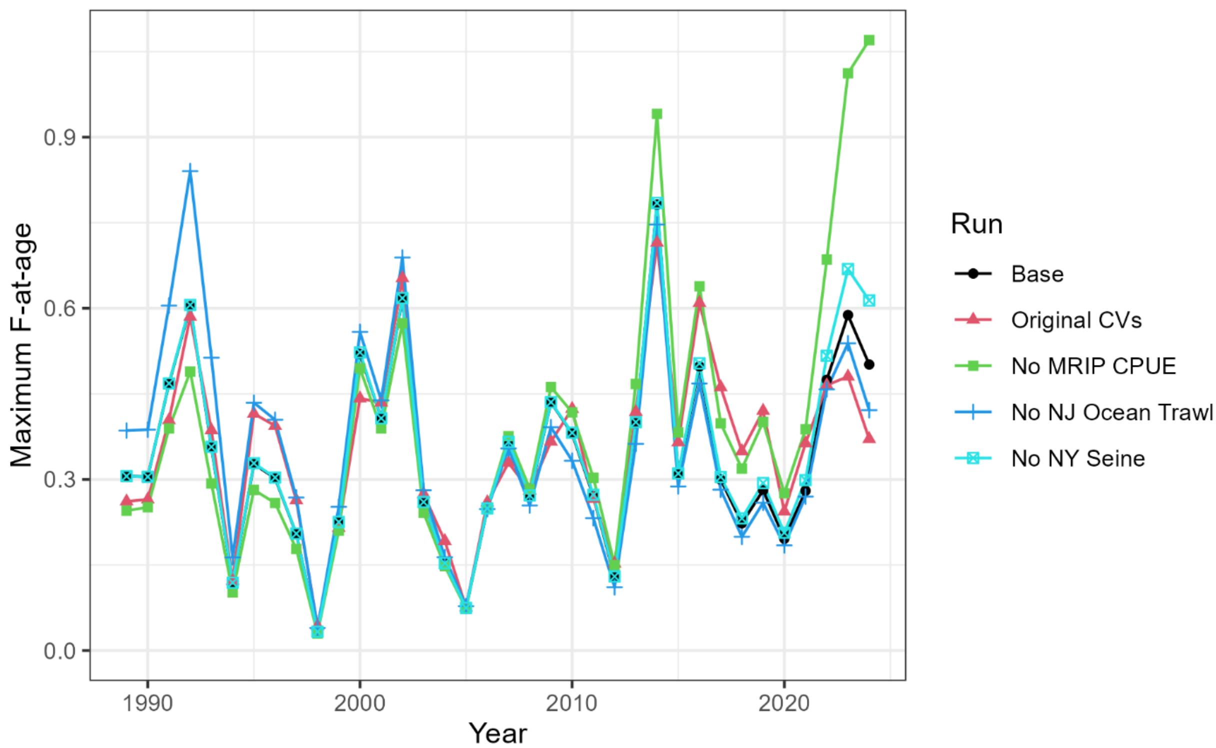


Figure A2.2. Spawning stock biomass (top) and average F (bottom) for sensitivity runs including the base run with the original CVs for the catch and indices and runs dropping one index at a time.



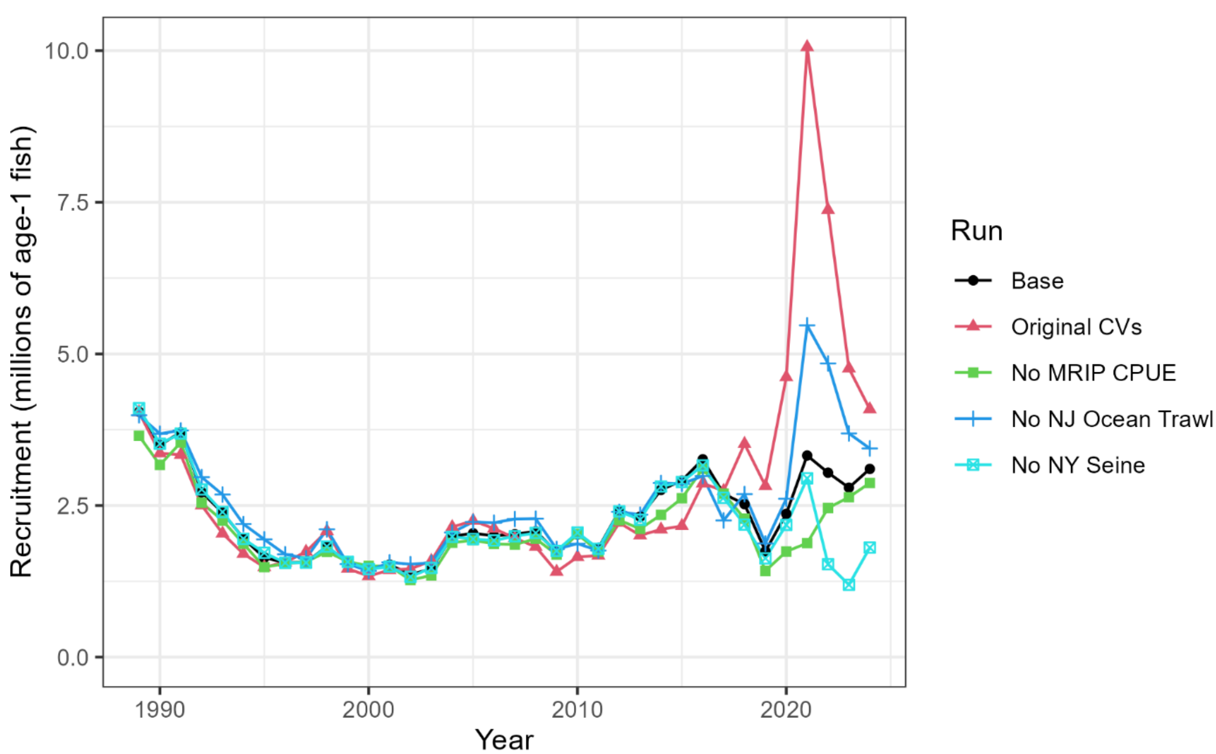


Figure A2.3. Maximum F-at-age (top) and recruitment (bottom) for sensitivity runs including the base run with the original CVs for the catch and indices and runs dropping one index at a time.

DMV Appendix 1: ASAP Input and Diagnostic Plots for the Base Run

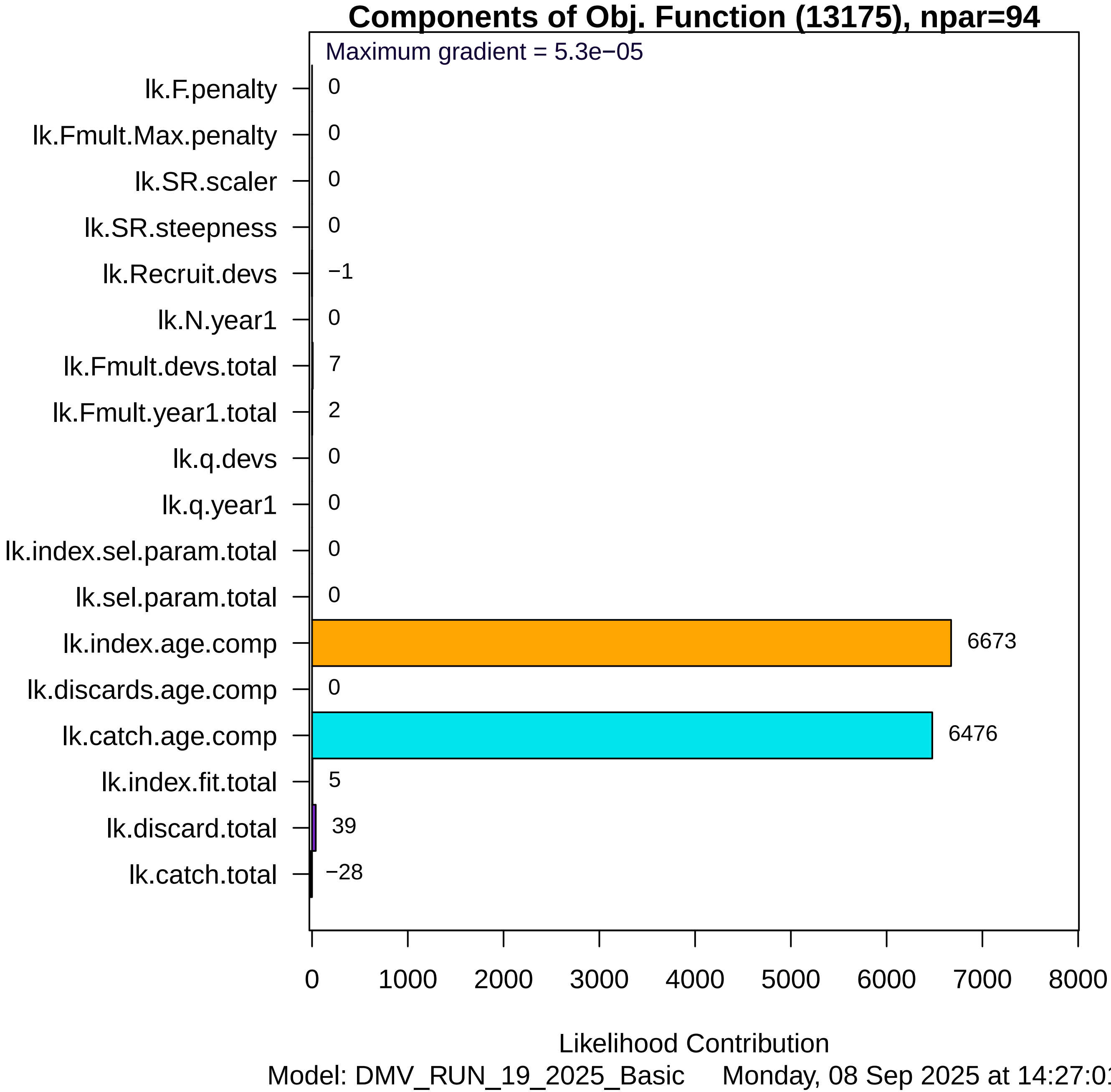
File = DMV_RUN_19_2025_Basic.dat

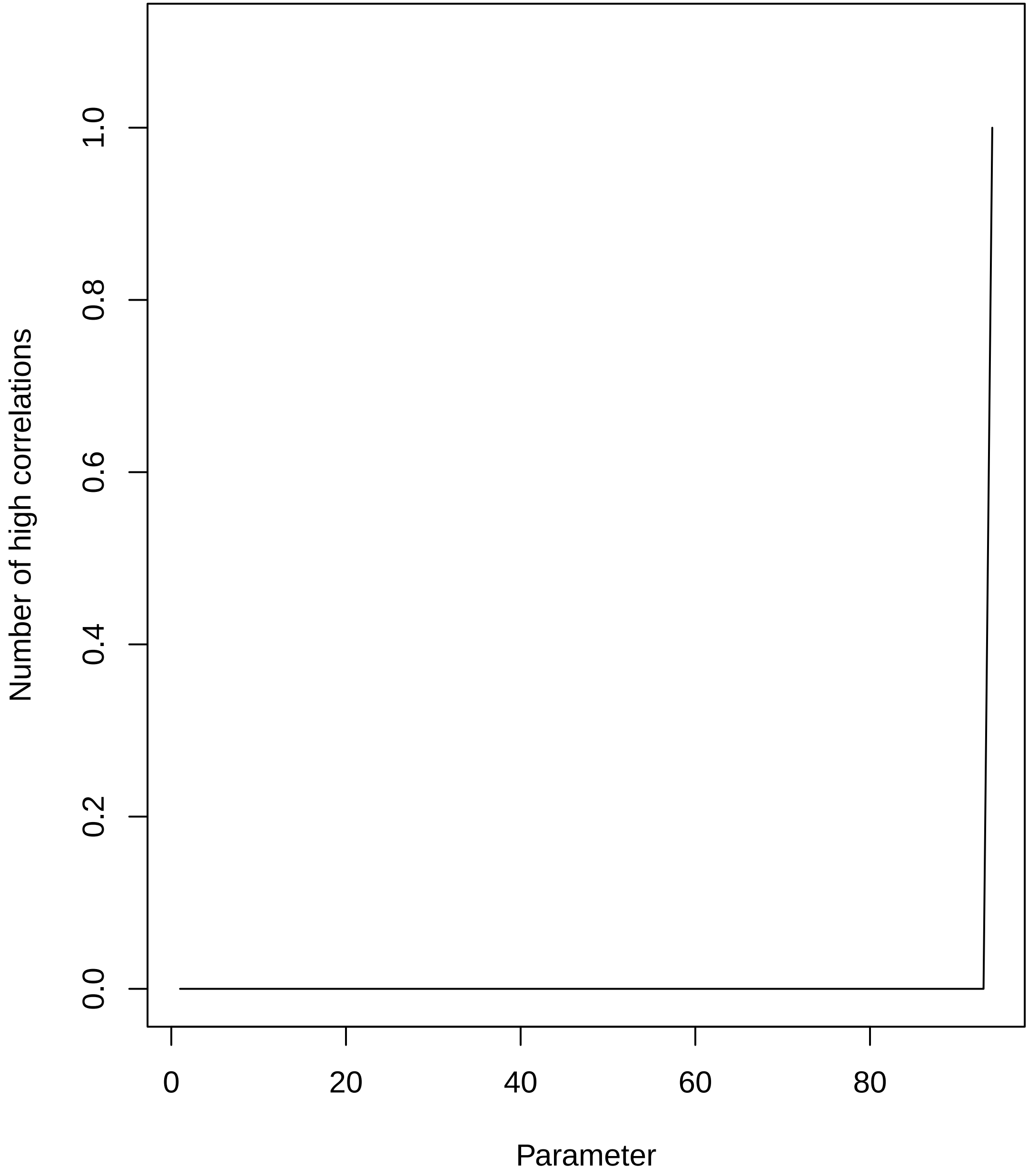
ASAP3 run on Monday, 08 Sep 2025 at 14:27:01

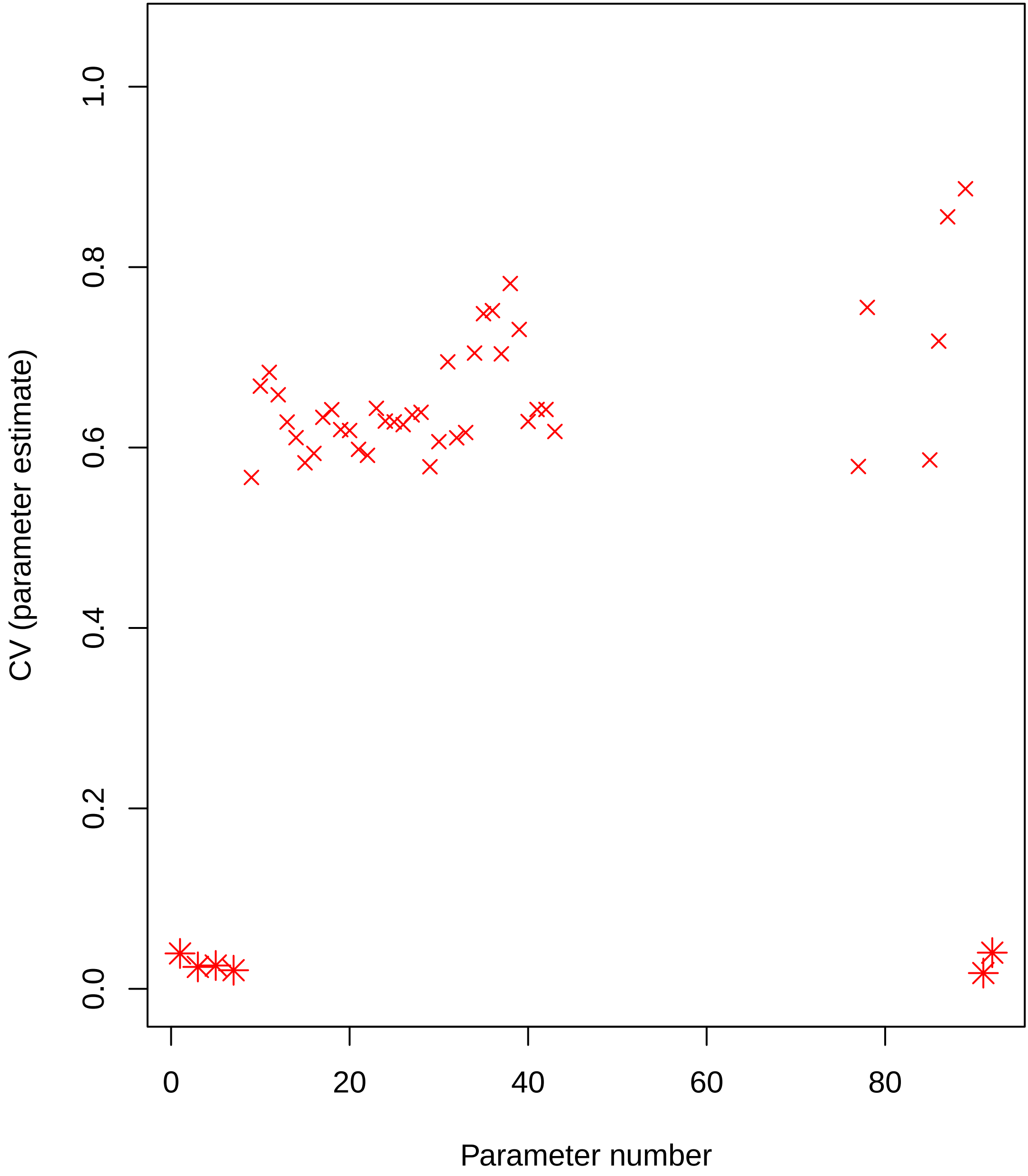
rive − STATE OF DELAWARE\MAFMC\Tautog SAS\2025 Assessment Update

ASAPplots version = 0.2.18

npar = 94, maximum gradient = 5.26744e−005

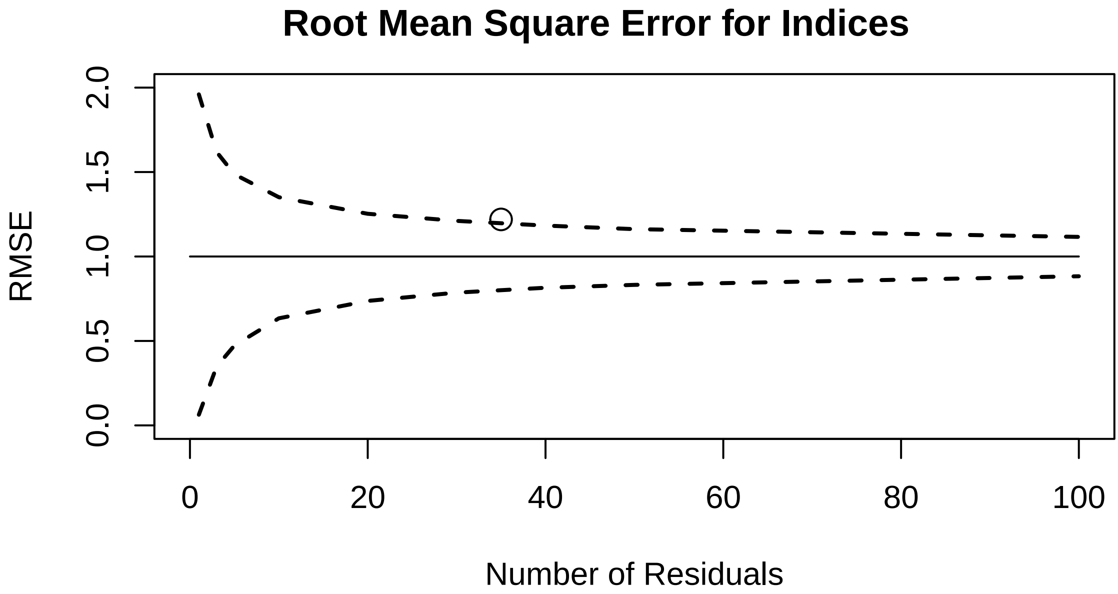

Components of Obj. Function (13175), npar=94
Maximum gradient = 5.3e−05
lk.F.penalty
lk.Fmult.Max.penalty
lk.SR.scaler
lk.SR.steepness
lk.Recruit.devs
lk.N.year1
lk.Fmult.devs.total
lk.Fmult.year1.total
lk.q.devs
lk.q.year1
lk.index.sel.param.total
lk.sel.param.total
lk.index.age.comp
lk.discards.age.comp
lk.catch.age.comp
lk.index.fit.total
lk.discard.total
lk.catch.total
0
0
0
0
−1
0
7
2
0
0
0
0
6673
0
6476
5
39
−28
0
1000
2000
3000
4000
5000
6000
7000
8000
Likelihood Contribution
Model: DMV_RUN_19_2025_Basic
Monday, 08 Sep 2025 at 14:27:0


1.0
0.8
0.6
0.4
0.2
0.0
Number of high correlations
0
20
40
60
80
Parameter

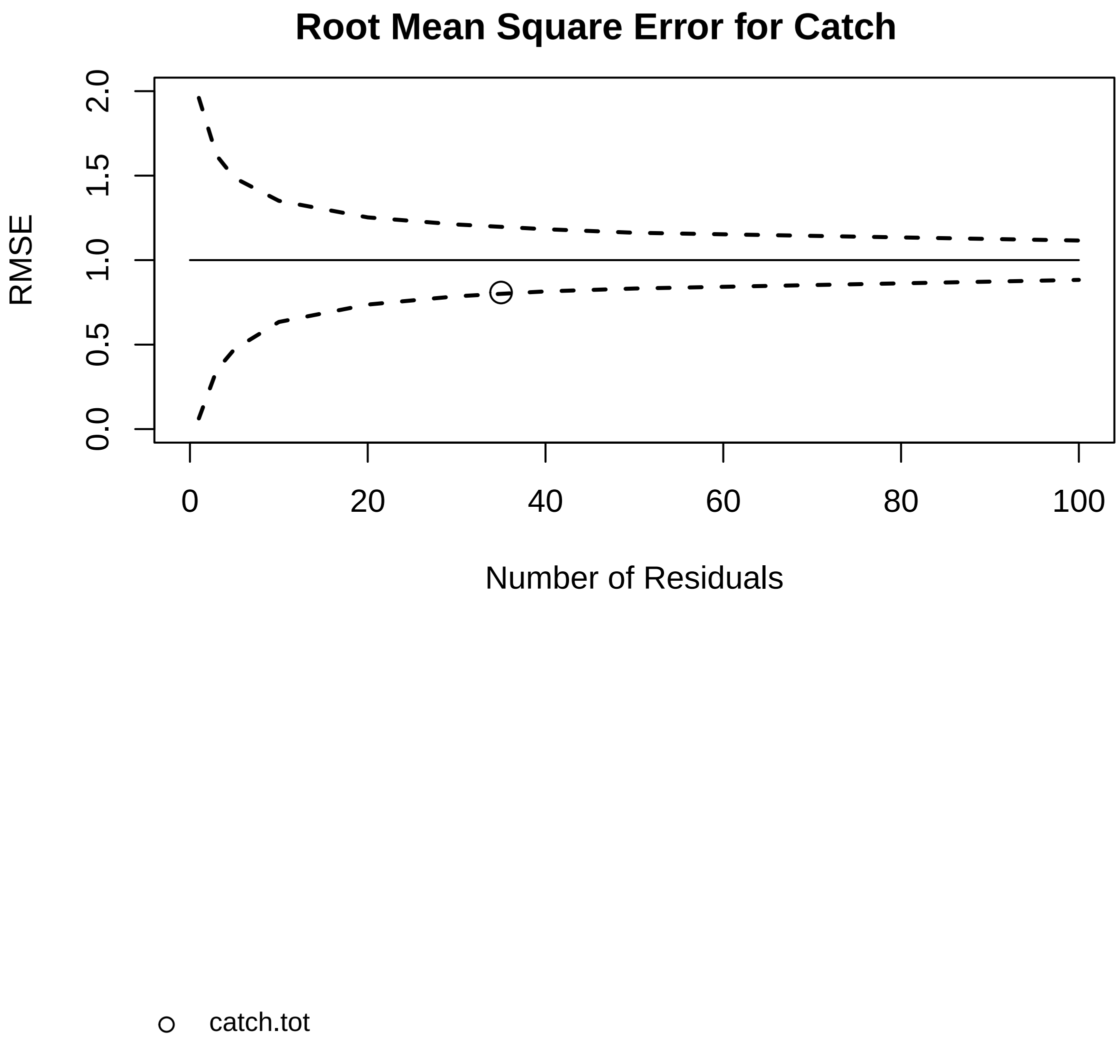

CV (parameter estimate)
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
Parameter number

Root Mean Square Error computed from Standardized Residuals

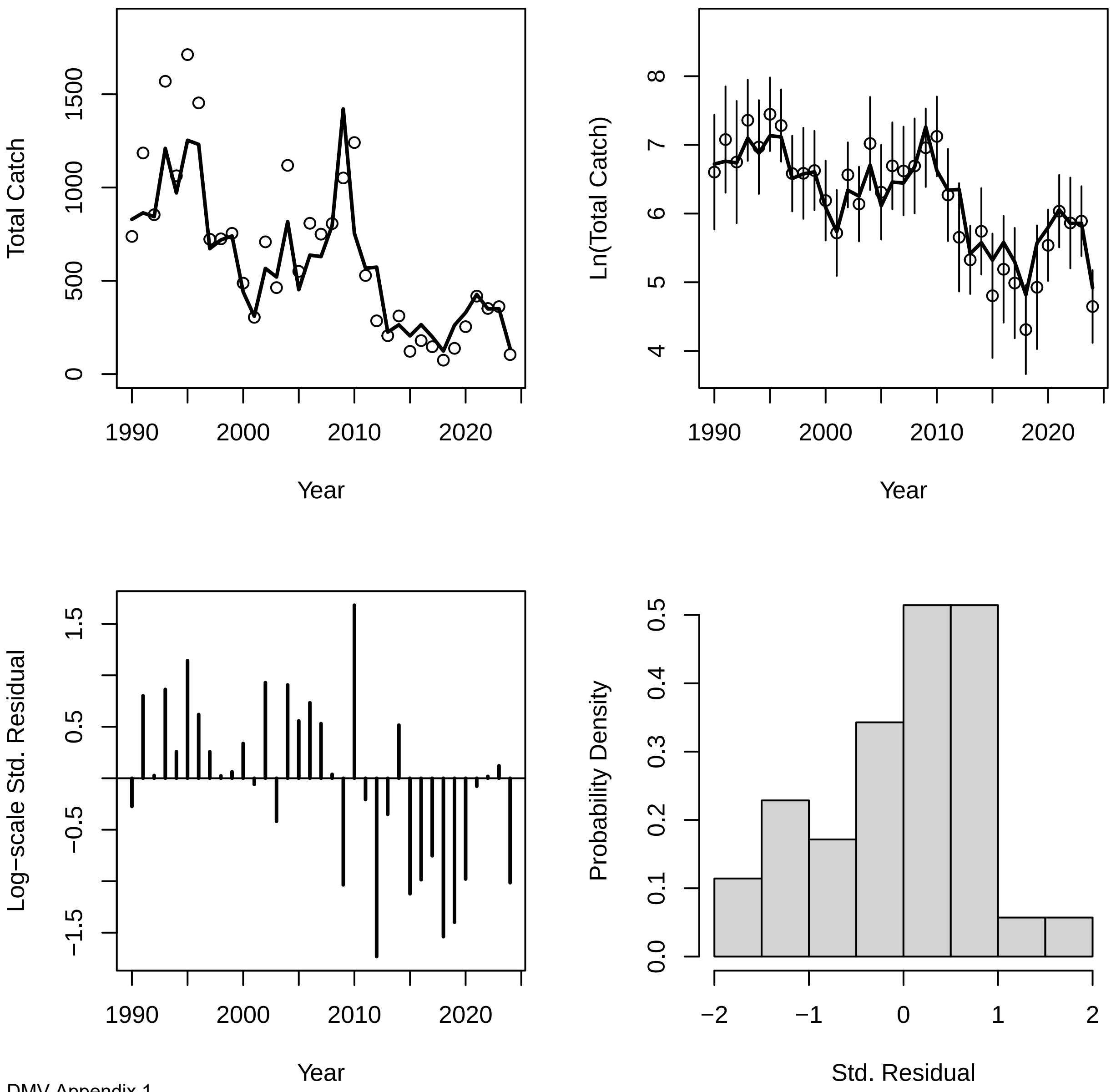
Component	# resids	RMSE
catch.tot	35	0.808
discard.tot	0	0
ind.total	35	1.22
N.year1	0	0
Fmult.year1	1	2.81
Fmult.devs.total	34	0.948
recruit.devs	35	1.21
fleet.sel.params	0	0
index.sel.params	0	0
q.year1	0	0
q.devs	0	0
SR.steepness	0	0
SR.scaler	0	0


Root Mean Square Error for Indices
RMSE
2.0
1.5
1.0
0.5
0.0
0
20
40
60
80
100
Number of Residuals

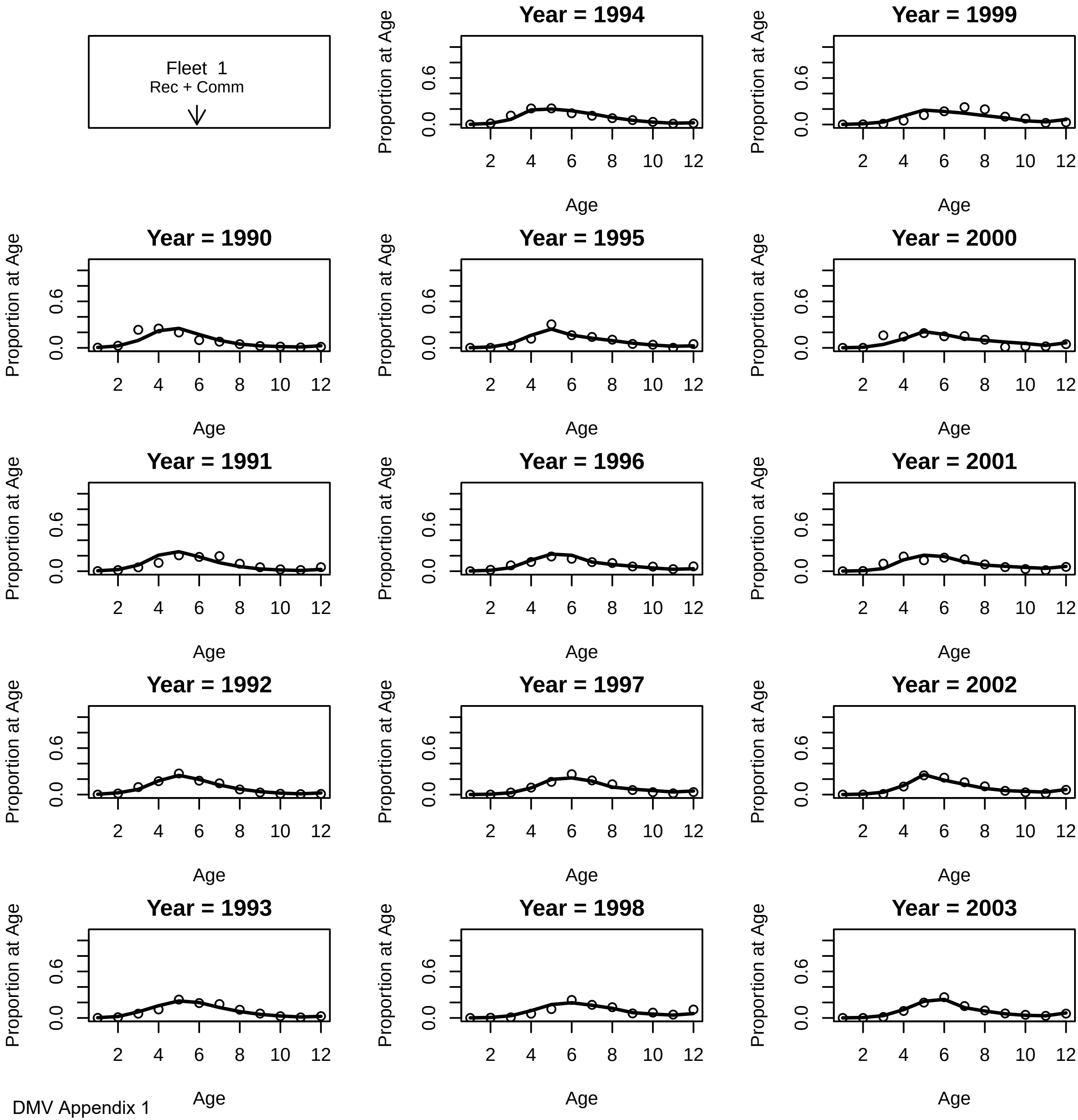

MRIP CPUE

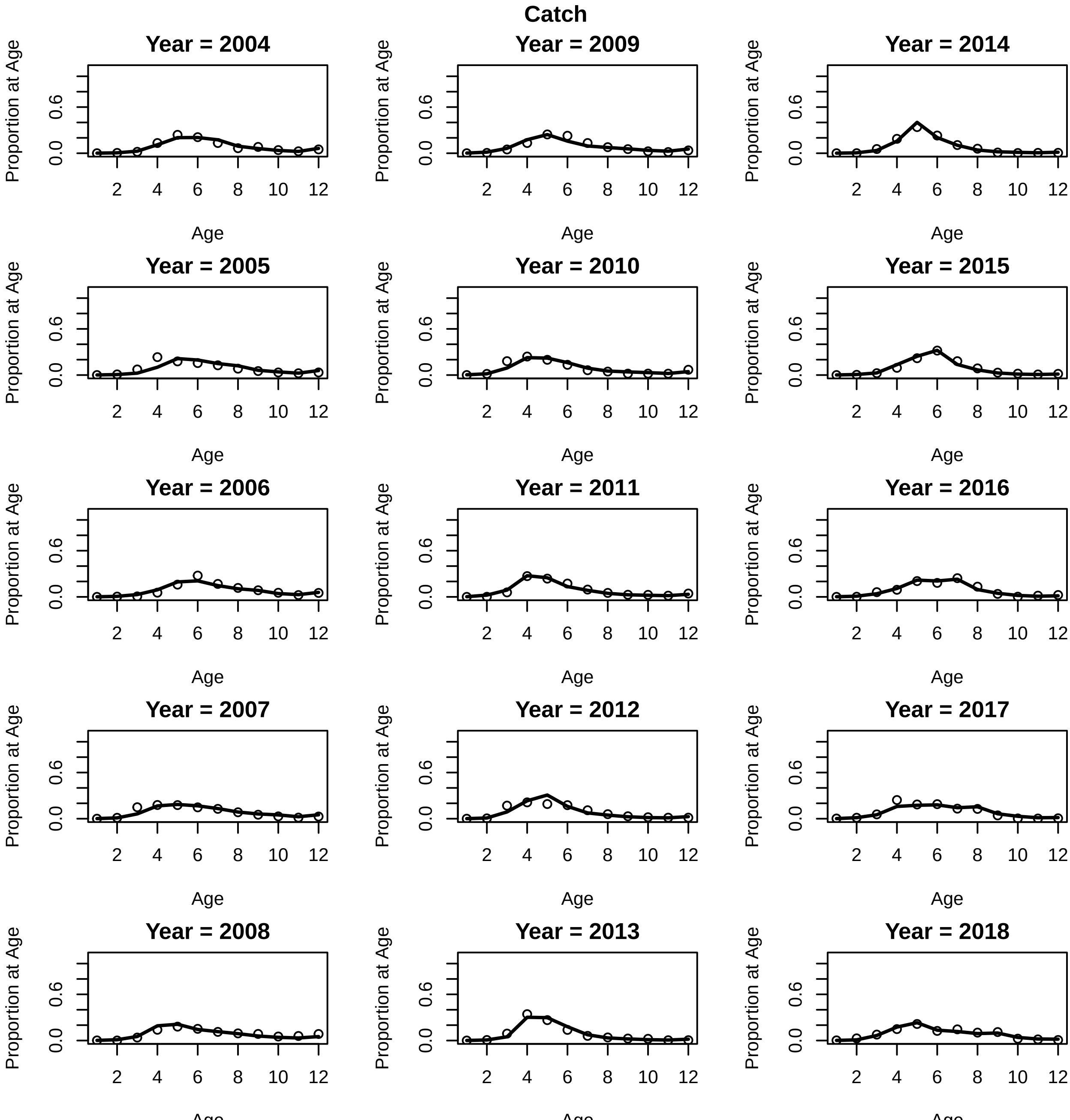

Root Mean Square Error for Catch
RMSE
0.0
0.5
1.0
1.5
2.0
0
20
40
60
80
100
Number of Residuals
catch.tot

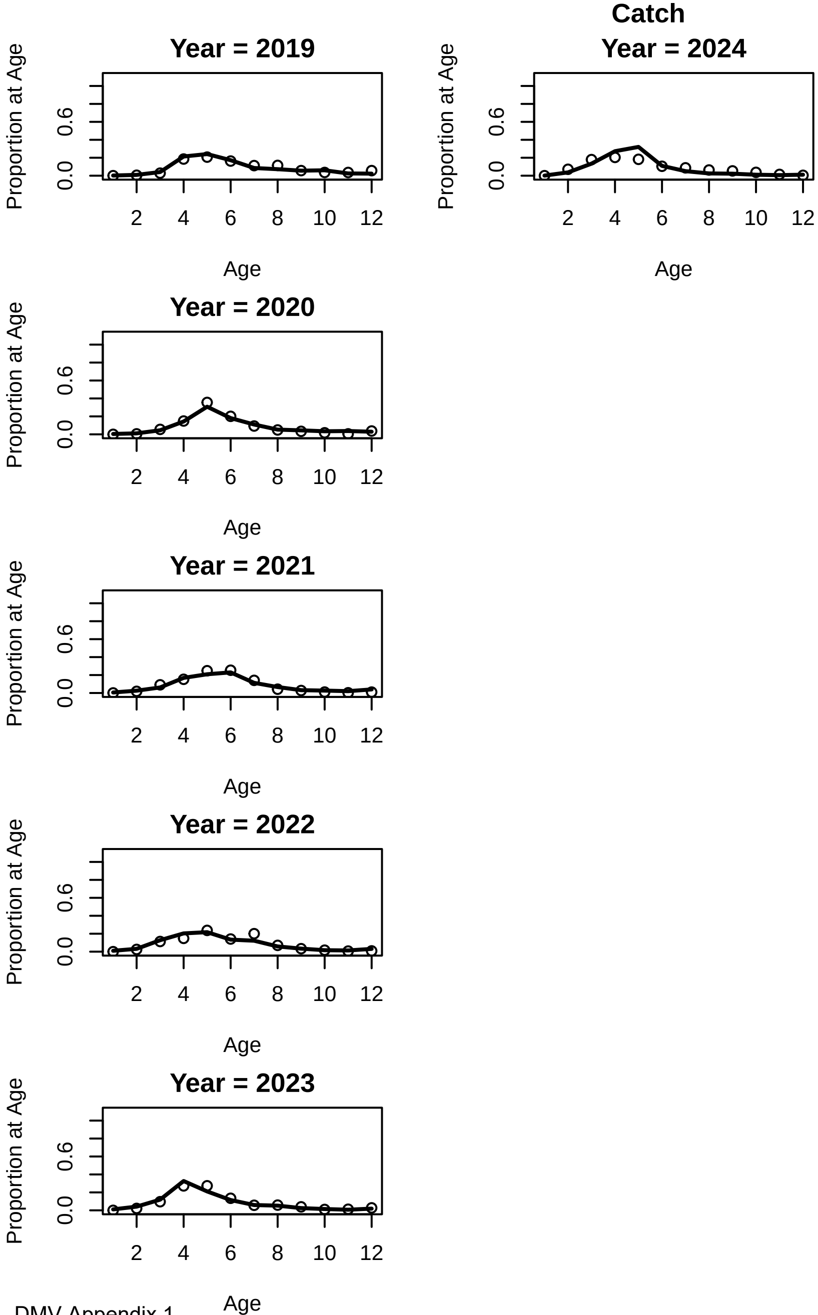
Fleet 1 Catch (Rec + Comm)

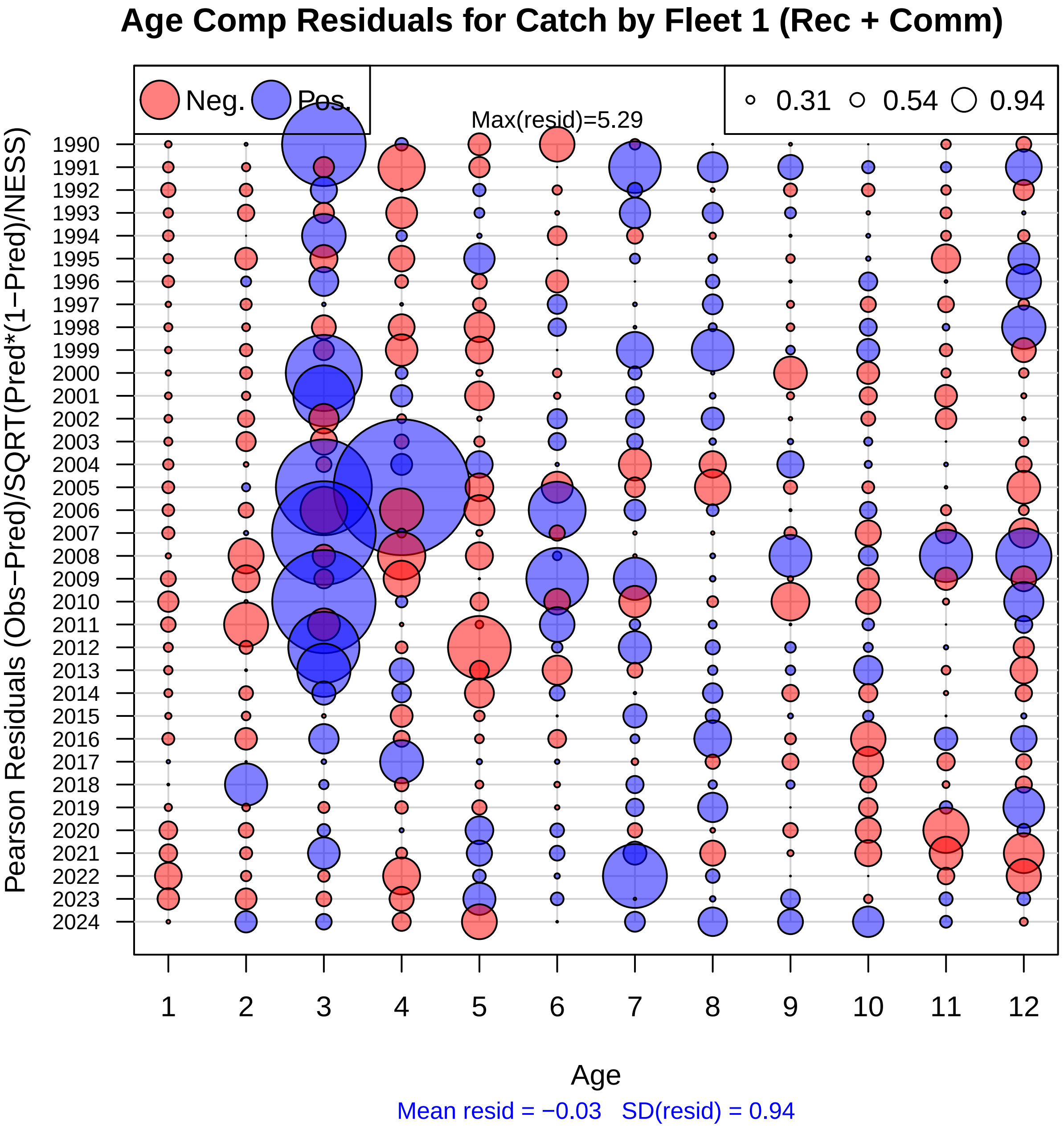


Catch

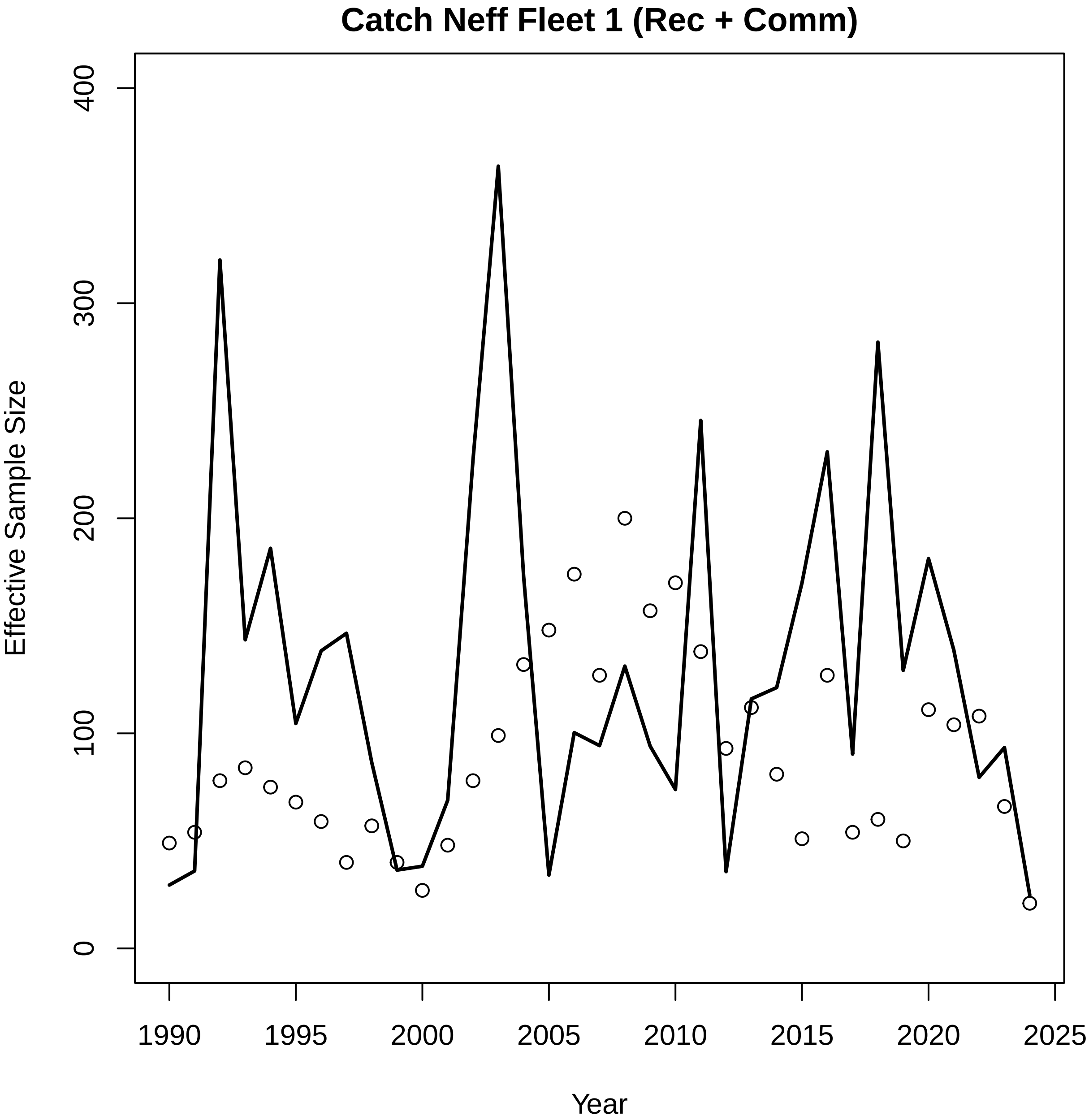

Fleet 1
Rec + Comm
Year = 1990
Year = 1991
Year = 1992
Year = 1993
Year = 1994
Year = 1995
Year = 1996
Year = 1997
Year = 1998
Year = 1999
Year = 2000
Year = 2001
Year = 2002
Year = 2003
Proportion at Age
0.0
0.6
Age
2
4
6
8
10
12

