Atlantic States Marine Fisheries Commission

Atlantic Herring Management Board

October 28, 2019
8:30 – 9:30 a.m.
New Castle, New Hampshire

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 *(P. Keliher)*	8:30 a.m.
2.	Board Consent • Approval of Agenda • Approval of Proceedings from April 2019	8:30 a.m.
3.	Public Comment	8:35 a.m.
4.	Progress Update on 2019 Atlantic Herring Area 1A Fishery Performance (*R. Zobel*)	8:45 a.m.
5.	Update on Development of NEFMC's Georges Bank Spawning Protection Discussion Document *(D. Boelke)* **Possible Action**	9:00 a.m.
6.	Review and Set 2020-2021 Fishery Specifications (*K. Rootes-Murdy*) **Final Action**	9:15 a.m.
7.	Update on Maine Enforcement Efforts on Quota Violation (*R. Beal*)	9:20 a.m.
8.	Elect Vice-Chair (*P. Keliher*) **Action**	9:25 a.m.
9.	Other Business/Adjourn	9:30 a.m.

The meeting will be held at Wentworth by the Sea; 588 Wentworth Road, New Castle, NH 03854; 603.422.7322

MEETING OVERVIEW

Atlantic Herring Management Board
Monday, October 28, 2019
8:30 – 9:30 a.m.
New Castle, New Hampshire

Chair: Pat Keliher (ME) Assumed Chairmanship: 02/18	Technical Committee Chair: Renee Zobel (NH)	Law Enforcement Committee: Michael Eastman (NH)
Vice Chair: Dr. David Pierce (MA)	Advisory Panel Chair: Jeff Kaelin (NJ)	Previous Board Meeting: April 2019
Voting Members: ME, NH, MA, RI, CT, NY, NJ, NMFS, NEFMC (9 votes)		

2. Board Consent

- Approval of Agenda
- Approval of Proceedings from April 2019

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

4. Progress Update on 2019 Atlantic Herring Area 1A Fishery Performance (8:45 – 9:00 a.m.)

Background

- In response to the 2018 stock assessment, the Board specified bi-monthly quota periods to manage the significantly reduced 2019 Area 1A fishery in October 2018.
- In April, the states of Maine through Massachusetts set effort controls for the 2019 Area 1A fishery that included no landings days during Period 1 due to the reduction in the ACL.

Presentations

- Progress update on 2019 Area 1A Fishery Performance by R. Zobel

5. Update on Development of NEFMC's Georges Bank Spawning Protection Discussion Document (9:00 – 9:15 a.m.) Possible Action

Background

- In May, the NEFMC hired a contractor to develop a report on spawning activities on Georges Bank to consider additional management action to protect spawning herring **(Briefing Materials)**

- In September, the NEFMC initiated a Framework action to develop options to protect spawning herring in offshore waters in response to the draft report.

Presentations

- Update on Development of NEFMC's Georges Bank Spawning Protection Discussion Document by D. Boelke

6. Review and Set 2020-2021 Fishery Specifications (9:15 – 9:20 a.m.) Final Action

Background

- In June, the NEFMC set specifications for the 2020 and 2021 fishing years through Framework 6 (**Briefing Materials**)
- Per Amendment 3, states annual set the quota specifications, including the quota period system, in Area 1A.
- For the 2019 fishing year, the Board adopted a bi-monthly quota period approach in which 16.4% of the quota is allocated to Period one (June), 40.1% to Period two (July/August), 34% to Period three (September/October), and 9.5% to Period 4 (November/December).

Presentations

- Overview of 2020-2021 Specifications and Quota Period Options in Amendment 3 by K. Rootes-Murdy

Board actions for consideration at this meeting

- Set the season split of the Area 1A sub-ACL, quota rollovers, and sub-ACL trigger.

7. Update on Maine Enforcement Efforts on Quota Violation

8. Elect Vice-Chair

9. Other Business/Adjourn

Atlantic Herring Technical Committee Task List

Activity Level: Medium

Committee Overlap Score: Medium

Committee Task List
While there are no Board tasks for the TC at present, there are several annual activities in which TC members participate, both through the Commission and NEFMC • Participation on ASMFC PDT (currently working on Draft Addendum III) • Participation on NEFMC PDT (will be working to recommend specifications for the 2020-2021 fishing years) • Summer/fall collection of spawning samples per the spawning closure protocol • Annual state compliance reports are due February 1

TC Members

Renee Zobel (NHFG – Chair), Kurt Gottschall (CT DMF), Dr. Matt Cieri (ME DMR), Micah Dean (MA DMF), Corinne Truesdale (RI DFW), Deirdre Boelke (NEMFC)

DRAFT PROCEEDINGS OF THE

ATLANTIC STATES MARINE FISHERIES COMMISSION

ATLANTIC HERRING BOARD

The Westin Crystal City
Arlington, Virginia
April 30, 2019

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

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INDEX OF MOTIONS

ATTENDANCE

Board Members

Pat Keliher, ME (AA)
Steve Train, ME (GA)
Sen. David Miramant, ME (LA)
Rep. Jay McCreight, ME, Legislative proxy
Doug Grout, NH (AA)
G. Ritchie White, NH (GA)
Dennis Abbott, NH, proxy for Sen. Watters (LA)
David Pierce, MA (AA)
Raymond Kane, MA (GA)
Sarah Ferrara, MA, proxy for Rep. Peake (LA)
Bob Ballou, RI, proxy for J. McNamee (AA)
David Borden, RI (GA)
Eric Reid, RI, proxy for Sen. Sosnowski (LA)
Justin Davis, CT (AA)
Bill Hyatt, CT (GA)
Maureen Davidson, NY, proxy for J. Gilmore (AA)
John McMurray, NY, proxy for Sen. Kaminsky (LA)
Joe Cimino, NJ (AA)
Tom Fote, NJ (GA)
Adam Nowalsky, NJ, proxy for Sen. Andrzejczak (LA)
Terry Stockwell, proxy for T. Nies, NEFMC
Allison Murphy, NMFS

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

Ex-Officio Members

Jeff Kaelin, Advisory Panel Chair
Michael Eastman, Law Enforcement Representative
Renee Zobel, Technical Committee Chair

Staff

Robert Beal
Toni Kerns
Kirby Rootes-Murdy
Jessica Kuesel

Guests

Dave Bard, ECS/NOAA
Victoria Brown, MD Watermen
Peter Burns, NMFS
Don Frei, NOAA OLE
Joseph Gordon, PEW Trusts
Dee Lupton, NC DMR
Loren Lustig, PA (GA)
Patrice McCarron, MLA
Mike Millard, USFWS
Derek Orner, NMFS
Mike Ruccio, NMFS
Monica Scheremann, Potomac River Watermen

The Atlantic Herring Management Board of the Atlantic States Marine Fisheries Commission convened in the Jefferson Ballroom of the Westin Crystal City Hotel, Arlington, Virginia; Tuesday, April 30, 2019, and was called to order at 8:30 o'clock a.m. by Chairman Patrick C. Keliher.

CALL TO ORDER

CHAIRMAN PATRICK C. KELIHER: Good morning everybody. We'll call the Atlantic Herring Management Board to order. My name is Pat Keliher, Chair of the Board. I want to welcome everybody. I noticed my Maine contingent is not here, with the exception of Representative McCreight.

Representative McCreight, if you would like to join us at the table, Senator Miramant will be here. If there are no objections, Representative McCreight knows that she can't speak to issues, but I thought I would invite her up as an opportunity to learn sitting at the table instead of the back of the room. Are there any objections to that? Seeing none; thank you. Here is the Senator, here is my Maine contingent.

APPROVAL OF AGENDA

CHAIRMAN KELIHER: Item Number 2 is Board Consent regarding Approval of the Agenda. Is there any objection to the agenda, anything that needs to be added under Other Business? Seeing none, the agenda is approved without objection.

APPROVAL OF PROCEEDINGS

CHAIRMAN KELIHER: Approval of the proceedings from the February, 2019 meeting, did everybody have a chance to Wordsmith the minutes from February, 2019? Are there any additions, any comments on that? Seeing none, we'll approve the proceedings from February, 2019.

PUBLIC COMMENT

CHAIRMAN KELIHER: Nobody has signed up for Public Comment. Does anybody have any?

Is there anybody from the public even here? Hello! It looks like we have nobody from the public here, so we will skip public comment. If anybody does come in, we'll allow them to potentially speak on issues as we go through the agenda.

CONSIDER ADDENDUM II FOR FINAL APPROVAL

CHAIRMAN KELIHER: Item Number 4 is Consider Addendum II for Final Approval**.** We will have a final action on this item. Up first is to Review the Options and Public Comments, so Kirby, if you could go through that please.

REVIEW OPTIONS AND PUBLIC COMMENT

MR. KIRBY ROOTES-MURDY: As mentioned, I'm going to go through the Draft Addendum II that's for Board review today, and I'll cover the public comment that was offered up on the document. Just an outline, I'll review the statement of the problem, go through an overview of what the options are that are in the Addendum, and then the public comment summary, and take any questions.

Statement of the problem, as you all are aware, the 2018 Stock Assessment showed reduced levels of recruitment of Atlantic herring over the last five years. In response, the Board initiated Draft Addendum II to strengthen the existing spawning protections for Area 1A. The Addendum considers measures that include the GSI30 trigger value that has been in place since Amendment 3, the closure period length and the reclosure protocol. As you are probably all aware by this point, these three issue items are connected to each other. The first being what the GSI30 trigger value is.

This is where the sampling of Atlantic herring helps us determine whether a closure needs to occur, followed by the question of the length of

that closure. Currently we are operating under a four week closure period. The third, which is connected to obviously the previous item, is regarding a reclosure protocol.

While there is a closure that's occurring, moving towards a point where they can open up the fishery again, sampling is happening, and that sampling helps inform whether spawning is continuing, and whether a reclosure is needed. The current framework we've been operating under allows for a reclosure based on the results of those samples.

We went out and did public comment over the last month and a half. Public hearings were held in three jurisdictions, Maine, New Hampshire, Massachusetts, 21 attendees approximately, came and provided comment at those meetings. In terms of written comment, there were a total of 9 that was offered up, 4 from individual stakeholders, and 5 from organizations.

I'll go through the management issues and the alternatives now. As I mentioned, the first issue item is the trigger value. There are four options under the trigger value alternatives. Option A would maintain us at status quo, the current trigger value of 25, which is equivalent to about 25 percent of the population of spawning.

Under this option we have a default closure date of August 28 in eastern Maine, October 4 in western Maine, and October 4 in Massachusetts/New Hampshire area. Option B while a similar trigger value as Option A has data that's updated through 2017, and therefore the default closure dates that I just read off. Those would be changed based on that updated information.

Option C would move to change the trigger value to a value of 23, which corresponds to about 20 percent of the population of spawning. It's a lower level that would trigger a closure based on sample counts. Option D would lower that trigger value even further to 22, which corresponds to about 15 percent of the population spawning.

As you can see on the slide, there are connected default closure dates that are adjusted slightly under each of those. In terms of public comment that was offered, a total of 4 individual were in favor of Option A explicitly. None were explicitly in favor of Option B, 3 were in favor of Option C, and 2 were in favor of Option D.

I want to make clear that when we were collating, pulling together the public comment, we found that we actually missed one, in terms of the document that went out to you all to review. We've updated this table to reflect that. In addition to what we have listed here as people who came, spoke on the record explicitly in favor of a specific option. There were 3 that were in support of a trigger value of 25 at the New Hampshire public hearing, but they were undecided between Options A or Option B. It's important to look at between Option A and B there is a total of 7 people who are in favor of that trigger value. Some additional comments were specific to reducing the trigger for spawning closures in the Gulf of Maine. One individual used a percentage shut down in the eastern closure area. When purse seining they recommended to take a sample, for example a five-gallon bucket, and have spawning closure triggers set at 20 percent, and if you have a 20 percent spawning individuals in the seine, you would dump the catch and contact the State Department of Natural Resources for that closure.

We had additional comments that supported no options for trigger values; they preferred going back to the old system that was in place, using a 20 percent catch tolerance. They believe that spawning closures from 0 to 200 nautical miles is the most effective way to conserve the fish. Those are some of the additional comments we received on this issue item.

The second issue item was regarding the closures length. As mentioned, the default right now or the status quo is four weeks. Option B moves to increase that closure period to five weeks, Option C to six, and Option D to eight weeks. Again, the increase in the closure length is trying to find, basically the best way to cover the spawning season, and ensure that the closure is most effective in helping protect those spawning fish.

In terms of public comment, there were 5 individuals in favor of the status quo, Option A, 2 in favor of moving to a five-week closure, 1 in favor of a six-week closure, and 1 in favor of an eight-week closure. We did receive some comments that were in support of shorter spawning closure periods, and again at the New Hampshire hearing we had 2 individuals who indicated they could support either Option A or B, which makes it a little bit difficult to count those and tally them up.

The last issue item for this Addendum is the reclosure protocol. Currently, as noted, there is the ability to reclose the fishery up to two additional weeks, if samples taken during a spawning closure indicate that a significant number of herring are spawning. Sub-Option 1 would maintain the significant number being 25 percent of more mature herring.

For the reclosure, we're not just looking at female herring; it's also males, so 25 percent or more of mature male or female herring. For Sub-Option 2, it would reduce that level down to 20 percent or more mature herring, and Sub-Option 3 would reduce it even further to 15 percent. Again, the lower you go the more likely you are to trigger a reclosure, potentially.

Option B would move to do away with the reclosure protocol, so there would be no reclosure once a spawning closure has happened. In terms of public comment that was offered on this. There were 9 individuals who indicated their support for Option A, status quo, and 1 in favor of doing away with the reclosure.