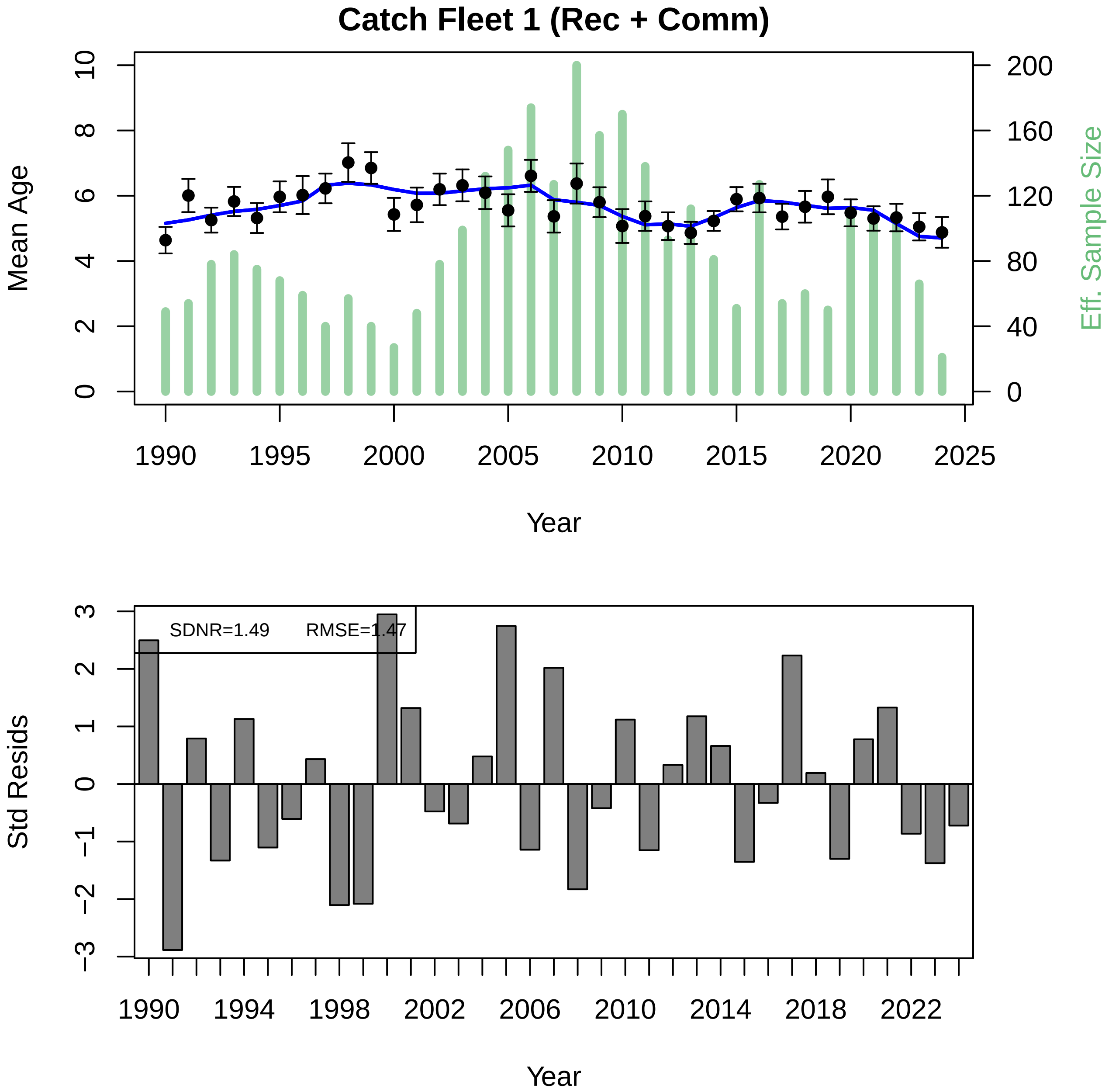

Catch
Year = 2004
Year = 2009
Year = 2014
Year = 2005
Year = 2010
Year = 2015
Year = 2006
Year = 2011
Year = 2016
Year = 2007
Year = 2012
Year = 2017
Year = 2008
Year = 2013
Year = 2018
Proportion at Age
0.0
0.6
Age
2
4
6
8
10
12


Catch
Year = 2019
Year = 2024
Year = 2020
Year = 2021
Year = 2022
Year = 2023
Proportion at Age
0.0
0.6
Age
2
4
6
8
10
12

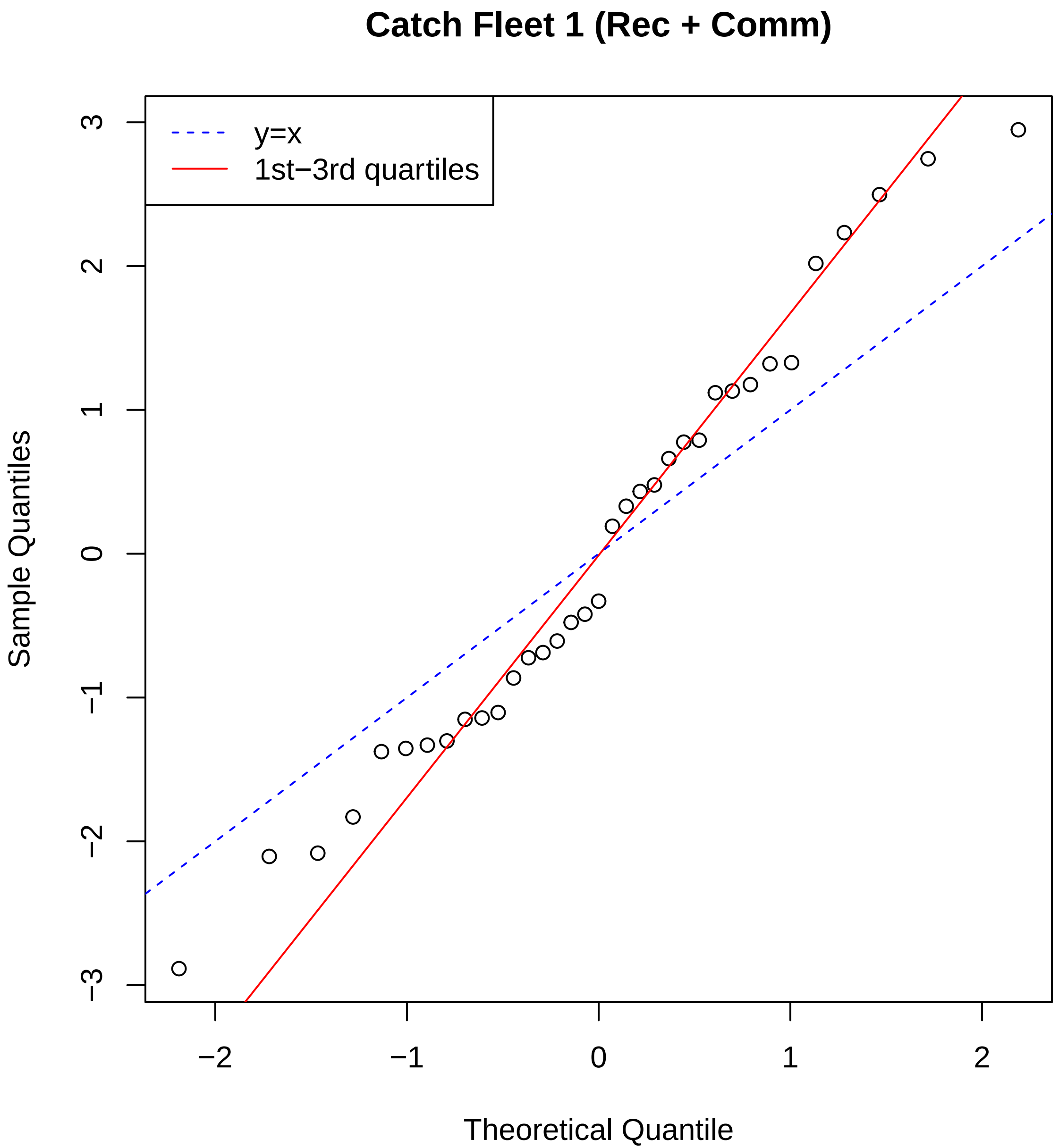


Age Comp Residuals for Catch by Fleet 1 (Rec + Comm)
Neg.
Pos.
0.31
0.54
0.94
Max(resid)=5.29
Pearson Residuals (Obs−Pred)/SQRT(Pred*(1−Pred)/NESS)
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
1
2
3
4
5
6
7
8
9
10
11
12
Age
Mean resid = −0.03 SD(resid) = 0.94

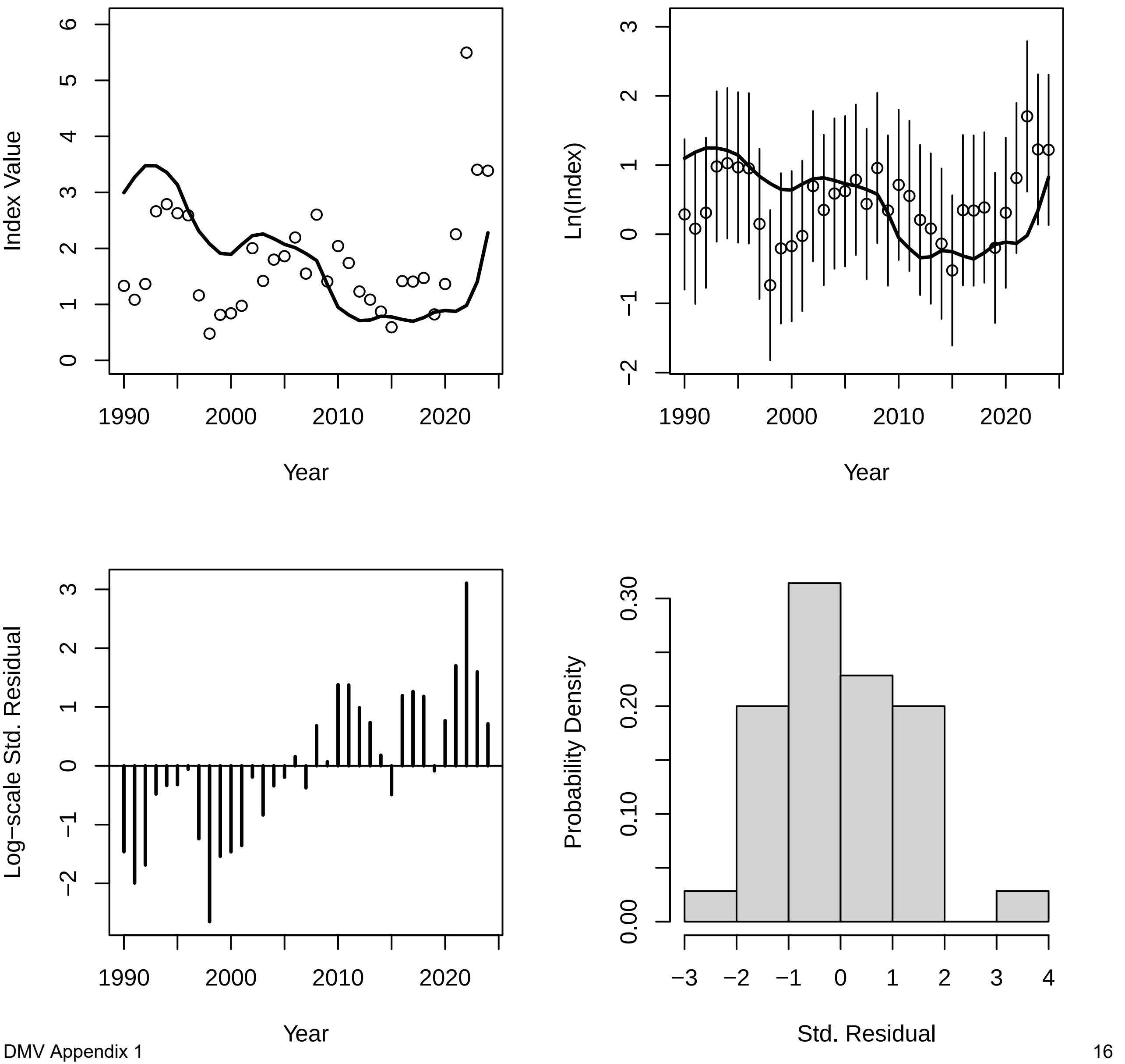

Catch Neff Fleet 1 (Rec + Comm)
Effective Sample Size
0
100
200
300
400
1990
1995
2000
2005
2010
2015
2020
2025
Year

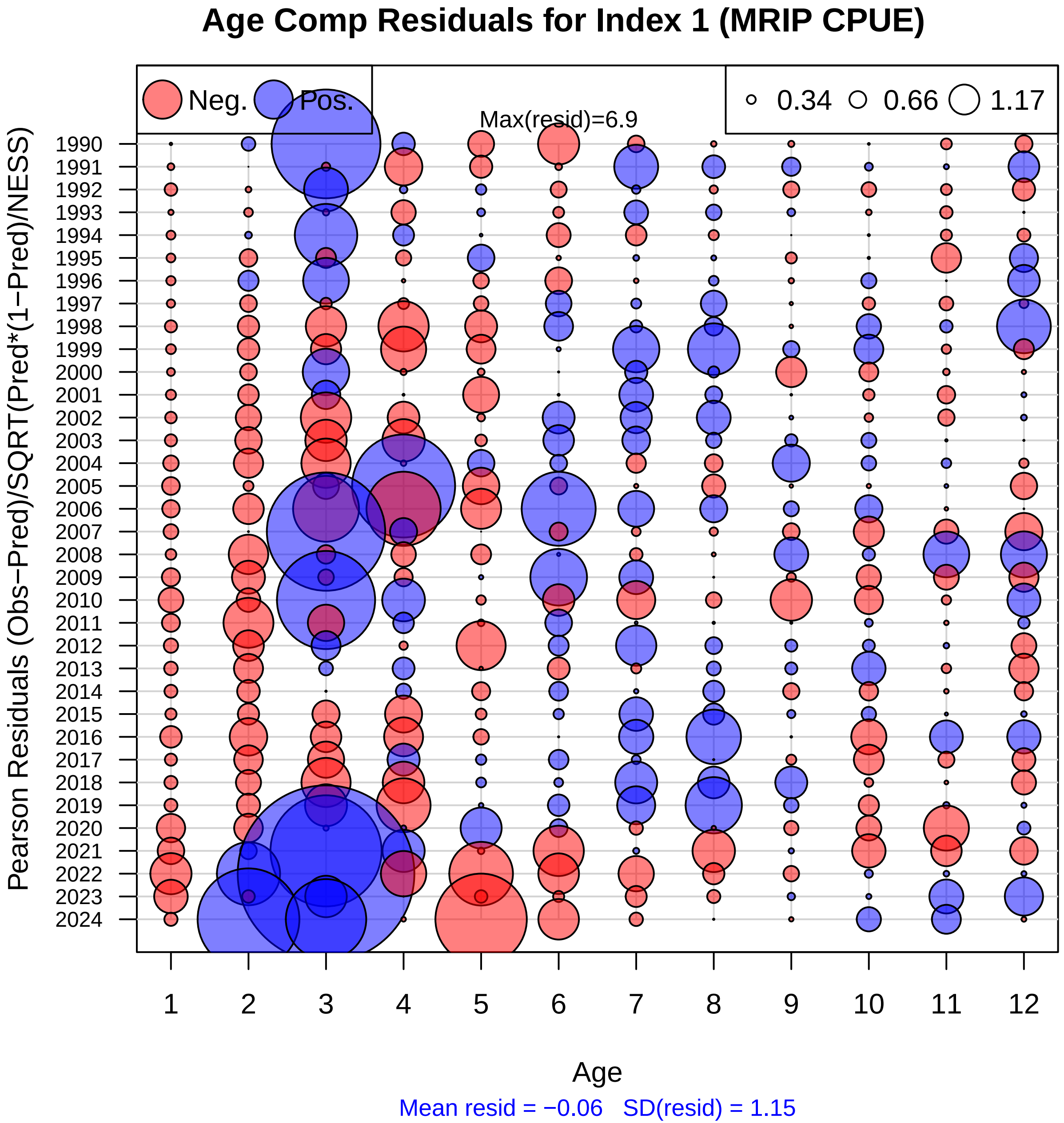


Catch Fleet 1 (Rec + Comm)
Mean Age
Eff. Sample Size
Year
SDNR=1.49
RMSE=1.47
Std Resids
Year

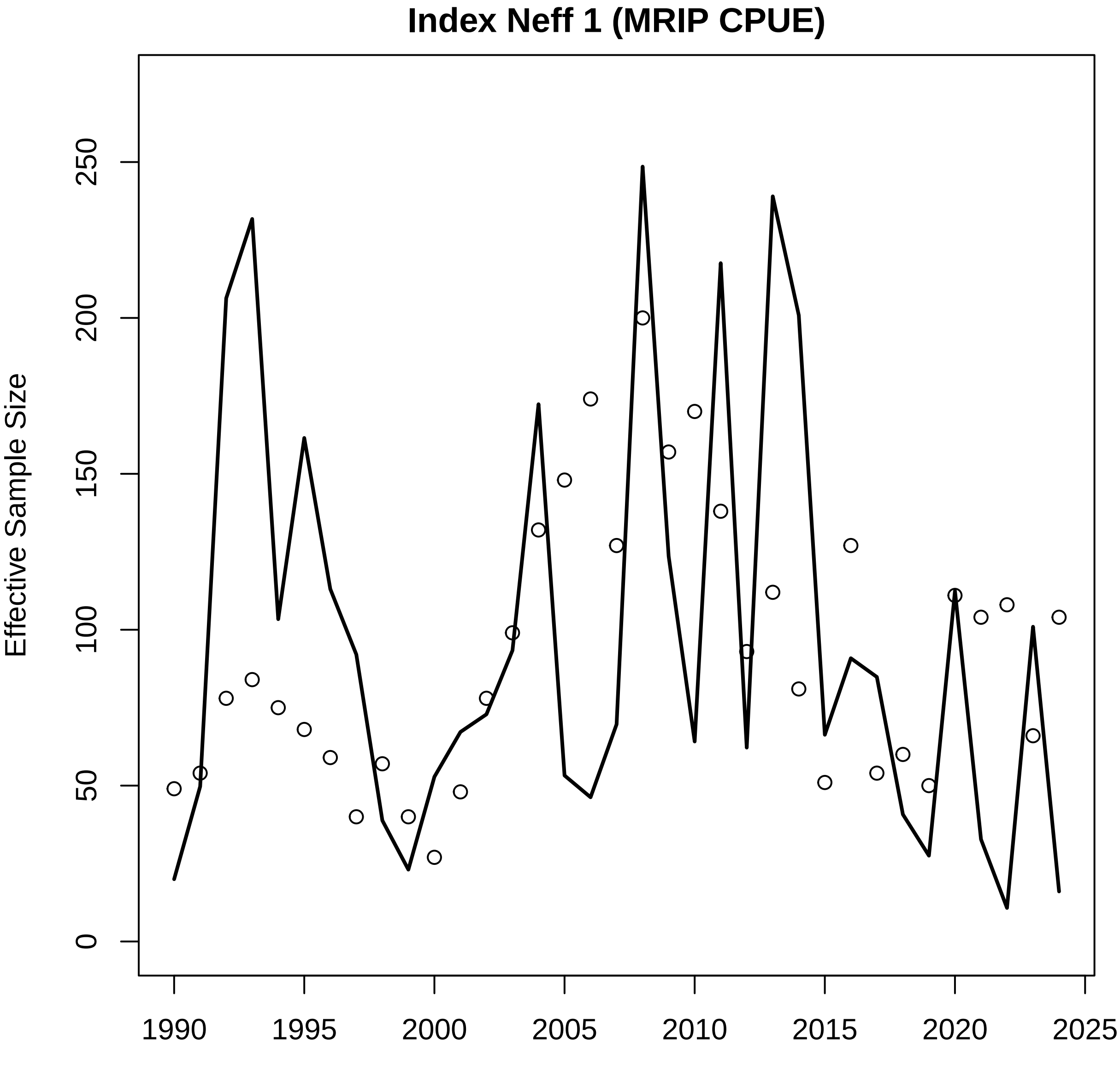

Catch Fleet 1 (Rec + Comm)
y=x
1st−3rd quartiles
Sample Quantiles
Theoretical Quantile
3
2
1
0
−1
−2
−3
−2
−1
0
1
2

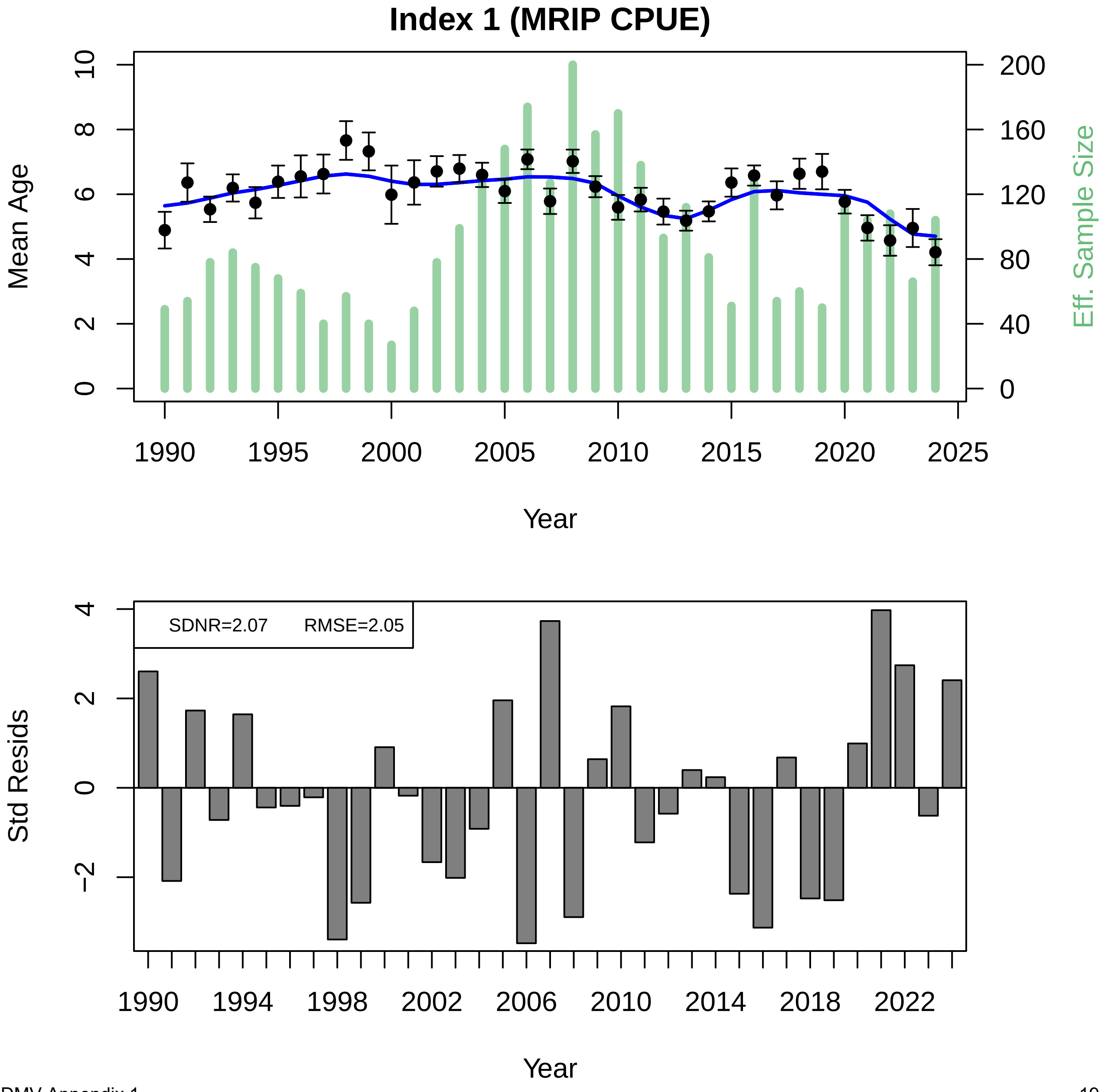
Index 1 (MRIP CPUE)

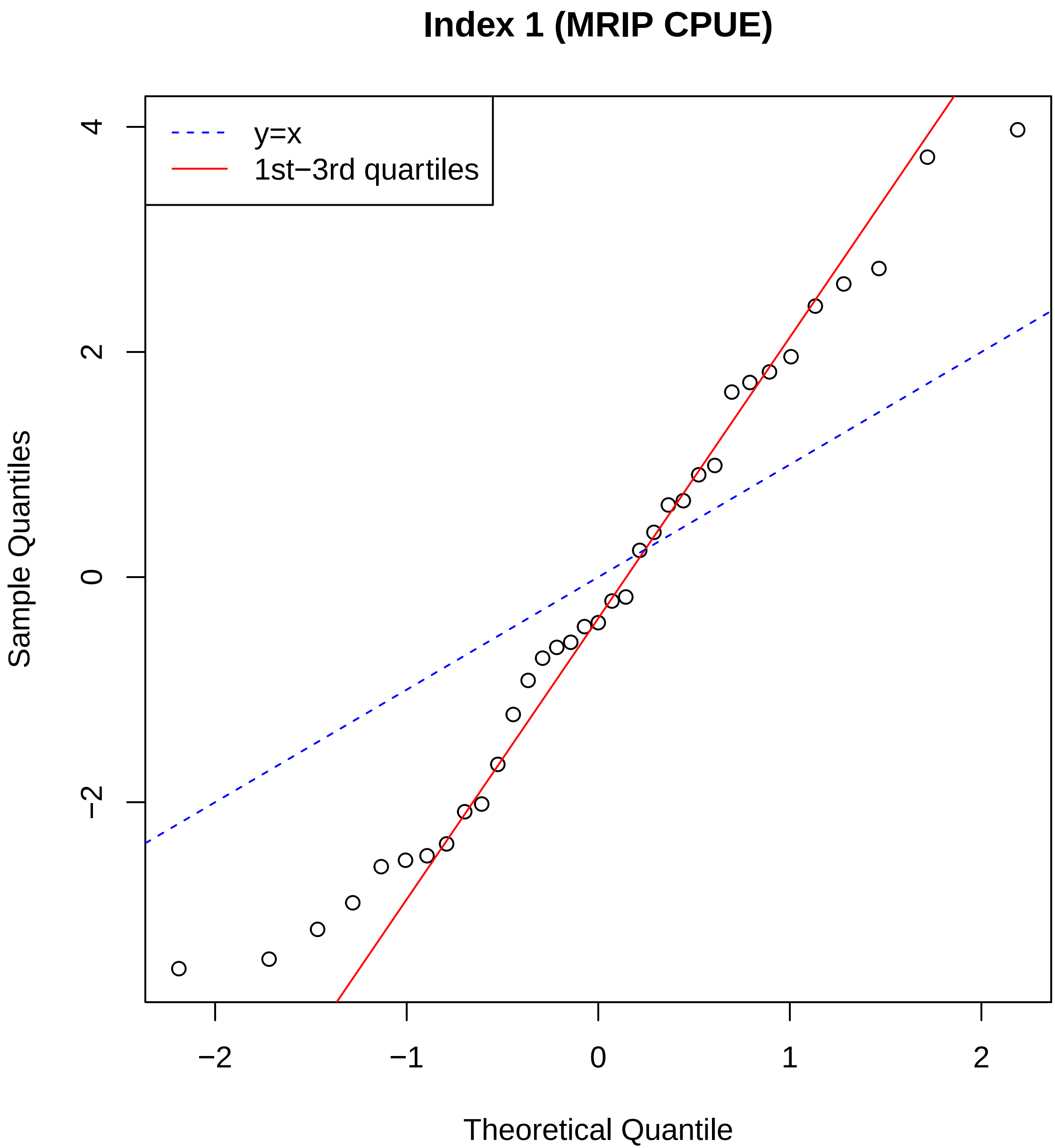


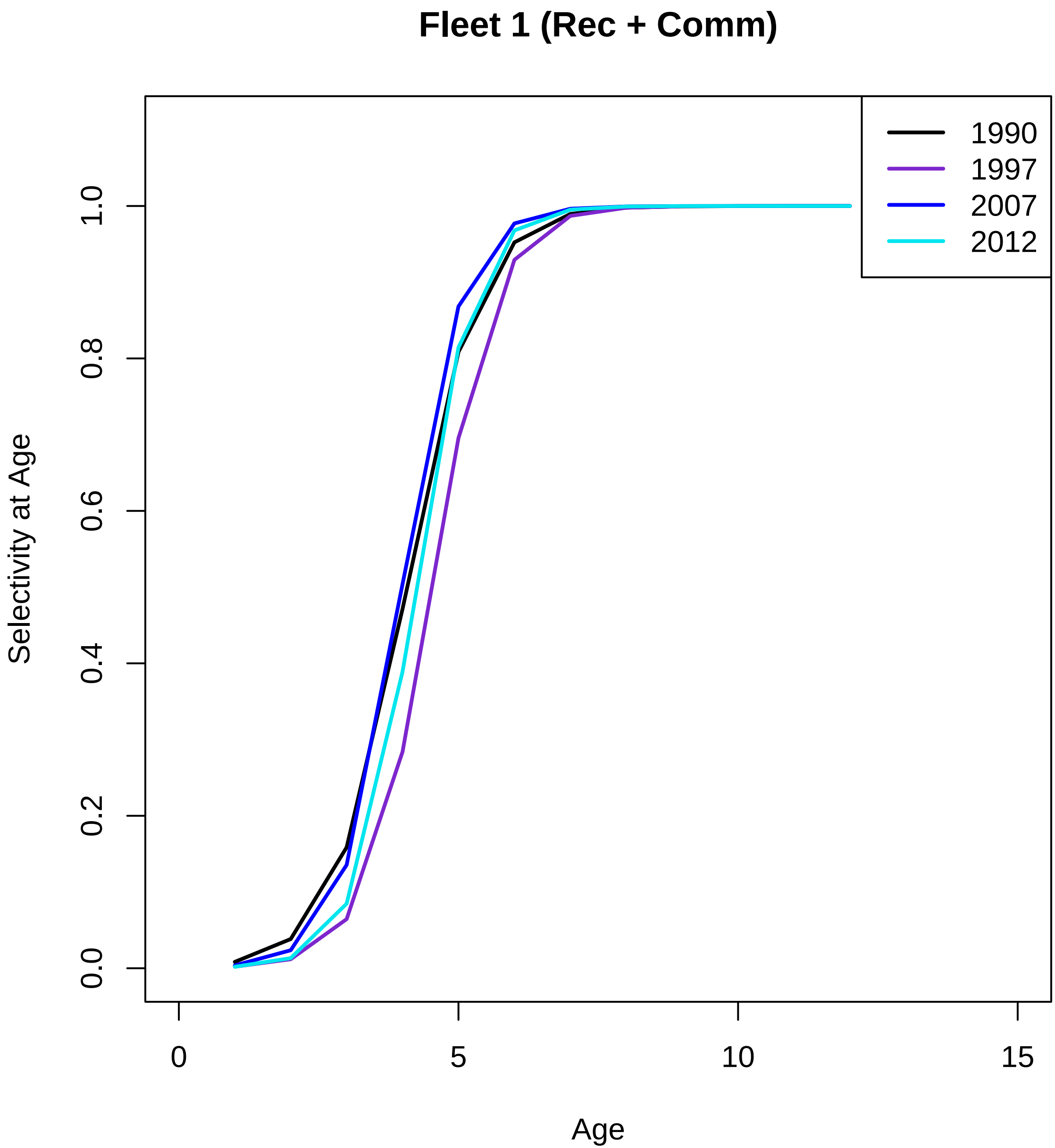


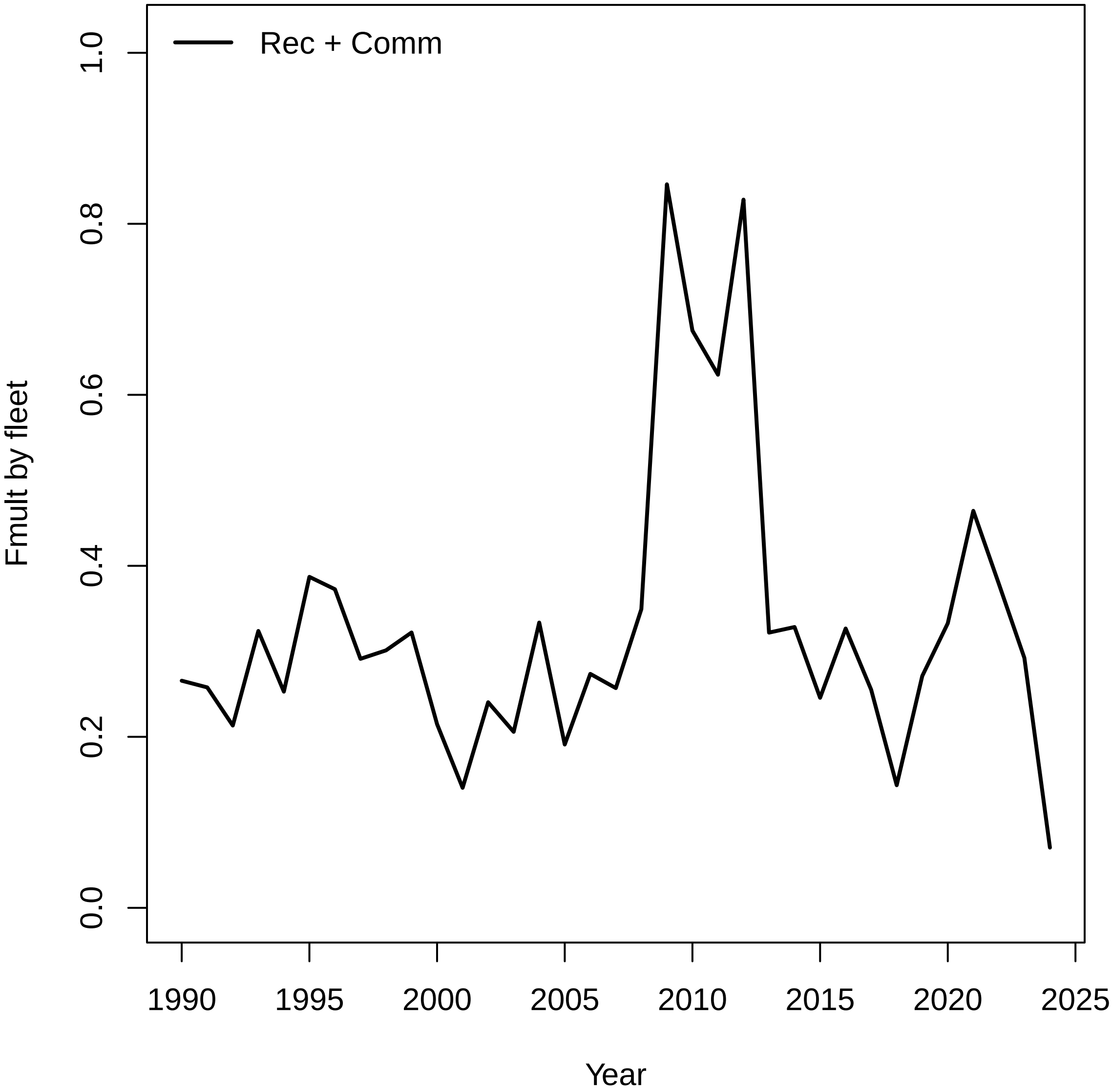
Age Comp Residuals for Index 1 (MRIP CPUE)
Neg.
Pos.
0.34
0.66
1.17
Max(resid)=6.9
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
Pearson Residuals (Obs−Pred)/SQRT(Pred*(1−Pred)/NESS)
1
2
3
4
5
6
7
8
9
10
11
12
Age
Mean resid = −0.06 SD(resid) = 1.15


Index Neff 1 (MRIP CPUE)
Effective Sample Size
0
50
100
150
200
250
1990
1995
2000
2005
2010
2015
2020
2025
Year

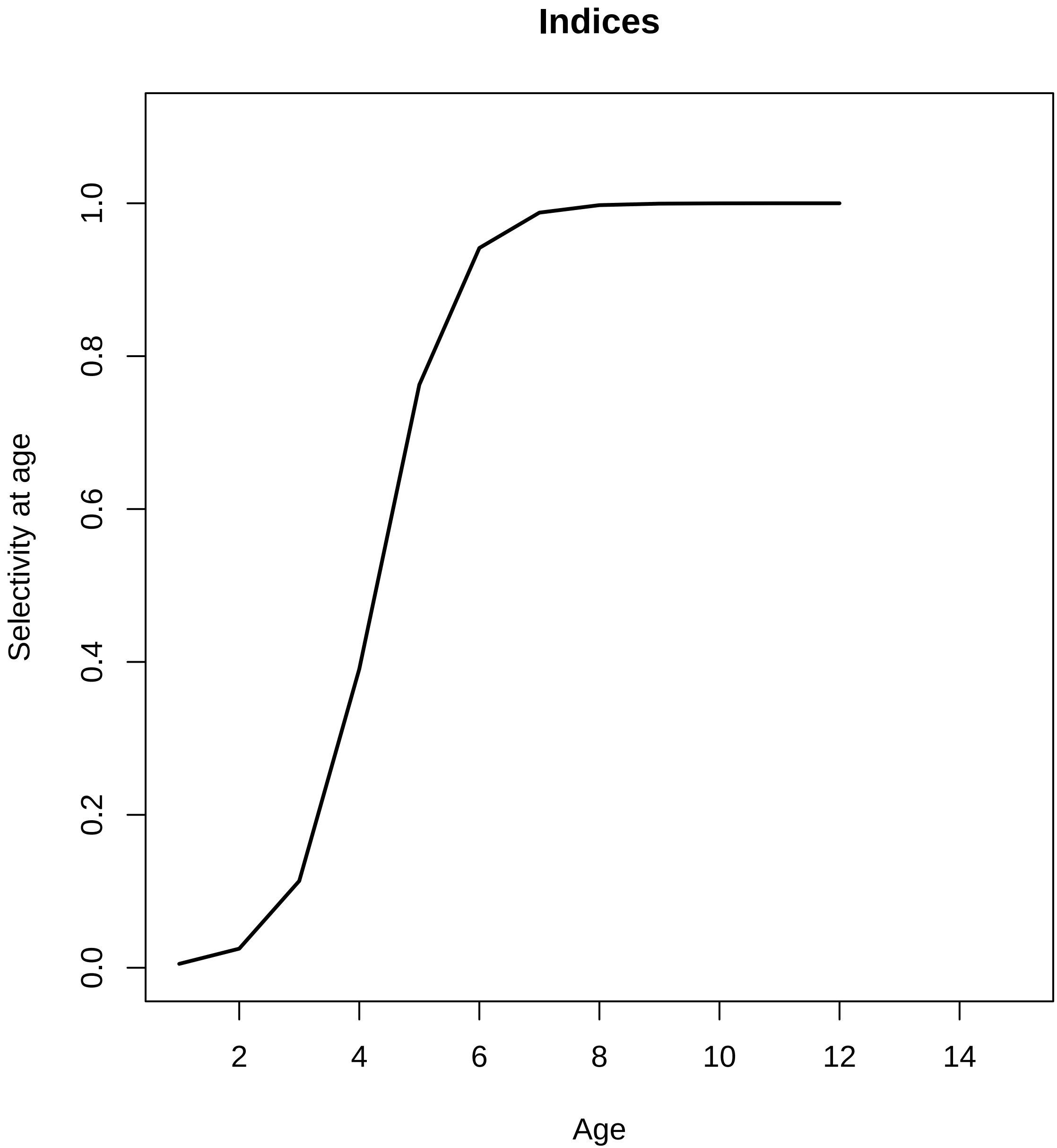

Index 1 (MRIP CPUE)
Mean Age
Eff. Sample Size
Year
SDNR=2.07
RMSE=2.05
Std Resids
Year

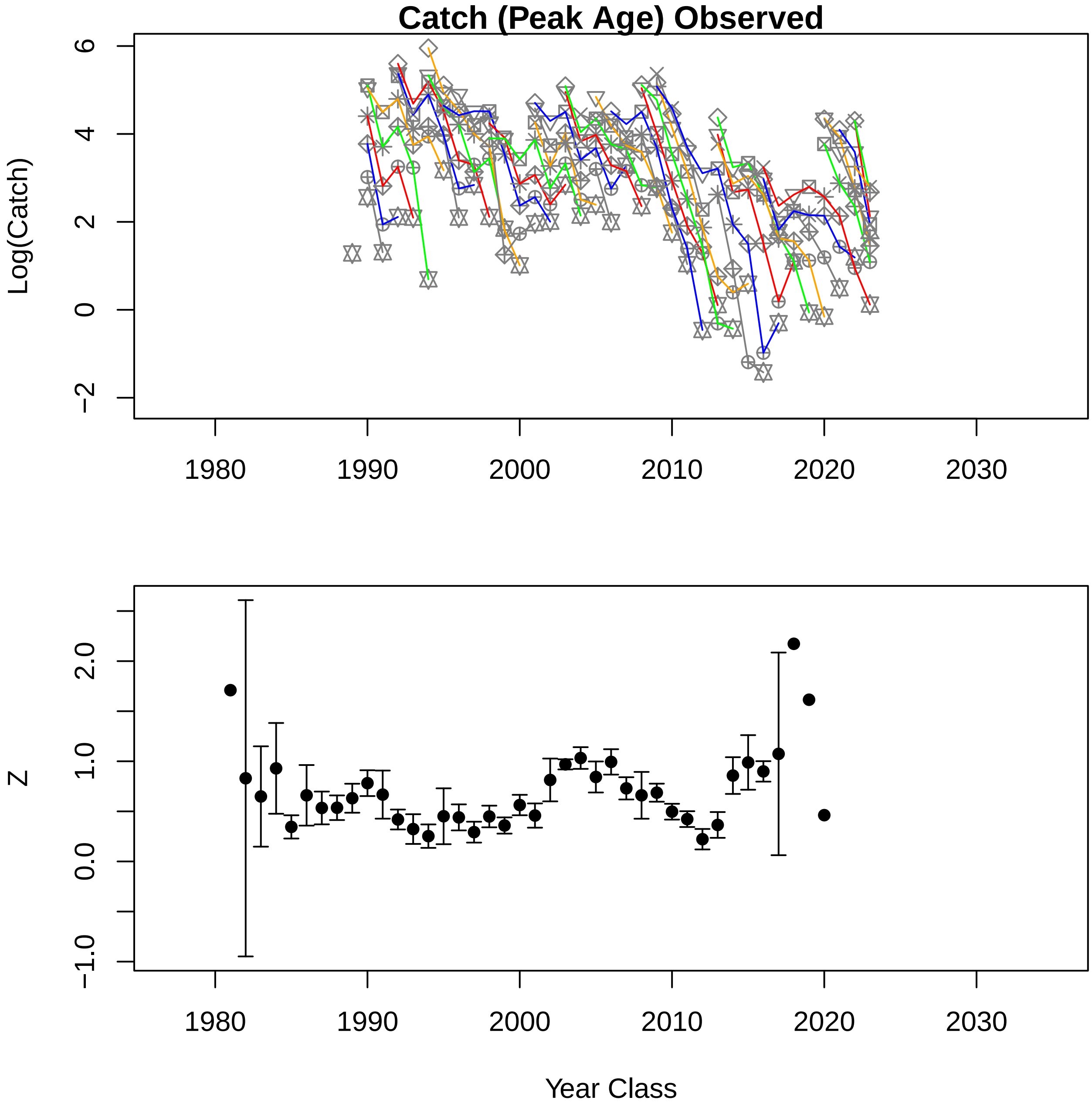

Index 1 (MRIP CPUE)
y=x
1st−3rd quartiles
Sample Quantiles
4
2
0
−2
−2
−1
0
1
2
Theoretical Quantile


Fleet 1 (Rec + Comm)
1990
1997
2007
2012
Selectivity at Age
0.0
0.2
0.4
0.6
0.8
1.0
0
5
10
15
Age

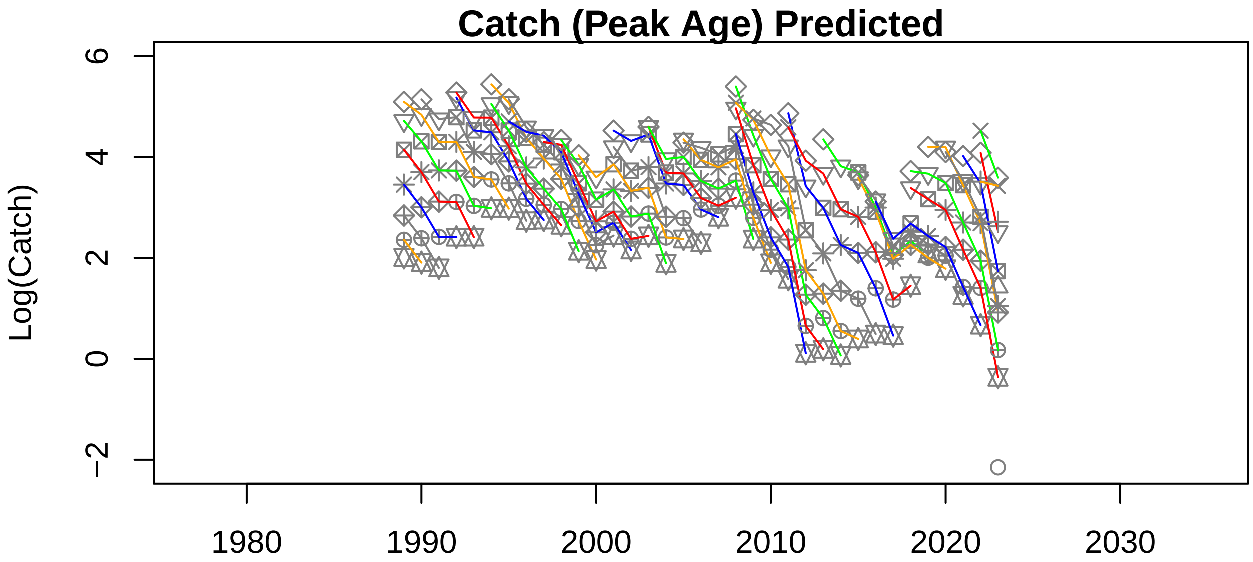


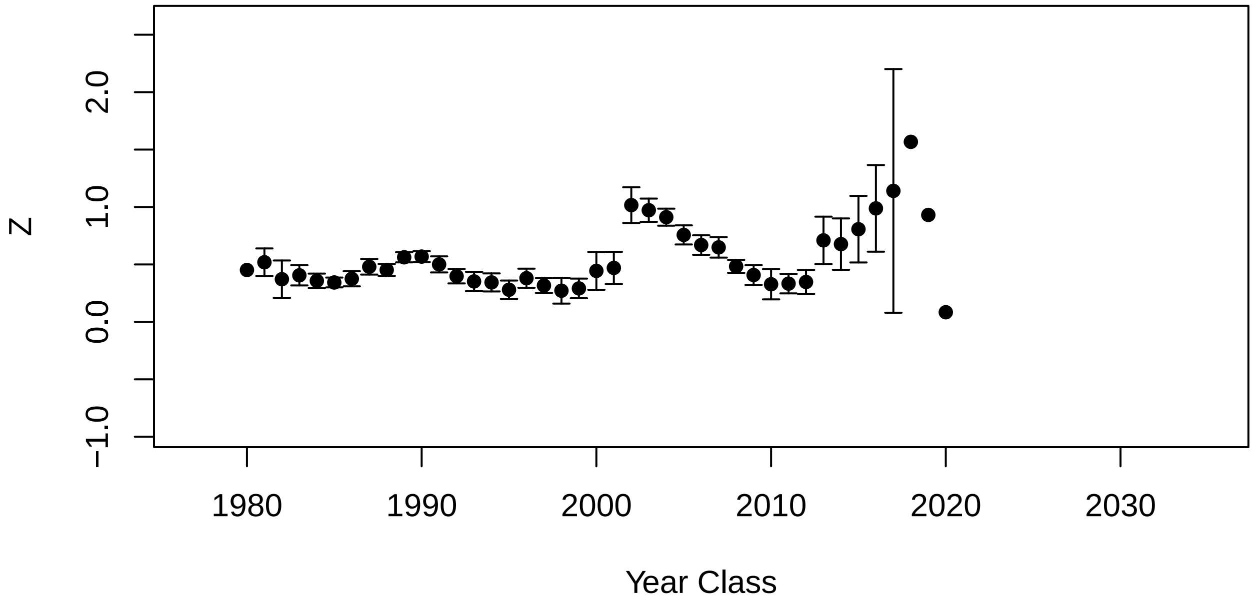
Rec + Comm
Fmult by fleet
0.0
0.2
0.4
0.6
0.8
1.0
1990
1995
2000
2005
2010
2015
2020
2025
Year