Specifically, in terms of the sub-options, there were 4 in favor of maintaining 25 percent as the significant number, 3 that were in support of moving to 20 percent, and 2 that were in support of moving to 15 percent. Some additional comments that were offered up that didn't pertain to any specific issue item or alternatives, was the need to consider measures that are consistent with the federal FMP, and allow the fishery to utilize optimal yield for this fishery, specifically looking to have shorter spawning closures and more flexibility with the reclosure protocol.

There was opposition to further restrictions on the Area 1A fishery, and recommended postponing action on this Addendum. Additional comments focused on the fact that they think the current sampling of the fishery in Area 1A is not sufficient that there is a need to have quicker closures, as well as longer closure periods.

Additional comments offered up focused on how the midwater trawlers, in their opinion, have a disproportionate impact on the resource, and then others indicated that low recruitment is being driven by other issues in the fishery, including available food sources for larval fish. Lastly, protecting spawning in the Gulf of Maine needs to have reciprocal protection on Georges Bank.

Obviously, these are from a variety of different people. They are not all the same, because some of them are contradictory to each other. But these were the comments we received on this Addendum. With that I'll take any questions, thank you.

ADVISORY PANEL REPORT

CHAIRMAN KELIHER: Are there any questions for Kirby? This will go quick. Seeing none, why don't we go right into the Advisory Panel Report? Jeff Kaelin, are you ready to go, Jeff?

MR. JEFF KAELIN: Yes sir, thank you. Good morning everybody. I'm Jeff Kaelin with Lunds Fisheries in Cape May, and I have the privilege of being the AP Chair. We had a call on the 16th. Kirby and I worked together to put this summary together, the list of participants on the call, eight Advisors on the call are here.

I can't remember if Ray was on the call or not, Mr. Kane, but I think he was listening in. Anyway, we've broken it up by issue relative to the management program. Issue Number 1, the GSI trigger value, 3 AP members were in favor of maintaining the status quo, Option A, with a 25 percent value. One member indicated the support for Option B, the 25 percent with the updated data, and 1 indicated support for Option C, value 23.

The reason cited in supporting the status quo were numerous, most notably concern that the current spawning program has only been in place for three years, and while spawning samples have been collected from 2005 to 2017, the current version of the program has not been in place long enough to justify adjusting it further.

Additional reasons in support of the status quo included the need to collect more spawning samples over time, and the potential negative impacts to the fishery from extended closures, on top of the already reduced quotas for 2019, actually for the next three years likely. Reasons cited in support of Option C were of course the need to provide greater protection to the herring population when spawning is occurring.

On the closure length, a similar kind of breakdown, 3 AP members were in favor of maintaining the status quo value of four weeks, 1 member indicated support for the five week, Option B, and 1 indicated support for Option C, the six week closure. The reasons cited in favor of status quo, again included the need for additional years of data from the current program, and additional negative impacts on the fishery, in addition to the reduced quotas. Then reasons cited in support of B and C was that the current closure period length has not been in place long enough to cover the spawning season, and extending the closure length may address this better. Reclosure protocol, 3 AP members indicated status quo support again, 2 members indicated support for Option A, the 20 percent value. The reasons were very similar to those I just outlined in both cases.

Then I'll switch over to the additional comments. This is on the document itself, 1 AP member took issue with the lack of information really, in Draft Addendum II on the 2018 Stock Assessment, specifically what was said about the lack of a stock recruitment relationship, and the limited impact of fishing mortality on the overall population.

Another AP member pointed out the assessment notes that environmental changes could also be affecting herring recruitment, and that AP member noted that the Draft Addendum was lacking in analysis on the impacts to the fishery by the proposed management alternatives, and stated this information is necessary for evaluating the cost of any potential changes today.

This AP member also noted the New England Council will likely be implementing catch limits for 2020 and 2021 that will be based on the new control rule part of Amendment 8 that afford greater protection to herring, and that this should be taken into account when considering expansion of the current spawning program.

Several AP members indicated that they disagree with some recent survey information that shows reduced recruitment in 1A, and those AP members think recruitment in the area is up in recent years, but lower in Areas 2 and 3. Of course Area 2 herring is closed at this time. One AP member noted that the 2018 Stock Assessment doesn't account for data from

the terminal year in 2018, which may be showing an increased trend in recruitment.

Then after the call an additional AP member communicated with Kirby, after being unable to participate on the call, and they supported Option B, the 25 percent value, Issue 1, Option C, the six week closure for Issue 2, and Option A, Sub-Option 2, the 20 percent trigger for Issue 3. That is reclosure I think.

For Issue 2 they indicated another option not listed that would include weekly monitoring of spawning so that the fishery could be closed, with a week buffer on either side of the spawning aggregation. That is not an option that is in the document specifically, so those are our comments, Mr. Chairman. I appreciate the opportunity to provide them to the Board this morning.

CHAIRMAN KELIHER: Thank you, Jeff for that thorough report. Are there any questions to Jeff Kaelin in regards to the Advisory Board? Seeing none, did you have enough coffee this morning?

CONSIDER FINAL APPROVAL OF ADDENDUM II

CHAIRMAN KELIHER: With no comments, now is the time to consider a final approval of the addendum. Do we have any, Doug Grout?

MR. DOUGLAS E. GROUT: Thank you, Mr. Chair, and I want to thank the PDT and the Advisors. I thank the PDT for putting together a very simple, easy to understand Addendum here. **With that I would like to move the following. I move to approve the following options for Addendum II to the Atlantic Herring FMP.**

Option C: GSI30 Trigger Value that is equal to 23 under Issue 1, GSI trigger values. Option B: a Five Week Initial Closure under Issue 2, Spawning Closure Length, and Option A: Sub-Option 2, a 20 percent of more mature herring under Issue 3 it would close protocol, and if I can get a second I'll provide a rationale.

CHAIRMAN KELIHER: I have a second by David Borden. Go ahead with your rationale, Doug.

MR. GROUT: These options provide additional protection to pre-spawning fish, and reduce the probability of catching spawning fish at the beginning of the spawning season. A five-year reclosure duration matches up best with the GSI30 trigger value of 23, as it is longer than the average spawning season in the document. The additional spawning protection will help enhance the opportunity for Atlantic herring stock to rebuild.

I tried to put together an option where we had a slightly more conservative trigger, even though the Technical Committee has told us that we should have a six-week closure with this. I took some of the public comment into consideration that they would probably rather have a shorter closure period, and then have reopening protocol. That is why I tried to put that in with a slightly more conservative reclosing protocol.

CHAIRMAN KELIHER: Thank you for that rationale, Doug. David, did you want to speak to the motion? David Pierce.

DR. DAVID PIERCE: I suspect we can support this motion with one exception, and that would be the length of the initial closure. I say that because of the status of the stocks, and in particular some of the text in the addendum that makes it very clear that we really are being faced with and are faced with, some historical low recruitment levels. Four out of the last five years or so historic low levels of recruitment, and granted there was some uncertainty about the recent year's recruitment.

But, I'm certainly more inclined to be pessimistic about it than to assume that the numbers we're looking at now are probably the correct ones. It has been said that perhaps there is a very weak relationship between stock recruitment and biomass. I suspect, and I'm guided by the fact that with recruitment being

the way it is, and with spawning stock biomass declining that there may actually now be a stock recruitment relationship that will affect us in the long term.