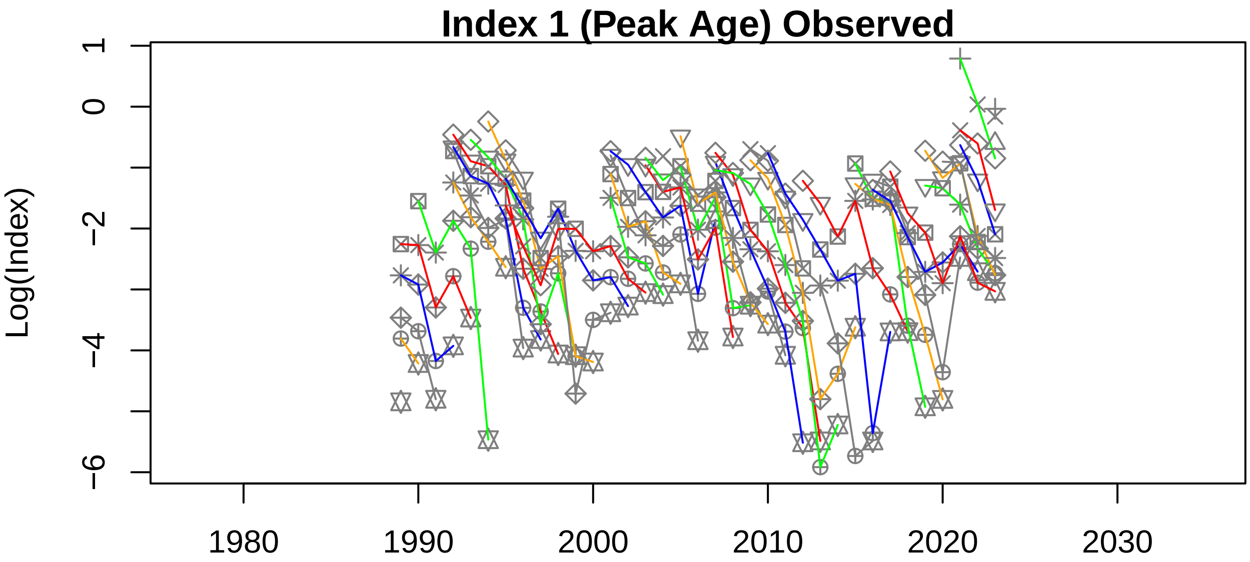

Indices
Selectivity at age
0.0
0.2
0.4
0.6
0.8
1.0
2
4
6
8
10
12
14
Age

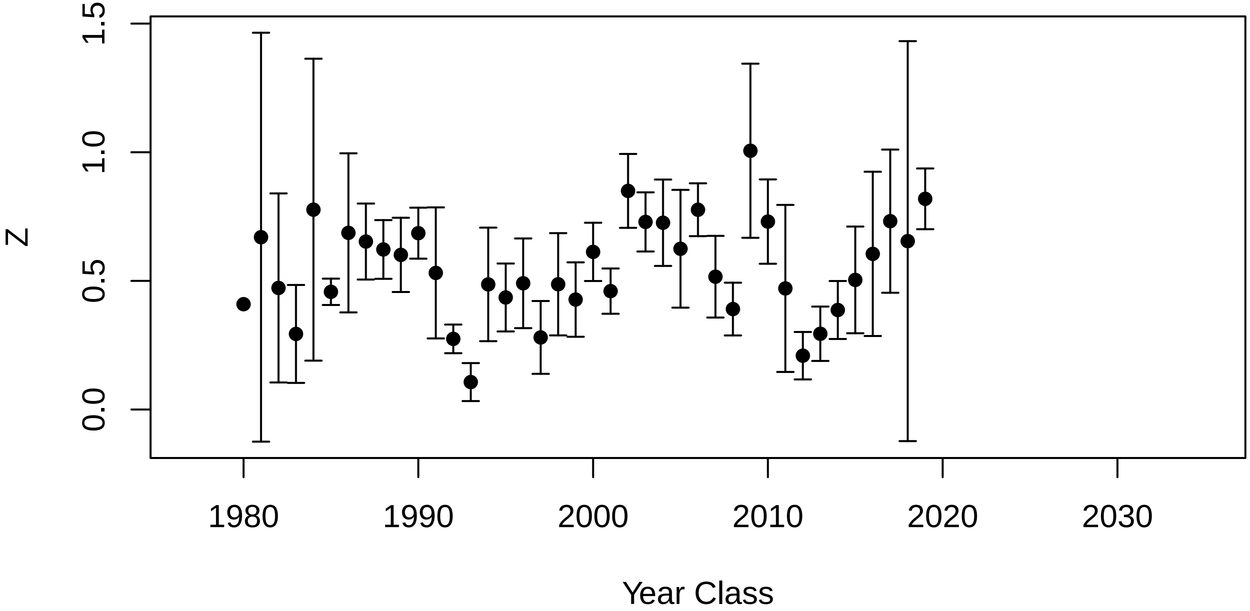


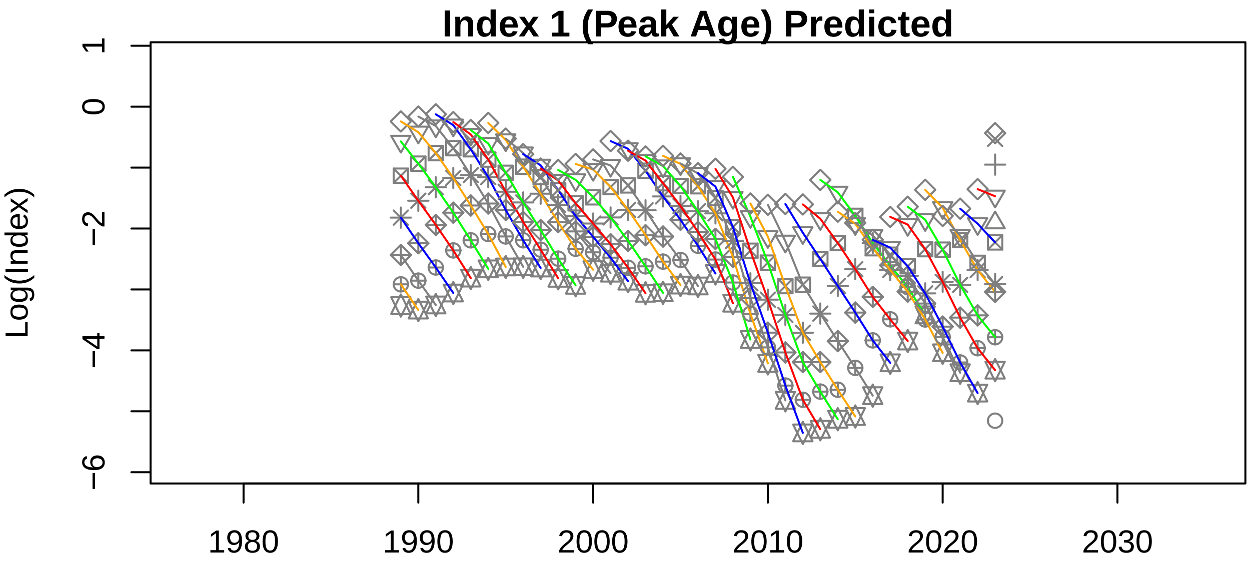
Catch (Peak Age) Observed
Log(Catch)
6
4
2
0
−2
1980
1990
2000
2010
2020
2030
Z
2.0
1.0
0.0
−1.0
1980
1990
2000
2010
2020
2030
Year Class

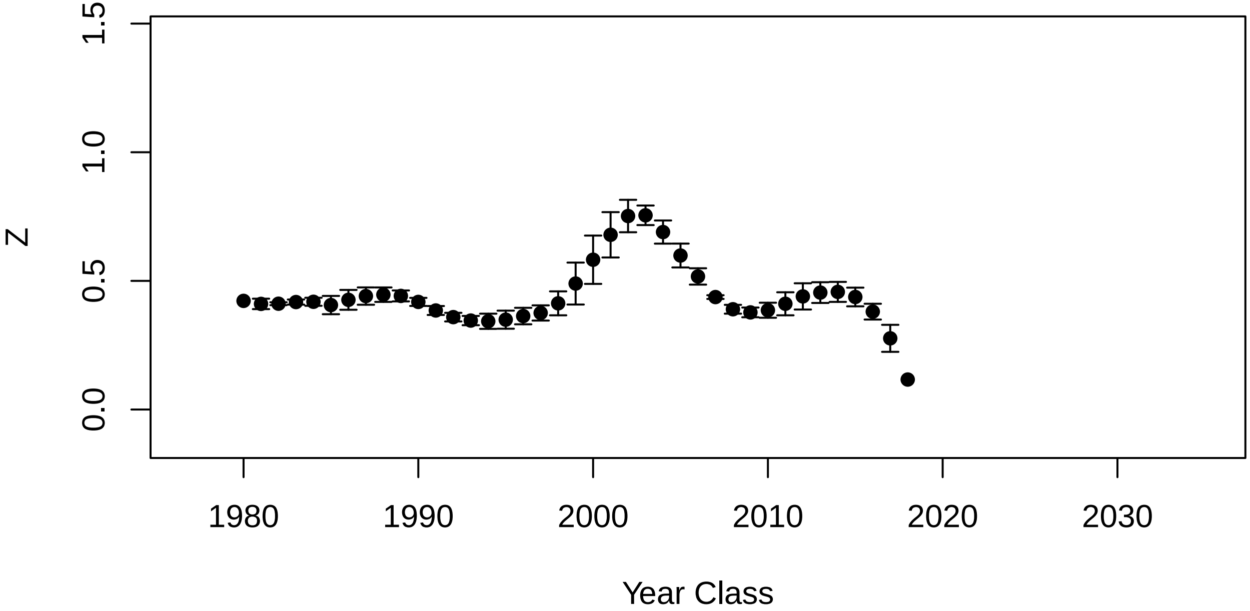

Catch (Peak Age) Predicted
Log(Catch)
6
4
2
0
−2
1980
1990
2000
2010
2020
2030

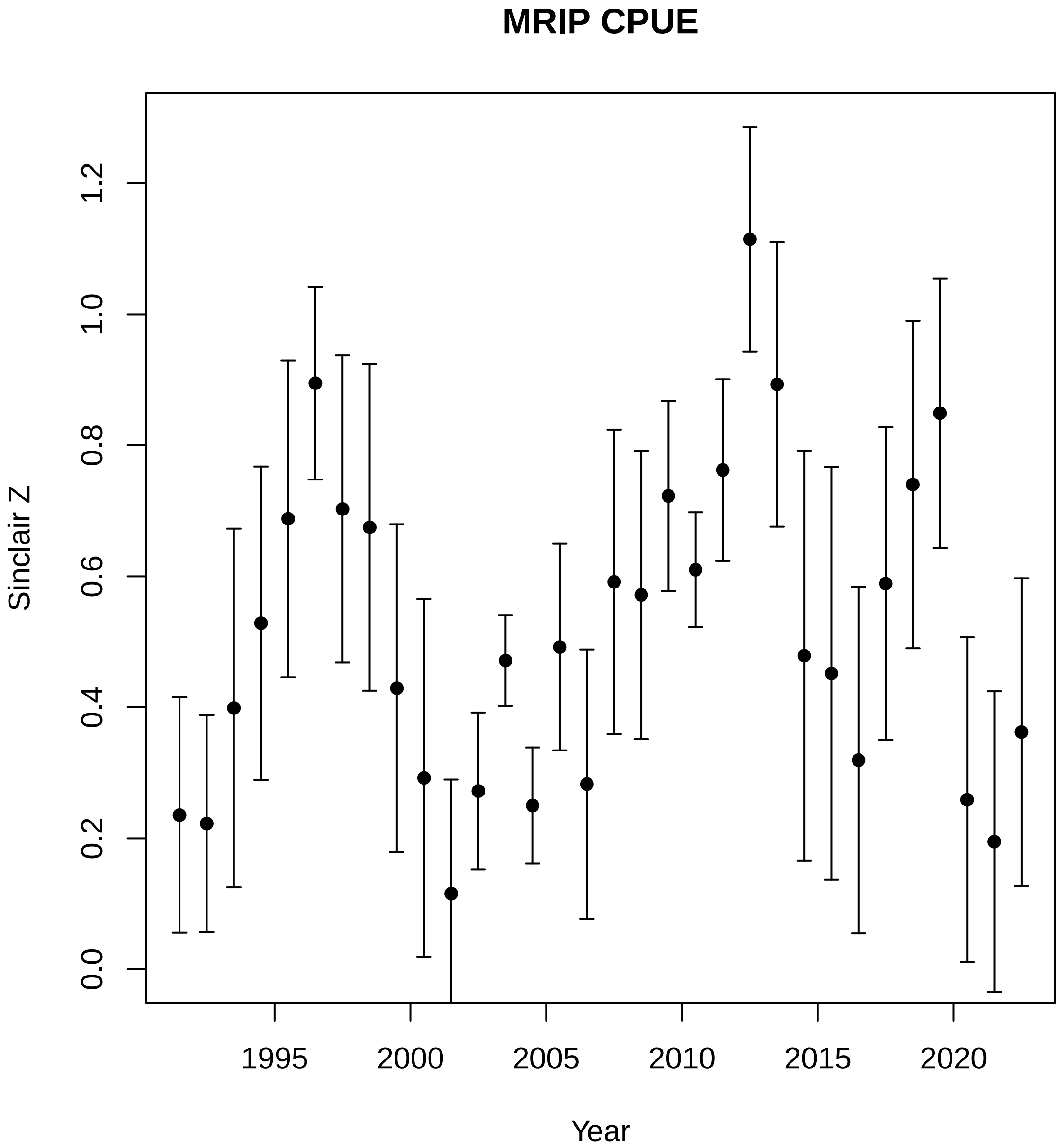

Z
2.0
1.0
0.0
−1.0
1980
1990
2000
2010
2020
2030
Year Class

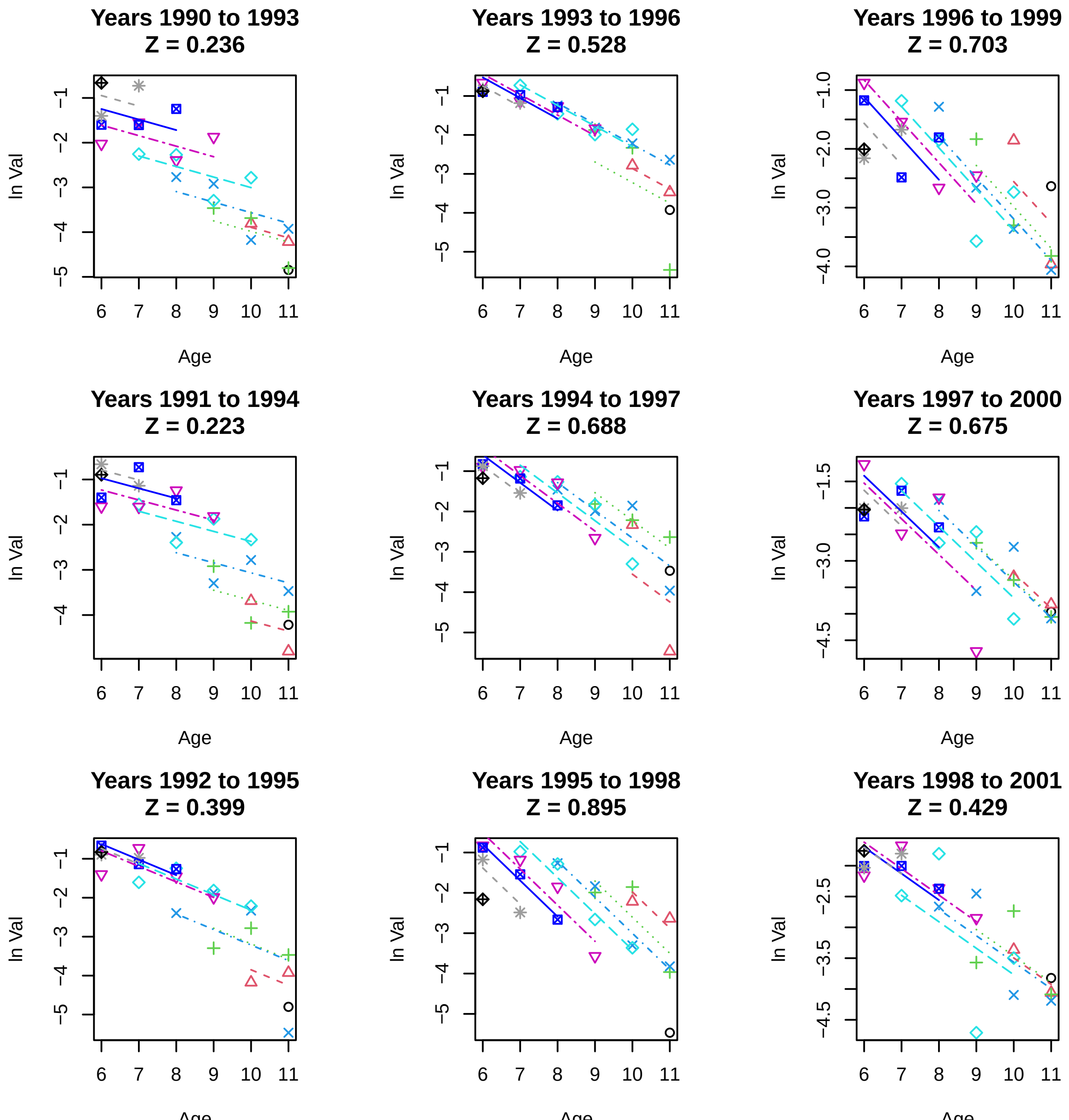

Index 1 (Peak Age) Observed
Log(Index)
1
0
−2
−4
−6
1980
1990
2000
2010
2020
2030

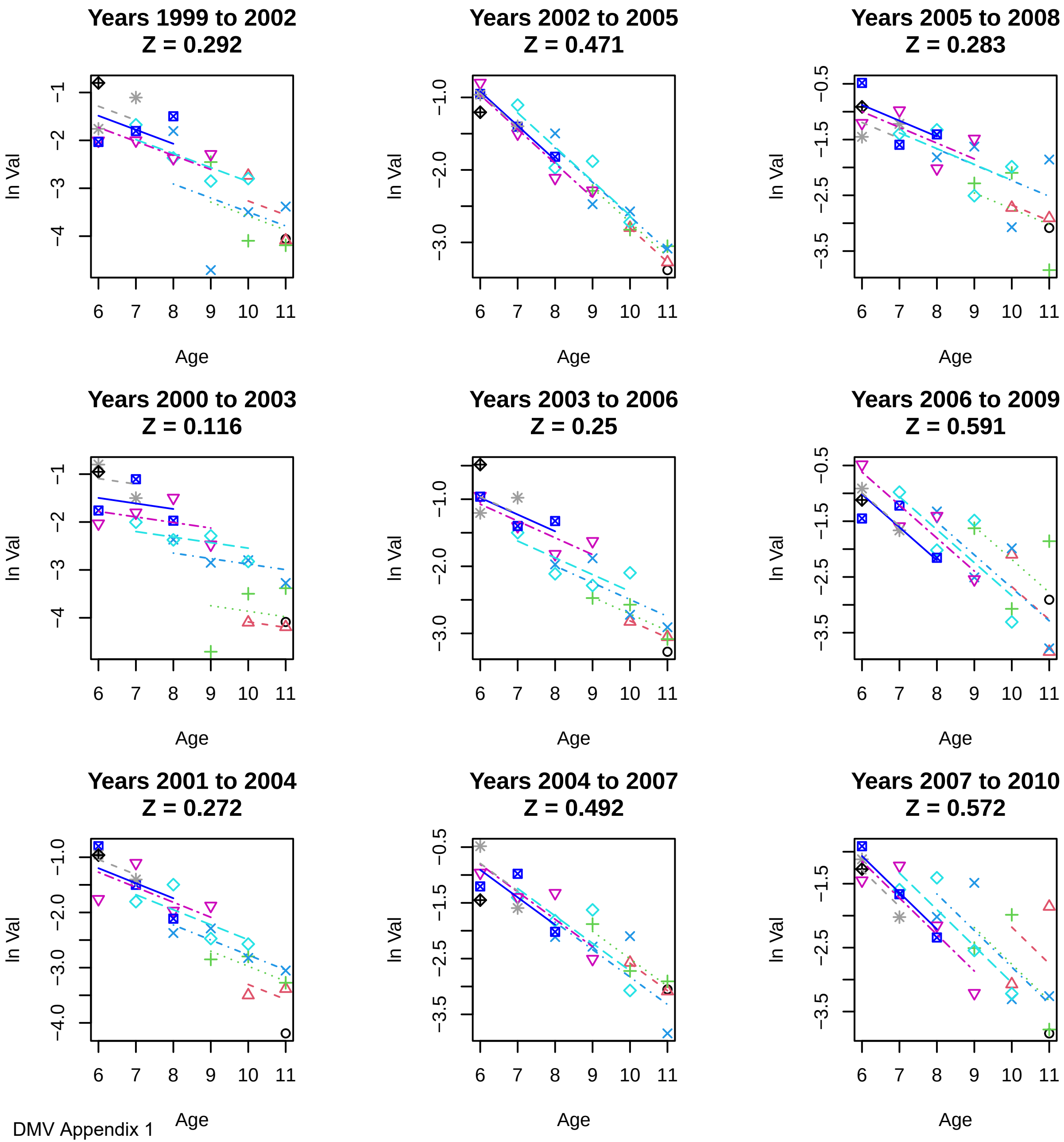

Z
1.5
1.0
0.5
0.0
1980
1990
2000
2010
2020
2030
Year Class


Index 1 (Peak Age) Predicted
Log(Index)
1
0
−2
−4
−6
1980
1990
2000
2010
2020
2030

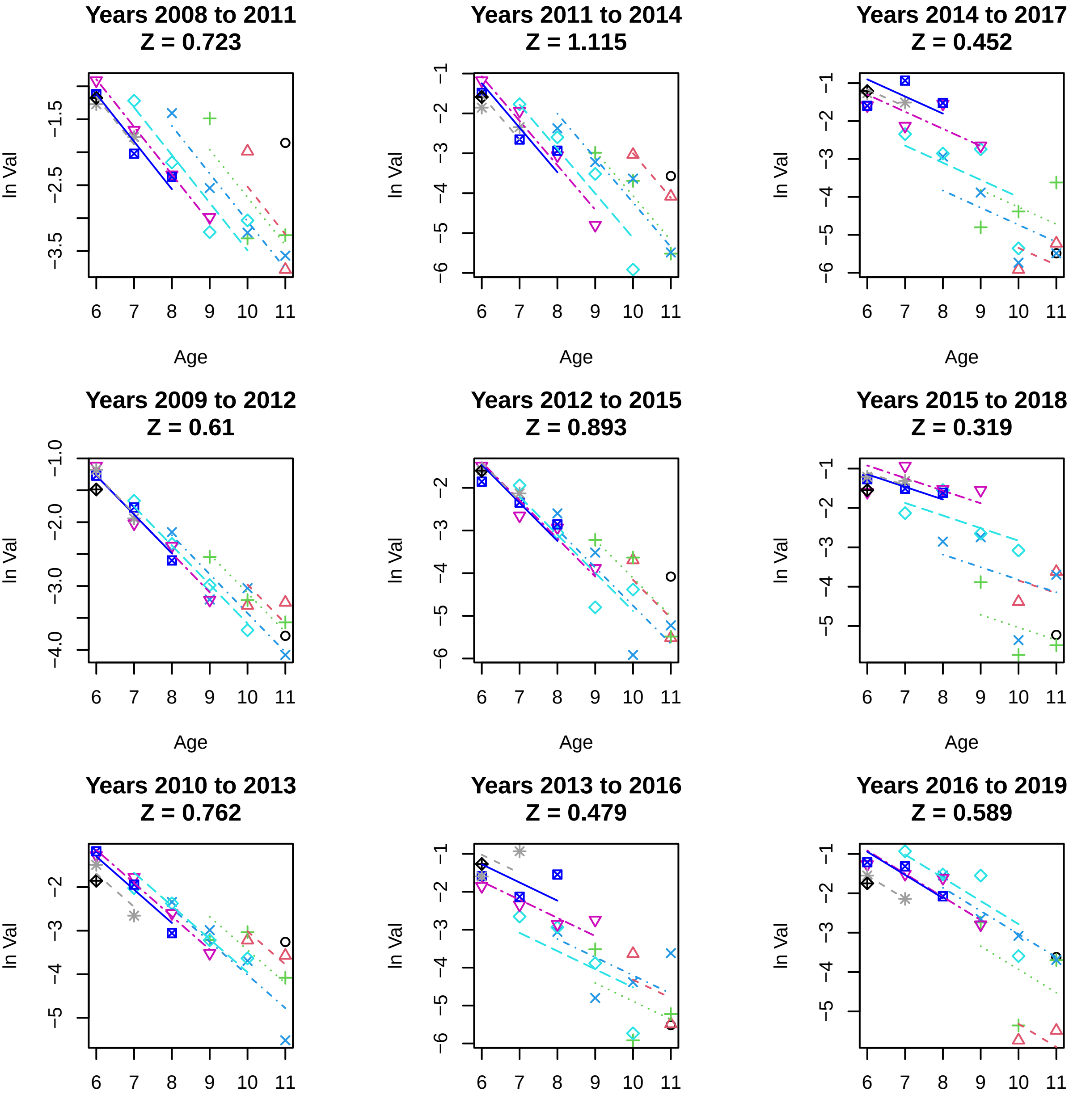

Z
1.5
1.0
0.5
0.0
1980
1990
2000
2010
2020
2030
Year Class

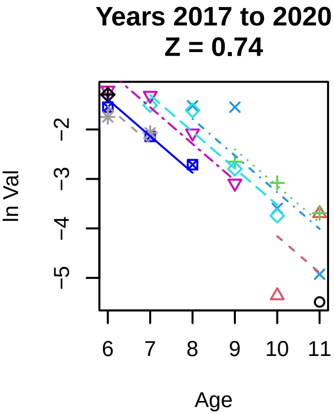

MRIP CPUE
Sinclair Z
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1995
2000
2005
2010
2015
2020
Year

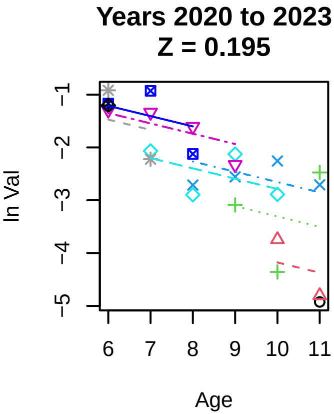

Years 1990 to 1993
Z = 0.236
Years 1993 to 1996
Z = 0.528
Years 1996 to 1999
Z = 0.703
Years 1991 to 1994
Z = 0.223
Years 1994 to 1997
Z = 0.688
Years 1997 to 2000
Z = 0.675
Years 1992 to 1995
Z = 0.399
Years 1995 to 1998
Z = 0.895
Years 1998 to 2001
Z = 0.429
ln Val
Age

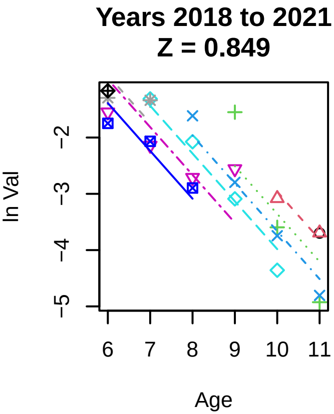


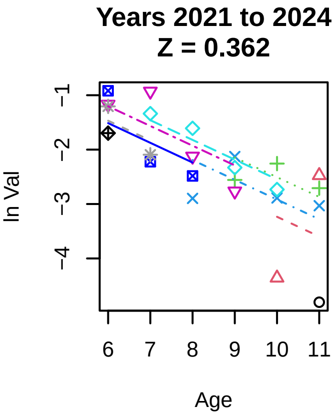
Years 1999 to 2002
Z = 0.292
Years 2002 to 2005
Z = 0.471
Years 2005 to 2008
Z = 0.283
Years 2000 to 2003
Z = 0.116
Years 2003 to 2006
Z = 0.25
Years 2006 to 2009
Z = 0.591
Years 2001 to 2004
Z = 0.272
Years 2004 to 2007
Z = 0.492
Years 2007 to 2010
Z = 0.572
ln Val
Age
6
7
8
9
10
11

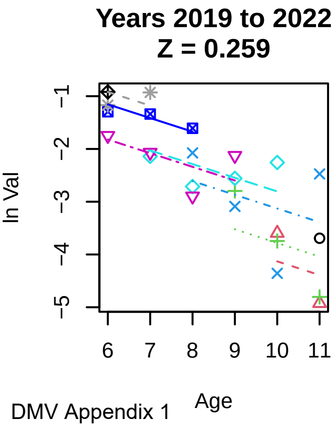

Years 2008 to 2011
Z = 0.723
Years 2011 to 2014
Z = 1.115
Years 2014 to 2017
Z = 0.452
Years 2009 to 2012
Z = 0.61
Years 2012 to 2015
Z = 0.893
Years 2015 to 2018
Z = 0.319
Years 2010 to 2013
Z = 0.762
Years 2013 to 2016
Z = 0.479
Years 2016 to 2019
Z = 0.589
ln Val
Age

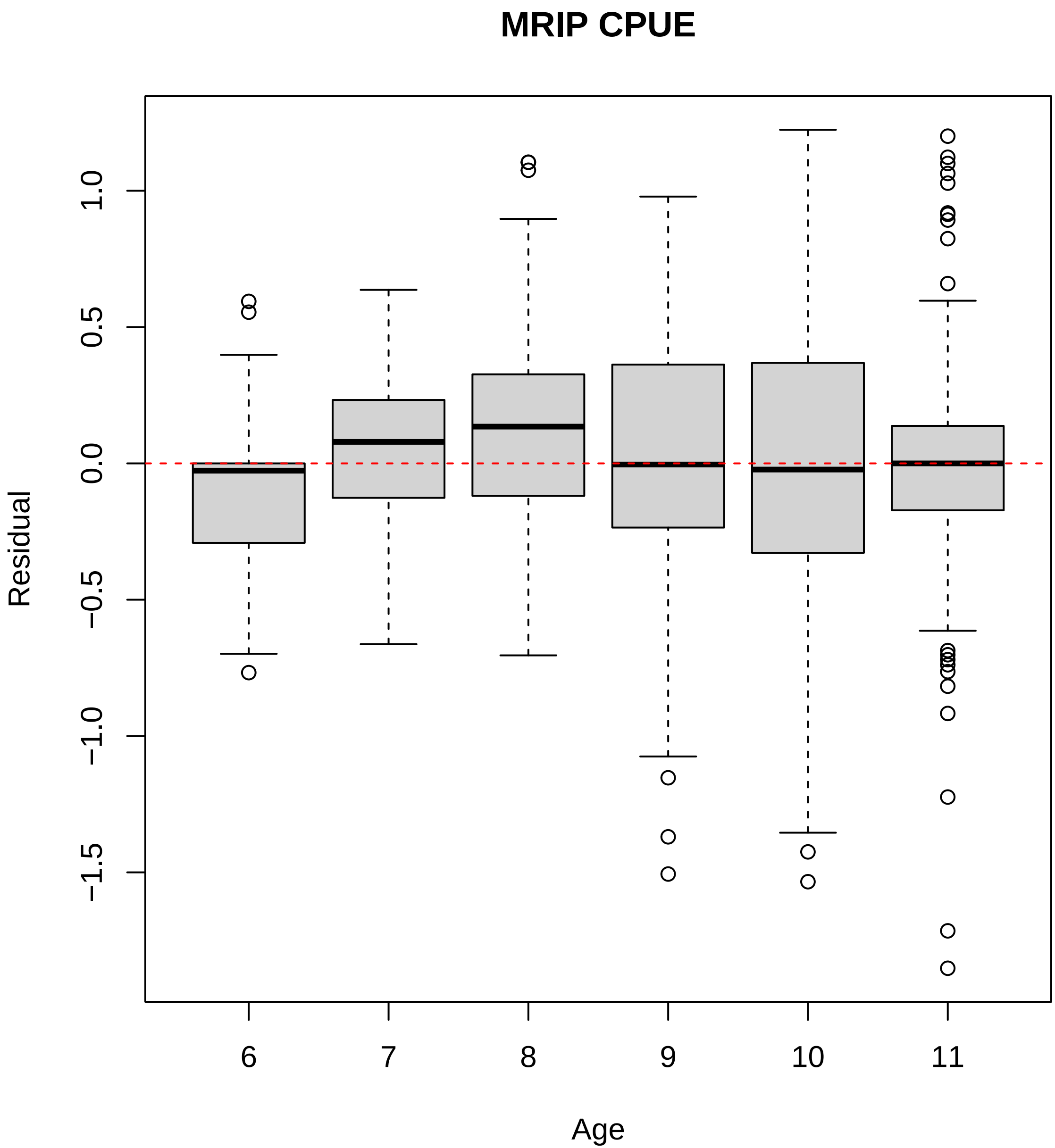

Years 2017 to 2020
Z = 0.74
ln Val
−2
−3
−4
−5
6
7
8
9
10
11
Age


Years 2020 to 2023
Z = 0.195
ln Val
−1
−2
−3
−4
−5
6
7
8
9
10
11
Age


Years 2018 to 2021
Z = 0.849
ln Val
−2
−3
−4
−5
6
7
8
9
10
11
Age

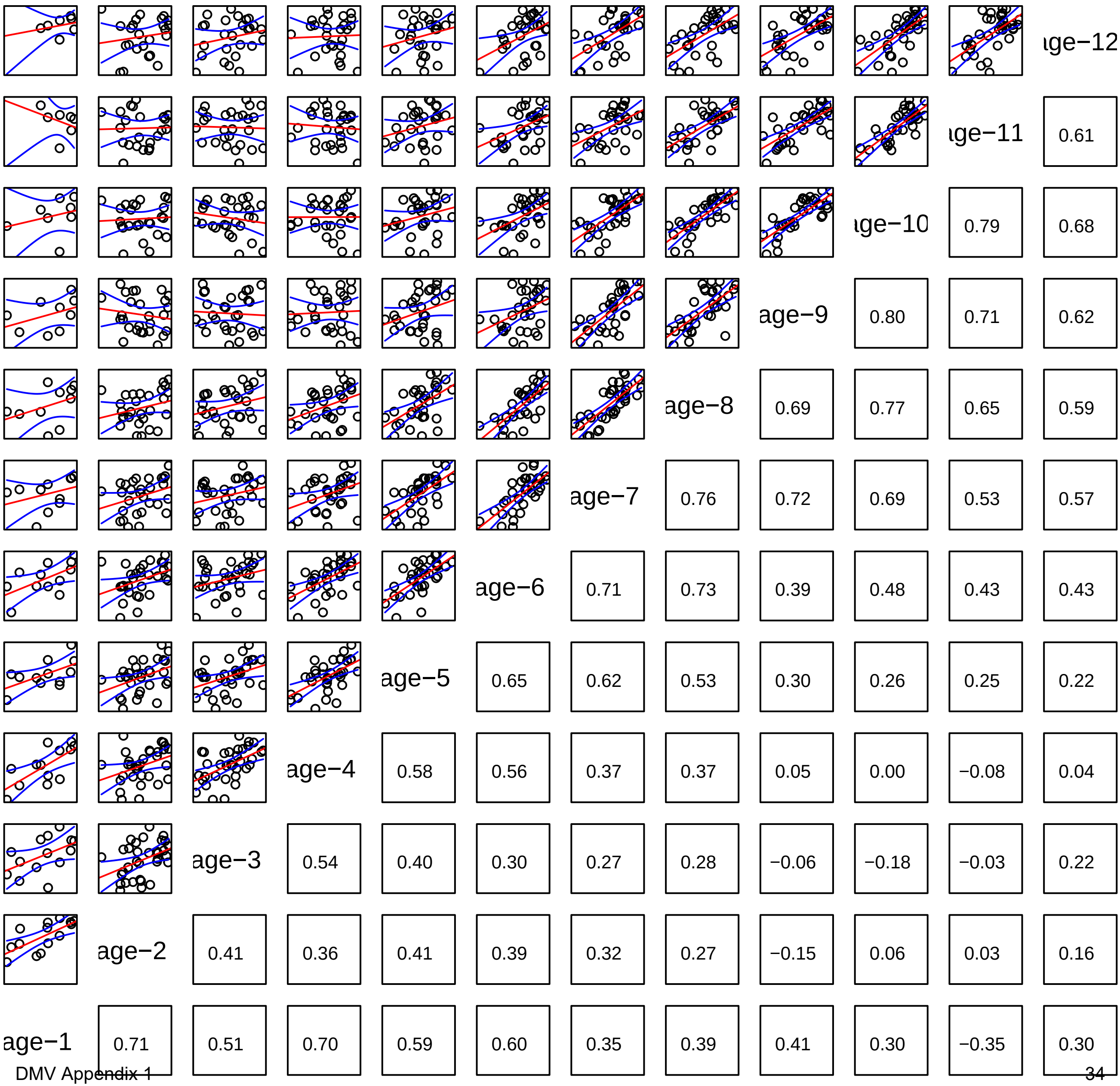

Years 2021 to 2024
Z = 0.362
ln Val
−1
−2
−3
−4
6
7
8
9
10
11
Age


Years 2019 to 2022
Z = 0.259
ln Val
−1
−2
−3
−4
−5
6
7
8
9
10
11
Age

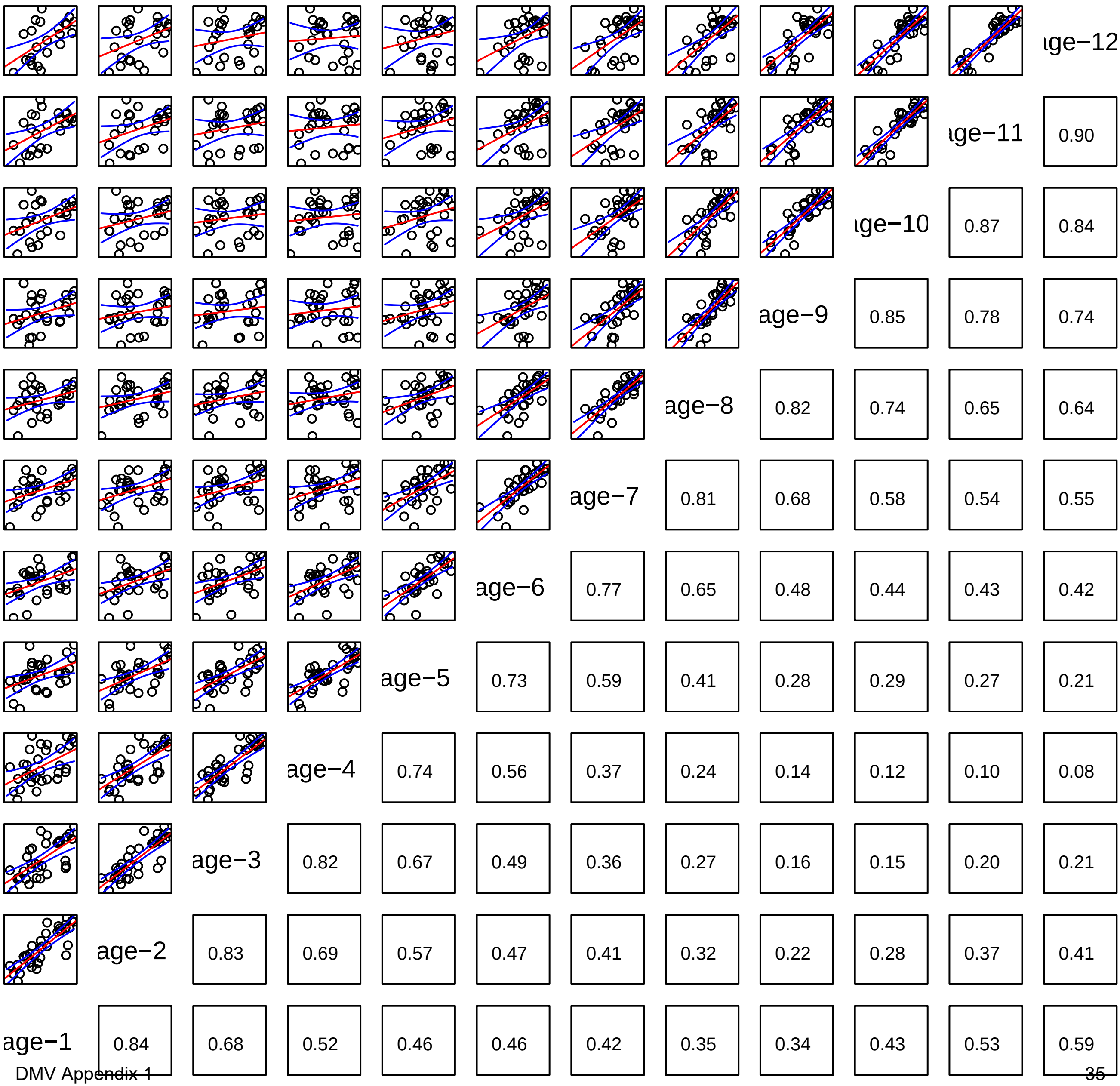


MRIP CPUE
Residual
1.0
0.5
0.0
−0.5
−1.0
−1.5
6
7
8
9
10
11
Age

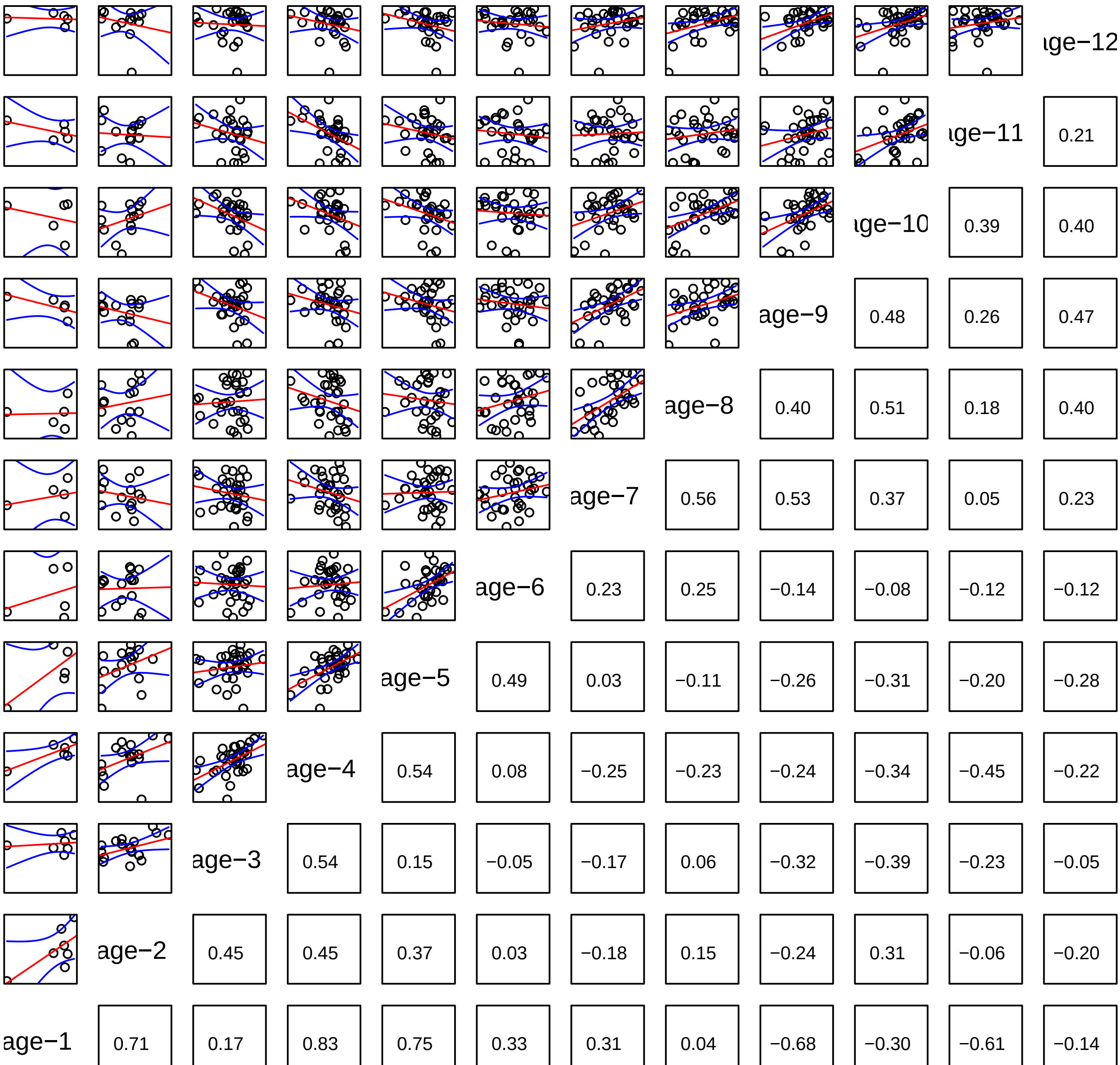
Catch Observed



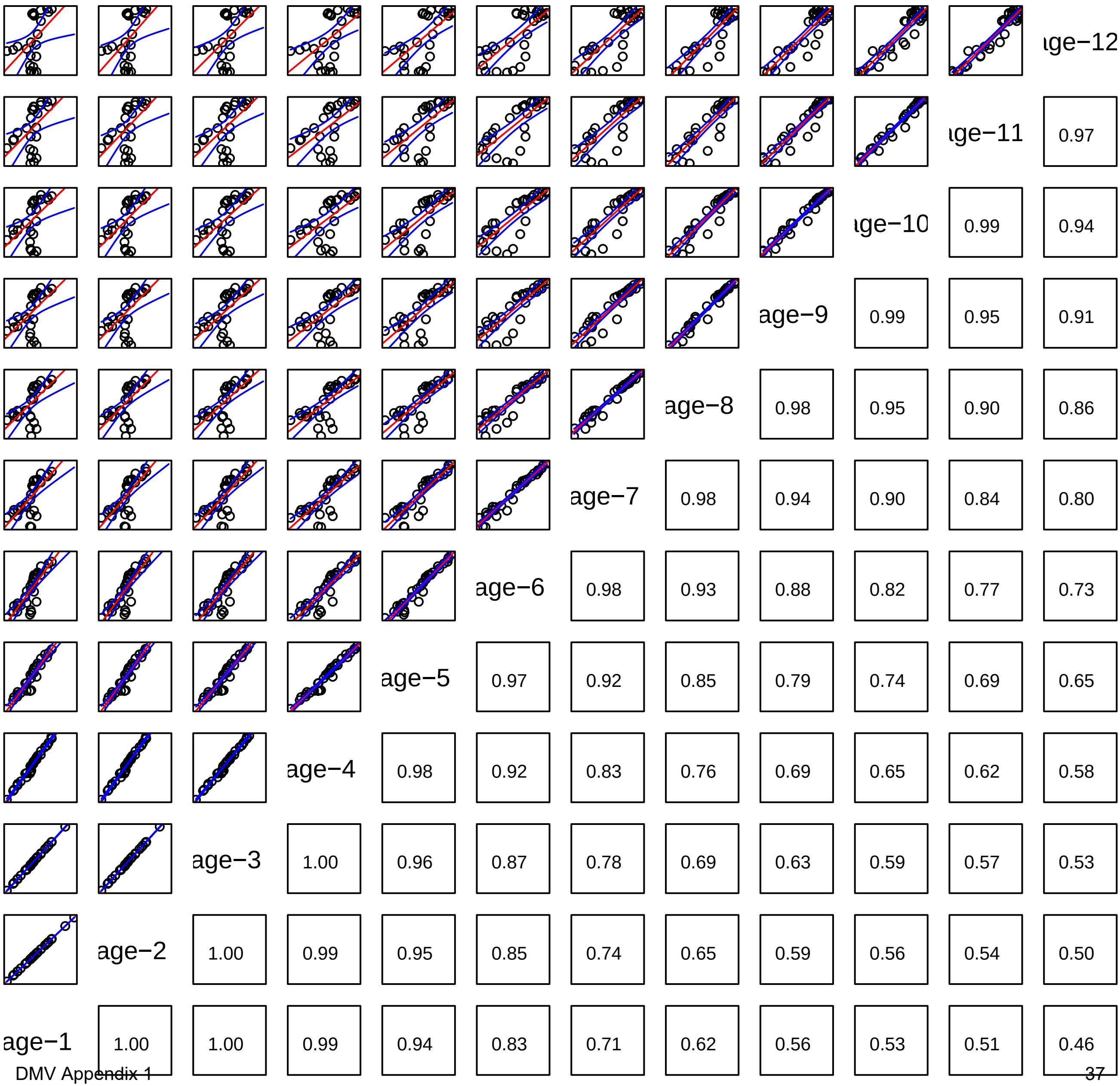
Catch Predicted

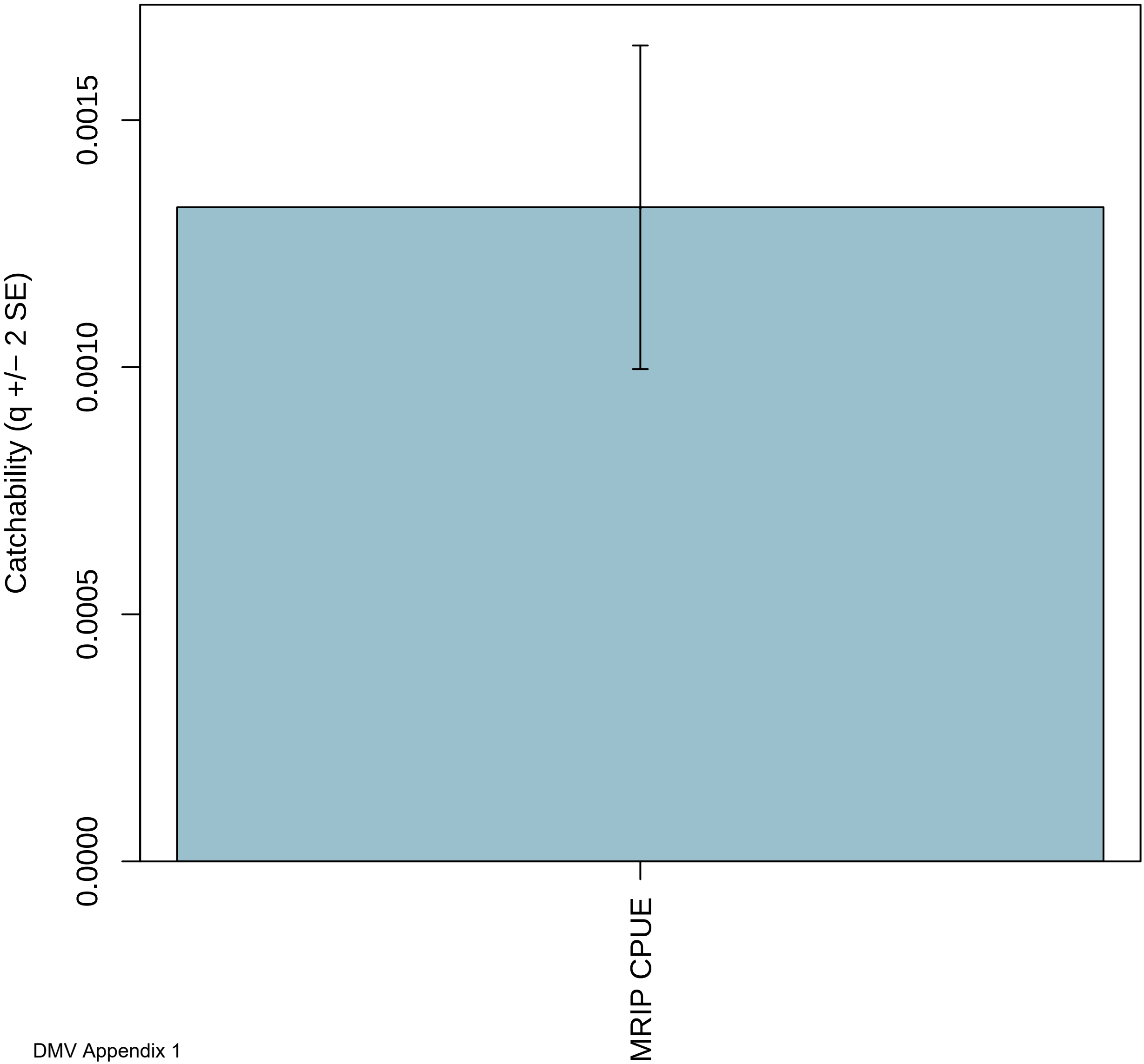


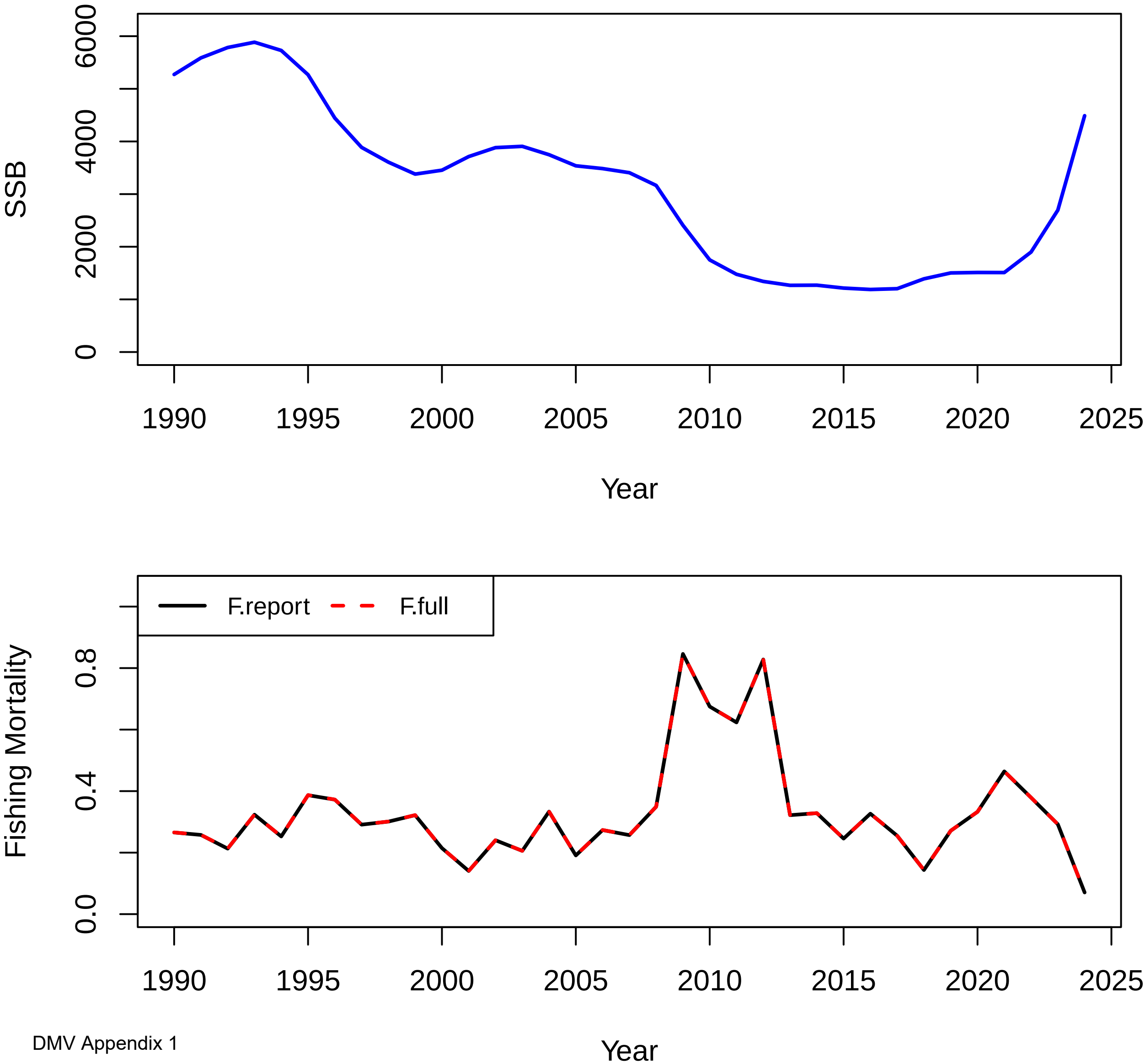
Index 1 (MRIP CPUE) Observed

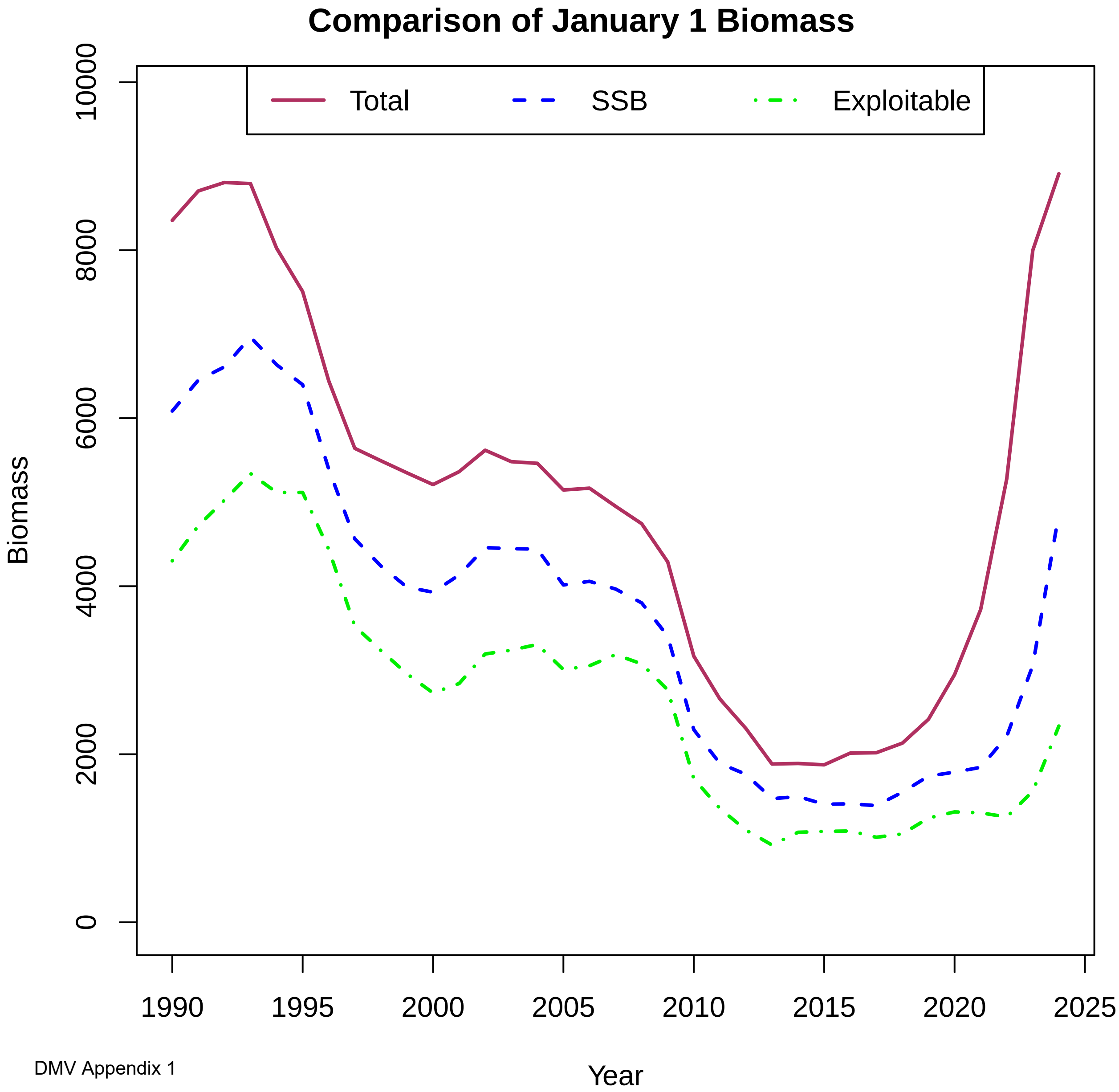


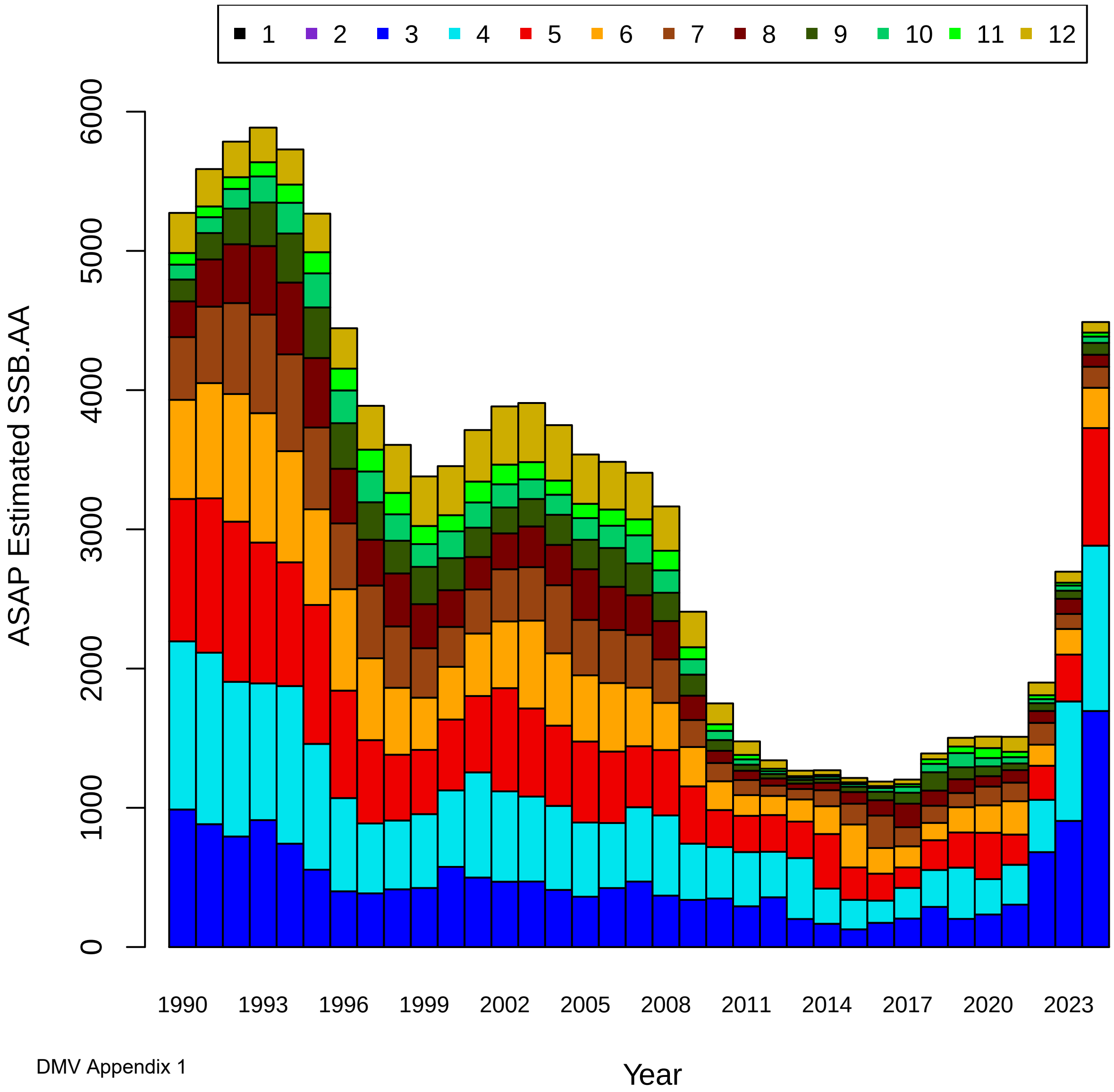
Index 1 (MRIP CPUE) Predicted



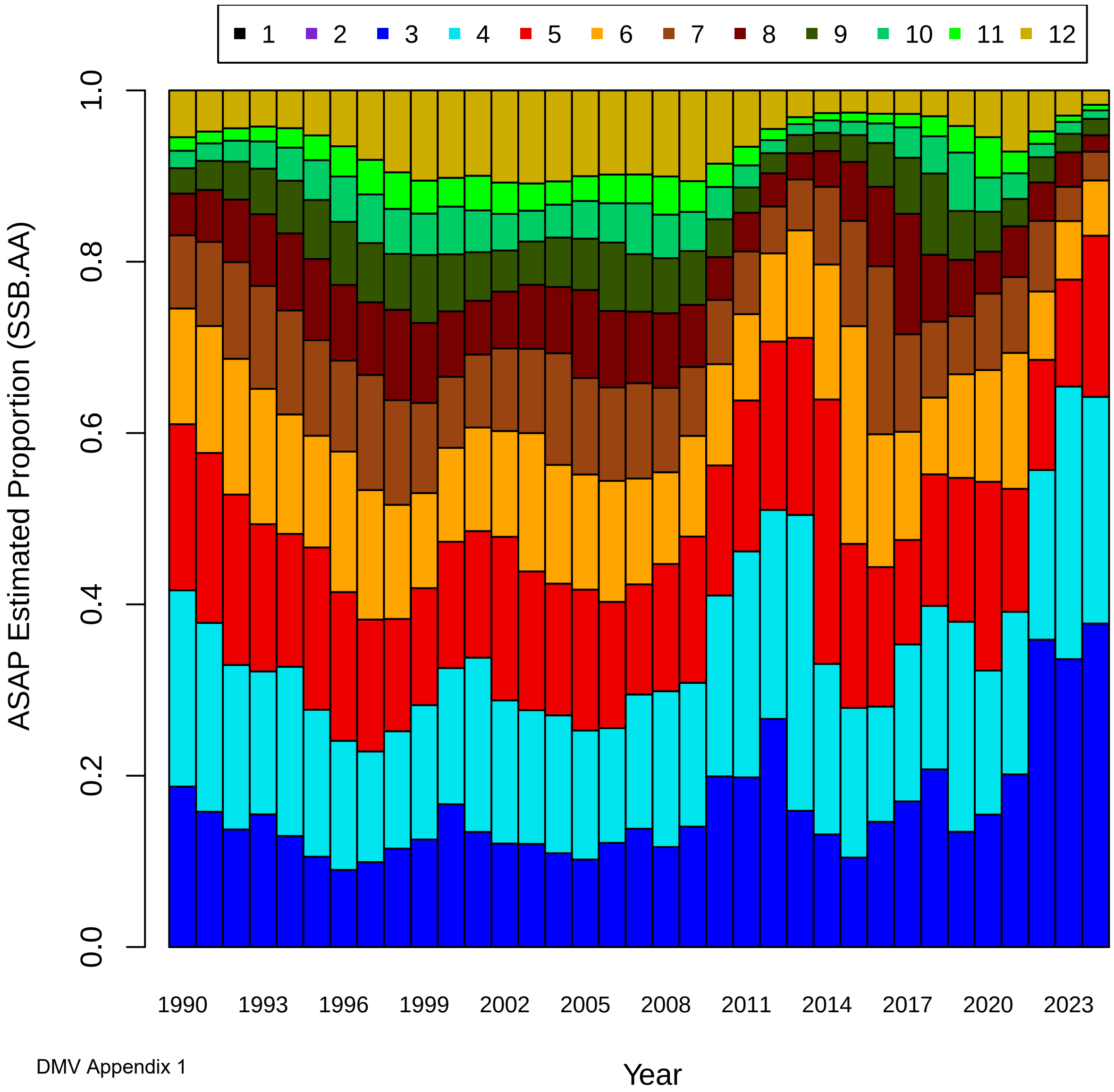

Catchability (q +/− 2 SE)
0.0015
0.0010
0.0005
0.0000
MRIP CPUE

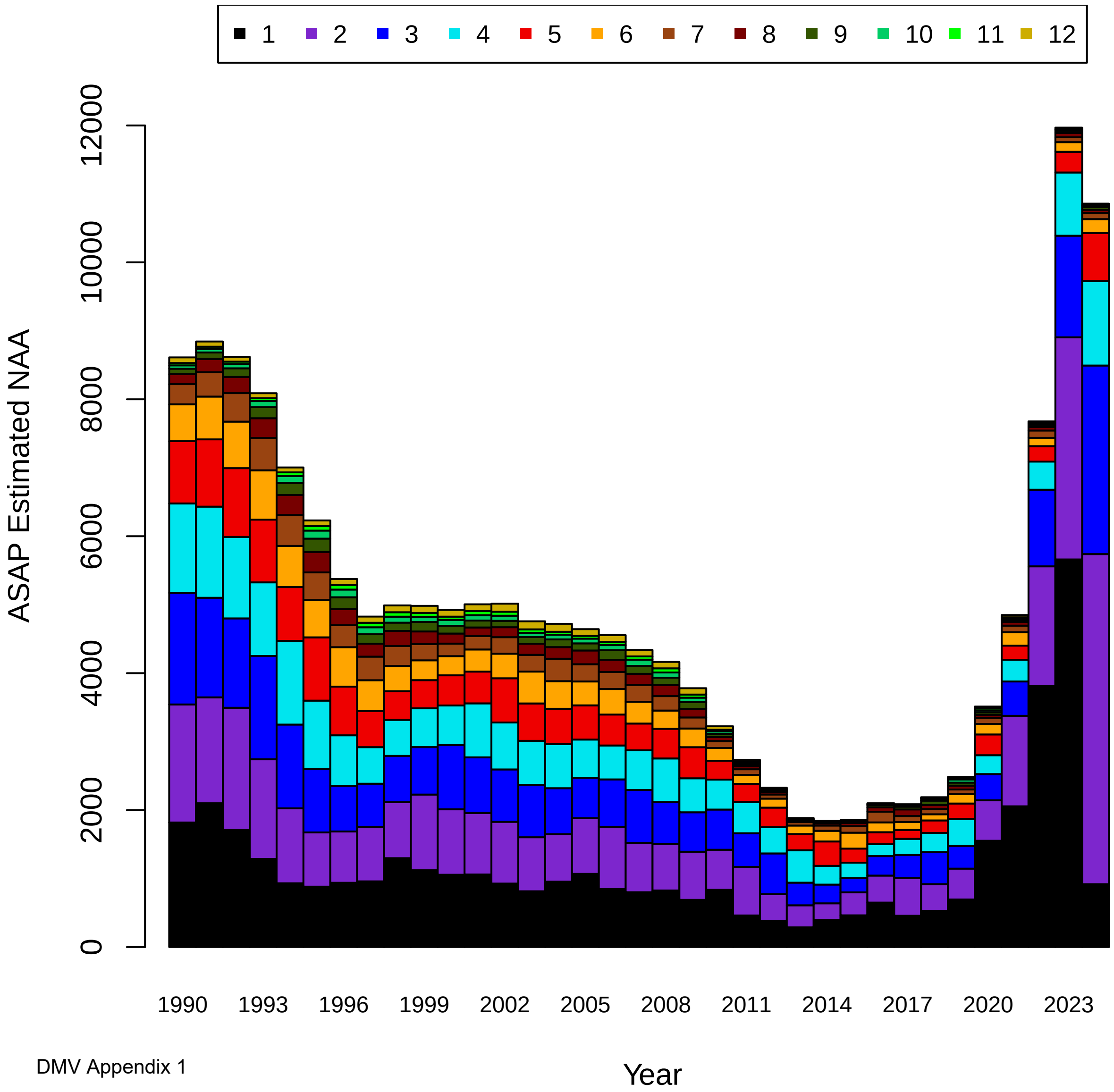

SSB
0
2000
4000
6000
1990
1995
2000
2005
2010
2015
2020
2025
Year
Fishing Mortality
0.0
0.4
0.8
F.report
F.full
1990
1995
2000
2005
2010
2015
2020
2025
Year

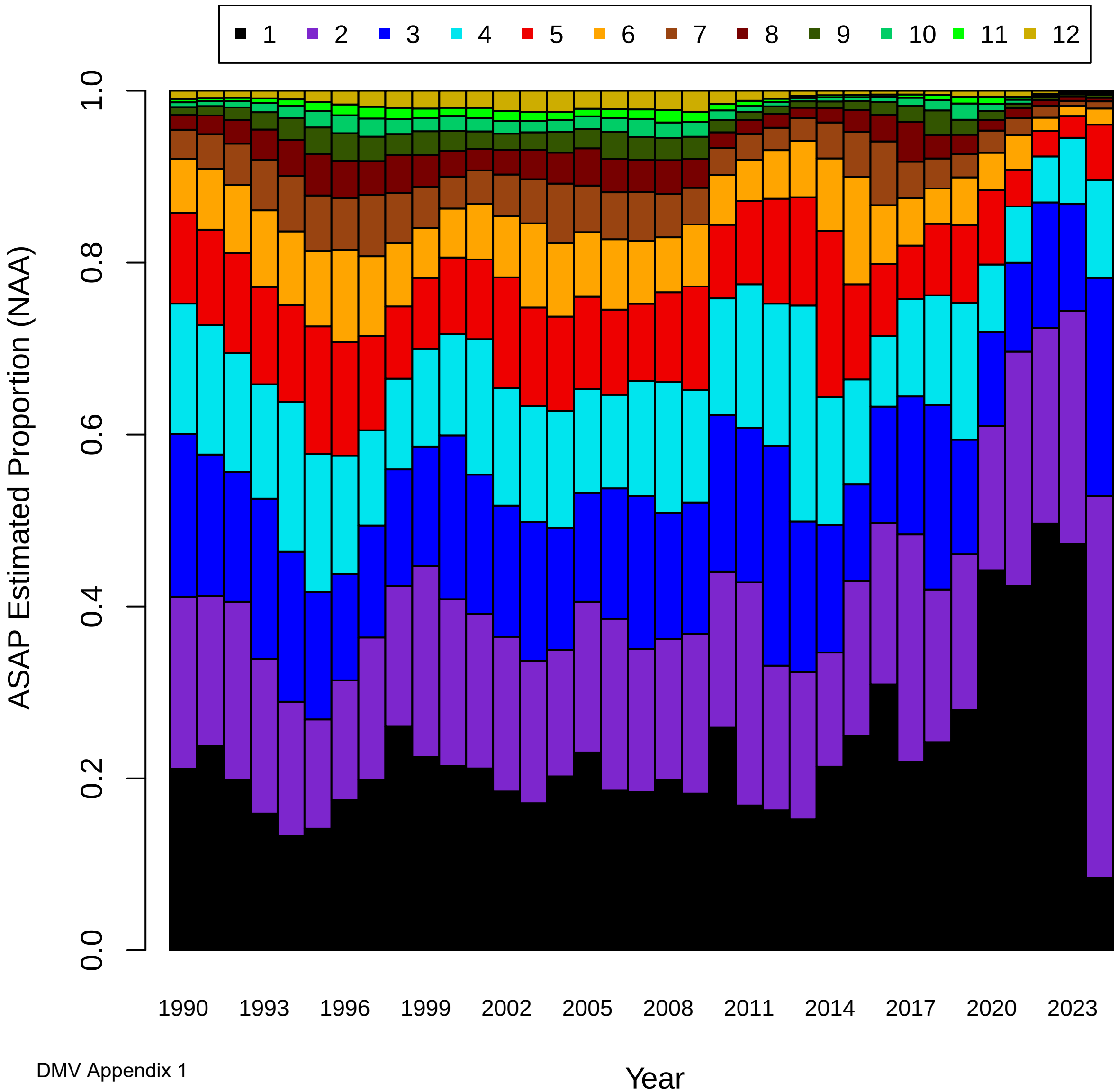

Comparison of January 1 Biomass
Total
SSB
Exploitable
Biomass
0
2000
4000
6000
8000
10000
1990
1995
2000
2005
2010
2015
2020
2025
Year



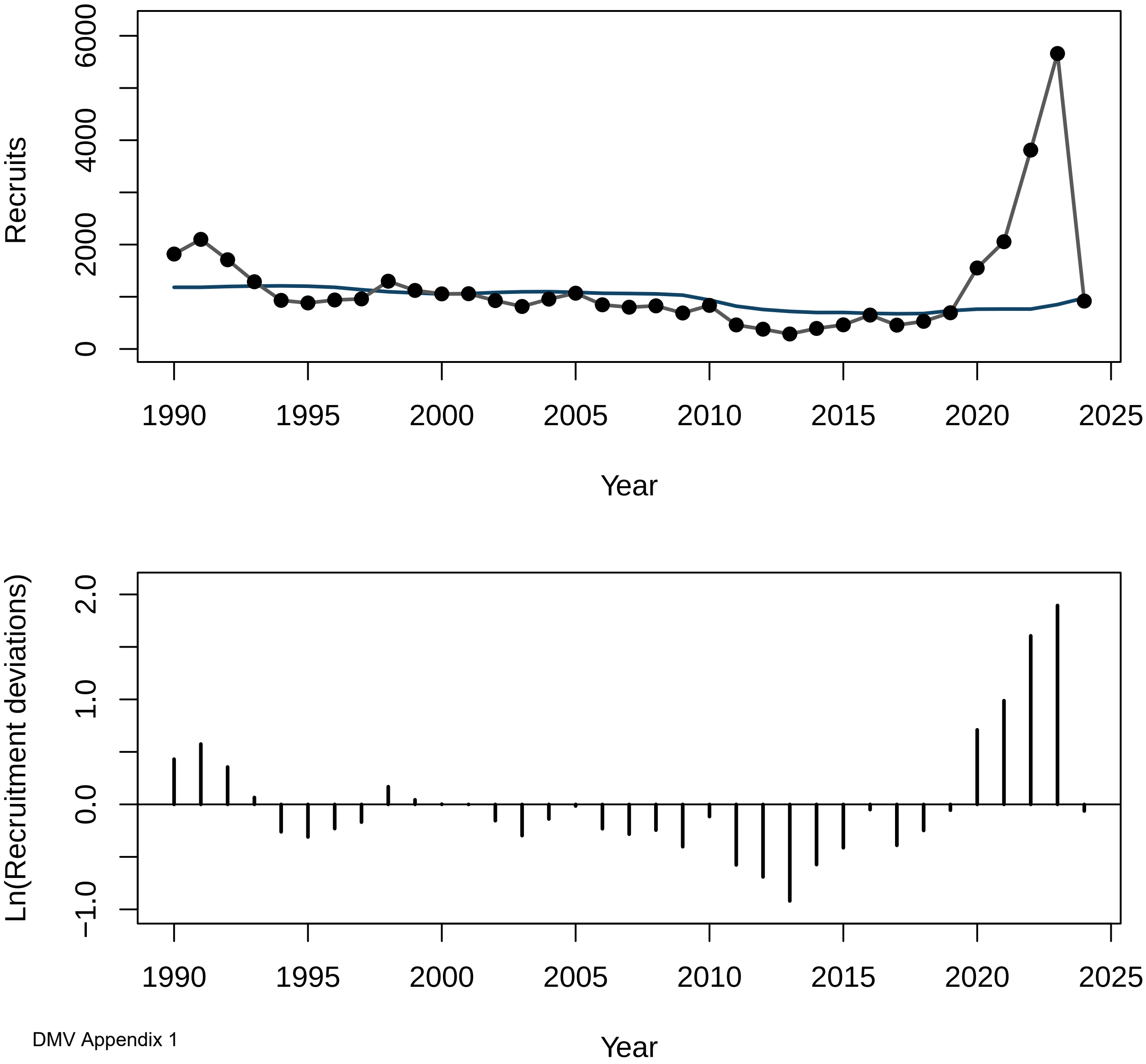
1
2
3
4
5
6
7
8
9
10
11
12
ASAP Estimated SSB.AA
0
1000
2000
3000
4000
5000
6000
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
2020
2023
Year

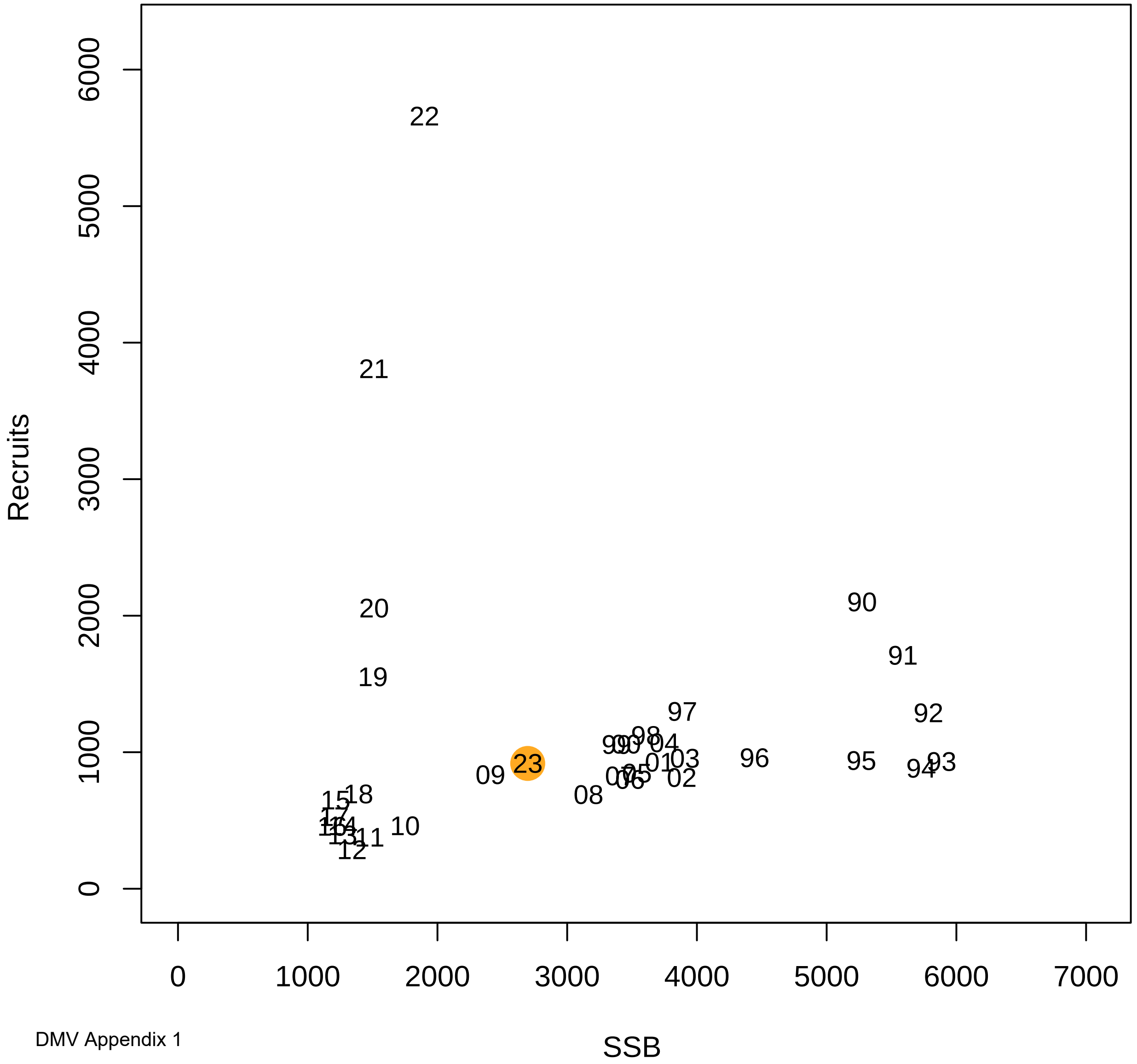

1 2 3 4 5 6 7 8 9 10 11 12
ASAP Estimated Proportion (SSB.AA)
0.0
0.2
0.4
0.6
0.8
1.0
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
2020
2023
Year


1
2
3
4
5
6
7
8
9
10
11
12
ASAP Estimated NAA
0
2000
4000
6000
8000
10000
12000
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
2020
2023
Year

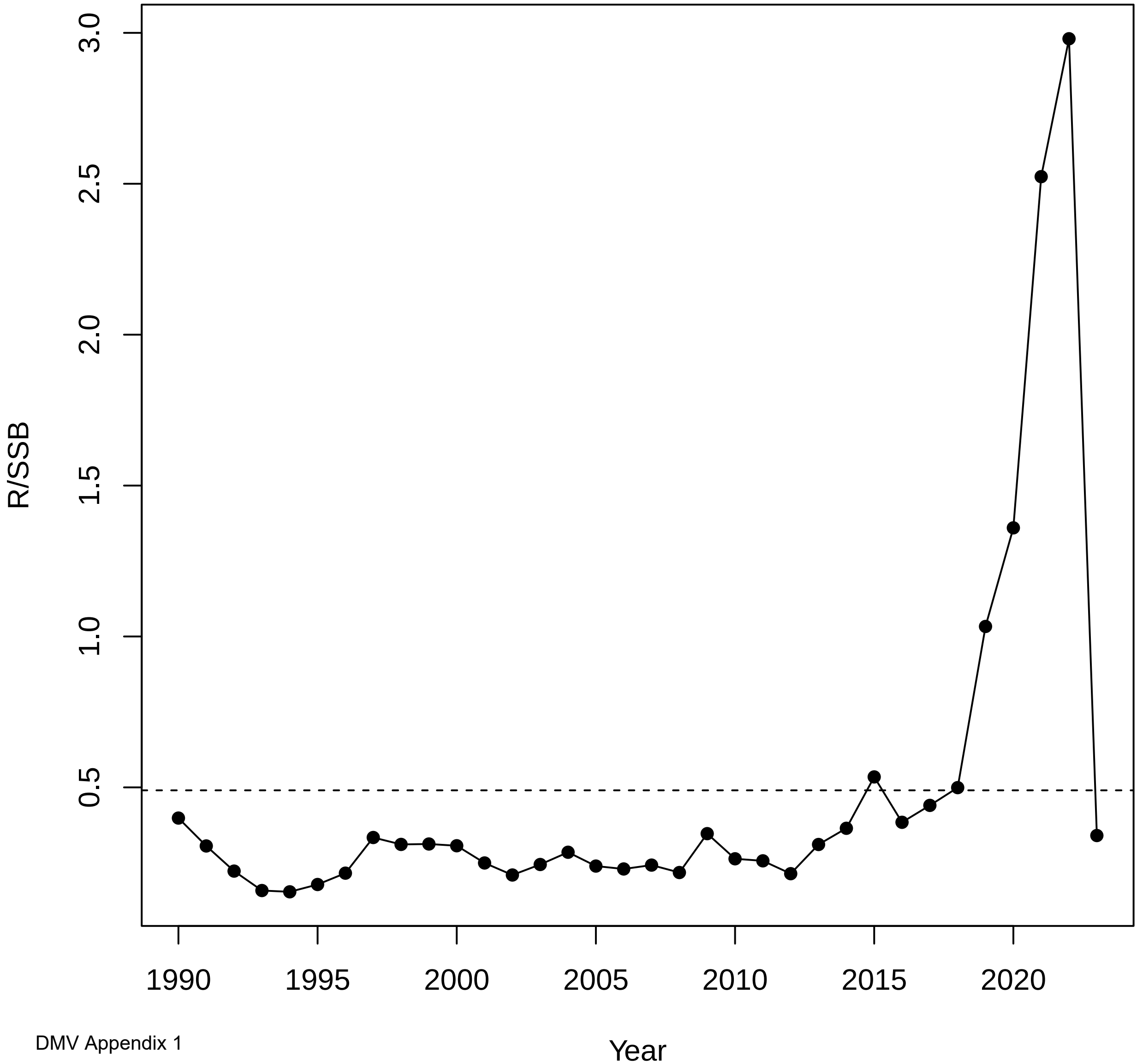


1
2
3
4
5
6
7
8
9
10
11
12
ASAP Estimated Proportion (NAA)
0.0
0.2
0.4
0.6
0.8
1.0
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
2020
2023
Year

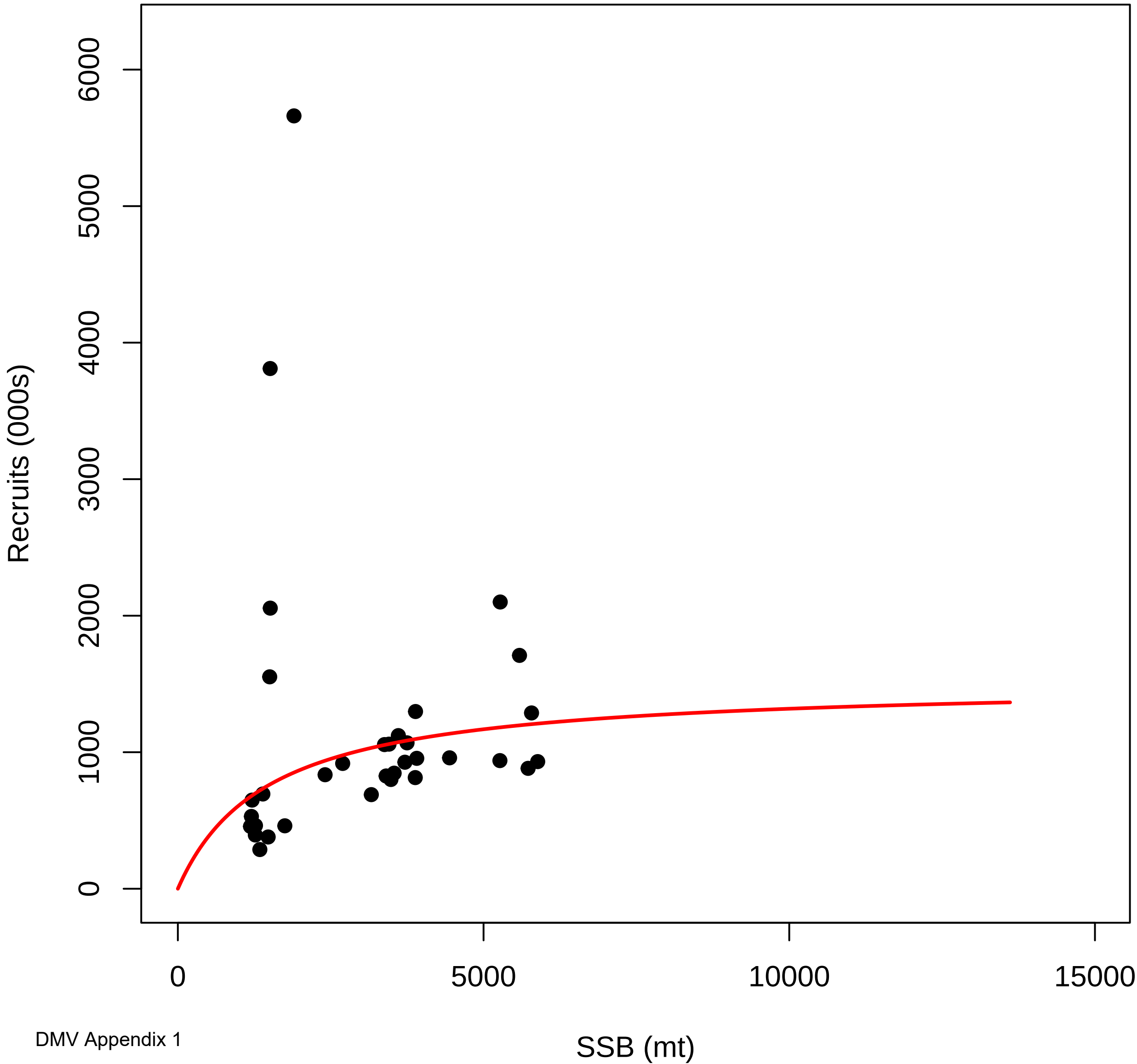

Recruits
0
2000
4000
6000
1990
1995
2000
2005
2010
2015
2020
2025
Year
Ln(Recruitment deviations)
−1.0
0.0
1.0
2.0
1990
1995
2000
2005
2010
2015
2020
2025
Year



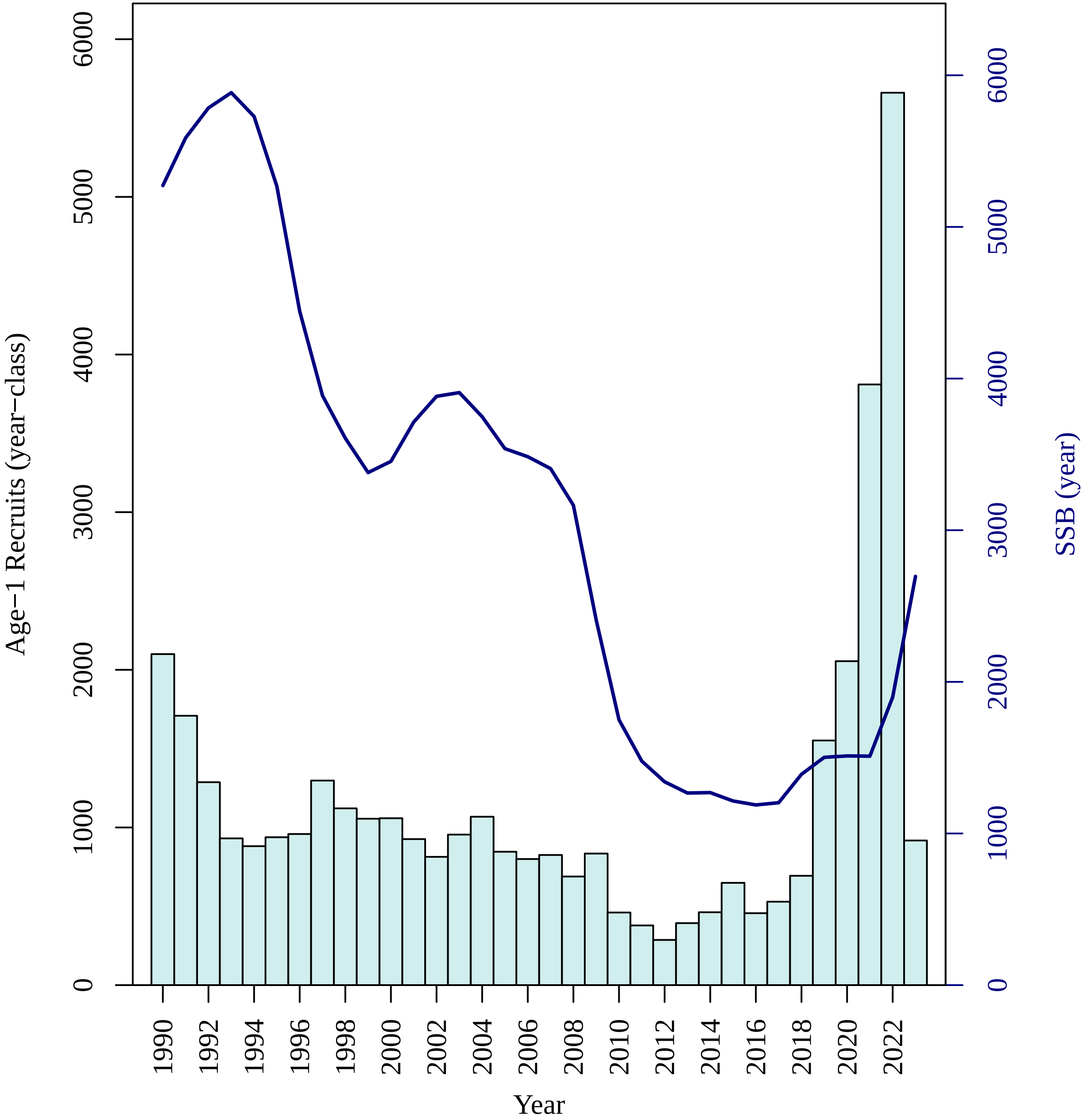
Recruits
SSB
0
1000
2000
3000
4000
5000
6000
7000
22
21
20
19
18
15
10
09
23
08
97
98
04
03
02
96
95
94
93
92
91
90
11
12