I prefer to be more cautious, and also to be more consistent with the Technical Committee advice. I would say okay, 23 on the trigger Option C that's fine, but Option B, I would make a motion to amend to go from Option B to Option C, relative to the closure length, so it would be a six-week initial closure instead of a five-week.

CHAIRMAN KELIHER: We have a motion to substitute, or amend?

DR. PIERCE: Just amend; change Option B to Option C, six week initial closure.

CHAIRMAN KELIHER: Motion to amend Option B to Option C. Dennis Abbott.

MR. DENNIS ABBOTT: I was going to suggest that we divide the question. We could probably do it either way. We could divide the question and vote on Option C the first part of it, and then go on to the second and third parts.

CHAIRMAN KELIHER: I certainly don't have any objections to do that. We don't have a second to the motion.

MR. ABBOTT: But I will second the motion at this time.

CHAIRMAN KELIHER: To complicate it you'll second the motion, thank you very much. Thank you very much, Mr. Abbott from New Hampshire. **We have a motion to amend on the table, moving Option B to Option C, a motion by Dr. Pierce, seconded by Dennis Abbott**. Are there any comments or questions in regard to the motion to amend? Ali.

MS. ALLI MURPHY: I just wanted to take a quick minute to summarize the NMFS comment letter on this Addendum. I certainly understand the Commission, or the Board's desire to be precautionary with regard to spawning herring. But I would ask that the Board balance this precaution with providing flexibility for the industry, and the opportunity to fully harvest the allocated quotas.

I think with the quotas that are expected this year, we're certainly going to see a closure, or we're likely to see a closure before the spawning closures kick in. But if the fish don't show up in time, or when they're expected, providing some flexibility to the industry to harvest the fish when they're available is preferred for us.

Secondly, looking forward under scenarios where there are higher quotas in future years, lengthier closures would likely limit industries ability to fully harvest the quota. I would urge the Board to support shorter, more targeted closures, and I plan on abstaining from votes on this Addendum.

CHAIRMAN KELIHER: Ray Kane, did you have your hand up?

MR. RAYMOND W. KANE: I get a little confused at these meetings. I support the amended part of this motion. We've got the Technical Committee sitting here saying we need a six week closure, and I think of the Technical Committee at ASMFC like I would think of the SSC, at Council level. I'm going to go ahead and support this.

I mean not only have we got a lobster industry that is concerned, but fish are not political, and we have to protect the predator fish. We have to give them enough forage, and we all know the state of the stock right now. It is my interest that we recover the stock as quickly as possible.

CHAIRMAN KELIHER: David Borden.

MR. DAVID V. BORDEN: A quick question. Has the New England Council taken a position or

outlined a preference under five or six weeks at all? I don't go to Council meetings, so I'm just asking.

CHAIRMAN KELIHER: I don't believe they have, but Terry Stockwell would you want to comment on that please?

MR. TERRY STOCKWELL: Yes thank you David for the question. The Council's Herring Committee received a report on the Addendum from Kirby in March, and there were no comments made at that time. There was some discussion at the recent Mystic meeting. In general the Council supports measures that will strengthen spawning protection, and I'm going to be listening to the conversation to determine how I vote at the end, but nothing specific to the question that you asked.

CHAIRMAN KELIHER: Thank you for that Terry, Steve Train.

MR. STEPHEN TRAIN: I would like to support this amendment, but I'm not sure I'm there yet. On Issue 2, a 25 percent increase in the closure period is what is on the table originally. Now we're going to a 50 percent. That's a lot of close time. We've already got a significant increase. I can see the benefits of it, but I need to be talked into it a little bit more to be able to support this. We're already increasing the closure with the original motion.

CHAIRMAN KELIHER: Dr. Pierce.

DR. PIERCE: I appreciate that point. What I would also like to do is to take the necessary steps to reduce the chances of our actually having to reclose, two week reclosure. That is another reason why I went with the six weeks as opposed to the five weeks. Right now we're at four, another week is five. I think again, considering the nature of the recruitment we're faced with right now, a longer duration of a closure makes sense, and we therefore minimize the chances of our needing a two week reclosure. I know in my staff we do a good job sampling the fishery with the state of Maine being involved in that of course. It's not an easy task to find the fish, so I would rather have them not having my staff and your staff not having to scramble around to try to find fish, to see if indeed a reclosure is necessary, minimize the chances of our having to reclose, go with the six weeks.

CHAIRMAN KELIHER: Any other comments, Ritchie White.

MR. G. RITCHIE WHITE: I guess I haven't made my mind up either, as Steve. Certainly it is important that the Technical Committee wanted the six weeks. Also important to me is that the Purse Seine Alliance that will probably catch over 90 percent of the herring in 1A this year supports the original motion. Those are the two issues that I have to balance to try to figure out what is a fair solution here, and I haven't done it yet.

CHAIRMAN KELIHER: Well you better hurry up, because we're going to call the question in a minute. Are there any other questions or comments in regarding the motion to amend? Senator Miramant.

SENATOR DAVID MIRAMANT: It seems like some of the purse seine folks thought that there was no need for closure, because you already have the option for the Department, so if they would move as an alliance to the five week or the first motion that is a good sign as well for cooperation. I'm new, just kind of a statement/question.

CHAIRMAN KELIHER: Are there any additional comments, any additional questions? **Seeing none, why don't we take two minutes to caucus? Do we need more time? Okay a roll call vote has been requested, and I'll read the motion to amend into the record. It is move to amend to replace Option B with Option C, Six Week Initial Closure under Issue 2, the**

Spawning Closure Length. I'll have Kirby go through the roll call.

MR. ROOTES-MURDY: I'll start with the state of Maine.

MR. TRAIN: No.

MR. ROOTES-MURDY: New Hampshire.

MR. ABBOTT: No.

MR ROOTES-MURDY: Massachusetts.

MASSACHUSETTS: Yes.

MR. ROOTES-MURDY: Rhode Island.

MR. ERIC REID: Yes.

MR. ROOTES-MURDY: Connecticut.

DR. JUSTIN DAVIS: Yes.

MR. ROOTES-MURDY: New York.

MR. JOHN G. McMURRAY: Yes.

MR. ROOTES-MURDY: New Jersey.

MR. JOE CIMINO: No.

MR. ROOTES-MURDY: New England Fishery Management Council.

MR. STOCKWELL: Abstain.

MR. ROOTES-MURDY: National Marine Fisheries Service.

MS. MURPHY: Abstain.

MR. ROOTES-MURDY: **The motion passes 4 in favor, 3 against, and 2 abstentions.**

CHAIRMAN KELIHER: With that the original motion has been amended, if we can get that on the board. With that the original motion has been amended to include the Option C, the six week initial closure. Is there any an additional question or comments on the newly amended original motion? Seeing none, do we need time to caucus?