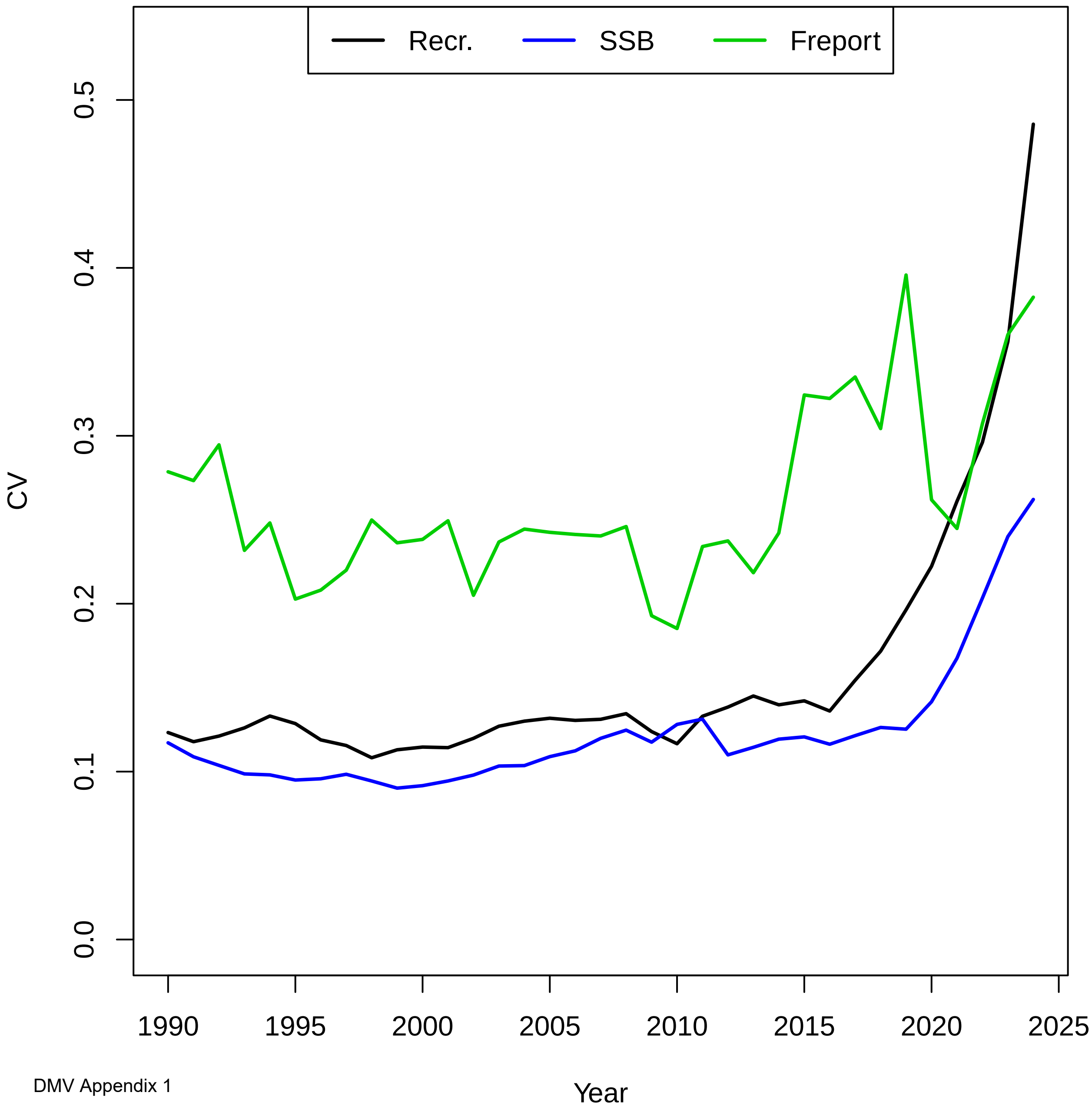


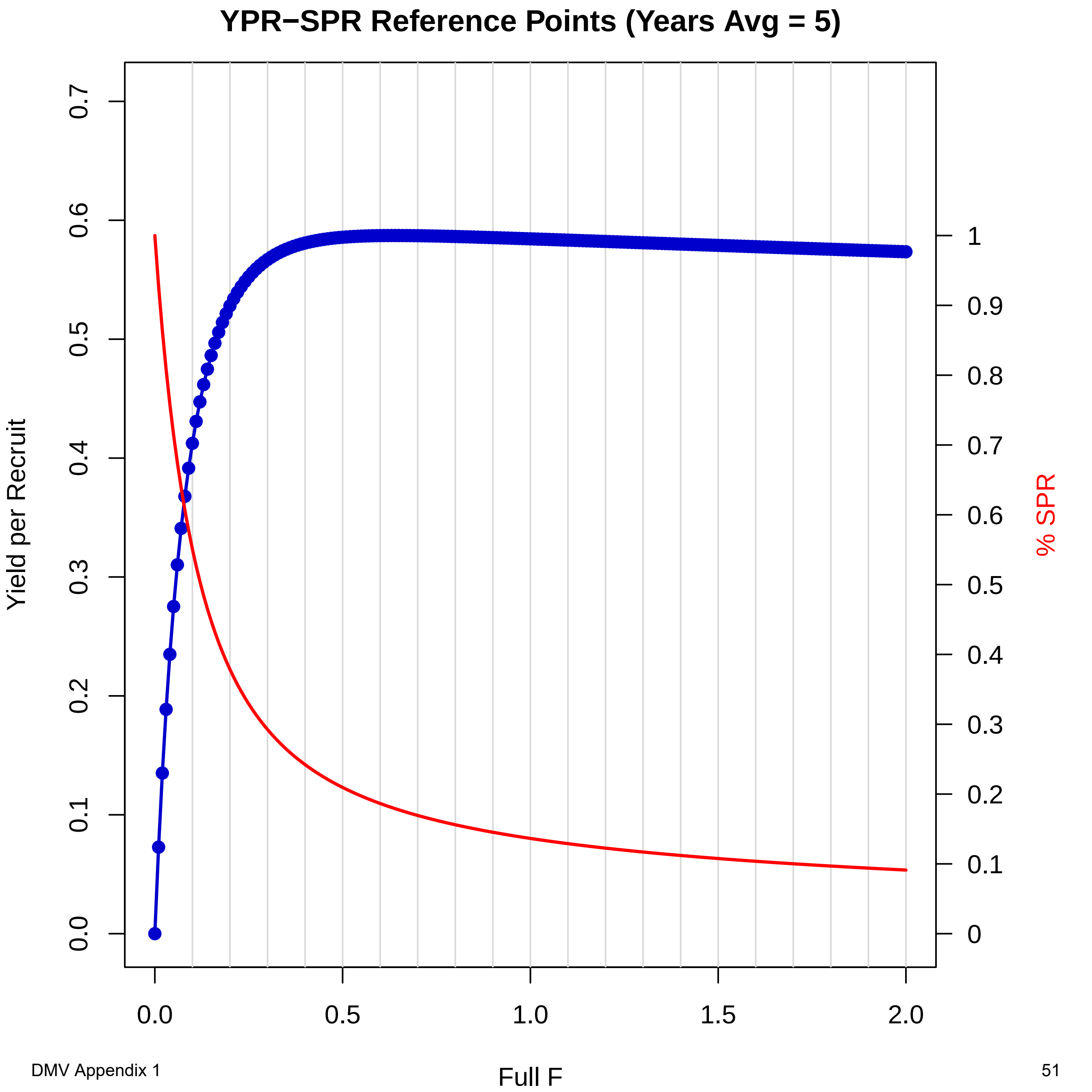
3.0
2.5
2.0
1.5
1.0
0.5
R/SSB
1990
1995
2000
2005
2010
2015
2020
Year



Recruits (000s)
0
1000
2000
3000
4000
5000
6000
0
5000
10000
15000
SSB (mt)


Age−1 Recruits (year−class)
SSB (year)
Year
0
1000
2000
3000
4000
5000
6000
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022

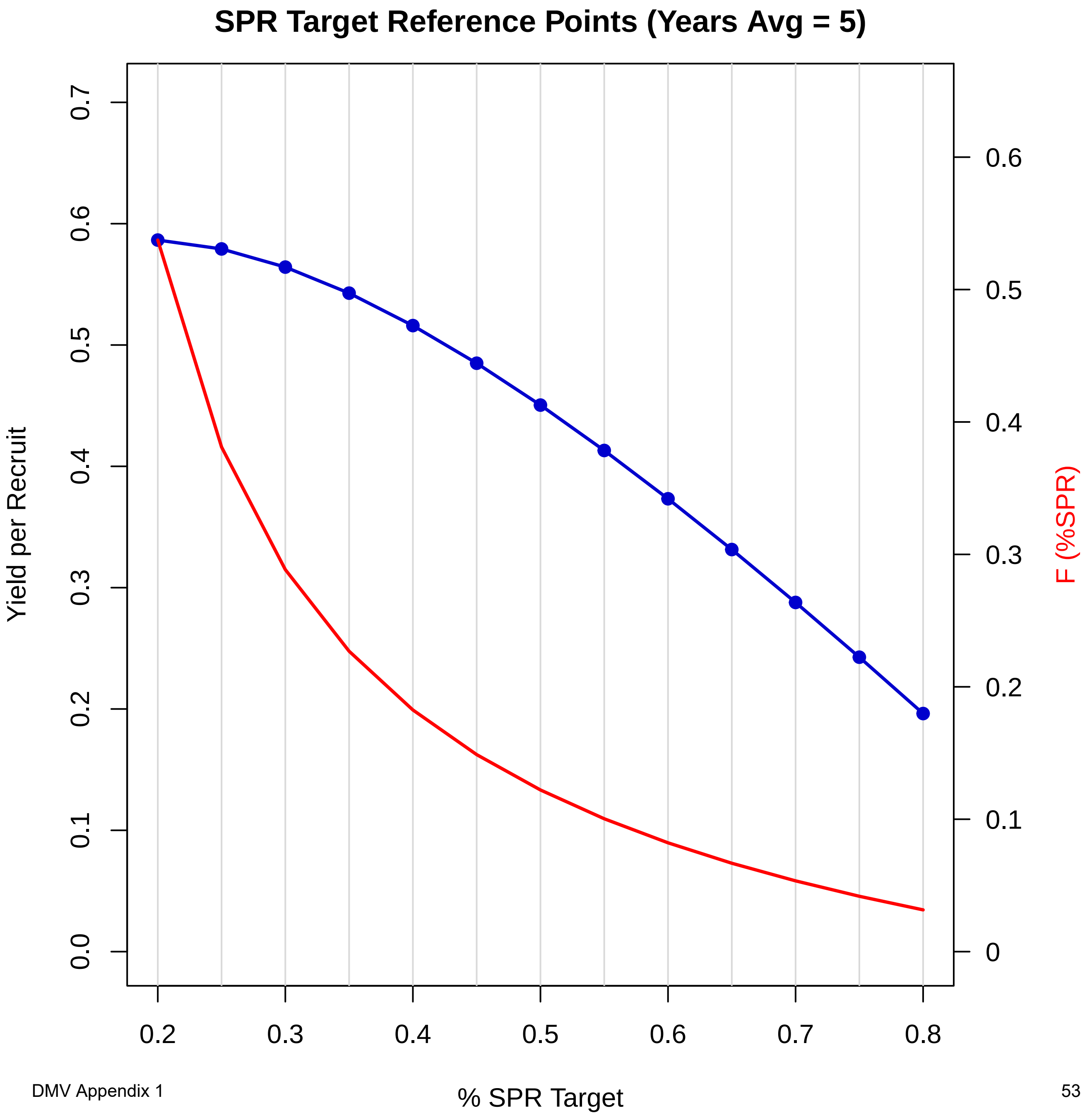

Recr.
SSB
Freport
0.0
0.1
0.2
0.3
0.4
0.5
CV
1990
1995
2000
2005
2010
2015
2020
2025
Year



YPR−SPR Reference Points (Years Avg = 5)
Yield per Recruit
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
% SPR
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0.0
0.5
1.0
1.5
2.0
Full F

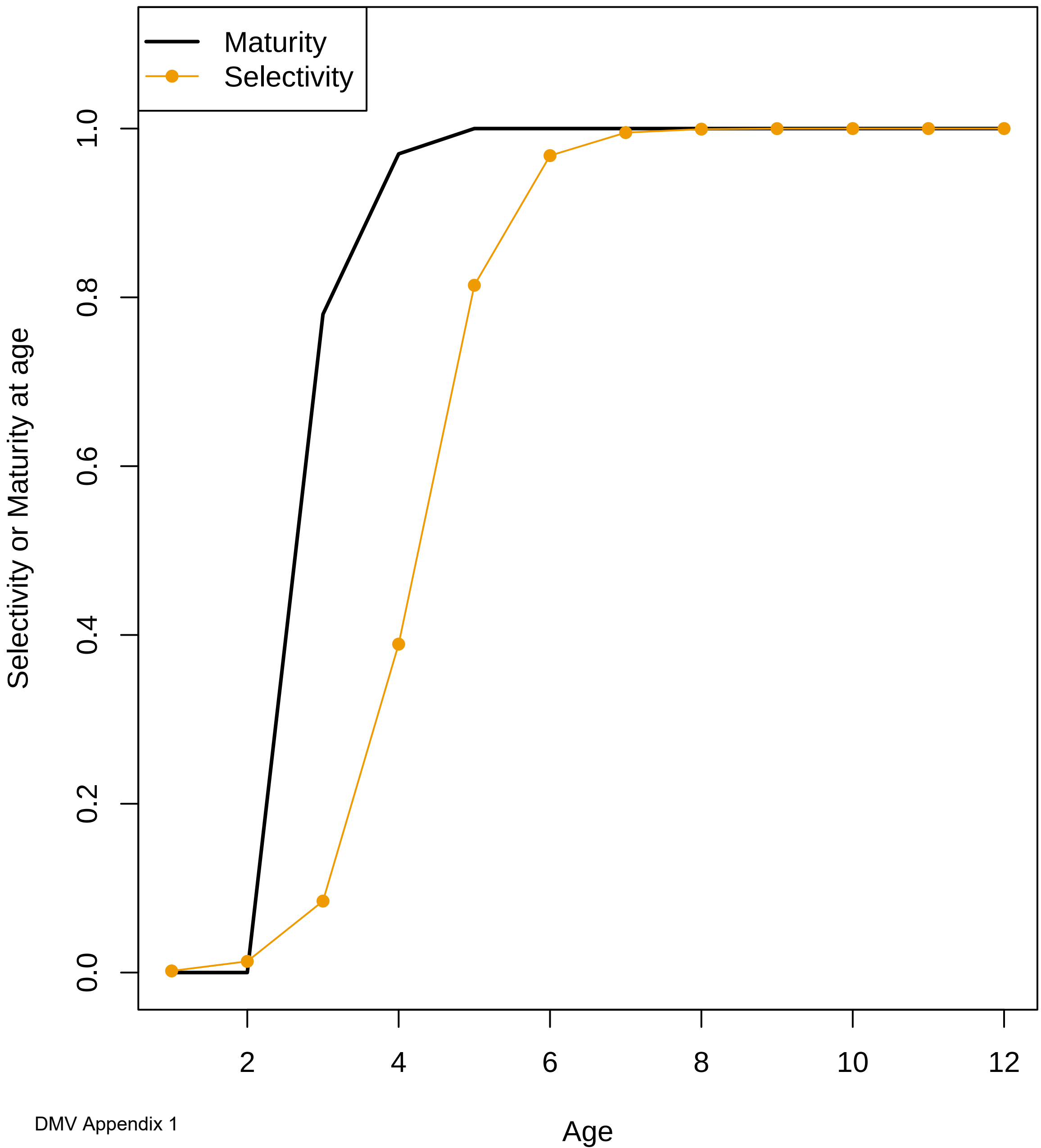
YPR−SPR Reference Points (Years Avg = 5)

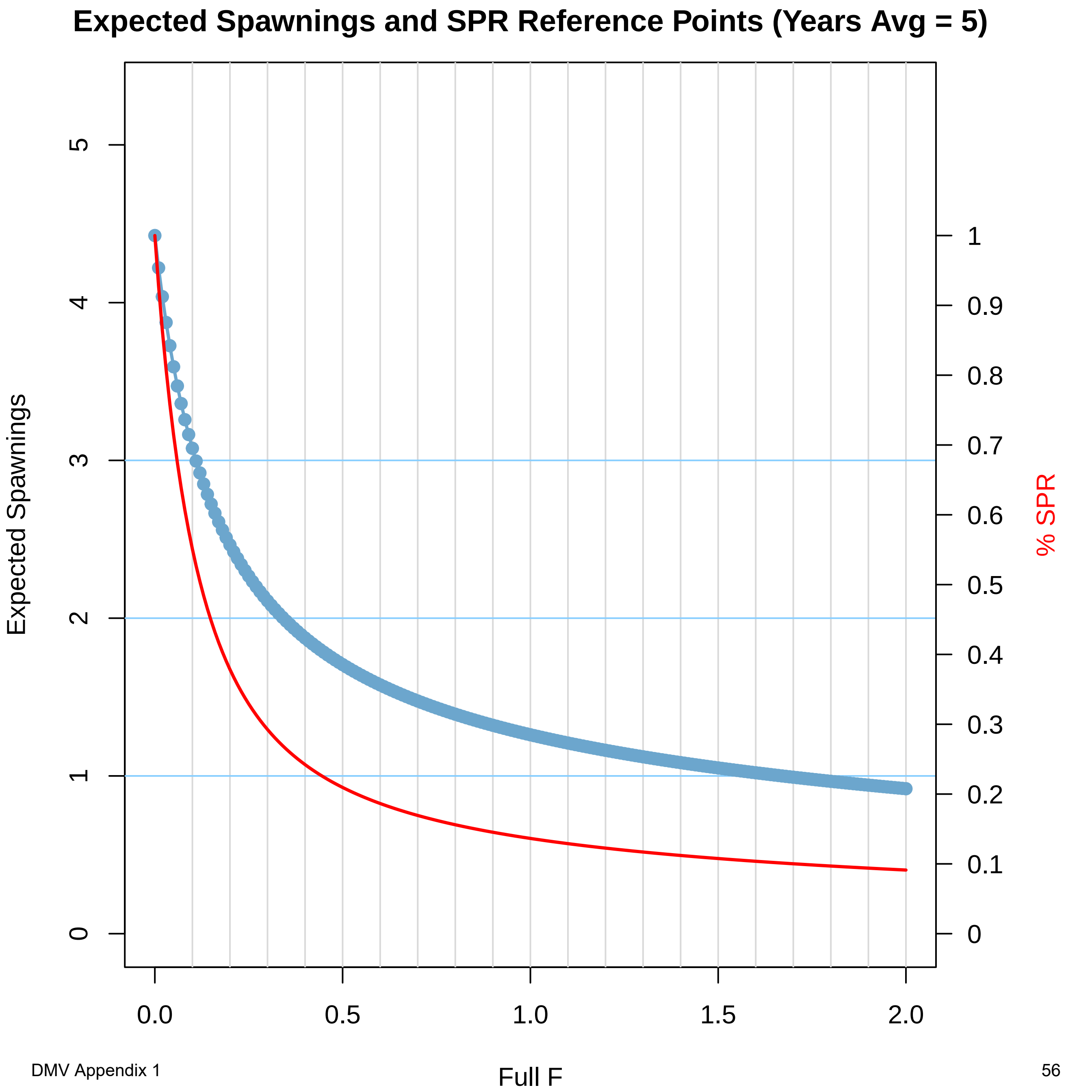
F	YPR	SPR	F	YPR	SPR	F	YPR	SPR
0	0	1	0.35	0.5756	0.2643	0.7	0.587	0.1693
0.01	0.0728	0.9275	0.36	0.5769	0.2595	0.71	0.587	0.1679
0.02	0.1351	0.864	0.37	0.578	0.2549	0.72	0.5869	0.1664
0.03	0.1886	0.8081	0.38	0.5791	0.2505	0.73	0.5868	0.165
0.04	0.235	0.7584	0.39	0.58	0.2462	0.74	0.5868	0.1636
0.05	0.2752	0.7142	0.4	0.5809	0.2422	0.75	0.5867	0.1623
0.06	0.3102	0.6745	0.41	0.5816	0.2383	0.76	0.5866	0.161
0.07	0.3409	0.6389	0.42	0.5823	0.2346	0.77	0.5866	0.1597
0.08	0.3678	0.6067	0.43	0.5829	0.231	0.78	0.5865	0.1585
0.09	0.3915	0.5775	0.44	0.5835	0.2276	0.79	0.5864	0.1572
0.1	0.4124	0.5509	0.45	0.5839	0.2243	0.8	0.5863	0.156
0.11	0.4309	0.5266	0.46	0.5844	0.2211	0.81	0.5863	0.1548
0.12	0.4473	0.5044	0.47	0.5848	0.218	0.82	0.5862	0.1537
0.13	0.4618	0.4841	0.48	0.5851	0.2151	0.83	0.5861	0.1526
0.14	0.4748	0.4653	0.49	0.5854	0.2122	0.84	0.586	0.1515
0.15	0.4863	0.448	0.5	0.5857	0.2095	0.85	0.5859	0.1504
0.16	0.4966	0.432	0.51	0.586	0.2068	0.86	0.5858	0.1493
0.17	0.5058	0.4171	0.52	0.5862	0.2043	0.87	0.5857	0.1483
0.18	0.5141	0.4033	0.53	0.5864	0.2018	0.88	0.5856	0.1473
0.19	0.5215	0.3905	0.54	0.5865	0.1994	0.89	0.5855	0.1463
0.2	0.5281	0.3785	0.55	0.5867	0.1971	0.9	0.5854	0.1453
0.21	0.534	0.3673	0.56	0.5868	0.1948	0.91	0.5853	0.1443
0.22	0.5394	0.3568	0.57	0.5869	0.1926	0.92	0.5852	0.1434
0.23	0.5442	0.347	0.58	0.587	0.1905	0.93	0.5851	0.1425
0.24	0.5485	0.3378	0.59	0.587	0.1885	0.94	0.585	0.1416
0.25	0.5524	0.3291	0.6	0.5871	0.1865	0.95	0.5849	0.1407
0.26	0.556	0.3209	0.61	0.5871	0.1845	0.96	0.5848	0.1398
0.27	0.5591	0.3132	0.62	0.5871	0.1827	0.97	0.5847	0.1389
0.28	0.562	0.3059	0.63	0.5872	0.1808	0.98	0.5846	0.1381
0.29	0.5646	0.299	0.64	0.5872	0.1791	0.99	0.5845	0.1373
0.3	0.5669	0.2924	0.65	0.5872	0.1773	1	0.5844	0.1364
0.31	0.569	0.2862	0.66	0.5871	0.1757	1.01	0.5843	0.1356
0.32	0.5709	0.2804	0.67	0.5871	0.174	1.02	0.5842	0.1349
0.33	0.5727	0.2748	0.68	0.5871	0.1724	1.03	0.5841	0.1341
0.34	0.5742	0.2694	0.69	0.587	0.1709	1.04	0.5839	0.1333


SPR Target Reference Points (Years Avg = 5)
Yield per Recruit
F (%SPR)
% SPR Target
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0
0.1
0.2
0.3
0.4
0.5
0.6
0.2
0.3
0.4
0.5
0.6
0.7
0.8

SPR Target Reference Points (Years Avg = 5)

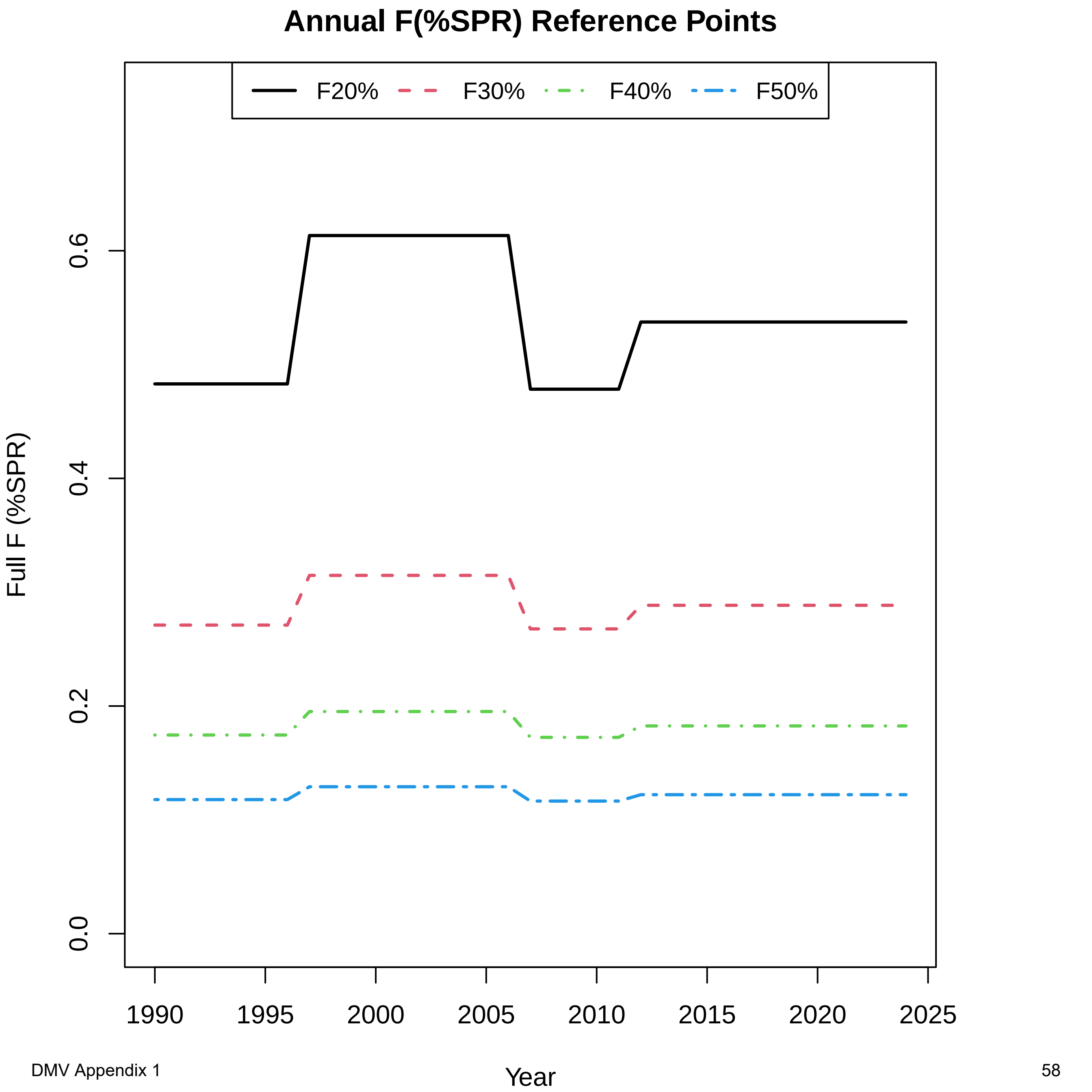
% SPR	F(%SPR)	YPR
0.2	0.5374	0.5865
0.25	0.3811	0.5792
0.3	0.2885	0.5642
0.35	0.2269	0.5428
0.4	0.1825	0.516
0.45	0.1488	0.485
0.5	0.1221	0.4505
0.55	0.1003	0.4131
0.6	0.0822	0.3733
0.65	0.0668	0.3314
0.7	0.0535	0.2878
0.75	0.0418	0.2427
0.8	0.0315	0.1962


Maturity
Selectivity
Selectivity or Maturity at age
0.0
0.2
0.4
0.6
0.8
1.0
2
4
6
8
10
12
Age

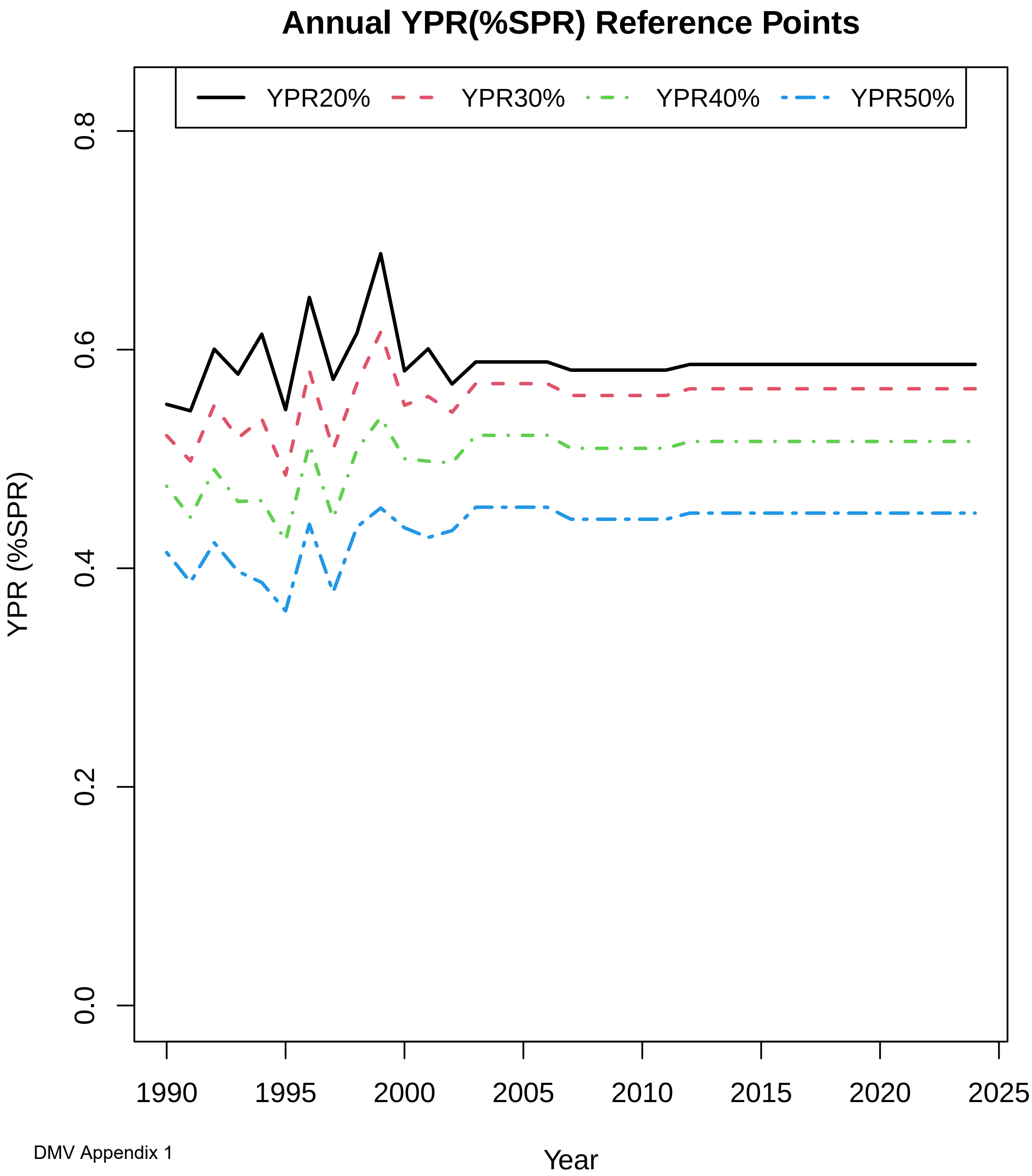

Expected Spawnings and SPR Reference Points (Years Avg = 5)
Expected Spawnings
% SPR
Full F
0
1
2
3
4
5
0.0
0.5
1.0
1.5
2.0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

Expected Spawnings & SPR Reference Points (Years Avg = 5)

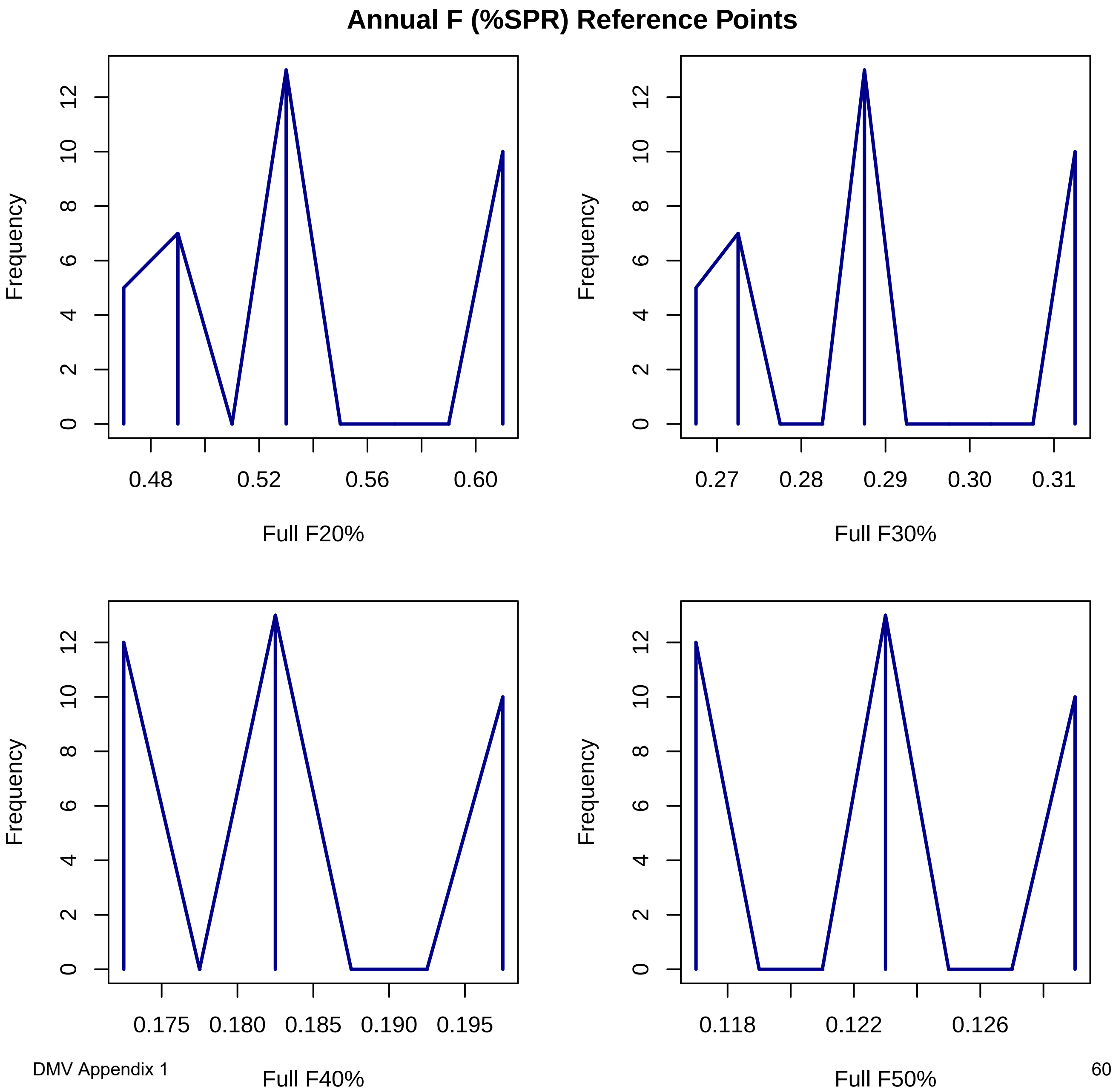
F	E[Sp]	SPR	F	E[Sp]	SPR	F	E[Sp]	SPR
0	4.4253	1	0.35	1.9814	0.2643	0.7	1.4749	0.1693
0.01	4.2203	0.9275	0.36	1.9586	0.2595	0.71	1.4658	0.1679
0.02	4.0378	0.864	0.37	1.9365	0.2549	0.72	1.4569	0.1664
0.03	3.8743	0.8081	0.38	1.9152	0.2505	0.73	1.4481	0.165
0.04	3.7269	0.7584	0.39	1.8945	0.2462	0.74	1.4395	0.1636
0.05	3.5933	0.7142	0.4	1.8746	0.2422	0.75	1.4311	0.1623
0.06	3.4716	0.6745	0.41	1.8553	0.2383	0.76	1.4228	0.161
0.07	3.3603	0.6389	0.42	1.8366	0.2346	0.77	1.4147	0.1597
0.08	3.258	0.6067	0.43	1.8185	0.231	0.78	1.4067	0.1585
0.09	3.1638	0.5775	0.44	1.8009	0.2276	0.79	1.3989	0.1572
0.1	3.0766	0.5509	0.45	1.7839	0.2243	0.8	1.3912	0.156
0.11	2.9957	0.5266	0.46	1.7673	0.2211	0.81	1.3837	0.1548
0.12	2.9205	0.5044	0.47	1.7512	0.218	0.82	1.3762	0.1537
0.13	2.8503	0.4841	0.48	1.7356	0.2151	0.83	1.3689	0.1526
0.14	2.7846	0.4653	0.49	1.7204	0.2122	0.84	1.3617	0.1515
0.15	2.723	0.448	0.5	1.7056	0.2095	0.85	1.3547	0.1504
0.16	2.6651	0.432	0.51	1.6913	0.2068	0.86	1.3477	0.1493
0.17	2.6106	0.4171	0.52	1.6772	0.2043	0.87	1.3409	0.1483
0.18	2.5591	0.4033	0.53	1.6636	0.2018	0.88	1.3341	0.1473
0.19	2.5105	0.3905	0.54	1.6503	0.1994	0.89	1.3275	0.1463
0.2	2.4645	0.3785	0.55	1.6373	0.1971	0.9	1.321	0.1453
0.21	2.4209	0.3673	0.56	1.6247	0.1948	0.91	1.3146	0.1443
0.22	2.3794	0.3568	0.57	1.6123	0.1926	0.92	1.3082	0.1434
0.23	2.34	0.347	0.58	1.6003	0.1905	0.93	1.302	0.1425
0.24	2.3024	0.3378	0.59	1.5885	0.1885	0.94	1.2959	0.1416
0.25	2.2666	0.3291	0.6	1.577	0.1865	0.95	1.2898	0.1407
0.26	2.2324	0.3209	0.61	1.5658	0.1845	0.96	1.2839	0.1398
0.27	2.1996	0.3132	0.62	1.5548	0.1827	0.97	1.278	0.1389
0.28	2.1683	0.3059	0.63	1.544	0.1808	0.98	1.2722	0.1381
0.29	2.1383	0.299	0.64	1.5335	0.1791	0.99	1.2665	0.1373
0.3	2.1095	0.2924	0.65	1.5232	0.1773	1	1.2608	0.1364
0.31	2.0819	0.2862	0.66	1.5131	0.1757	1.01	1.2553	0.1356
0.32	2.0553	0.2804	0.67	1.5033	0.174	1.02	1.2498	0.1349
0.33	2.0298	0.2748	0.68	1.4936	0.1724	1.03	1.2444	0.1341
0.34	2.0051	0.2694	0.69	1.4841	0.1709	1.04	1.2391	0.1333



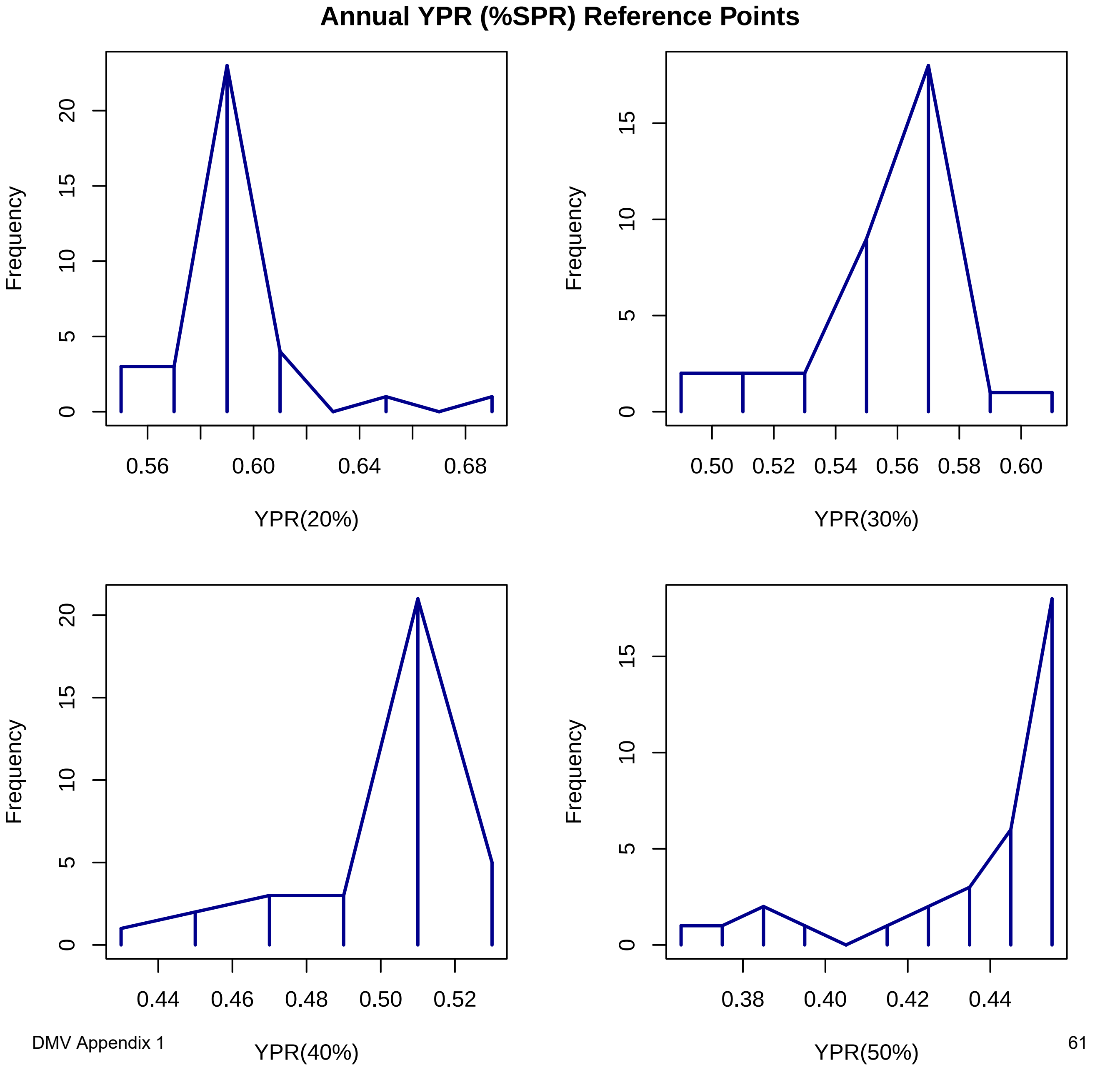
Annual F(%SPR) Reference Points
F20%
F30%
F40%
F50%
Full F (%SPR)
0.0
0.2
0.4
0.6
1990
1995
2000
2005
2010
2015
2020
2025
Year



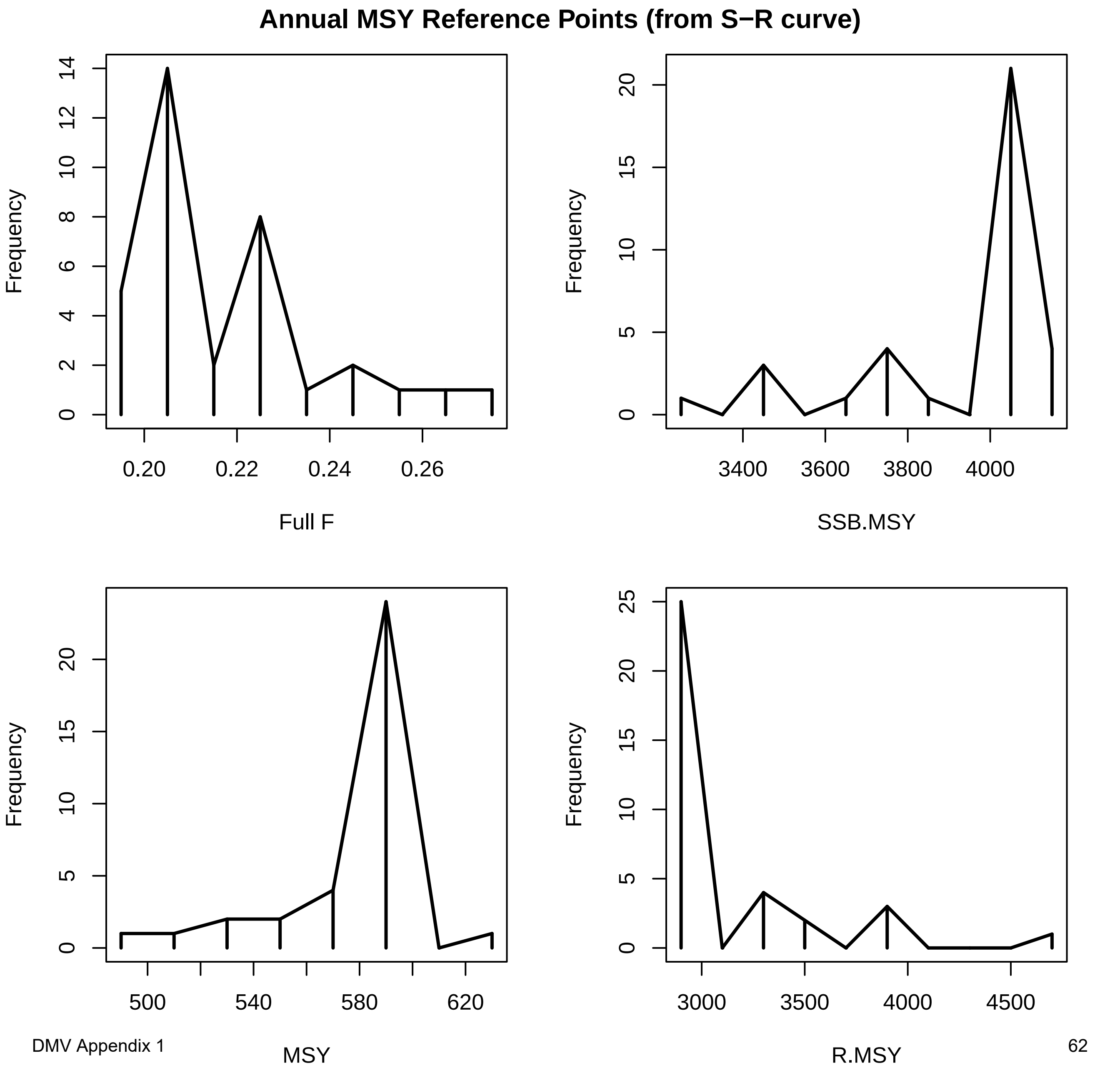
Annual YPR(%SPR) Reference Points
YPR20%
YPR30%
YPR40%
YPR50%
0.0
0.2
0.4
0.6
0.8
YPR (%SPR)
1990
1995
2000
2005
2010
2015
2020
2025
Year



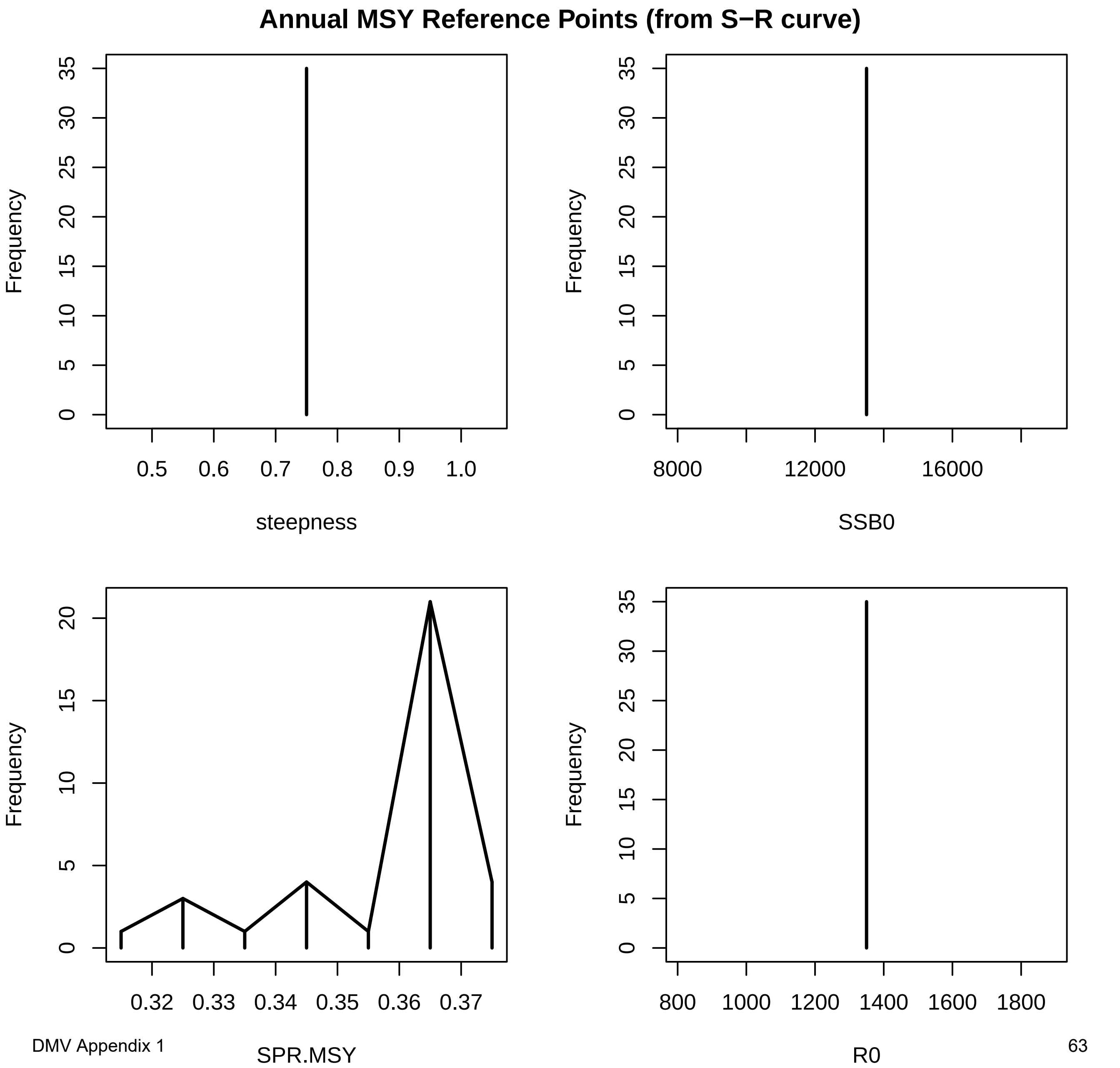
Annual F (%SPR) Reference Points
Frequency
Full F20%
Full F30%
Full F40%
Full F50%
0
2
4
6
8
10
12
0.48
0.52
0.56
0.60
0.27
0.28
0.29
0.30
0.31
0.175
0.180
0.185
0.190
0.195
0.118
0.122
0.126