Seeing none, is there any objection to the original motion that has been amended? We do have opposition, so I am going to call the question. **Well, let me read the new motion into the record. Move to approve the following options for Addendum II to the Atlantic Herring FMP: Option C, the GSI30 Trigger Value = 23 under Issue 1, GSI30 trigger values. Option C, Six Week Initial Closure under Issue 2, Spawning Closure Length.**

Option A, Sub-Option 2, 20 percent or more mature herring under Issue 3, the reclosure protocol. I'm going to call the question. All in favor of the newly amended original motion please signify by raising your hand. All opposed abstentions or null votes, 1 abstention. The motion passes 6 to 1 to 1. Okay thank you very much. That is the final approval of Addendum II, no excuse me, we have a couple more motions, I'm sorry. Doug.

MR. GROUT: I believe we have to have an implementation date and then I don't know which order I should do this. **My motion is to move the states implement Addendum II no later than August 1, 2019, and I'm also moving to approve Addendum II as modified today.**

CHAIRMAN KELIHER: We have a motion on the table, do I have a second? Mr. Train, seconded by Steve Train, is there any comments, questions on the motion? Ray Kane.

MR. KANE: A question of the maker. I thought at our AP meeting the season was going to start July 15, 2019. Why couldn't we use that as a date as opposed to August 1, 2019?

MR. GROUT: Well, my thought was the spawning closures typically don't start until August, and that would give the states sufficient

enough time to go through their regulatory process to get this in place.

MR. KANE: Thank you.

CHAIRMAN KELIHER: Are there any additional comments or questions? Seeing none, I'll read the motion into the record. **Move that states implement Addendum II no later than August 1, 2019, and move to approve Addendum II as modified today. The motion was by Mr. Grout, and seconded by Mr. Train.** Is there any objection to the motion on the board? We have objection. There is final action, so we'll have a roll call vote, Kirby.

MR. ROOTES-MURDY: We'll go through this fairly quickly. Maine.

MR. TRAIN: Yes.

MR. ROOTES-MURDY: New Hampshire.

MR. GROUT: Yes.
MR. ROOTES-MURDY: Rhode Island.

MR. REID: Yes.

MR. ROOTES-MURDY: Connecticut.

DR. DAVIS: Yes.

MR. ROOTES-MURDY: New York, oh we missed a state, sorry. Massachusetts.

MR. KANE: Yes.

MR. ROOTES-MURDY: New York.

MR. McMURRAY: Yes.

MR. ROOTES-MURDY: New Jersey.

MR. CIMINO: No.

MR. ROOTES-MURDY: New England Fishery Management Council.

MR. STOCKWELL: Yes.

MR. ROOTES-MURDY: National Marine Fisheries Service.

MS. MURPHY: Abstain.

MR. ROOTES-MURDY: **Motion passes 7 in favor, 1 against, 1 abstention**.

CHAIRMAN KELIHER: **That concludes the final action in regards to Addendum II**.

UPDATE ON THE 2020 AND 2021 FISHERY SPECIFICATIONS

CHAIRMAN KELIHER: Moving right along on the agenda, we'll go to Item Number 5, an Update on the 2020 and 2021 Fishery Specifications, Kirby.

MR. ROOTES-MURDY: I'll try to go through this quickly, but not too fast, sorry. As you all know, we have 2019 specifications that were set at the February meeting earlier this year. The New England Fishery Management Council met earlier this month to consider Framework 6, which outlines specifications for the 2020 through 2021 fishing season.

Framework 6 was developed to set those specifications based on new information from the 2018 Benchmark Assessment. Because the Benchmark Assessment adjusts what the overfishing reference points are for Atlantic herring, it required a framework, and in turn the document outlines alternatives to consider setting those specifications.

The Council agreed to include two overfishing definitions for the 2020 specifications. The first is a no action, which would maintain the current overfishing definition, and the second would update it to be more consistent with the 2018 assessment results. On the screen you can see an Alternative 1, which is no action, Alternative 2, which is an original calculation, and then Alternative 2 updated. Alternative 1 is straightforward; it's no action, which is the case

where you would rollover 2019 specifications as implemented through the NOAA Fisheries in-season adjustment.

Alternative 2 original, this alternative was recommended by the Scientific and Statistical Committee of the Council back in October, based on the proposed Amendment 8 Control Rule. Alternative 2 updated, is consistent with the proposed Amendment 8 Control Rule that was updated by the Herring Plan Development Team, to include more accurate catch data for 2018.

In terms of the other items that are considered as part of the framework, there is a management uncertainty buffer. Before the U.S. catches are set, the ABC is reduced to account for the potential harvest in the New Brunswick, Canada weir fishery, and other potential sources. In recent years the Council has subtracted 6,200 metric tons as a management uncertainty buffer for Framework 6.

The Council will consider three alternatives based on updated 3 year, 5 year, and 10 year averages of the New Brunswick weir catch. These averages total to about 5,888 metric tons, 3,992 metric tons, and 4,560 metric tons respectively. The Council also agreed that 1,000 metric tons of that management uncertainty buffer, could continue to roll over into the Area 1A catch limit on October 1, if that New Brunswick weir fishery has not landed a majority of that buffer up to that point.

Regarding border transfers, the framework includes two alternatives for border transfers of U.S. caught fish that is shipped to Canada via carrier vessels, and used for human consumption. The alternatives are 0 metric tons, and 250 metric tons. While the two options will be analyzed on their own, the Council will be able to select a number anywhere between 0 and 250 metric tons when it takes final action in June.

In terms of the U.S. at-sea processing, the Council moved to set that at 0 when allocated the supplies to U.S. vessels that want to process herring at sea, but don't meet the vessel size limit. In terms of the sub-ACL proportions, those were also maintained, so specific to Area 1A that remains at 28.9 percent.

In terms of the seasonal sub-ACLs, for Area 1A that remains 0 for January through May, and then 100 percent from June through December. Regarding RSA, the Council voted to maintain the RSA at 3 percent of the sub-ACL for each of the management areas for 2020 and 2021. The 2019 RSA value was set at 3 percent through the National Marine Fisheries Service in-season adjustment.

Then in terms of the fixed gear set-aside, the Council voted to set that at a level that's equivalent to the same proportional reduction from 2019 to 2020, as a total fishery reduction. The set-aside applies to the fixed gear fishermen west of Cutler, Maine, and is removed from the Area 1A sub-ACL, and it's returned to the sub-ACL if not used by November 1st. Last, I've included in here what the catch caps are by each of the gear types and areas for 2020. With that in terms of next steps, the New England Plan development Team, the AP, and the New England Management Council's Herring Committee will meet in May, and the Council is expected to take final action on Framework 6 in June. With that I'll take any questions.

CHAIRMAN KELIHER: I've got Terry Stockwell and then David Borden.

MR. STOCKWELL: Just a slight edit to the border transfer bullet. It's a range between 0 and 250, not one or the other.

CHAIRMAN KELIHER: Thanks for that clarification, Terry. David.

MR. BORDEN: Kirby, how close are we coming to the bycatch limits? In other words, if you go

back two slides you have what the allocation is. If you use the prior year bycatch as an indicator, how close are we to those numbers? If this takes too long, you can answer it after the meeting.