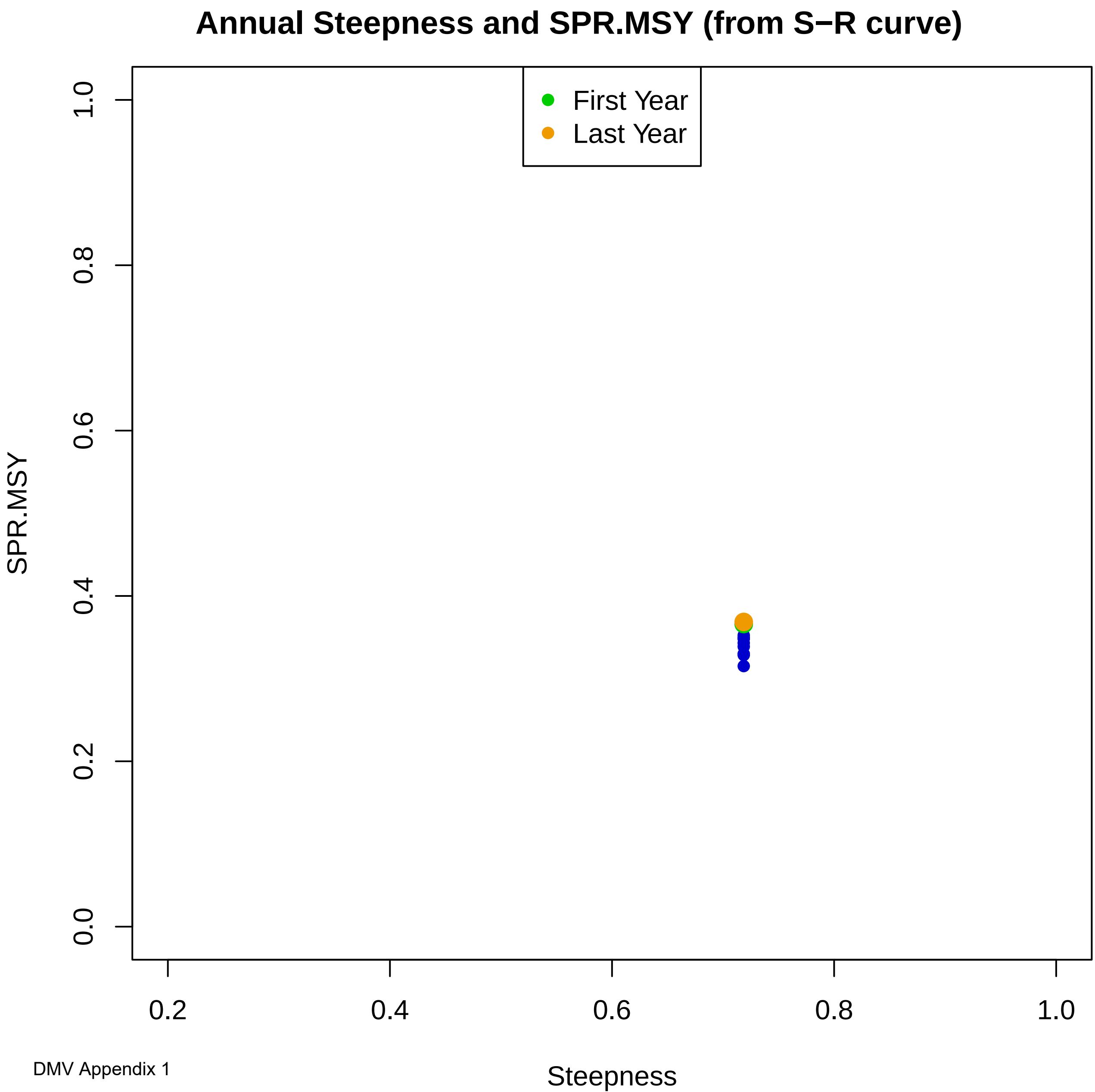
Annual YPR (%SPR) Reference Points
Frequency
0
5
10
15
20
0.56
0.60
0.64
0.68
YPR(20%)
Frequency
0
5
10
15
0.50
0.52
0.54
0.56
0.58
0.60
YPR(30%)
Frequency
0
5
10
15
20
0.44
0.46
0.48
0.50
0.52
YPR(40%)
Frequency
0
5
10
15
0.38
0.40
0.42
0.44
YPR(50%)

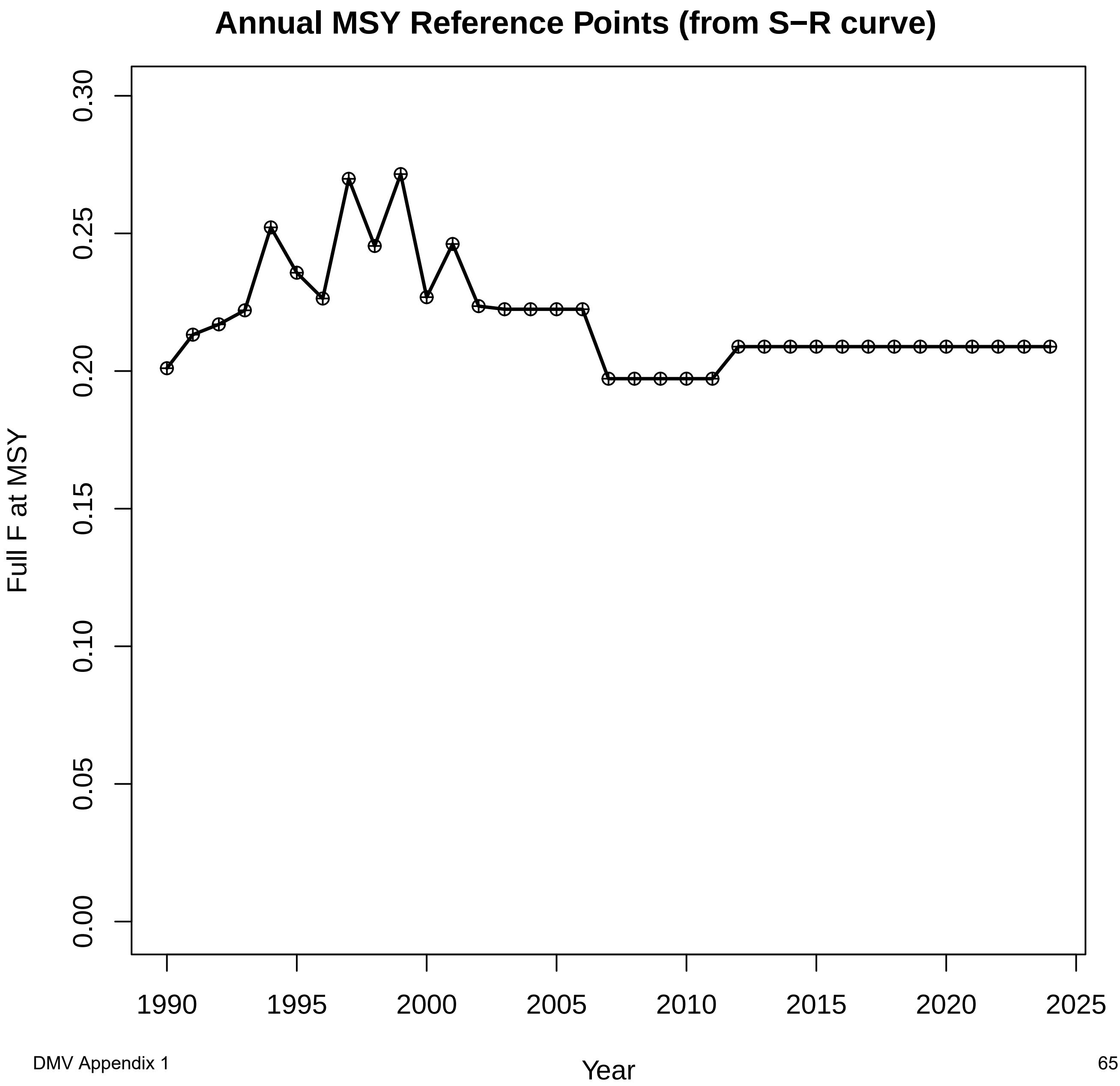


Annual MSY Reference Points (from S−R curve)
Frequency
Full F
0.20
0.22
0.24
0.26
SSB.MSY
3400
3600
3800
4000
MSY
500
540
580
620
R.MSY
3000
3500
4000
4500

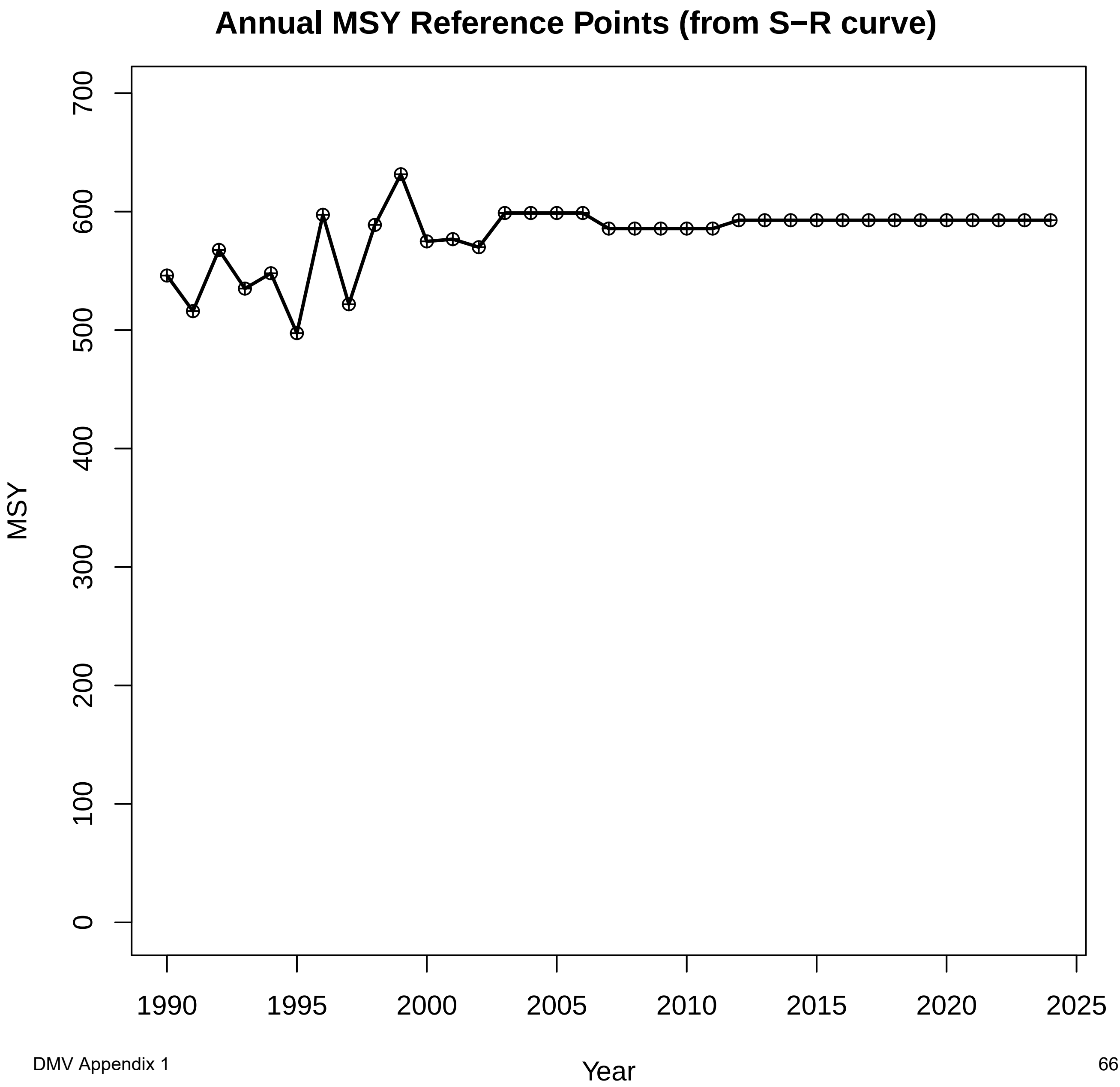


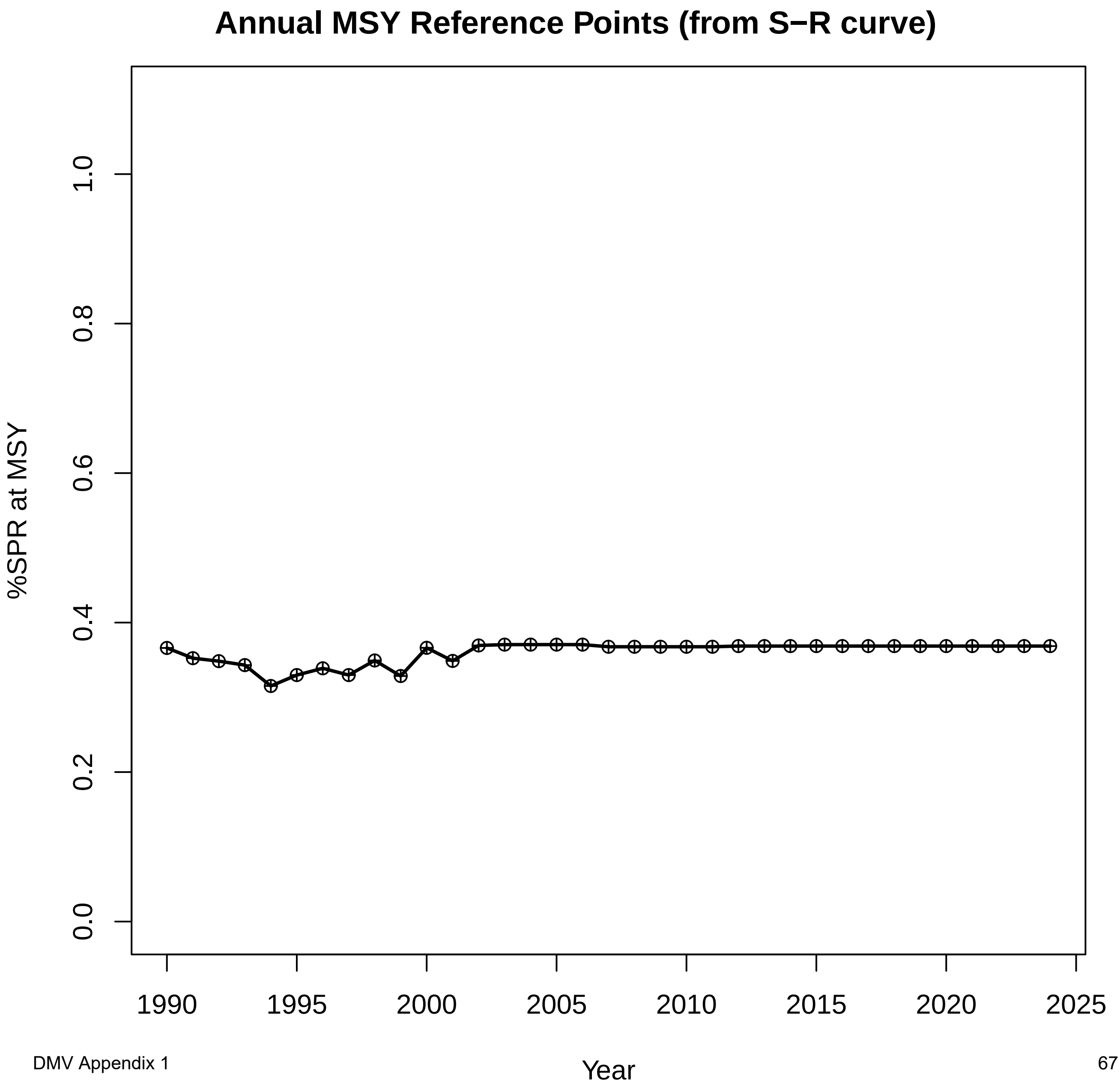
Annual MSY Reference Points (from S−R curve)
Frequency
0
5
10
15
20
25
30
35
0.5
0.6
0.7
0.8
0.9
1.0
steepness
8000
12000
16000
SSB0
20
0.32
0.33
0.34
0.35
0.36
0.37
SPR.MSY
800
1000
1200
1400
1600
1800
R0

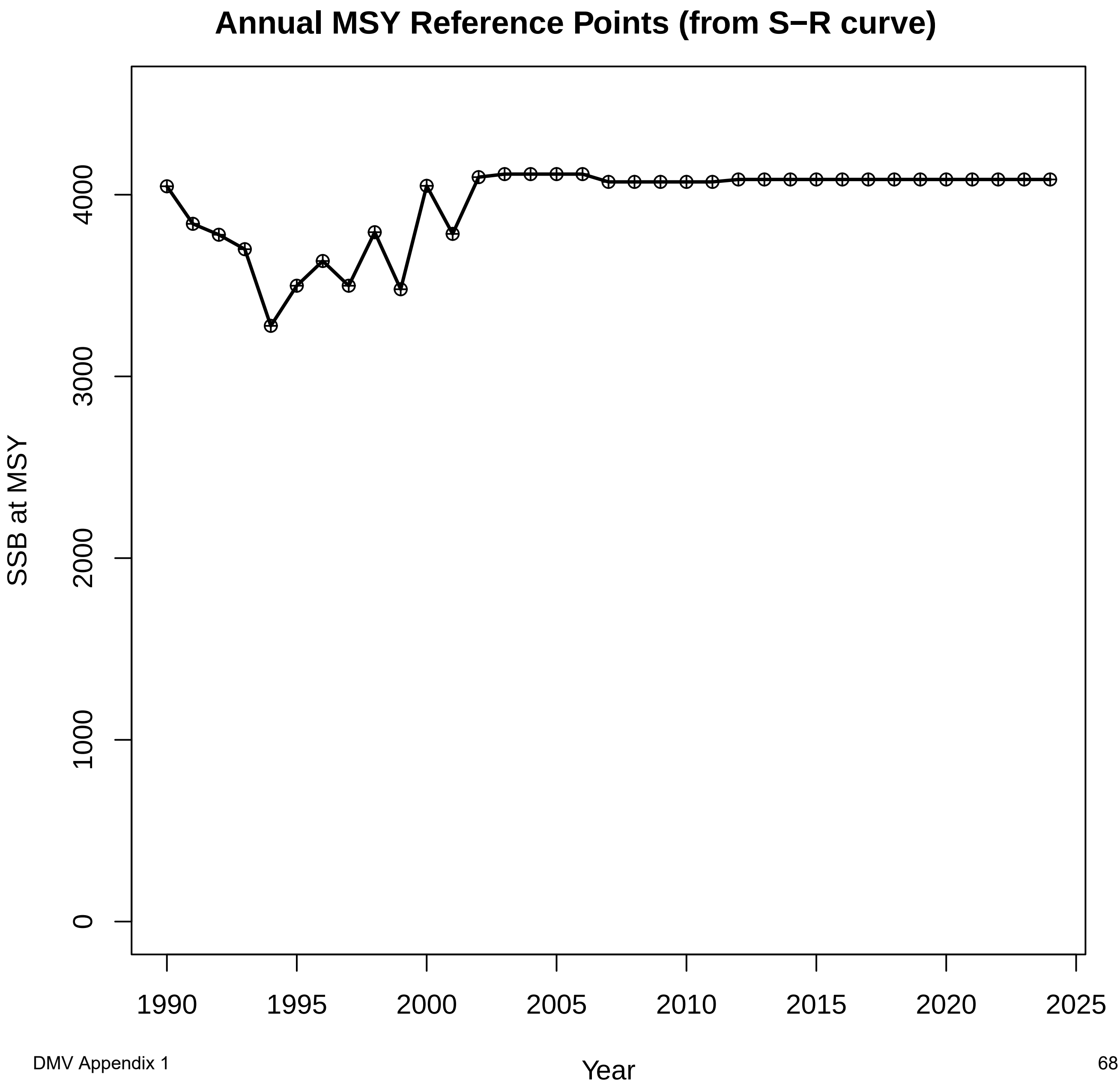

Annual Steepness and SPR.MSY (from S−R curve)
First Year
Last Year
SPR.MSY
1.0
0.8
0.6
0.4
0.2
0.0
0.2
0.4
0.6
0.8
1.0
Steepness

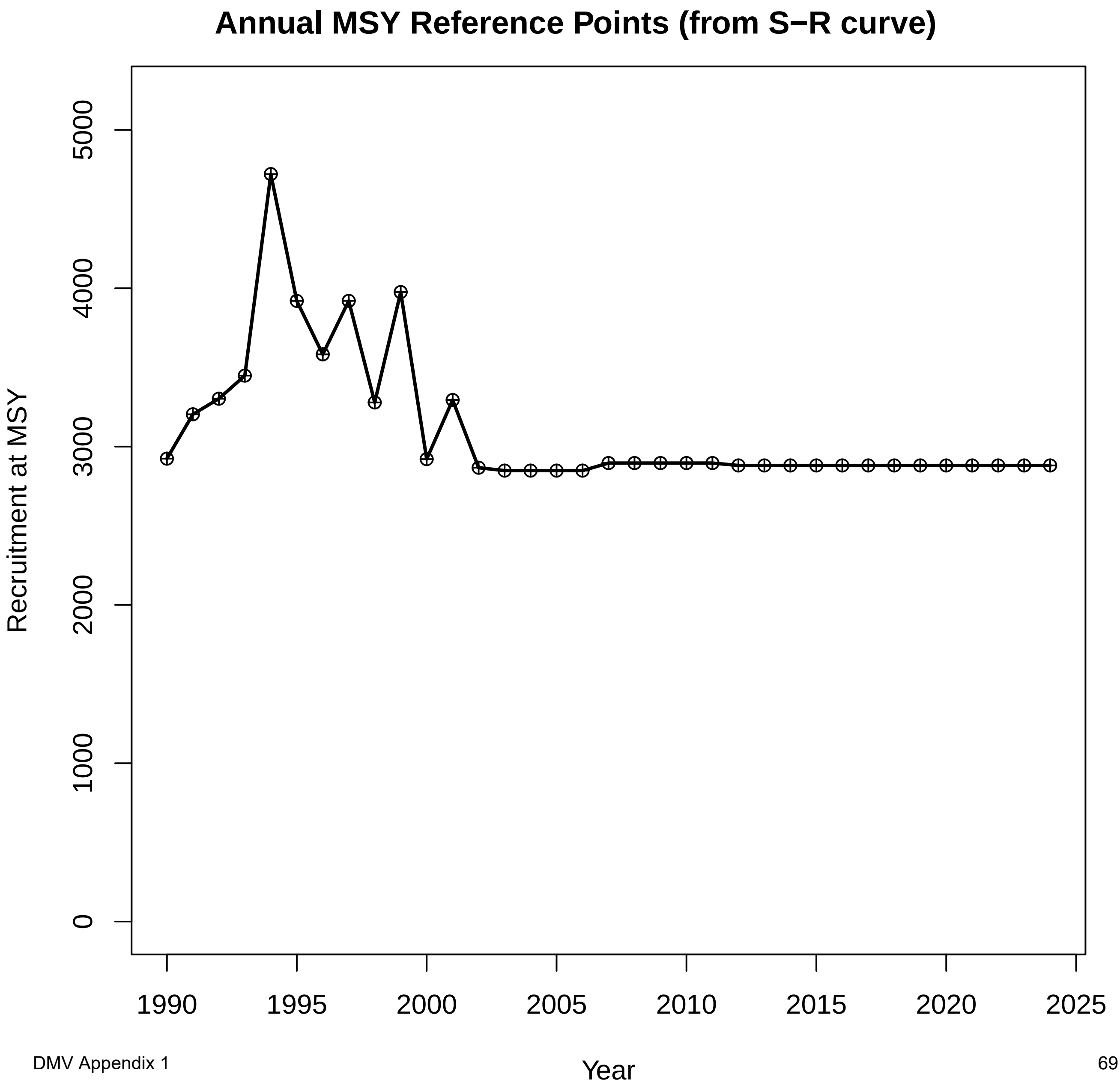


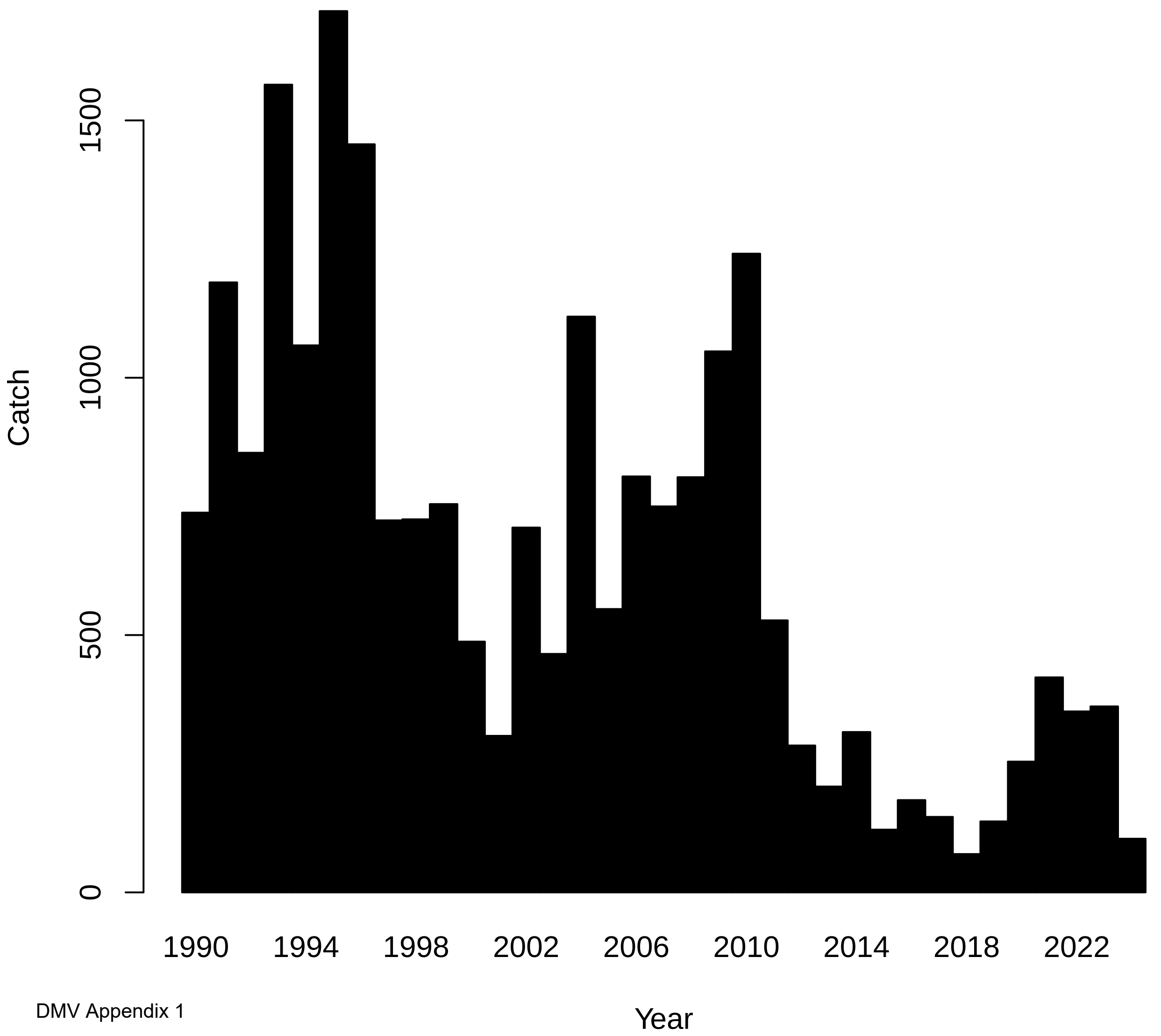
Annual MSY Reference Points (from S−R curve)
Full F at MSY
Year
0.00
0.05
0.10
0.15
0.20
0.25
0.30
1990
1995
2000
2005
2010
2015
2020
2025

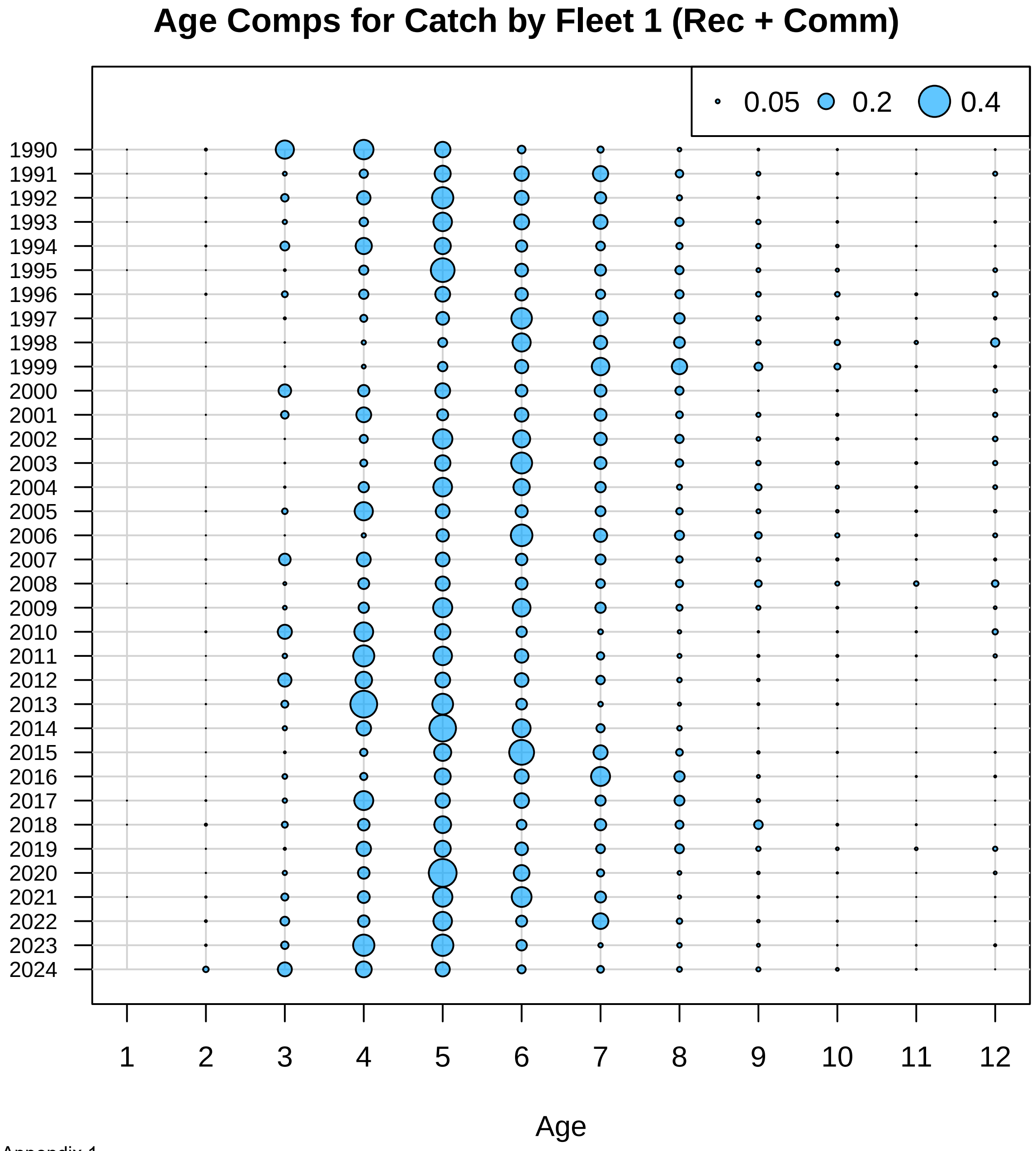

Annual MSY Reference Points (from S−R curve)
MSY
Year
0
100
200
300
400
500
600
700
1990
1995
2000
2005
2010
2015
2020
2025

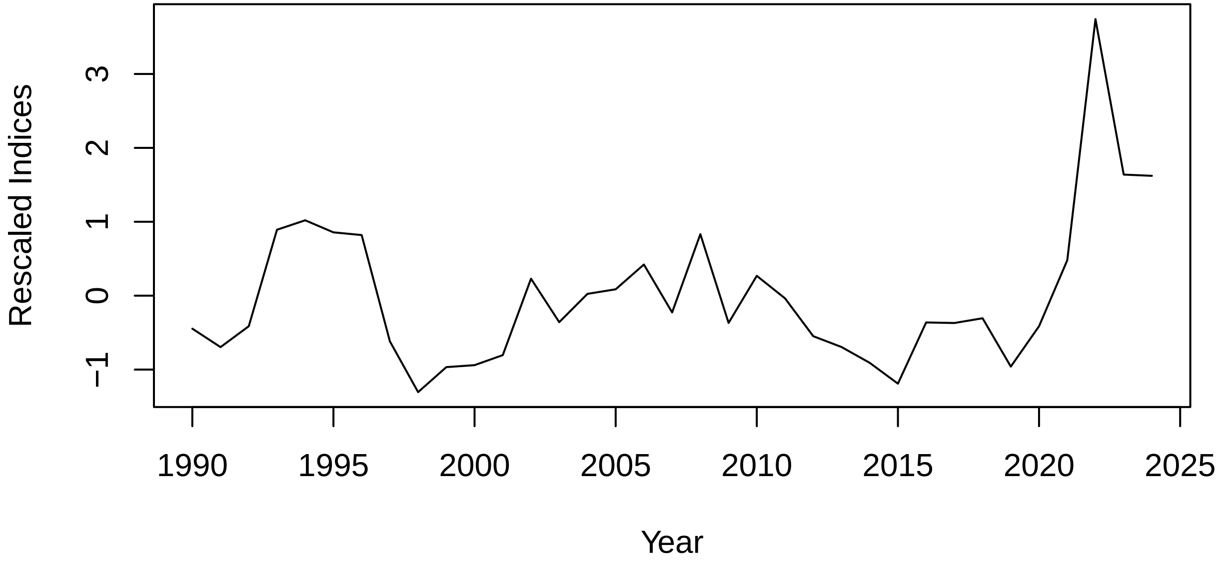

Annual MSY Reference Points (from S−R curve)
%SPR at MSY
0.0
0.2
0.4
0.6
0.8
1.0
1990
1995
2000
2005
2010
2015
2020
2025
Year

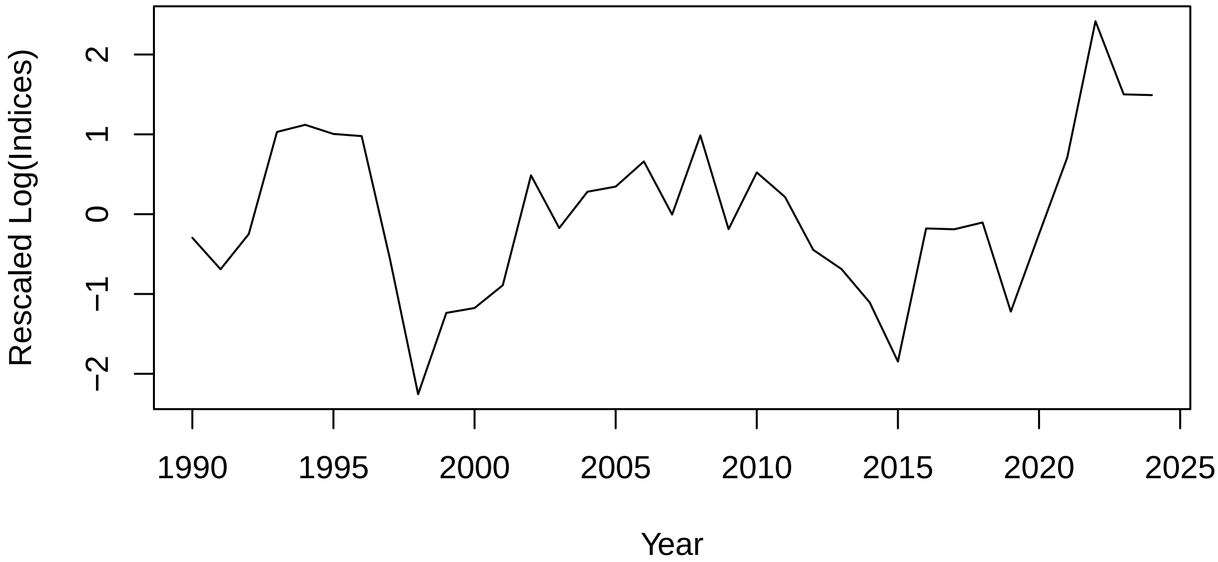

Annual MSY Reference Points (from S−R curve)
SSB at MSY
0
1000
2000
3000
4000
1990
1995
2000
2005
2010
2015
2020
2025
Year

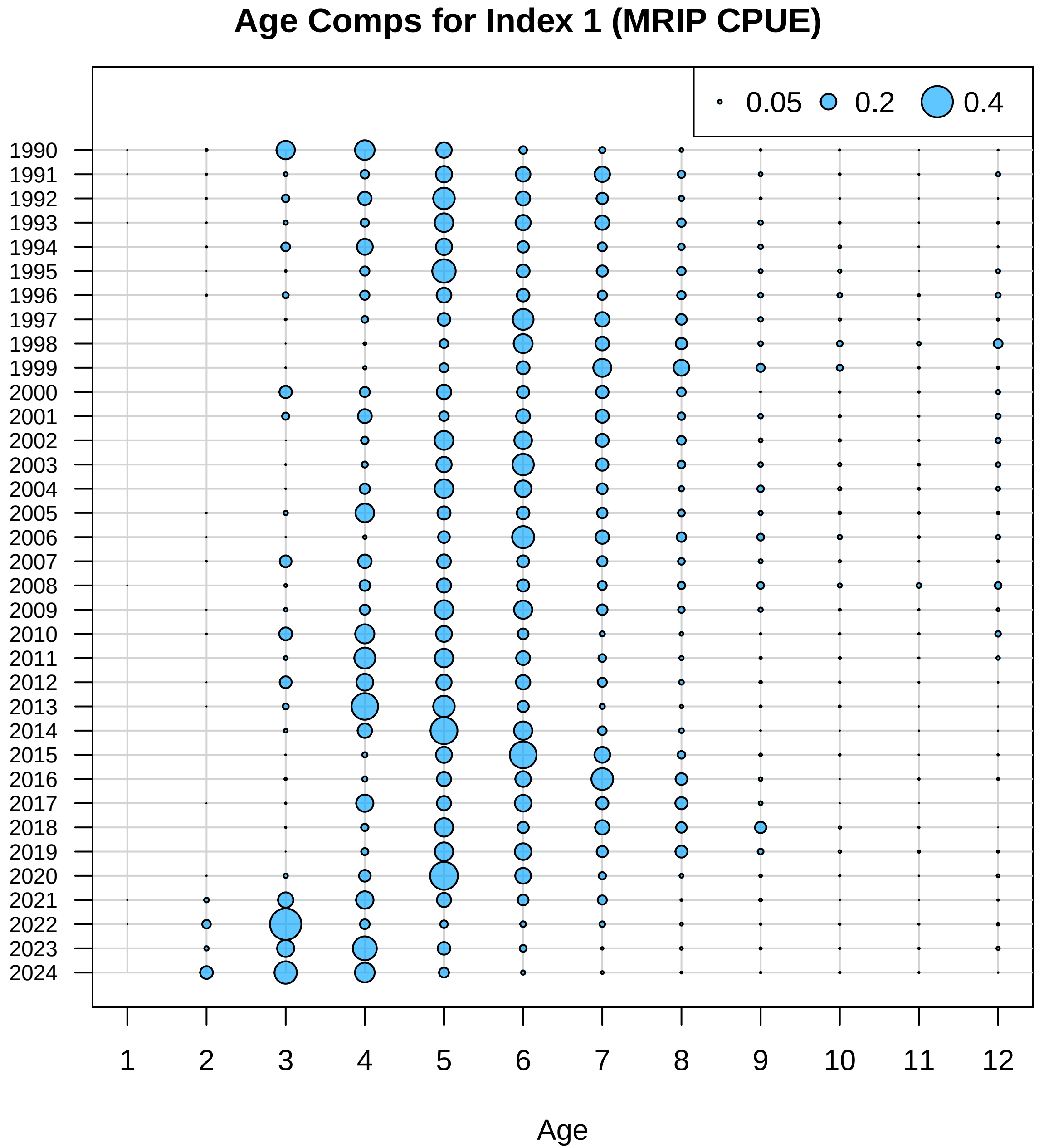

Annual MSY Reference Points (from S−R curve)
Recruitment at MSY
0
1000
2000
3000
4000
5000
1990
1995
2000
2005
2010
2015
2020
2025
Year


Catch
0
500
1000
1500
1990
1994
1998
2002
2006
2010
2014
2018
2022
Year

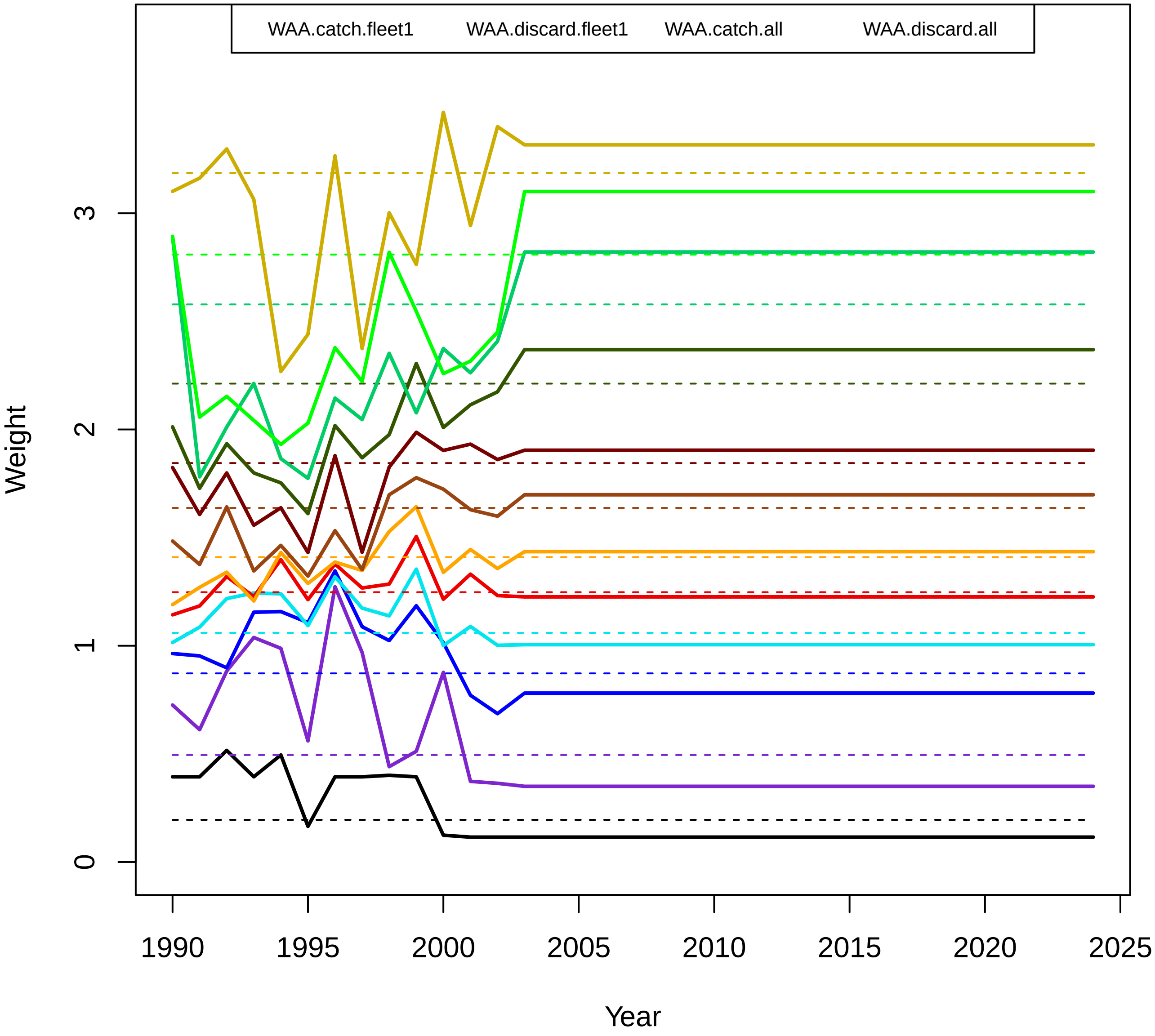

Age Comps for Catch by Fleet 1 (Rec + Comm)
0.05
0.2
0.4
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
1
2
3
4
5
6
7
8
9
10
11
12
Age