MR. ROOTES-MURDY: Yes, I don't know off the top of my head, but I can look it up and get back to you.

CHAIRMAN KELIHER: David, too many Davids?

DR. PIERCE: Kirby, I think you mentioned that 6,000 metric tons is pretty much the management uncertainty that accounts for the New Brunswick weir catch. Do we have an update as to what the New Brunswick weir catch was recently? Was it greater than 6,000? There is a number, but I can't recall what it is.

My colleague here mentions 11,500, so we've gone way over the 6,000. I just can't recall, but I can turn to the other members of the New England Council to help me with this. What is the consequence of our going over the 6,000, in terms of an impact on the amount of herring that is available for Massachusetts, Maine, New Hampshire fishermen, and of course New Jersey?

MR. ROOTES-MURDY: For the first question I don't know the exact value. On the second I would have to look at up as well.

CHAIRMAN KELIHER: That's a really good question, David on your second part, because it was always my understanding that that overage would not penalize the jurisdictions here, where they're coming off the top. But that has become less clear to me, and I'm going to look to Terry to see if he can create some clarity around that issue.

MR. STOCKWELL: I might have to phone a friend.

CHAIRMAN KELIHER: Mr. Grout.

MR. GROUT: Can I be your friend? It is my understanding from the discussion at the Herring Committee meeting that what that does is there isn't a payback from that at all. But what that does is that means the catch is higher than we anticipated, so when they put that into the stock assessment, or in any projections that takes into effect, and may lower the overall quota in future years.

CHAIRMAN KELIHER: There is no objection by Mr. Stockwell, so I think he must have thought you were his friend on that one, Doug, so very good.

MR. STOCKWELL: Very friendly here. I mean there is no payback for the Canadian coverage currently in our FMP. As you all know, the weir fishery is highly variable.

CHAIRMAN KELIHER: Any additional questions in regards to this topic? Toni.

MS. TONI KERNS: I don't have a question, but I can tell you that the midwater trawl, southern New England, Mid-Atlantic bycatch caps have been reached in total, I think the past two years. I'm not sure about the rest of them.

CHAIRMAN KELIHER: Mr. Kaelin just whispered that in my ear, but not this year so that's a good sign. Are there any additional comments on this topic?

PROGRESS UPDATE ON DRAFT ADDENDUM III

CHAIRMAN KELIHER: Let's move on to the next agenda item, Progress Update on the Draft Addendum III.

MR. ROOTES-MURDY: I'll go through just a brief background, give you all as much of an update as there is, and then we have some kind of questions for you to consider, to think about moving forward, and then I'll take any questions you may have. In terms of background, the Board initiated Draft Addendum III at the annual meeting last October. The Addendum was initiated to develop spawning protection in

Area 3. The Board also requested that the New England Council consider herring spawning protection in its 2019 priorities.

The Commission sent a letter to the Council in November. In terms of updates, the Council added herring spawning protection to its 2019 priorities, in that they have hired a consultant to support the development of a Discussion Document that would really be pulling together a lot of the information on what has been done in the past, in terms of monitoring, data collection in Area 3, as well as evaluating what the available information is out there, in terms of research and literature.

They closed the advertisement on, I believe it was April 22, and so I believe they are hoping to bring somebody on in May of this year. In terms of the Addendum itself, there has not been any progress made in drafting it up until this point. We did have a New England Council sub-PDT call that was convened to try to identify some of the challenges, brainstorm a little bit what spawning protection in Area 3 could look like.

We developed at least a couple of questions that we think may help us in furthering this document, by posing it to this Board to consider. As you all are aware, right now we have a program in Area 1A that outlines spawning closures in three discreet places, right. We have eastern Maine, western Maine, and then Massachusetts/New Hampshire.

But we also have information that demonstrates how and where herring are likely spawning throughout the overall region. You can see for a good chunk of Area 3, it is a continuous coverage along Georges Bank, up over to off the coast of Cape Cod. These are important considerations in thinking about how moving forward, spawning protection for Area 3 could and should develop in relation to what is currently in place for Area 1A. First off, one of the significant challenges is that Area 3 is a large area.

There are many unknowns regarding the timing and location of spawning events. There may also be spawning events that are occurring at different times, and in multiple large areas. This is stuff that the group was able to kind of talk through, but we again don't have a lot of great data that we can speak to at this point that demonstrate this.

Partly because current sampling in Area 3 is limited, we don't have a dedicated fishery independent sampling survey at this point. That further creates challenges to understand the dynamic of these temporal and spatial changes in herring spawning over time. The other facet that will create some challenges moving forward that you all are aware of, is that there is likely reduced quotas in future years that will further limit the ability to collect samples from fishery dependent sources.

Those fisheries that are currently operating and they encounter herring, but may not be targeting them directly. To give you a sense of kind of the extent of sampling what's happening or has happened, this slide is pulled from the white paper that was included in meeting materials from October of last year, and the number of herring samples taken from vessels fishing in Georges Bank and Nantucket Shoals from 1998 to 2018.

These samples were obtained by Massachusetts DMF, and as you can see over the last three years, a total of eight trips have been sampled. The figure is taken, as I said, from that white paper, and I think really just demonstrates the limit of how many samples we would be able to evaluate spawning activities in Area 3 right now, based on current data collection.

In terms of the Council's timetable moving forward, as I said they advertised to hire a consultant. They're hoping to bring that person on next month. Then they're looking to develop the discussion document in consultation with the Commission's Technical Committee, and the Council's PDT over this

summer, with the aim of having that Discussion Document presented to the Council for their consideration, and discuss possible next steps at the Council meeting then.

In trying to think through with Council staff what might happen beyond that is really difficult, because it really depends on what the Council decides, how that discussion goes in September. For the Board's consideration, these are some questions that the Sub-group had thought through and thought would be useful for this Board to consider, not necessarily providing feedback today, if you aren't ready for that.

But in trying to guide staff in developing this Addendum, thinking back to the goal of that Board motion from October: Is there an interest in trying to have more discreet spawning closures like we have in Area 1A, or is the move to try to do a much larger, broad spawning closure? Examples would be for discreet closures, you know specific places on Georges Bank or Nantucket Shoals or as a large area closure might be the entire Area 3. If there is interest in going down that road, what type of monitoring or protocol would help inform spawning closures for that type of program. Some key questions to think about. I'll leave those up on the board for now. If you have any further questions, please let me know.

CHAIRMAN KELIHER: Thank you, Kirby for that update. These questions that Kirby has posed could get us quickly into the weeds, I think and likely prematurely, because of the work that is ongoing at the Council. I would certainly be open to a few questions and comments though at this time. Dr. Pierce.

DR. PIERCE: We'll see what the Discussion Document reveals; again the Council will make a decision as to who will do that work, whether it's a particular state, or someone else. I'm sure that the state of Maine, the state of Massachusetts, Technical Committee members who have been so immersed in this issue over the years, and have already given us some great advice regarding closures in Area 1A.