Rescaled Indices
Year
1990
1995
2000
2005
2010
2015
2020
2025
−1
0
1
2
3

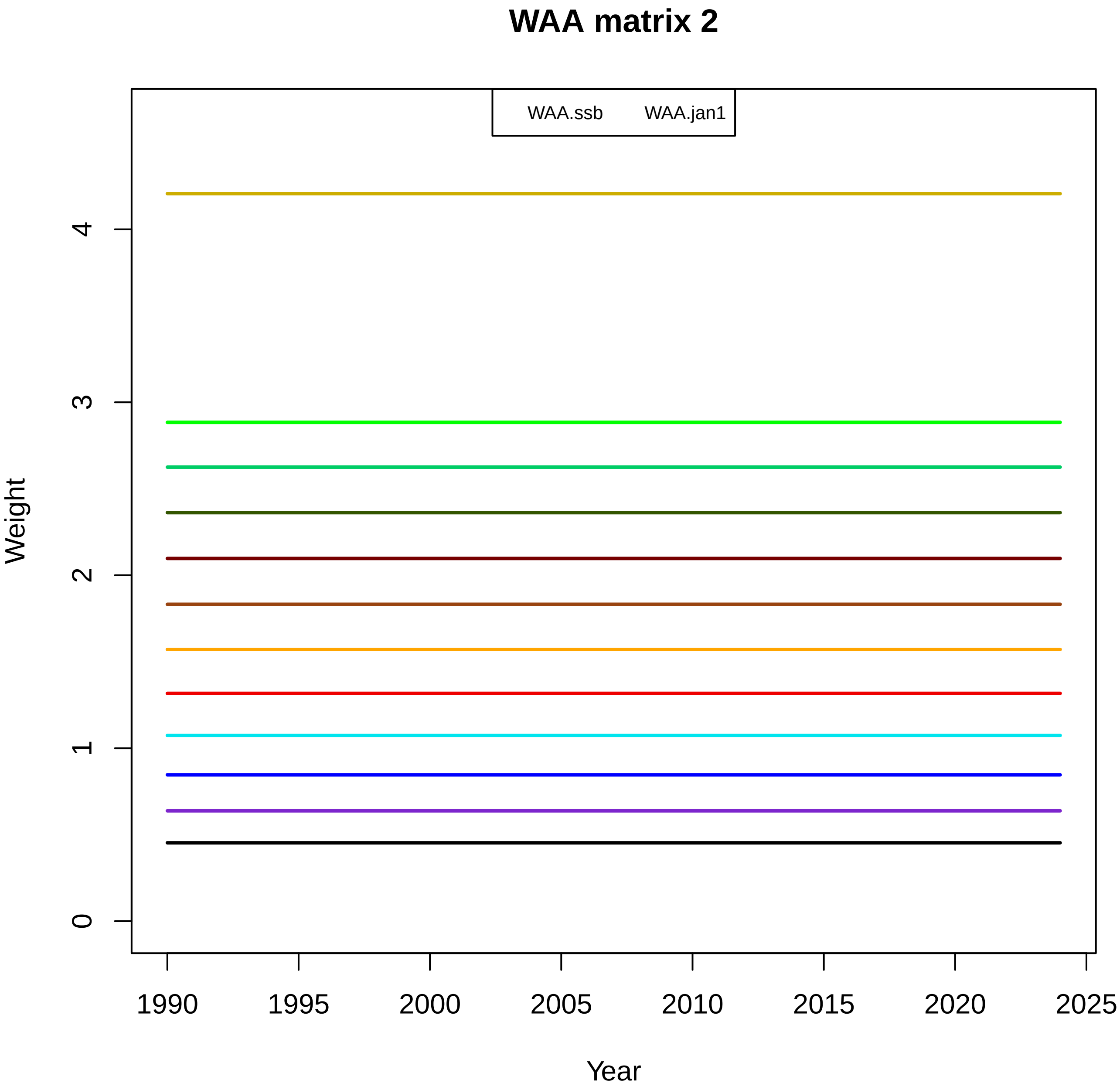

Rescaled Log(Indices)
Year
1990
1995
2000
2005
2010
2015
2020
2025
−2
−1
0
1
2

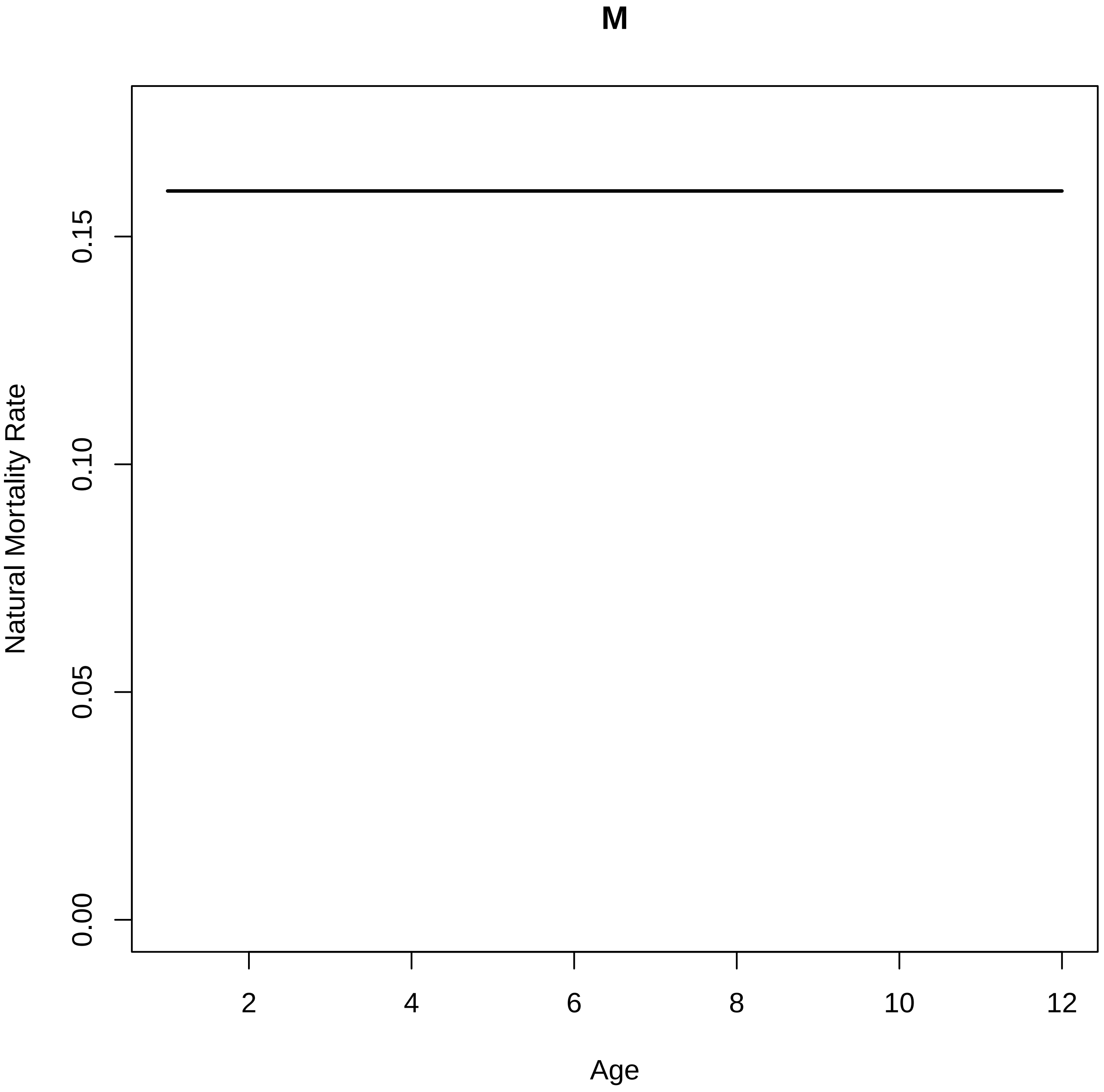

Age Comps for Index 1 (MRIP CPUE)
0.05
0.2
0.4
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
1
2
3
4
5
6
7
8
9
10
11
12
Age

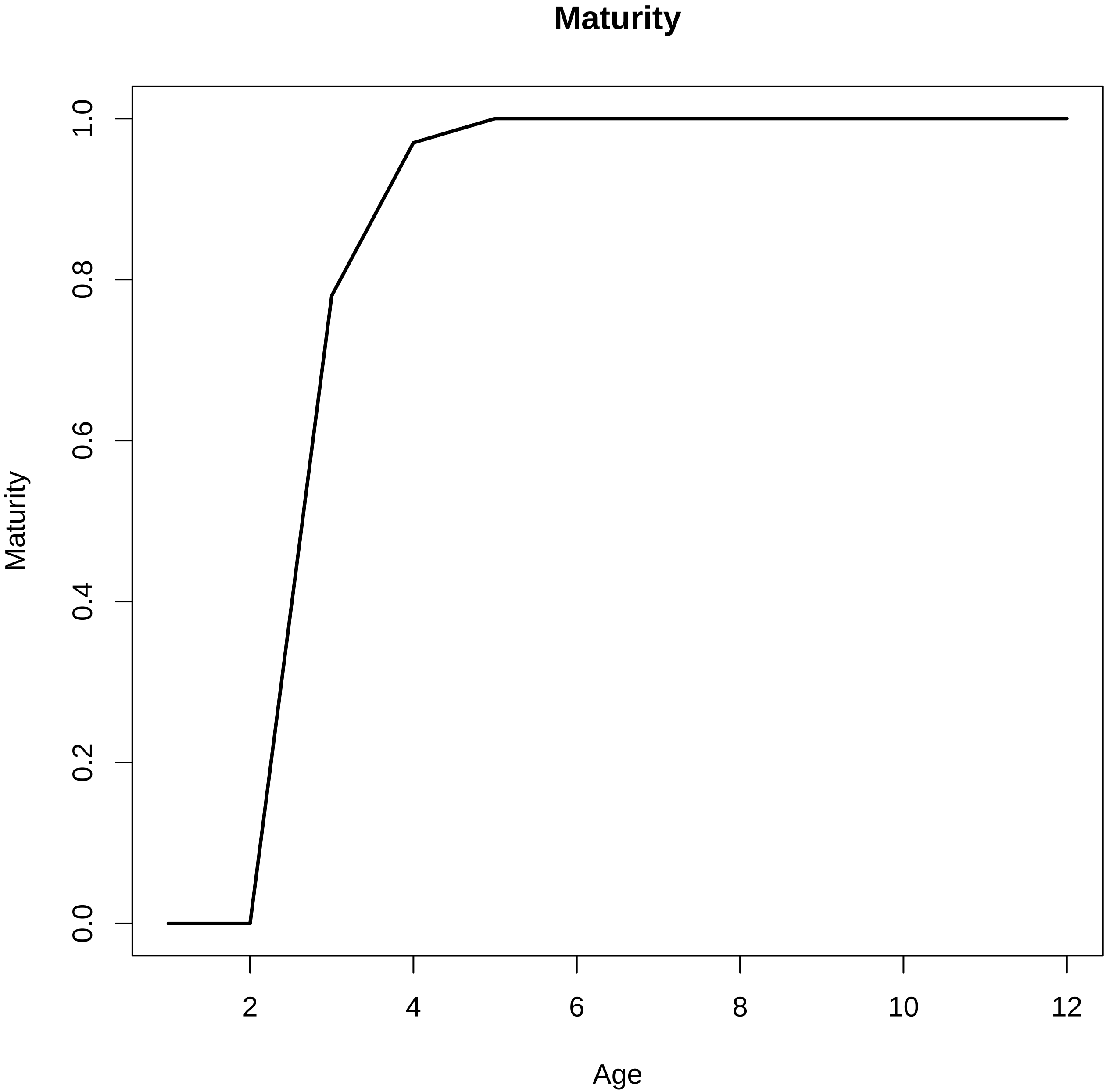
WAA matrix 1



WAA.catch.fleet1
WAA.discard.fleet1
WAA.catch.all
WAA.discard.all
Weight
0
1
2
3
Year
1990
1995
2000
2005
2010
2015
2020
2025


WAA matrix 2
WAA.ssb
WAA.jan1
Weight
0
1
2
3
4
1990
1995
2000
2005
2010
2015
2020
2025
Year


M
Natural Mortality Rate
0.00
0.05
0.10
0.15
2
4
6
8
10
12
Age


Maturity
Maturity
0.0
0.2
0.4
0.6
0.8
1.0
2
4
6
8
10
12
Age

DMV Appendix 2: Retrospective Adjustment and Sensitivity Runs

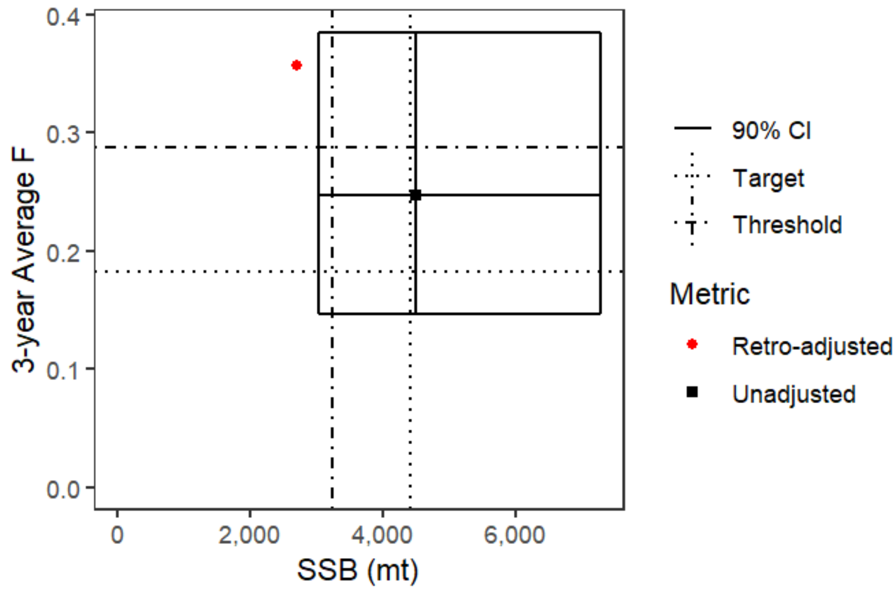


Figure A2.1. Unadjusted (black square) and adjusted for retrospective bias (red circle) 2024 estimates of F and SSB. 90% confidence limit intervals for F and SSB shown as a box around the unadjusted data point, corresponding target and limit SSB shown as vertical lines and target and limit F as horizontal lines.

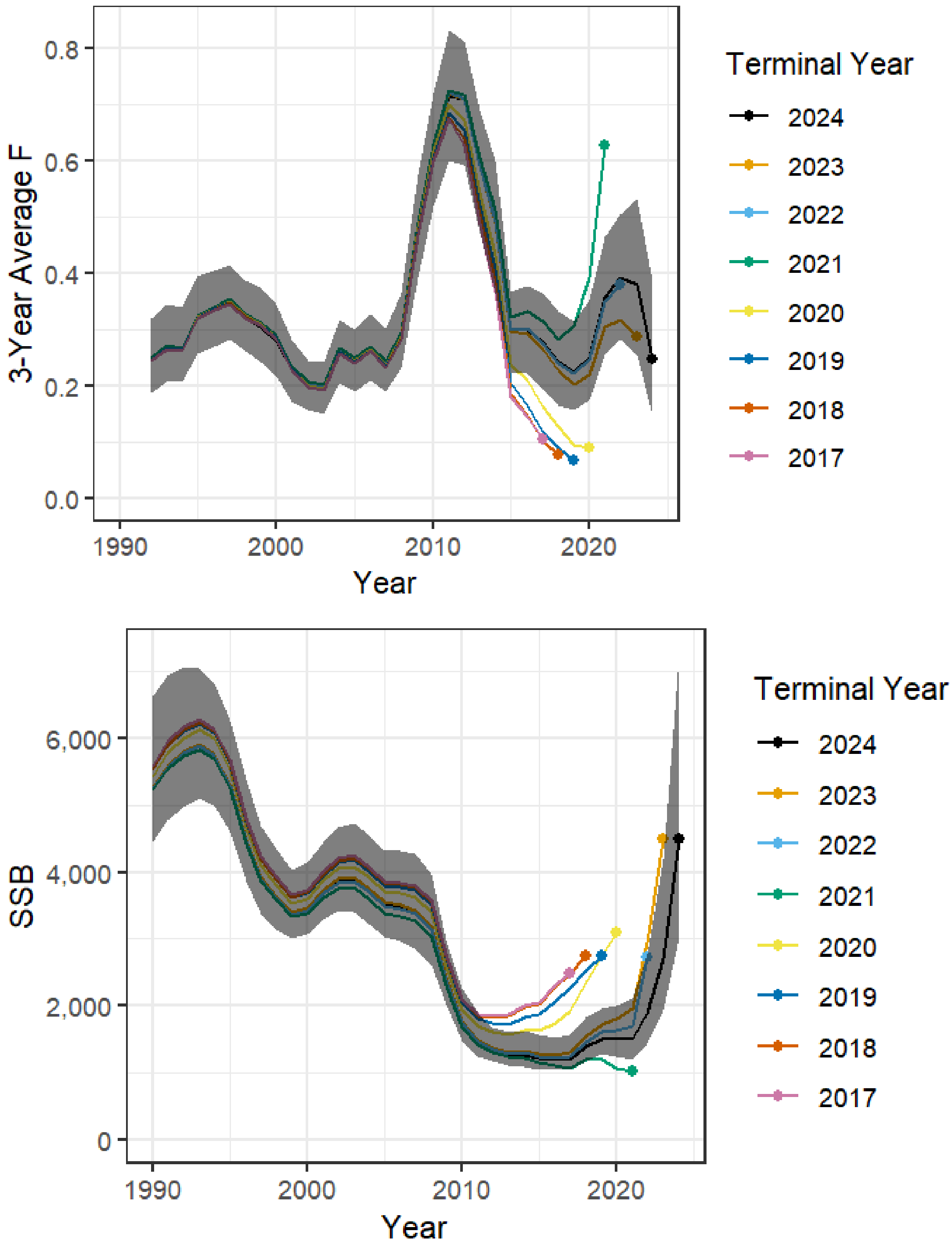
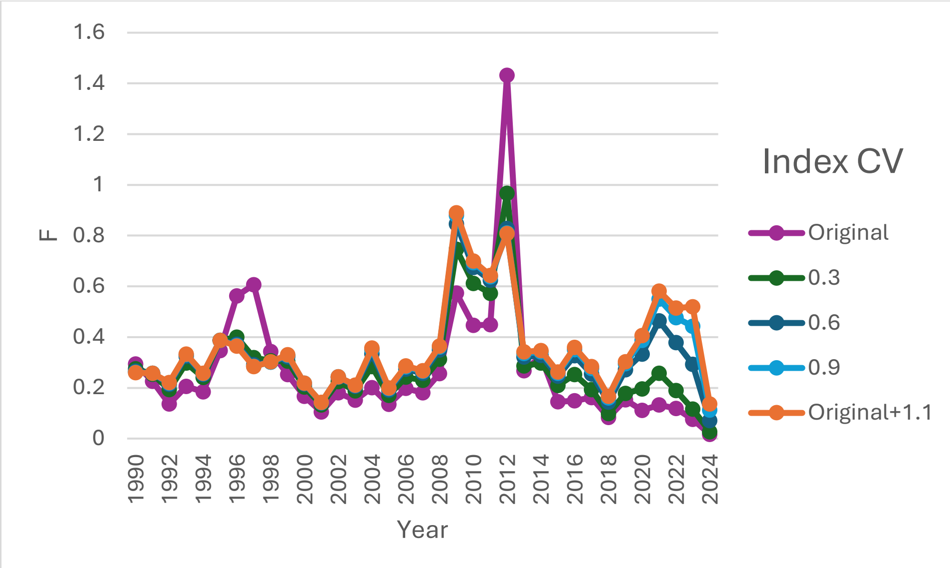


Figure A2.2. Retrospective estimates of F and SSB compared to the 2024 base run with the 90% confidence intervals.

Table A2.1 Summary of sensitivity runs focused on varying the index CV. Original CVs were based on the GLM-standardized CVs, which had a mean of 0.1027 and a standard deviation of 0.0081.

Input Parameters Changed			RMSE					SSB	Mohn's Rho	
					Fmult					
Index CV	Catch CV	Objective Function	Catch	Index	Year 1	Devs	Recruitment Devs	Terminal Year	F	SSB
1.2	original	13172.5	0.7195	0.8844	2.8597	0.9138	1.0836	2260.52	0.3248	-0.0693
original+1	original	13172	0.7238	0.9185	2.8553	0.9166	1.0948	2412.38	0.28	-0.0146
1.1	original	13172.1	0.7242	0.9208	2.855	0.9169	1.0954	2420.16	0.28	0.0641
1	original	13171.8	0.7309	0.9629	2.8492	0.906	1.1095	2624.26	0.2309	0.1674
0.9	original	13171.7	0.7407	1.012	2.842	0.9252	1.1267	2891.5	0.1295	0.3363
0.8	original	13172	0.7655	1.0695	2.833	0.9309	1.148	3251.66	-0.0377	0.5221
0.7	original	13172.8	0.7766	1.1378	2.8213	0.9382	1.1753	3754.55	-0.1769	0.6708
0.6	original	13174.6	0.8083	1.2194	2.8063	0.9478	1.2111	4488.87	-0.3187	0.6708
0.5	original	13178	0.8555	1.3178	2.787	0.961	1.2599	5,623.15	-0.4923	0.82
0.4	original	13184.5	0.9257	1.4401	2.7613	0.9801	1.328	7,489.41	-0.55	0.8765
0.3	original	13197.1	1.0348	1.612	2.7289	1.0118	1.4164	10,677.20	-0.5283	0.7085
0.2	original	13226.3	1.2306	1.9549	2.6677	1.0793	1.487	16,424.50	-0.3725	0.3322
original	original	13340.4	1.7241	3.0134	2.5907	1.2237	1.4365	15,093.10	-0.416	0.3489
0.1	original	13352	1.764	3.0745	2.5564	1.2491	1.4577	15,856.60	-0.3867	0.321



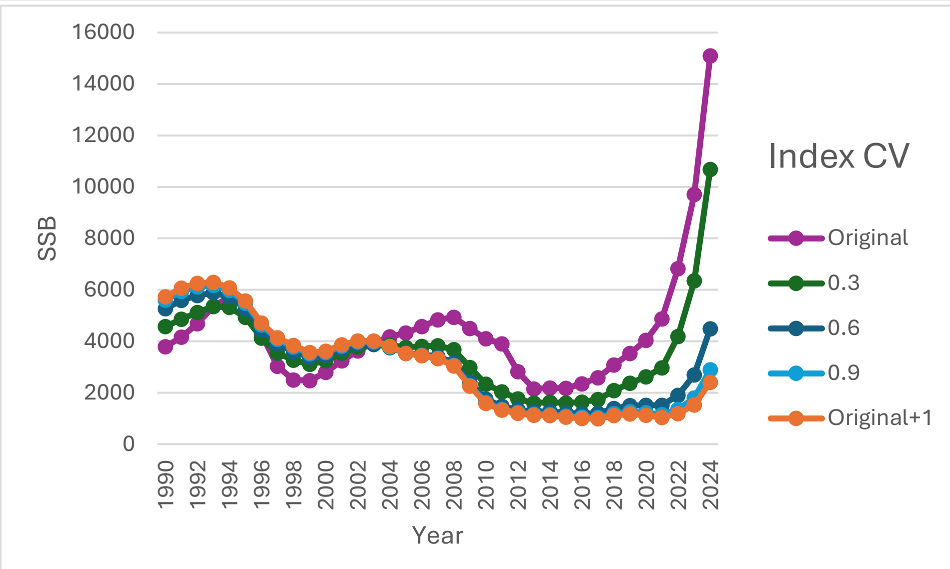


Figure A2.3. Spawning stock biomass (top) and annual *F* (bottom) estimates from ASAP runs with different CV values for the MRIP index.

ATLANTIC STATES MARINE FISHERIES COMMISSION

REVIEW OF THE INTERSTATE FISHERY MANAGEMENT PLAN

FOR TAUTOG
(Tautoga onitis)

2024 FISHING YEAR

Prepared by the Plan Review Team

October 2025

Sustainable and Cooperative Management of Atlantic Coastal Fisheries

REVIEW OF THE ASMFC FISHERY MANAGEMENT PLAN AND STATE COMPLIANCE FOR TAUTOG (*Tautoga onitis*) FOR THE 2022 FISHERY

Management Summary

Date of FMP: March 1996

Addenda/Amendments:

- Addendum I to FMP (May 1997)
- Addendum II to FMP (November 1999)
- Addendum III to FMP (February 2002)
- Technical Addendum I (February 2003)
- Addendum IV to FMP (January 2007)
- Addendum V to FMP (August 2007)
- Addendum VI to FMP (March 2011, revised March 2012)
- Amendment 1 to FMP (October 2017)

Management Unit: US state waters from Massachusetts through Virginia[1].

States With Declared Interest: Massachusetts-Virginia, excluding Pennsylvania

Additional Jurisdictions: National Marine Fisheries Service

Active Boards/Committees: Tautog Management Board (Board)

- Tautog Plan Development Team (PDT)
- Tautog Plan Review Team (PRT)
- Tautog Technical Committee (TC)
- Tautog Stock Assessment Subcommittee (SAS)
- Tautog Advisory Panel (AP)

Stock Assessments:

- Benchmark: 1999, 2005, 2015
- Update: 2011 (revised in 2012), 2016, 2021, 2025

[1] North Carolina was originally included in the management unit, but as of 2017 was removed due to insignificant landings. North Carolina's landings will continue to be monitored.

I. Status of Fishery Management Plan

Fishery Management Plan for Tautog

The original FMP responded to concerns about the vulnerability of tautog to overfishing and increasing fishing pressure in the early 1990s. It established goals and objectives for tautog management and adopted a fishing mortality rate (F) target of 0.15 to rebuild the stocks and prevent overfishing; however, an interim target of 0.24 was applied for two years (1997–1998). States were required to implement state-specific, Board-approved plans to reduce F from the coastwide average of 0.58 (i.e., a 55% reduction), or an alternative state-specific F, if it could be demonstrated as equivalent. Recreational and commercial minimum size limits of 13” in 1997 and 14” beginning in 1998 were required. Tautog pots and traps were also required to have degradable fasteners on one panel or door.

Addendum I

Addendum I modified the FMP’s compliance schedule to allow all states until April 1, 1998 to implement management measures to reach the interim F target. Several states were having difficulty determining a state-specific F to meet the original compliance schedule due to data deficiencies. In addition, the compliance schedule implemented the interim F target one year earlier in the area north of Delaware Bay (April 1, 1997) than further to the south (April 1, 1998). The addendum also delayed the implementation of management measures to achieve the permanent F target from April 1, 1999 to April 1, 2000. Finally, the Addendum included *de minimis* requirements and corrected several typographical errors in the FMP.

Addendum II

Addendum II further extended the compliance schedule to achieve the permanent F target until April 1, 2002 because the effects of the regulations to achieve the interim F target were uncertain. It also listed four issues to be considered in subsequent revisions of the FMP: (1) development of alternative F targets that will allow states to quantify harvest reductions associated with a variety of management approaches, (2) clarification of the F targets to be met by sector or overall state program, (3) monitoring requirements to improve fisheries and biological data collection, and (4) data requirements to analyze management options by fishing modes within commercial and recreational fisheries.

Addendum III* and *Technical Addendum I

Addendum III addressed the four issues listed in Addendum II. It adopted a new F target based on achieving 40% of the spawning stock biomass ($F_{40\%\ SSB}$), which was estimated at 0.29 (compared to the coastwide average F estimate of 0.41). The addendum required states to maintain current or more restrictive measures for 2002 and implement measures to achieve the new F target—a 29% reduction through restrictions in the recreational fishery only—by April 1, 2003. It also updated information on tautog habitat and established monitoring requirements to support stock assessments, including the collection of 200 age and length samples per state, within the range of lengths commonly caught by the fisheries. Technical Addendum 1 corrected a typographical error in Addendum III.

Addendum IV
Addendum IV established SSB target and threshold reference points based on a benchmark stock assessment completed in 2005. The target was set as the average SSB over 1982–1991, and the threshold at 75% of this value. It also set a new F target of 0.20 to initiate rebuilding. States were required to implement recreational management programs to achieve a 28.6% reduction in F relative to 2005 (and maintain existing commercial management programs) by January 1, 2008.

Addendum V
As individual states developed management proposals to comply with Addendum IV's mandated reduction in fishing mortality, it became apparent that commercial harvest of tautog had grown in proportion to the recreational fishery in some states. The Board approved Addendum V to give states flexibility for implementing reductions in their recreational *and/or* commercial fisheries to reach the fishing mortality target rate of F = 0.20 established in Addendum IV by January 1, 2008.

Addendum VI
Based on the 2011 stock assessment update indicating that tautog were still overfished and experiencing overfishing, Addendum VI reduced the F target to 0.15 to rebuild the stock. States were required to implement Board-approved regulations in their commercial and/or recreational fisheries to reduce harvest by 39%. The addendum also allowed for regional considerations if a state or group of states could demonstrate that the local F is below the rates indicated in the stock assessment update.

Amendment 1
Amendment 1 replaced the original FMP, with an implementation date of April 1, 2018 for most measures. Major revisions to the FMP include: new goals and objectives, establishment of four tautog stocks for regional recreational and commercial management, and creation of a commercial harvest tagging program (implementation in 2020).

Goals:
- To sustainably manage tautog over the long-term using regional differences in biology and fishery characteristics as the basis for management.
- To promote the conservation and enhancement of structured habitat to meet the needs of all stages of tautog's life cycle.

Objectives:
- To develop and implement management strategies to rebuild tautog stocks to sustainable levels (reduce fishing mortality to the target and restore spawning stock biomass to the target), while considering ecological and socio-economic impacts.
- To adopt compatible management measures among states within a regional management unit.
- To encourage compatible regulations between the states and the EEZ, which includes enacting management recommendations that apply to fish landed in each state (i.e., regulations apply to fish caught both inside and outside of state waters).

- To identify important habitat and environmental quality factors that support the long-term maintenance and productivity of sustainable tautog populations throughout their range.
- To promote cooperative interstate biological, social, and economic research, monitoring and law enforcement.
- To encourage sufficient monitoring of the resource and collection of additional data, particularly in the southern portion of the species range, that are necessary for development of effective long-term management strategies and evaluation of the management program.
- To work with law enforcement to minimize factors contributing to illegal harvest.

Regional Management: Based on the 2016 regional stock assessment, Amendment 1 delineates the stock into four regions due to differences in biology and fishery characteristics: Massachusetts - Rhode Island (MARI); Long Island Sound (LIS); New Jersey - New York Bight (NJ-NYB); and Delaware - Maryland - Virginia (DelMarVa). The four regions are required to implement measures to achieve the regional fishing mortality target with at least a 50% probability.

The 2016 assessment found that all regions except MARI were overfished, and overfishing was occurring in the LIS and NJ-NYB regions in 2015. As such, Amendment 1 requires the LIS region to reduce harvest by at least 20.3%, and the NJ-NYB region to reduce harvest by at least 2%. The MARI and DelMarVa regions were not required to reduce harvest but established regional measures.

Commercial Harvest Tagging Program: Amendment 1 also establishes a commercial harvest tagging program to address an illegal, unreported, and undocumented fishery. Coastwide implementation of the program began in 2020; more information on the current implementation can be found in Section VI. Status of Management Measures and Issues.

II. Status of the Stocks

Current stock status is based on the 2021 stock assessment update, which uses the methodology that was approved for management use as part of the 2016 benchmark stock assessment. The assessment evaluates each of the four regions—MARI, LIS, NJ–NYB, and DelMarVa–separately using the ASAP statistical catch-at-age model with landings and index data through 2020. This is the first stock assessment for tautog to use recreational catch estimates from the Marine Recreational Information Program (MRIP) since major revisions to its methodology in 2018. The new MRIP estimates resulted in higher estimates of spawning stock biomass (SSB) and recruitment in all regions but had less of an impact on fishing mortality.

The 2021 stock assessment update found improvements in most regions since the last assessment (2017). Overfishing was no longer occurring in any region in 2020 (a change for LIS and NJ-NYB), while only the NJ-NYB region remained overfished in 2020 (with LIS and DelMarVa moving out of this category). F was below the target in the DelMarVa and MARI regions, and between the target and threshold in the LIS and NJ-NYB regions. Strong year classes in MARI and LIS in recent years appear to have contributed to increasing trends in spawning stock biomass, while a significant decline in F in DelMarVa since 2012 has resulted in an increase in SSB there. While the NJ-NYB region remains overfished, the SSB has been trending upward since the last assessment. The current overfishing and overfished definitions for management use are shown in Table 1, and fishing mortality and spawning stock biomass (SSB) for each region relative to the respective targets and thresholds are shown in Figures 1-8. The next assessment update (with data through 2024) is scheduled to be presented to the Board in October 2025.

IV. Status of the Fishery

Total Harvest

Between 1981 and 2024[2], total coastwide tautog harvest (recreational + commercial) peaked at 22.5 million pounds in 1986 (Figure 9). Harvest has since declined significantly, starting before state restrictions were implemented. Total harvest during the ASMFC managed period (1996–2024) has averaged approximately 8.08 million pounds per year.

Recreational Harvest

Tautog is predominantly taken by the recreational fishery: 96% on average, by weight, coastwide (Table 2), although individual states' proportions vary (Table 3). Coastwide, anglers harvested historic highs of over 20 million pounds of tautog in 1986 and 1992 (Figure 9). Since then, harvest has declined, fluctuating between a low of 3.4 million pounds (in 2018) and a high of 13.2 million pounds (in 2021). In 2024, recreational harvest was over 10.7 million pounds, which was an approximate 25% decrease from 2023. Recreational harvest occurs primarily in September–December (Figure 10). At the state level, Massachusetts through New Jersey account for the vast majority of recreational harvest (Tables 4 and 5), with New York and Massachusetts anglers harvesting the most tautog in 2024, although the highest harvesting states vary year-to-year (Figure 11).

Recreational releases have generally increased relative to harvest over the time series. Prior to the FMP's implementation in 1996, the number of fish released alive annually was less than harvest, but since then releases have been several times greater than the harvest (Table 4). In 2024, the live releases of 26.1 million fish—while down 19% from the timeseries peak in 2023—were still more than eight times the estimated harvest of 3.1 million fish. A discard mortality rate of 2.5% is assumed for the recreational tautog fishery, resulting in an estimated 652,871 recreational dead discards in 2024. This equates to approximately 17.5% of all recreational removals.

Commercial Landings

Historically, tautog was considered a "trash fish" until the late 1970s, when demand increased, and a directed commercial fishery developed. Landings quickly rose, peaking in 1987 at nearly 1.2 million pounds, then rapidly began to decline (Figure 12). In 1992, states began to implement commercial regulations, which contributed to a decline in landings. Non-confidential commercial landings in 2024 were approximately 497,713 pounds (Table 2). The coastwide average ex-vessel price (dollars per pound) for tautog has increased nearly steadily from the late 1970s, peaking at $4.54 per pound in 2022. In 2024, the coastwide average price was $3.47 per pound (Figure 12).

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[2] Systematic data collection for recreational catch estimation began in 1981, while commercial landings data exists back to 1950.

Commercial landings accounted for approximately 4.4% of total coastwide harvest in 2024. On a state level, commercial landings comprised no more than 24.4% of a state's total landings (Table 3). New York had the most commercial landings of tautog in 2024 (69% of the coastwide total), with Massachusetts landing the second greatest amount (approximately 14% of the coastwide total) (Table 6). Data on commercial discards are not available.

V. Status of Research and Monitoring

All states are required to collect the following data to continue support of a coast-wide stock assessment: commercial and recreational catch estimates, and 200 age and length samples per state, within the range of lengths commonly caught by the fisheries. In 2019, the Technical Committee reconfirmed that 200 was the minimum number of biological samples needed for adequate catch characterization. Additionally, the 2023 ASMFC Quality Assurance/Quality Control Fish Ageing Workshop recommended for states to convert from using opercula to using spines and otoliths for ageing tautog. Table 7 lists the number and source of samples collected by states in 2024.

Ongoing fishery-independent and fishery-dependent monitoring programs performed by each state are summarized in Tables 10 and 11, respectively. Details of monitoring results are found in the state compliance reports.

VI. Status of Management Measures and Issues

Amendment 1 to the Tautog Fishery Management Plan was approved by the Board in October 2017, with an implementation deadline of April 2018 for all mandatory measures except the commercial tagging program having a January 2019 deadline. All states adopted regulations compliant with the FMP in time for the April 2018 deadline. The Board subsequently delayed the tagging program implementation deadline to January 2020, which all states met with the exception of Connecticut and New York; these states requested an extension until 2021 due to challenges presented by the COVID-19 pandemic. Since 2021, all states have implemented the tagging program.

VII. Implementation of FMP Compliance Requirements

A. Submission of Compliance Report

All states in the tautog management unit submitted state compliance reports for the 2024 fishing year.

B. *De Minimis* Status Requests

A state may apply for *de minimis* status with regards to its commercial fishery. To qualify for *de minimis* status a state must prove that its commercial landings in the most recent year for which data are available did not exceed 10,000 pounds or 1% of the regional commercial landings, whichever is greater. States must request *de minimis* status each year, and requests for *de minimis* status will be reviewed by the PRT as part of the annual FMP review process.

If *de minimis* status is granted, the *de minimis* state is still required to implement the commercial minimum size provision, the pot and trap degradable fastener provision, the commercial tagging program, and regulations consistent with those in the recreational fishery (including possession limits and seasonal closures). The state must monitor its landings on at least an annual basis. If granted *de minimis* status, a state must continue to collect the required 200 age/length samples. *De minimis* status does not impact a state's compliance requirements in the recreational fishery.

The commercial landings threshold for *de minimis* status for 2024 in each region is 10,000 pounds. The states of Delaware and Maryland have requested and qualify for continued *de minimis* status for the commercial sector. <u>The PRT recommends that the Board approve the states of Delaware and Maryland's requests.</u>

C. Regulatory Requirements: 14" minimum size limit for recreational and commercial fisheries; degradable fasteners on one panel or door in fish pots and traps; and regional management programs to achieve the required regional target F.

State regulations are summarized in Tables 8 and 9. Every state adjusted their commercial and recreational measures to comply with the provisions of Amendment 1 and align with the other states in their regions.

For the 2024 fishing year, there were no reported regulatory changes. Massachusetts' and Rhode Island's commercial landings exceeded their state quotas; the states have adjusted their 2025 quotas to account for these overages.

<u>The PRT finds that each state has met the regulatory requirements and recommends the Board find all states in compliance with the regulatory requirements.</u>

D. Biological Sampling Requirements: commercial and recreational catch estimates; and 200 age/length samples

The PRT finds that all states met the sampling requirements and recommends the Board find all states in compliance with the sampling requirements of the FMP. <u>However, the PRT recommends that the states using opercula to age some or all of their tautog samples (six out of eight states in 2024) transition to the use of spines and otoliths.</u>

E. Commercial Tagging Program

All states participated in the commercial tagging program in 2024. State tagging information is summarized in Table 12.

The PRT noted that preliminary estimates of unaccounted tags, which may decrease as late tags are returned after the compliance report deadline, show there were 17,825 tags unaccounted for coastwide, primarily in New York, which represents 7% of all tags issued and an 83% increase from 2023 (9,737 unaccounted for tags). The highest rates of unaccounted tags were in Rhode Island (9.7%) and New York (8.2%). The PRT is still recommending that states work to reduce the number of tags unaccounted for and encourage harvesters to return unused tags in a timely manner.

VIII. Prioritized Research Needs

The following research recommendations are from the 2016 Tautog Regional Stock Assessment and Desk Review Report. The Technical Committee identified the research recommendations to improve the stock assessment and our understanding of tautog population and fishery dynamics. Research recommendations are organized by topic and level of priority. Research recommendations that should be completed before the next benchmark assessment are underlined. The Technical Committee will update these recommendations as part of the next benchmark stock assessment.

8.1 Fishery-Dependent Priorities

High

- Expand biological sampling of the commercial catch for each gear type over the entire range of the stock (including weight, lengths, age, sex, and discards).
- Continue collecting opercula from the tautog catch as the standard for biological sampling in addition to collecting paired sub-samples of otoliths and opercula.
- Increase catch and discard length sampling from the commercial and recreational fishery for all states from Massachusetts through Virginia.
- Increase collection of effort data for determining commercial and recreational CPUE.
- Increase MRIP sampling levels to improve recreational catch estimates by state and mode. Current sampling levels are high during times of the year when more abundant and popular species are abundant in catches, but much lower in early spring and late fall when tautog catches are more likely.

8.2 Fishery-Independent Priorities

High

- Conduct workshop and pilot studies to design a standardized, multi-state fishery independent survey for tautog along the lines of MARMAP and the lobster ventless trap survey.
- Establish standardized multi-state long-term fisheries-independent surveys to monitor tautog abundance and length-frequency distributions, and to develop YOY indices.
- Enhance collection of age information for smaller fish (<20 cm) to better fill in age-length keys

8.3 Life History, Biological, and Habitat Priorities

Moderate

- Define local and regional movement patterns and site fidelity in the southern part of the species range. This information may provide insight into questions of aggregation versus recruitment to artificial reef locations, and to clarify the need for local and regional assessment.
- Assemble regional reference collections of paired operculum and otolith samples and schedule regular exchanges to maintain and improve the precision of age readings between states that will be pooled in the regional age-length keys.
- Calibrate age readings every year by re-reading a subset of samples from previous years before ageing new samples. States that do not currently assess the precision of their age readings over time should do so by re-ageing a subset of their historical samples.

Low

- Evaluate the potential impacts of climate change on tautog range, life history, and productivity.
- Conduct a tag retention study to improve return rates, particularly in the northern region.
- Define the status (condition and extent) of optimum or suitable juvenile habitats and trends in specific areas important to the species. It is critical to protect these habitats or to stimulate restoration or enhancement, if required.
- Define the specific spawning and pre-spawning aggregating areas and wintering areas of juveniles and adults used by all major local populations, as well as the migration routes used by tautog to get to and from spawning and wintering areas and the criteria or times of use. This information is required to protect these areas from damage and overuse or excessive exploitation.
- Define larval diets and prey availability requirements. This information can be used as determinants of recruitment success and habitat function status. Information can also be used to support aquaculture ventures with this species.
- Define the role of prey type and availability in local juvenile/adult population dynamics over the species range. This information can explain differences in local abundance, movements, growth, fecundity, etc. Conduct studies in areas where the availability of primary prey, such as blue mussels or crabs, is dependent on annual recruitment, the effect of prey recruitment variability as a factor in tautog movements (to find better prey fields), mortality (greater predation exposure when leaving shelter to forage open bottom), and relationship between reef prey availability/quality on tautog condition/fecundity.
- Define the susceptibility of juveniles to coastal/anthropogenic contamination and resulting effects. This information can explain differences in local abundance, movements, growth,

fecundity, and serve to support continued or increased regulation of the inputs of these contaminants and to assess potential damage. Since oil spills seem to be a too frequent coastal impact problem where juvenile tautog live, it may be helpful to conduct specific studies on effects of various fuel oils and typical exposure concentrations, at various seasonal temperatures and salinities. Studies should also be conducted to evaluate the effect of common piling treatment leachates and common antifouling paints on YOY tautog. The synergistic effects of leaked fuel, bilge water, treated pilings, and antifouling paints on tautog health should also be studied.

- Define the source of offshore eggs and larvae (in situ or washed out coastal spawning).
- Confirm that tautog, like cunner, hibernate in the winter, and in what areas and temperature thresholds, for how long, and if there are special habitat requirements during these times that should be protected or conserved from damage or disturbance. This information will aid in understanding behavior variability and harvest availability.

8.4 Management, Law Enforcement, and Socioeconomic Priorities

Moderate

- Collect data to assess the magnitude of illegal harvest of tautog and the efficacy of the tagging program.

Low

- Collect basic sociocultural data on tautog user groups including demographics, location, and aspects of fishing practices such as seasonality.

Figures & Tables

Figure 1. Estimated spawning stock biomass, with target and threshold levels, for MARI region. Source: 2021 ASMFC Tautog Regional Stock Assessment Update.

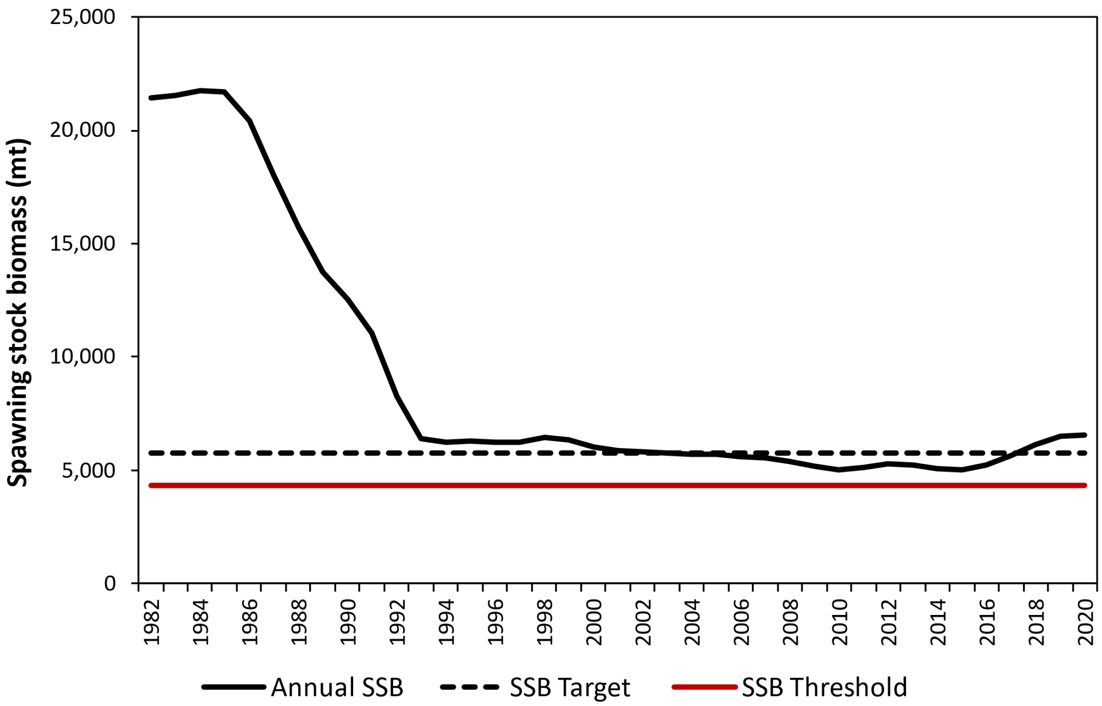

Figure 2. Estimated spawning stock biomass, with target and threshold levels, for LIS region. Source: 2021 ASMFC Tautog Regional Stock Assessment Update.

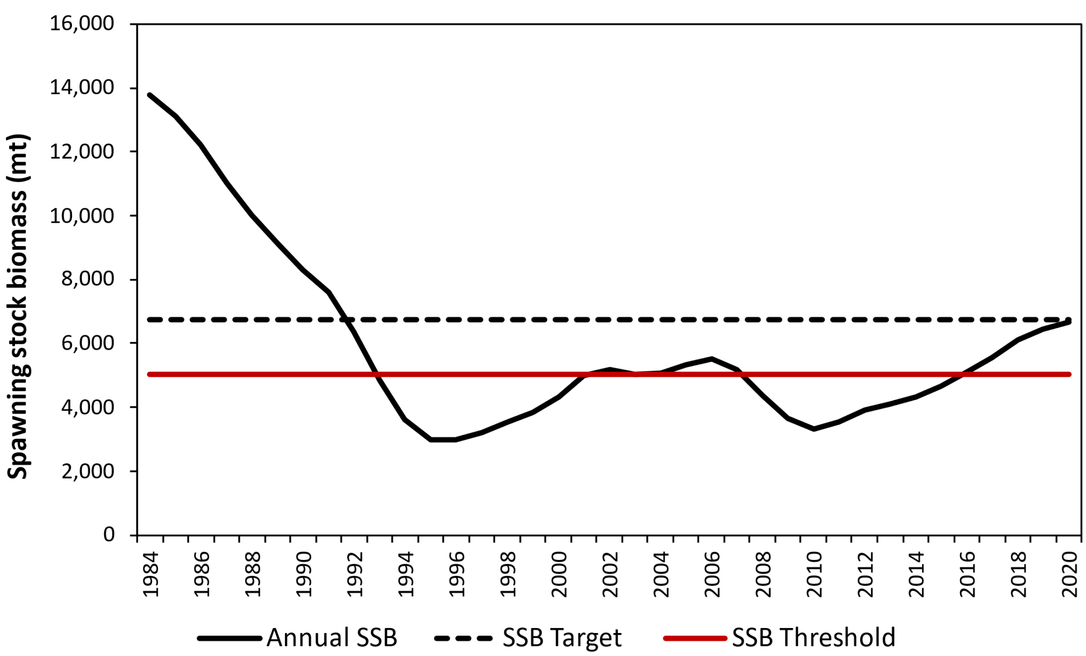

Figure 3. Estimated spawning stock biomass, with target and threshold levels, for NJ-NYB region.
Source: 2021 ASMFC Tautog Regional Stock Assessment Update.

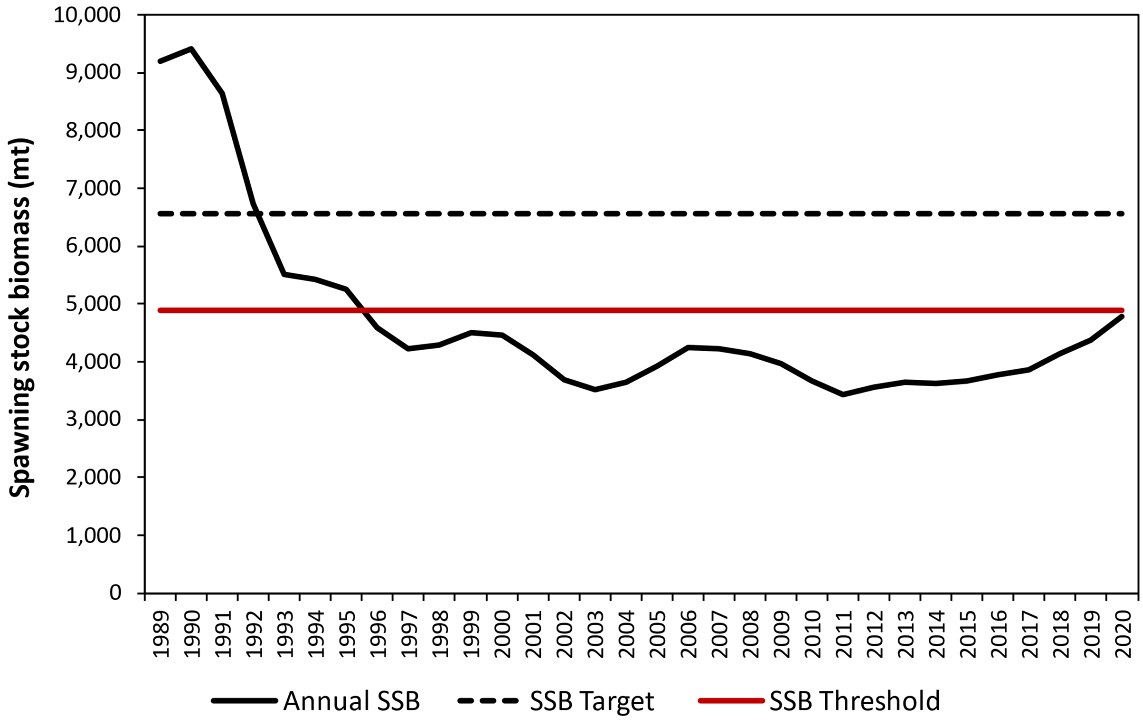

Figure 4. Estimated spawning stock biomass, with target and threshold levels, for DelMarVa region.
Source: 2021 ASMFC Tautog Regional Stock Assessment Update.

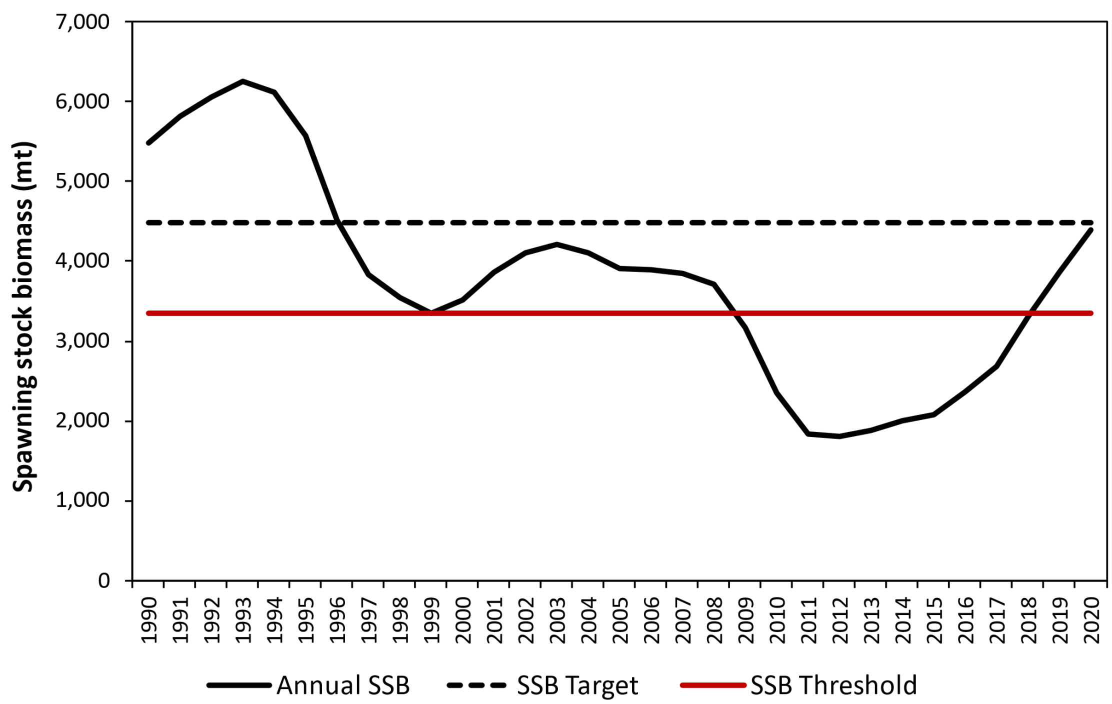

Figure 5. Three-year average fishing mortality rate plotted with the F target and threshold, for MARI region. Source: 2021 ASMFC Tautog Regional Stock Assessment Update.

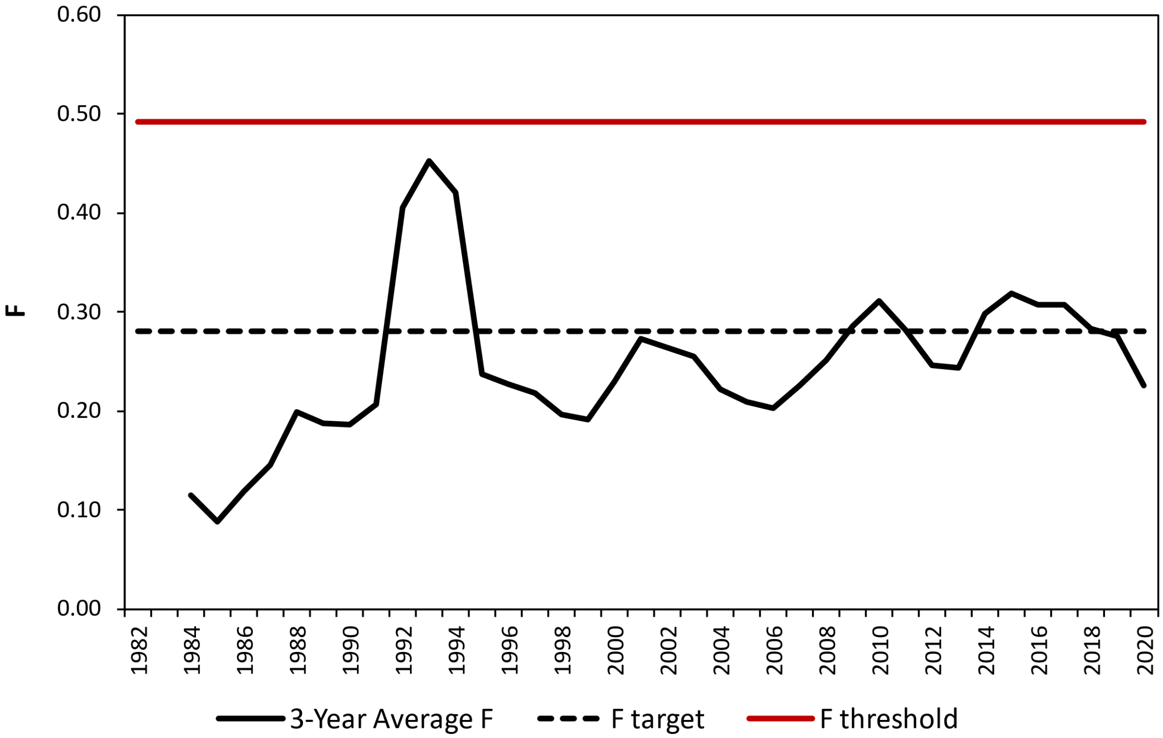

Figure 6. Three-year average fishing mortality rate plotted with the F target and threshold, for LIS region. Source: 2021 ASMFC Tautog Regional Stock Assessment Update.

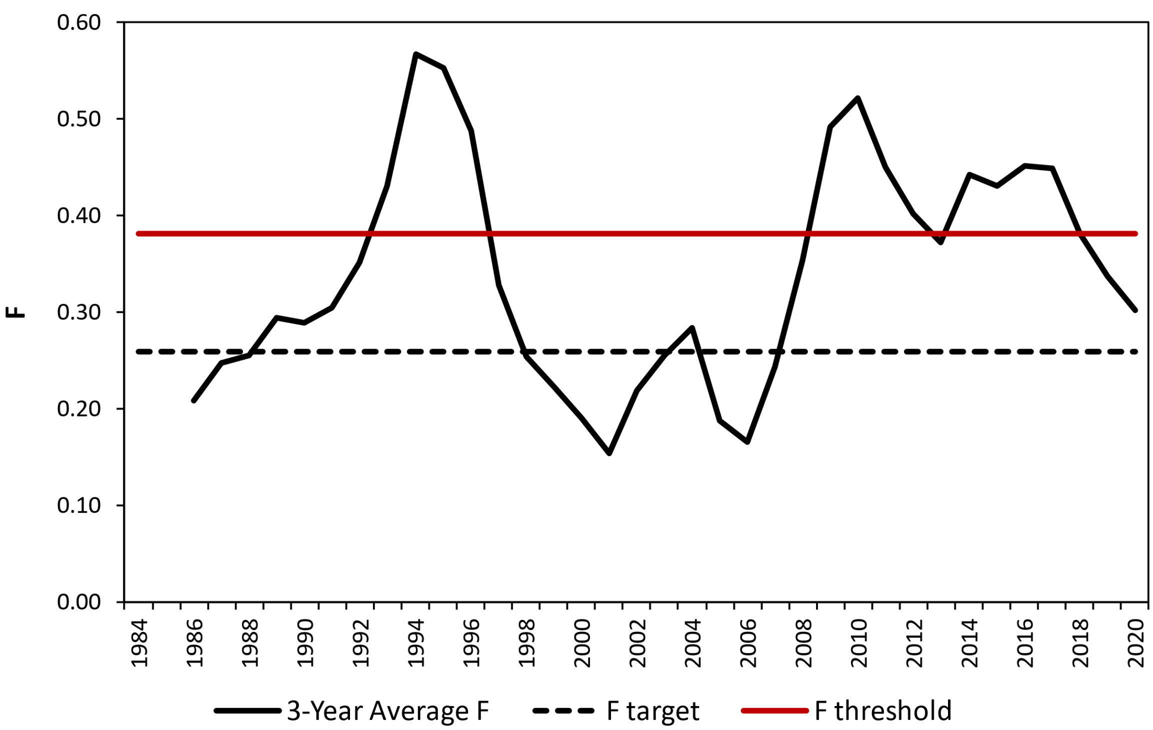

Figure 7. Three-year average fishing mortality rate plotted with the F target and threshold, for NJ-NYB region. Source: 2021 ASMFC Tautog Regional Stock Assessment Update.

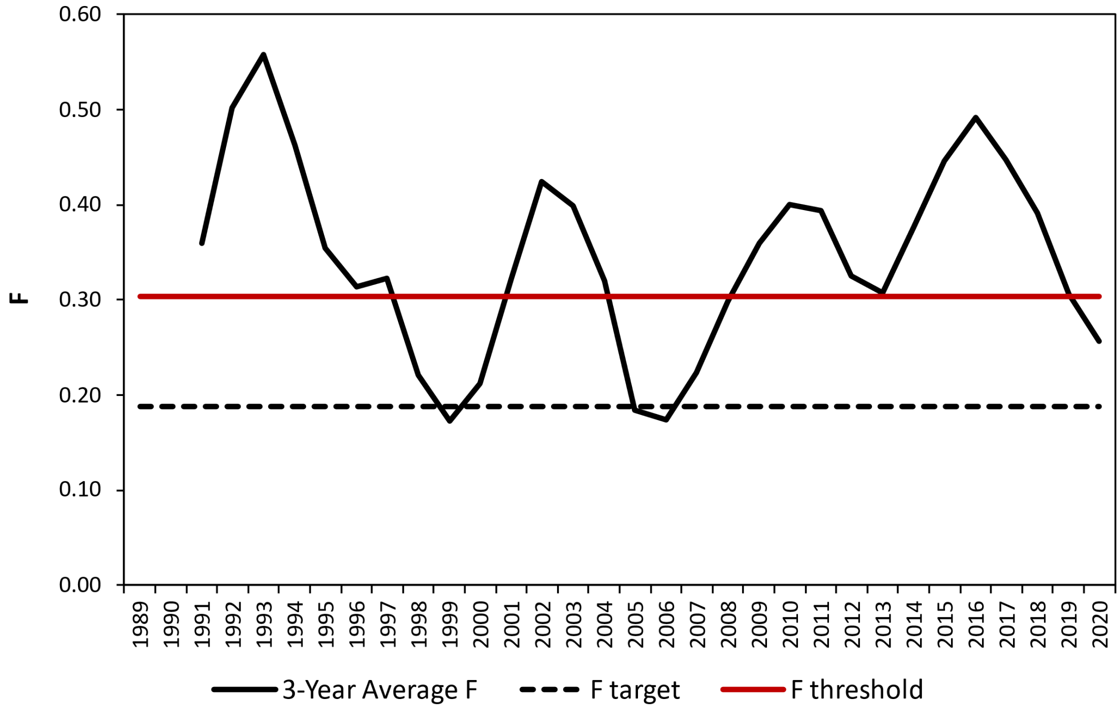

Figure 8. Three-year average fishing mortality rate plotted with the F target and threshold, for DelMarVa region. Source: 2021 ASMFC Tautog Regional Stock Assessment Update.

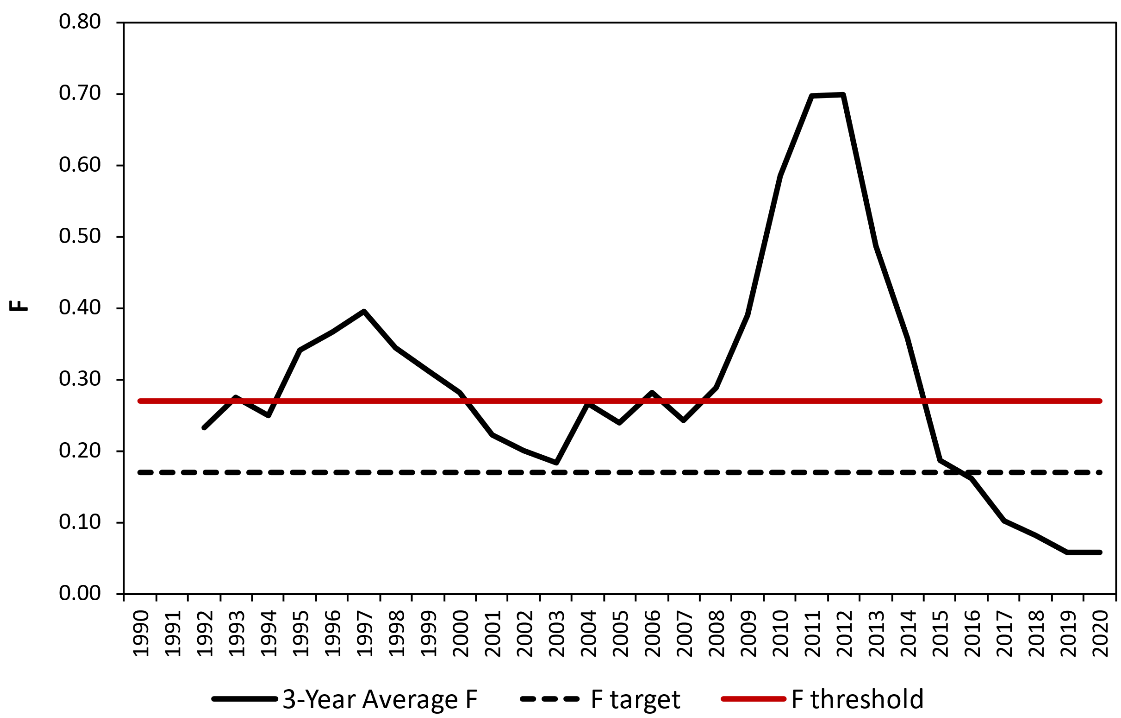

Figure 9. Total tautog harvest (recreational and commercial) in weight, 1981–2024. Source: State compliance reports, MRIP.

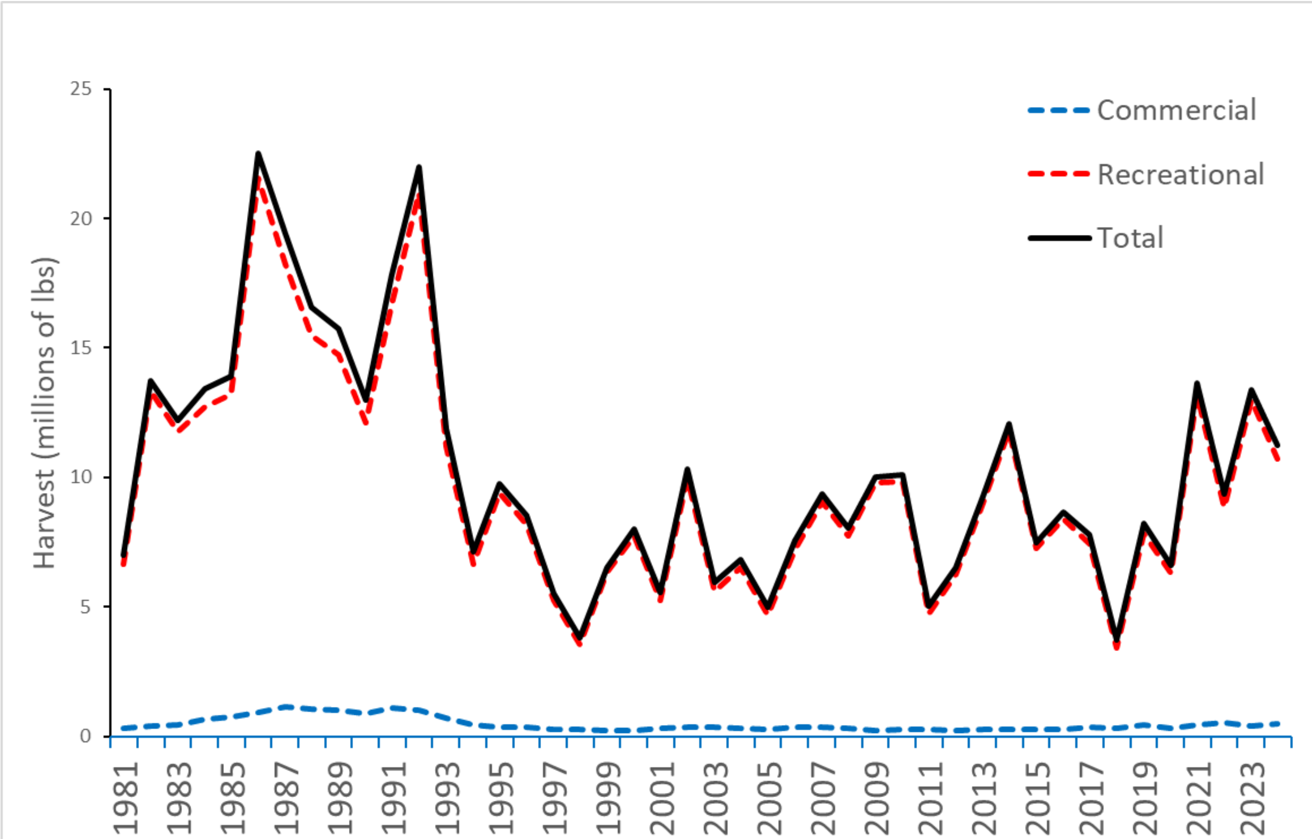

Figure 10. **Percent of annual recreational tautog harvest by wave in numbers of fish (2022-2024).** Source: MRIP

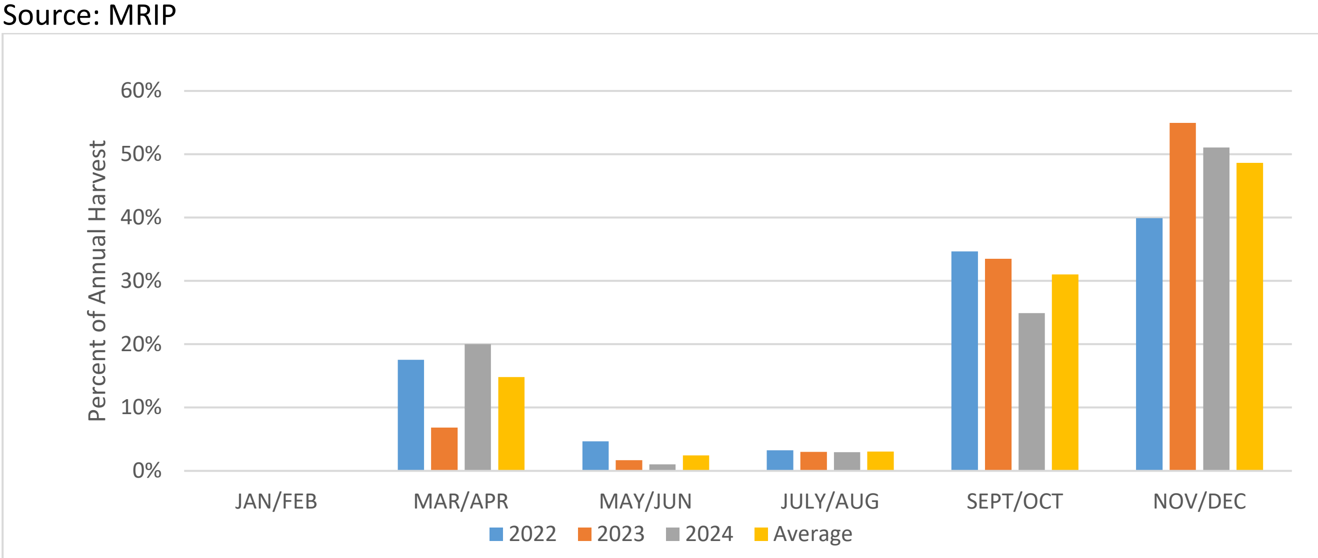

Figure 11. **Percent of annual recreational tautog harvest by state in numbers of fish (2022-2024).**
Source: MRIP

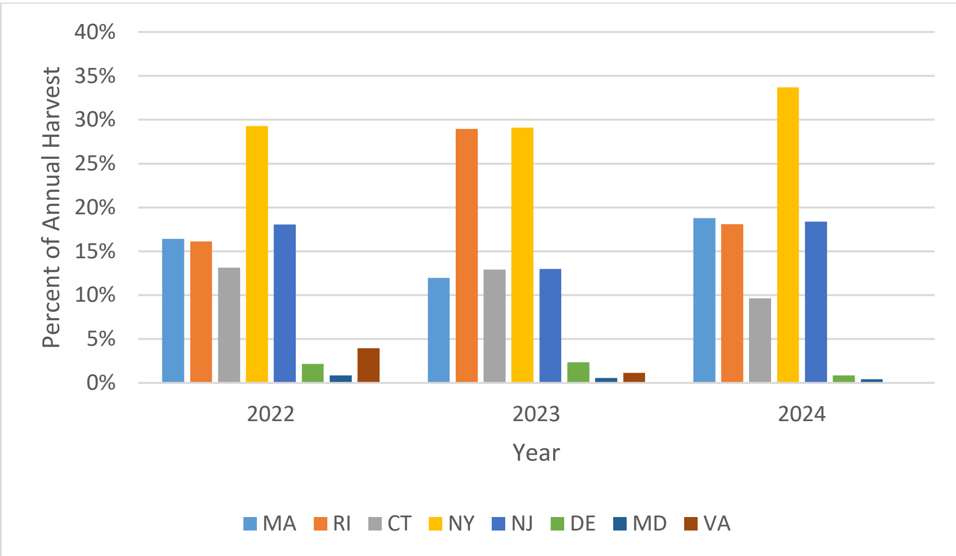

Figure 12. Changes in tautog commercial landings (mt) and price ($/lb) over time, 1950–2024.
Source: ACCSP and State Compliance Reports. Price unadjusted for inflation.

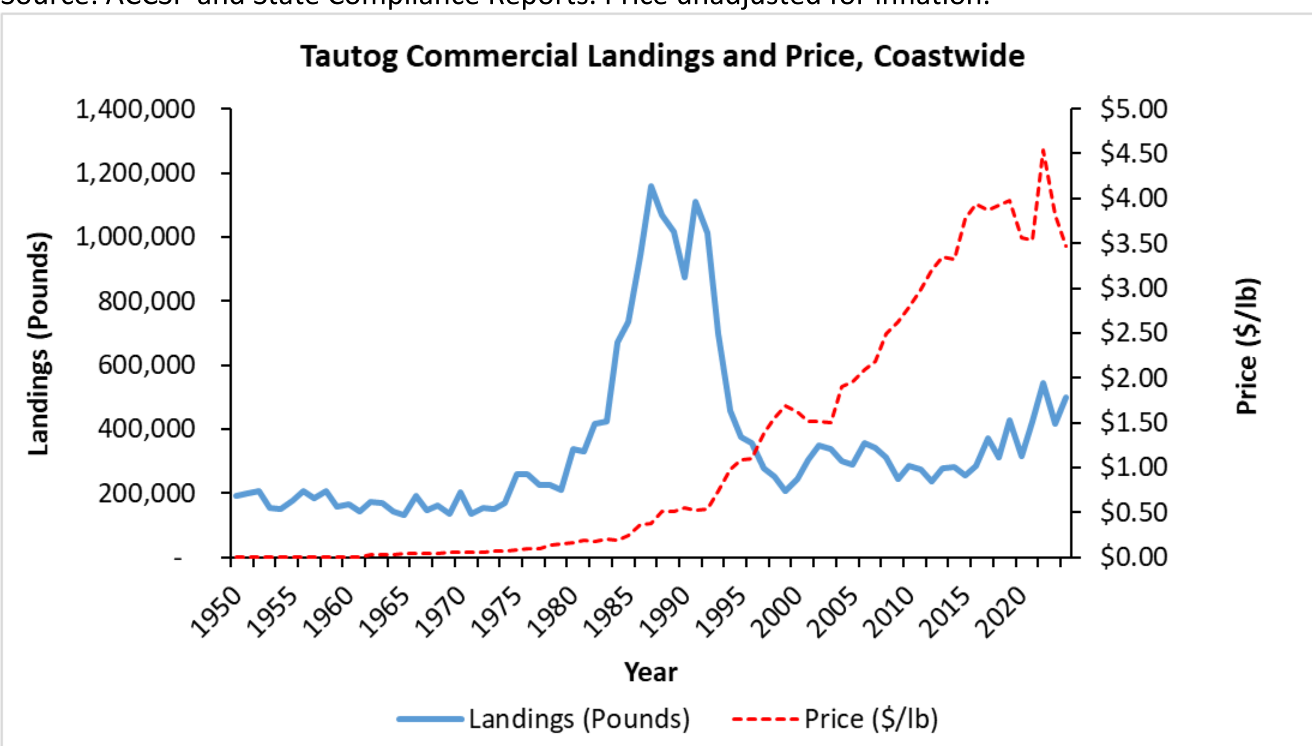

Table 1. Tautog stock status and reference points by region, 2020. Source: ASMFC 2021 Tautog Regional Stock Assessment Update.

Stock Region	Spawning Stock Biomass (in millions of pounds)			Fishing Mortality			Stock Status
	Target	Threshold	2020 Estimate	Target	Threshold	3-year Average	3-year Average
MARI	**10.09**	**7.57**	**14.90**	**0.28**	**0.49**	**0.23**	**Not overfished; overfishing not occurring**
LIS	**14.83**	**11.12**	**14.70**	**0.26**	**0.38**	**0.30**	**Not overfished; overfishing not occurring**
NJ-NYB	**14.45**	**10.78**	**10.54**	**0.19**	**0.30**	**0.26**	**Overfished; overfishing not occurring**
DelMarVa	**9.90**	**7.40**	**9.66**	**0.17**	**0.27**	**0.06**	**Not overfished; overfishing not occurring**

Table 2. Tautog recreational and commercial landings, 1998–2024, in pounds.
Source: State Compliance Reports, MRIP, and ACCSP Data Warehouse.

Year	Commercial Landings (lb)	Recreational Harvest (lb)	Total Harvest (lb)	% Recreational
1998	254,186	3,566,683	3,820,869	93.3
1999	207,981	6,330,077	6,538,058	96.8
2000	247,177	7,761,542	8,008,719	96.9
2001	305,193	5,235,671	5,540,864	94.5
2002	350,820	9,984,334	10,335,154	96.6
2003	336,685	5,601,992	5,938,677	94.3
2004	300,749	6,503,538	6,804,287	95.6
2005	289,984	4,699,066	4,989,050	94.2
2006	355,504	7,213,042	7,568,546	95.3
2007	340,925	9,032,590	9,373,515	96.4
2008	310,940	7,756,958	8,067,898	96.1
2009	243,644	9,775,106	10,018,750	97.6
2010	286,081	9,829,795	10,115,876	97.2
2011	263,241	4,737,343	5,000,584	94.7
2012	236,974	6,263,067	6,500,041	96.4
2013	275,839	8,991,815	9,267,654	97.0
2014	282,624	11,807,533	12,090,157	97.7
2015	255,915	7,239,327	7,495,242	96.6
2016	283,906	8,378,240	8,662,146	96.7
2017	364,736	7,418,997	7,783,733	95.3
2018	309,568	3,408,672	3,718,240	91.7
2019	427,078	7,815,558	8,242,636	94.8
2020	313,467	6,290,647	6,604,114	95.3
2021	423,280	13,211,745	13,635,025	96.9
2022	543,751	8,835,135	9,378,886	94.2
2023	417,713	12,967,833	13,385,546	96.9
2024	497,713	10,726,600	11,224,313	95.6
Average	325,939	7,828,997	8,154,936	95.7

Table 3. 2024 tautog landings by sector: percent recreational and commercial by weight.

State	Commercial Landings (%)	Recreational Harvest (%)
MA	3.2	96.8
RI	2.3	97.7
CT	2.1	97.9
NY	8.5	91.5
NJ	0.5	99.5
DE	1.5	98.5
MD	0.8	99.2
VA	24.4	75.6
Coastwide	4.4	95.6

Table 4. Tautog recreational harvest by state and coastwide discards, in number of fish, 1998-2024. Source: MRIP (calibrated estimates), queried September 4, 2025. *indicates PSE above 50. Dead discards are calculated by applying a 2.5% release mortality rate to live releases.

Year	MA	RI	CT	NY	NJ	DE	MD	VA	Coastwide Harvest	Live Releases	Dead Discards
1998	81,038	122,830	110,246	149,595	24,693*	149,392	16,252*	183,082	837,128	3,013,869	75,347
1999	302,889	191,287	44,582*	407,886	279,728	267,875	23,467*	77,899	1,595,613	5,412,629	135,316
2000	347,449	152,459	68,080*	203,145*	986,482	188,454	63,232*	40,543	2,049,844	3,524,480	88,112
2001	246,811	86,818	51,940	118,266	819,589	69,987	57,983	39,133	1,490,527	4,239,587	105,990
2002	232,803	177,094	180,754	1,239,614	501,979	274,967	55,339	69,301	2,731,851	6,328,481	158,212
2003	95,969	328,391	337,867	245,761	215,920	100,802	18,223*	126,406	1,469,339	4,027,987	100,700
2004	39,975*	281,619*	30,930	471,302	238,124	163,915	18,287*	455,060	1,699,212	3,853,750	96,344
2005	155,754	311,966	75,848	153,333	110,309	98,541	63,321	165,204	1,134,276	3,613,608	90,340
2006	102,739	234,043	361,978	265,746	406,801	169,410	34,483*	207,061	1,782,261	5,019,740	125,494
2007	67,431*	234,152	544,712	509,816	624,916	203,846	118,459	155,011	2,458,343	6,687,395	167,185
2008	72,170*	288,488	244,689	577,629	440,587	162,605	45,166	208,062	2,039,396	5,765,700	144,142
2009	66,280	396,835	356,880	690,544	420,013	324,157	107,288	196,143	2,558,140	7,227,057	180,676
2010	153,979	369,831	274,246	540,668	716,532	182,090	289,635	323,724	2,850,705	8,156,502	203,913
2011	173,101	79,061*	42,290*	322,704	313,745	117,938	64,294*	153,066	1,266,199	6,386,818	159,671
2012	96,355	341,478	411,073	302,811	92,340	95,299	20,018*	66,343*	1,425,717	8,106,879	202,672
2013	239,700	539,787	307,410	472,562	442,786	96,732	22,954	19,720*	2,141,651	10,163,184	254,080
2014	444,332	238,595	515,823	913,414*	533,299	131,857	1,154*	87,315*	2,865,789	10,957,469	273,937
2015	188,145	295,674	389,140	581,203	339,358	29,198	12,441*	24,493	1,859,652	10,660,410	266,510
2016	73,516	343,781	312,312	1,068,979	190,163	46,330	3,775*	39,759*	2,078,615	13,424,793	335,620
2017	635,828	141,131	218,410	405,432	569,178	32,230	18,751*	22,259*	2,043,219	13,641,859	341,046
2018	77,950	330,372*	74,530	163,131	385,283	8,926	18,373*	8,186	1,066,751	9,568,826	239,221
2019	168,766	369,450	503,528	635,866	311,363	24,066	779*	27,215*	2,041,033	13,348,138	333,703
2020	184,653	228,995	376,271	491,869	309,380	46,618	44,087	63,373	1,745,246	14,626,535	365,663
2021	518,470	748,308	490,329	770,796	606,685	134,450	48,258*	27,947	3,345,243	21,985,595	549,640
2022	442,456	435,013	354,364	789,620	486,833	58,142	23,546	106,959*	2,696,933	24,355,265	608,882
2023	463,088	1,119,703	498,799	1,124,867	501,779	90,373	22,265	44,556	3,865,430	32,396,574	809,914
2024	576,466	554,408	295,804	1,033,483	564,051	26,425	13,445	1,835*	3,065,917	26,114,841	652,871

Table 5. Tautog recreational harvest by state in pounds, 1998-2024.
Source: MRIP (calibrated estimates), queried September 4, 2025. *indicates PSE above 50

Year	MA	RI	CT	NY	NJ	DE	MD	VA	Coastwide Harvest
1998	310,599	605,908	391,934	485,811	70,731*	659,865	69,541*	972,294	3,566,683
1999	1,489,331	788,279	153,339*	1,509,978	895,556	1,049,563	42,003*	402,028	6,330,077
2000	1,301,436	689,697	256,201*	662,491*	3,756,594	692,466	161,426*	241,231	7,761,542
2001	1,052,174*	392,503	205,109	506,300	2,502,116	240,771	168,595*	168,103	5,235,671
2002	994,467	743,409	811,658	4,428,842	1,530,756	948,850	140,672	385,680	9,984,334
2003	527,044	1,388,656	1,180,217	875,272	639,109	358,999	59,071	573,624	5,601,992
2004	213,381*	1,590,436*	144,278	1,687,077	639,684	563,332	41,258*	1,624,092	6,503,538
2005	744,036	1,575,453	290,848	566,376	333,100	357,682	167,633	663,938	4,699,066
2006	484,094	1,130,146	1,589,614	1,002,050	1,443,679	599,179	106,149*	858,131	7,213,042
2007	260,547*	1,173,787	2,109,802	1,923,067	2,073,632	598,290	270,530	622,935	9,032,590
2008	230,548*	1,385,062	1,077,400	2,238,161	1,261,010	575,319	119,208	870,250	7,756,958
2009	236,974	1,648,613	1,353,958	3,057,550	1,273,529	1,034,484	277,125	892,873	9,775,106
2010	506,622	1,933,773	1,073,576	1,818,921	1,864,817	464,860	920,773	1,246,453	9,829,795
2011	803,547	328,959*	137,565*	1,284,037	1,008,755	380,758	189,361*	604,361	4,737,343
2012	403,108	1,512,424	2,093,848	1,285,933	312,531	341,016	62,097*	252,110*	6,263,067
2013	860,594	2,602,962	1,290,726	2,207,750	1,530,776	341,896	81,663	75,448*	8,991,815
2014	1,623,718	1,017,780	2,274,293	4,188,165*	1,849,044	485,332	3,544*	365,657*	11,807,533
2015	1,041,059*	1,105,258	1,594,233	2,153,150	1,100,116	100,301	45,067*	100,143*	7,239,327
2016	317,005	1,290,428	1,368,362	4,514,164	582,199	164,888	15,059*	126,135*	8,378,240
2017	2,883,015	600,869	908,162	1,393,812	1,381,993	103,000	59,917*	88,229*	7,418,997
2018	300,067	1,075,131*	295,758	536,332	1,091,047	30,239	54,332*	25,766	3,408,672
2019	646,031	1,483,124	2,133,656	2,455,836	908,872	87,348	2,680*	98,011*	7,815,558
2020	692,588	853,470	1,462,227	1,733,995	1,010,010	154,066	148,759	235,532	6,290,647
2021	1,895,686	2,623,173	2,153,889	3,058,499	2,772,462	479,069	138,987*	89,980	13,211,745
2022	1,446,707	1,617,446	1,279,024	2,614,265	1,275,563	171,034	70,776	360,320*	8,835,135
2023	1,597,477	3,816,532	1,798,841	3,956,752	1,331,911	228,197	70,696	167,427	12,967,833
2024	2,036,480	2,176,929	1,185,416	3,665,685	1,522,768	94,341	36,032	8,949*	10,726,600

Table 6. Commercial landings for tautog in pounds, by state, 1998-2024.
Source: ACCSP Data Warehouse and State Compliance Reports. 2024 Landings are preliminary.

Year	MA	RI	CT	NY	NJ	DE	MD	VA
1998	91,319	20,304	6,905	68,892	42,426	1,715	5,682	14,770
1999	75,619	26,090	12,961	37,886	27,307	confid	6,489	20,901
2000	96,001	43,719	8,504	39,953	39,636	confid	3,896	14,794
2001	84,330	56,065	22,259	62,795	60,152	confid	4,591	14,587
2002	148,073	50,007	26,781	60,805	36,605	confid	5,010	22,834
2003	86,205	54,650	40,784	72,264	66,766	confid	5,213	10,705
2004	88,192	36,581	26,037	76,606	51,057	3,064	6,049	13,079
2005	99,344	42,838	24,053	52,525	61,163	confid	4,338	5,667
2006	147,609	47,261	16,841	71,683	58,119	confid	5,411	8,533
2007	95,820	63,441	30,002	73,797	62,979	2,814	3,297	8,588
2008	73,867	48,027	20,160	88,571	63,958	2,253	2,964	10,946
2009	54,703	50,920	21,194	87,289	14,591	2,116	1,638	11,132
2010	75,317	44,054	16,948	93,153	49,213	confid	1,285	6,077
2011	57,787	47,426	14,784	82,761	45,865	confid	confid	14,590
2012	67,870	50,126	6,233	76,373	20,831	1,444	confid	13,870
2013	70,157	53,428	5,887	110,849	22,079	confid	1,458	11,776
2014	63,191	53,384	5,164	121,538	31,665	confid	confid	7,545
2015	61,752	47,140	7,249	111,925	17,538	2,108	1,173	6,937
2016	58,095	50,680	7,651	144,650	13,367	2,083	1,098	6,252
2017	66,481	52,844	8,485	231,644	6,551	1,372	confid	5,165
2018	61,055	51,451	7,341	186,108	1,559	654	273	1,349
2019	67,021	46,562	18,651	289,746	2,512	646	confid	1,982
2020	63,405	52,651	11,644	181,639	1,941	585	confid	2,210
2021	68,865	50,164	16,504	283,872	2,219	confid	confid	2,196
2022	70,198	51,919	16,409	397,924	1,730	confid	confid	3,770
2023	confid	50,829	15,690	285,624	1,785	confid	confid	2,705
2024	67,944	51,641	24,941	342,708	7,597	confid	confid	2,882

Table 7. Number of age/length samples by state in 2024. Amendment 1 requires all states to collect 200 samples per year. Source: State compliance reports

State	2024 Samples	Ageing Sample	Sample Sources
MA	422 lengths; 286 ages	Otoliths and Spines	Commercial Fishery Market sampling; Directed Pot and Rod and Reel sampling; F-I trawl survey; Lobster ventless trap survey; recreational fishery sampling
RI	225 lengths; 223 ages	Spines	Recreational fishery sampling, RIDMF Trawl Survey, and RIDMF Fish Pot Survey and Rod and Reel sampling
CT	302 lengths and ages	Opercula and Spines	Long Island Sound Trawl Survey
NY	1,459 lengths; 389 ages	Opercula and Otoliths	Commercial market sampling; Peconic Bay Small Mesh Trawl Survey; Western Long Island Seine Survey; and East End Seine Survey
NJ	222 lengths; 213 ages	Opercula and Otoliths	Recreational fishery; NJ Ocean Trawl Survey, and Raritan and Sandy Hook Bays Survey
DE	200 lengths and ages	Opercula, Spines and Otoliths	Recreational sampling
MD	306 lengths; 200 ages	Opercula	Recreational sampling; Resource Assessment Trawl, and Submerged Aquatic Vegetation Habitat surveys
VA	316 lengths and ages	Opercula, Otoliths, and Spines	Commercial markets and recreational sampling

Table 8. State recreational regulations implemented for tautog in the 2024 fishing year.

STATE	SIZE LIMIT	POSSESSION LIMITS (fish/person/day)	OPEN SEASONS (dates inclusive)
Massachusetts	16" min; only one fish allowed above 21"	3	Apr 1-May 31; Aug 1-Oct 14
		1	Jun 1-Jul 31
		5 (10 fish/day/vessel max for private/rental mode)	Oct 15-Dec 31
Rhode Island	16" min; only one fish allowed above 21"	3	Apr 1 – May 31
		3	Aug 1 – Oct 14
		5 (10 fish/day/vessel max for private/rental mode)	Oct 15 – Dec 31
Connecticut	16" min	2 2 3	Apr 1 – Apr 30 July 1 – Aug 31 Oct 10 – Nov 28
New York	16" min	LIS: 2 LIS: 3	Apr 1- Apr 30 Oct 11-Dec 9
		NY Bight: 2 NY Bight: 4	Apr 1- Apr 30 Oct 15-Dec 22
New Jersey	15" min	4 4 1 5	Jan 1 – Feb 28 Apr 1 – Apr 30 Aug 1 – Nov 15 Nov 16 – Dec 31
Delaware	16" min	4	Jan 1 – May 15 Jul 1 – Dec 31
Maryland	16" min	4 2 4	Jan 1- May 15 Jul 1 – Oct 31 Nov 1 – Dec 31
Virginia	16" min	4	Jan 1 – May 15 July 1 – Dec 31

Table 9. State commercial regulations implemented for tautog in the 2024 fishing year.

STATE	MINIMUM SIZE LIMIT	POSSESSION LIMITS (number of fish)	OPEN SEASONS	QUOTA (pounds)	GEAR RESTRICTIONS
Massachusetts	16"	40	Sept 1 – 100% of Quota	59,981*	Mandatory pot requirements. Area/time closures for specific gear types.
Rhode Island	16"	10	Apr 1 – May 31 (42.5%) Aug 1 – Sep 15 (15%) Oct 15 – Dec 31 (42.5%)	51,295*	Mandatory pot requirements.
Connecticut	16"	3 (restricted licenses) 10 (all other)	Apr 1 – Apr 30 Jul 1 – Aug 31 Oct 8 – Dec 24	-	Mandatory pot requirements.
New York	15"	25 (10 fish w/ lobster gear and when 6 lobsters are in possession)	LIS: May 7 – July 31; Sept 1- Nov 23 NY Bight: Apr 16 –Jan 25	-	Mandatory pot requirements. Gill or trammel net is prohibited.
New Jersey	15"	*> 100 lb requires directed fishery permit;* *<= 100 lb requires either directed or non-directed fishery permit*	Jan 1 – May 1 Sept 19-Dec 31	103,000	Mandatory pot requirements.
Delaware	16"	4	Jan 1 – May 15 July 1 – Dec 31	-	Mandatory pot requirements.
Maryland	16"	4 2 4	Jan 1-May 15 July 1 – Oct 31 Nov 1- Dec 31	-	Mandatory pot requirements.
Virginia	15"	-	Jan 1 – Jan 21 Mar 1 – May 15 Nov 1 – Dec 31	-	Mandatory pot requirements. Pots prohibited in tidal waters.

*Quotas as adjusted from their base due to overages in 2023 (Massachusetts' base quota = 64,753 pounds, and Rhode Island's base quota = 51,348 pounds).

Table 10. Ongoing fishery-independent surveys, as of 2024. Shaded cells indicate survey data used in the 2021 stock assessment update.

State	Areas Surveyed	Survey Type	# of Survey Stations	Dates of Survey	Initial Year
MA	MA territorial waters	Trawl	1 station per 19 square nautical miles	May and September	1978
	Buzzards Bay, south of the Elizabeth Islands, and portions of Rhode Island Sound	Trap	42 stations twice per month	June through September	2015
	Buzzards Bay and Vineyard Sound	Rod & Reel	48 stations per month	Spring (Apr-May) Fall (Sep-Nov)	2016 (fall)
RI	Narragansett Bay	Trawl	13 stations per month	June through October	1990
	Narragansett Bay, Rhode Island Sound and Block Island Sound	Trawl	44 stations	Spring (April-May) Fall (Sept/October)	1979
	Narragansett Bay Beach	Seine	18 stations per month	June through October	1988
	Coastal Ponds	Seine	24 stations in 8 coastal ponds per month	May through October	1994
	Narragansett Bay	Trap	10 5-pot trawls set per month	April through October	2013
CT	Long Island Sound (CT and NY waters)	Trawl	40 stations per month	Spring (April-June) Fall (Sept-Oct)	1984
NY	Peconic Bay	Trawl	16 stations per week	May through October	1987
	Western Long Island (Little Neck, Manhasset Bay, Jamaica Bay)	Seine	5-10 sites, semi-monthly	May through October	1984
	Long Island Sound	Trap	35 stations per week	May through October	2007
	East End	Seine	30 stations per month	June through October	2021
NJ	Nearshore ocean waters between Cape May and Sandy Hook	Trawl	30 tows in Jan; 39 tows per month in Apr, Jun, Aug & Oct	Jan, Apr, June, Aug & Oct	Aug-88
	Nearshore ocean waters within Sea Girt, Manasquan Inlet and Little Egg Artificial Reefs	Trap	48-54 traps set each Spring, Summer, Fall sampling periods	Spring (March-April); Summer (June-August); Fall (October-November)	2016
DE	Delaware Bay (Adult)	Trawl	9 stations per month	March through December	1990
	Delaware Bay (Juvenile)	Trawl	39 stations per month	April through October	1990
	Inland Bays (Juvenile)	Trawl	12 sites per month	April through October	1980
	Delaware Bay and Atlantic Ocean	Ventless Pot	14 rigs on 7 reef sites every two weeks	April through December	2018
MD	Maryland Coastal Bays	Trawl	20 stations per month	April through October	1989
		Seine	19 stations per month	June, September	1989
	Submerged Aquatic Habitat in Sinepuxent Bay	Seine	5 zones	September only	2015
VA	Fisheries independent surveys do not collect tautog in quantities needed for monitoring purposes				NA

Table 11. Ongoing fishery-dependent monitoring in each state, as of 2024.

State	Fishery Sector	Data Collected	Data Source
MA	Commercial	Length, Weight	Market sampling
RI	Recreational	Age, Length	Recreational harvest sampling
NY	Commercial	Age, Length	Markets and dockside sampling
NJ	Commercial	Age, Length, Weight, Sex	Commercial vessel sampling
	Recreational	Age, Length, Sex	Party/charter boat sampling (retained fish)
DE	Recreational	Age, Length	Recreational harvest sampling
MD	Recreational	Age, Length, Weight, Sex	Charter boat hook and line sampling
VA	Commercial	Age, Length, Weights	Samples from commercial hook-and-line gear, haul seines, pots/traps, pound nets
	Recreational	Age, Length, Weights	VMRC Marine Sport Fish Collection Project
		Tagging data	Game Fish Tagging Program

*Surveys as part of MRIP occur in all states and are not included in the table. All commercial landings monitoring systems are also excluded.

Table 12. Tagging Data collected in 2024. Amendment 1 requires all states to implement a commercial harvest tagging program. Source: state compliance reports.

<table>
<tr><th>State</th><th>MA</th><th>RI</th><th>CT</th><th>NY</th><th>NJ</th><th>DE</th><th>MD</th><th>VA</th></tr>
<tr><td>Quota (if applicable)</td><td>59,981</td><td>51,295</td><td></td><td></td><td>103,000</td><td></td><td></td><td></td></tr>
<tr><td>Maximum Commercial Harvest per Region</td><td></td><td></td><td></td><td></td><td>1,785</td><td></td><td></td><td></td></tr>
<tr><td>Avg. Commercial Weight</td><td>3.14</td><td>4.00</td><td></td><td>3.17</td><td>2.66</td><td>4.3</td><td>6.6</td><td>3.71</td></tr>
<tr><td>Number of Participants</td><td>154</td><td>285</td><td>84</td><td>436</td><td>12</td><td>2</td><td>1</td><td>37</td></tr>
<tr><td>Number of Tags Issued</td><td>37,750</td><td>24,506</td><td>8,975</td><td>175,170</td><td>4,000</td><td>C</td><td>C</td><td>2,475</td></tr>
<tr><td>Number of Tags Returned</td><td>15,004</td><td>8,604</td><td>2,790</td><td>22,424</td><td>1,393</td><td>C</td><td>C</td><td>1,589</td></tr>
<tr><td>Number of Tags Used</td><td>21,922*</td><td>13,168</td><td>5,815</td><td>137,162</td><td>2,589</td><td>C</td><td>C</td><td>775</td></tr>
<tr><td>Tags Reported Lost</td><td>84</td><td>341</td><td></td><td>1,113</td><td rowspan="2">18</td><td>C</td><td>C</td><td>0</td></tr>
<tr><td>Tags Reported Damaged</td><td>140</td><td>22</td><td></td><td>69</td><td>C</td><td>C</td><td>0</td></tr>
<tr><td>Number of Tags Unaccounted for</td><td>600</td><td>2,371</td><td>341</td><td>14,402</td><td>0</td><td>C</td><td>C</td><td>111</td></tr>
</table>

*Estimate (based on average weight of reported landings).