I suspect that they'll be very helpful in developing some response to Number 2, the type of monitoring and protocol that would inform spawning closures. I know that my staff and I think your staff, Pat, have already weighed in, in previous discussions about this. I suspect that it will blossom, and we'll see before the fall, I hope, the results of that consultants work.

Then we'll be in a position to have some further discussion about the way we wish to go, maybe at our meeting later on this year, in preparation I would hope, for some action to be taken by ASMFC, to deal with Georges Bank spawning, Nantucket Shoals spawning in 2020.

CHAIRMAN KELIHER: Any additional questions or comments on this topic? Mr. Grout.

MR. GROUT: Yes, a couple things. I think what we're going to need to use the advice of our Technical and PDT members as to the answer to the first question; do we have enough data to develop discreet closures? If we don't, then clearly something on a broader scale is going to have to be.

I think we're going to have to rely on their scientific advice on that. As far as monitoring, as I remember at the last meeting, one of our previous Executive Committee meetings we had set aside some of the ASMFC plus-up funds just for this type of a project, to try and get better information on Georges Bank spawning closure.

I hope that we can start moving forward with developing a spend plan for that so that we can get this information, to help both the Council and the Commission in their decision in how to move forward with the potential spawning closure. I also think another thing that it will also help, could potentially help inform the white paper that the Council is working on, so that we're working together on this. Hopefully

the Council will move forward in September with a framework to address that.

CHAIRMAN KELIHER: Are you suggesting that the work associated with monitoring could help inform the development of the white paper? I was thinking of it kind of in reverse that the white paper would inform how we may need to move forward with the development of a spend plan, if we have to go in that direction.

MR. GROUT: You know you're probably right, because the white paper is going to be crafted during the summer. Probably some of the data from the monitoring program would not be able to be included. But I think we should be looking at trying to develop a spend plan this year, so that we can get some information on spawning, even before we put in any kind of spawning closure provisions.

CHAIRMAN KELIHER: I've got Terry Stockwell and then Ritchie White.

MR. STOCKWELL: Yes, I just want to underscore the ongoing collaboration between the Technical teams of the Commission and the Council staff. I know they've got a lot of work planned ahead, but I do want to wave a bit of a yellow flag, because come fall the Council's number one priority is going to be getting the Spec package out the door.

If it is group intent to make a very complicated document with a number of discreet spawning closures, and we haven't even, the Council's document refers to Georges Bank; it does not yet include Nantucket Shoals. It's going to languish, so just want to put that out for everyone's future consideration.

CHAIRMAN KELIHER: Ritchie White.

MR. WHITE: I think it's important that we maintain this Addendum in the queue. Clearly the Council is working towards making a decision in September. But if they don't, I think it's important that we look at the option of doing a temporary addendum that would not close fishing in Area 3.

But not allow the landing of spawned herring, which we clearly have the right to do, for an interim period until the Council does implement spawning protection. We would have the ability to protect spawn in 2020, if the Council is still working on something in a more permanent nature. This would give us the ability to do that and I think it's important for us to have that option.

CHAIRMAN KELIHER: Any additional comments on this topic? I think we probably ought to be putting this as a follow up to our next agenda in August, just to be thinking through some of these questions, and keeping this on the front burner, and be thinking about how we're going to be dealing with this.

But to Doug Grout's point on the spend plan, I think we need to be putting some more thought in regards to those additional data needs, and if some additional work can be done to the sampling for this year. We probably ought to be thinking about maybe a small work group associated with that. Do you have thoughts on that Doug?

MR. GROUT: I was thinking that maybe we should start tasking our Technical Committee and PDT to come up with a monitoring spend plan for this. But if you feel that it would be helpful, or if the Technical Committee feels it would be helpful to have Board input into it, I think a work group would also be a good way to move forward. As long as we, again, include our Technical Committee with this.

CHAIRMAN KELIHER: I'm sensitive a little bit to staff time around this issue. Renee, do you have any thoughts in regards to TC involvement with this? Would you like some additional input from the Board members from the work group?

RENEE ZOBEL: I think they've certainly been looking for input, as you saw the questions up

there. One of the problems we're going to face is the ability to encounter samples is going to be very low. We just can't rely on fishery dependent sources with the low quotas. The problem then becomes how do we get these samples?

I think we've been looking for the Council – that's kind of what a lot of the work has been done in communicating with the Council – yes, we have this money available. We need samples, how are we going to get them? We can't get them from the fishery. I know the state of Maine has actually contracted boats to go out and obtain spawning samples. I know that has not been super successful thus far, but we may be looking at something similar if we want to get samples outside of any lack of a dedicated fisheries independent survey for herring.

CHAIRMAN KELIHER: It would seem to me a small subset of the Board, working with some TC members on a potential work plan would be advisable in this situation. Without putting anybody on the spot, now why don't we work on pulling that group together? If anybody has any interest in doing that please see Kirby or I after the meeting, we'll put together a small group, and set up a call on that issue. Are there any objections to that? Seeing none, great.

REVIEW MANAGEMENT TOOLS USED FOR SETTING THE DAYS OUT MEASURES

CHAIRMAN KELIHER: Let's move on to Item Number 7, Reviewing Management Tools Used for Setting the Days Out measures.

MR. ROOTES-MURDY: This will be a pretty brief overview of what we've talked about thus far. It's laid out also in your supplemental materials, but basically the 2019 sub-ACL is much lower than previous years. In 2018, we had a sub-ACL of 31,000 metric tons. This year it is down to 3,850 metric tons.

In April the Days Out meeting occurred, and the Board moved to, well prior to that meeting moved to have bimonthly quota periods for 2019, and they specified what the permit and start of the season would be based on that framework. Given some of the variables that impact this fishery, the quota for 2019 could be harvested as quickly as three weeks.

Today we wanted to just provide a review again of what the Days Out management tools are, and to consider this moving forward for this season and looking towards the 2020 season when there may be a much lower quota than we have right now. Just a reminder, we have the Days Out Program, which currently prohibits landing days, or the possession of herring for only Category A permit holders, Category C limited access permits, and Category D, open access permits, only those designated small mesh bottom trawls can be submit to Days Out measures.

All other permit holders are not subject to Days Out measures, unless stipulated by state regulations. In terms of other tools, there is the weekly landings limit; they limit the amount of herring that a vessel can land on a weekly basis for Category A permit holders, and then last there are restrictions on transfers at sea, and carrier vessels. It restricts who can transfer at sea, and the number of transfers that can occur. States can elect to allow for limited transfers at sea or prohibited transfers at sea. When prohibiting transfers at sea, states can chose to restrict harvester to harvester, harvester to carrier, or both. In terms of next steps, staff and the states will monitor the effectiveness of the current management tools during the first few quota periods this year.

We will plan to provide an update to the Board at their next meeting on how the fishery is being prosecuted. At this point if the Board so chooses, you can have a discussion on the utility of the current Area 1A management tools, given changes in the abundance of Atlantic herring. But again, much of this stuff is a kind of wait and see, depending on how the fishery plays

out this year. With that I'll take any questions if you have any.

CHAIRMAN KELIHER: Are there any questions for Kirby? Seeing none, I do want to point out a shortcoming. The last Days Out meeting there was a motion made that was specific to no carriers, a no carrier provision only applies to Category A vessels, does not apply to Category C vessels. The state of Maine will be moving forward with rules that pertain to our own fishery that will restrict carriers within the fishery, so there is consistency.

Maybe this would be a good topic for the Sub-group, since there is going to be a Sub-group having a conversation about this, maybe bring some thoughts back to our August meeting in regards to a possible Addendum to create some additional tools in the toolbox, so we potentially could affect other permit categories.

Are there any thoughts or concerns in regards to that? Seeing none, any objections to adding that to the task of the work group that will be developed? Seeing none, we'll make sure that comes back to the Board at the August meeting.

CONSIDER APPROVAL OF THE 2019 FMP REVIEW AND STATE COMPLIANCE REPORTS

CHAIRMAN KELIHER: Item Number 8 is Consider Approval of the 2019 FMP Review. Kirby, can you go through that quickly?

MR. ROOTES-MURDY: I'm going to go through the status of the stock, status of the fishery, days out measures from 2018, and then state compliance. As you all know, the most recent assessment was peer reviewed and found that herring are not overfished, and overfishing is not occurring. But there are concerning trends in recruitment and spawning stock biomass.

The recruitment has been below average for the last five years. In terms of the status of the fishery, as you are aware the Atlantic herring fishery is controlled by an annual catch limit set by the Council, and approved by NOAA. The stock-wide ACL is distributed among four management areas.

Once 92 percent of the sub-ACL for an area is reached, the respective fishery is closed. The stock-wide fishery closes when 95 percent of the total ACL is projected to be reached. The stock-wide ACL for 2016 to 2018 was 104,000 metric tons. Obviously this year it has been reduced down for Area 1A from a little more than 30,000 metric tons to 3,000 metric tons.

In terms of 2018 measures, this slide lays out what the Days Out program and the Effort Controls that were in place last year. It shows you what the effective date was for the number of landing days for Category A permits, and how those changed over time, as well as what the weekly landing limits were for Category A permits, and the amount that they could transfer to carrier vessels. In terms of the spawning closures, the eastern Maine spawning area closed on the default date of August 28 through September 24 last year, given there was no samples taken from that area. Western Maine there was no spawning area closure last year, and for Massachusetts/New Hampshire spawning area, based on the GSI30 model, the projected date of closure was October 26, and continued through November 22, and that closure was based on 8 samples.

In reviewing state compliance, the Plan Review Team found that all states were in compliance with the FMP. In terms of de minimis, states may be eligible for de minimis if their combined average over the last three years, in terms of their commercial landings, constitutes less than 1 percent of the coastwide commercial landings for that same three-year period. New York has requested and has met that requirement. I'll take any questions if you have, but the Herring Board approved the 2019 Atlantic herring FMP State Compliance and de minimis status for New York.

CHAIRMAN KELIHER: Doug Grout.

MR. GROUT: One slide jumped out at me that surprised me was the slide that says there was no western Maine spawning closure last year. I would like to get that confirmed, because I thought we hit the default days.

MR. ROOTES-MURDY: Yes that was an error on my part. They did close, I would have to double check reviewing the materials, but they did close last year.

CHAIRMAN KELIHER: Bob, can you dock his pay, please?

EXECUTIVE DIRECTOR ROBERT E. BEAL: Yes, duly noted.

CHAIRMAN KELIHER: Thank you. Are there any other questions or comments for Kirby on that? Do we have a motion? Mr. Grout.

MR. GROUT: If you put the motion up on the board, I'll read it for you, save you the trouble, okay? **Move to approve the 2019 Atlantic Herring FMP Review, state compliance reports, and de minimis status for New York.**

CHAIRMAN KELIHER: Who will second it, Ray Kane? Too many hands going up at once, thank you. **Are there any comments on the motion, any objections to the motion? Motion passes without objection, thank you.** That concludes the items on the agenda.

OTHER BUSINESS

CHAIRMAN KELIHER: Is there any other business to be brought before the Board? Mr. Abbott.

MR. ABBOTT: Regarding this fishing year. I have some questions about what's going to happen. We already know that Area 2 has gone over their quota by 800 metric tons, and we also know that Area 1A meters out its fishery, in order to support the lobster bait industry. I think we can also assume that Area 3 will catch their quota, as will Area 1B and possibly go over the numbers that they have. Meaning that Area 1A will bear the brunt of any overages by the other three areas, which to me becomes concerning on a fairness issue, in that it's likely that the Commonwealth of Massachusetts won't see a season in October as a result of that. But my questions are, with the fact that Area 2 went over by a substantial amount, will in the future be any penalty in Area 2, just assuming that the entire small quota is caught in all the areas? In the future does Area 2 bear any responsibility to have a reduction?

Assuming they're separate stocks, is that not a consideration? My concern is by our efforts to control the Area 1A fishery as we do, we actually are penalizing, call it ourselves, in Area 1A because of our efforts. That I find is very concerning, and I'm sure it's concerning to the affected states. I don't know really who to address my questions to, but I think it needs some thought for the future, because with these low quotas, we've never had this before where we've caught the complete quotas in all the areas.

CHAIRMAN KELIHER: I don't have an answer, but I'll put Toni on the spot.

MS. KERNS: I mean, I think these questions should be addressed to the NOAA Fisheries, as well as the New England Fishery Management Council, in terms of looking towards to be able to closely monitor these other fisheries as these quotas are lower and lower. These fisheries are being caught faster and faster, and the monitoring of these fisheries will be essential. I know we've had a couple of conversations with NOAA Fisheries, and they're looking to figure out ways to improve the monitoring, to be able to close on a timely basis.

But you know as we talked about before, because the Area 2 fishery has gone over, it potentially could mean that the 1A fishery that is occurring in the latter months could be closed earlier, because we close the total fishery at 92 percent of the ACL. That means that if one area goes over their portion of the ACL, the other areas will get cut short potentially. I think those

comments would be directed towards them, 95 percent, sorry.

CHAIRMAN KELIHER: Ray Kane.

MR. KANE: This would be a question directed to Terry Stockwell, you represent the Council here. My understanding, this might be very what Toni has just said, very much so. But I thought the action of the Council in years past was like this year Area 2 went over, and there will be a payback in two years, so Area 2 quota will be reduced in two years. I mean we used to have this issue with Area 1B all the time. Am I correct in stating that Terry?

MR. STOCKWELL: We're entering brave new frontiers with these new lower quotas. As you know, when the Council discussed the Spec Package a month ago, there is no discussion on realigning the areas. I think the question you raised is going to be part of the Spec Package discussion that we have leading up to the fall.

CHAIRMAN KELIHER: Doug Grout.

MR. GROUT: Ray is right. It does get taken off the Area 2, two years from now. The same thing with any other sub-area overage, it will be taken off two years from now. Yes, we are in a brave new world, because I am very sympathetic to NOAA Fisheries challenge to try and close. We already have a 92 percent buffer in there to try and prevent overage.

But when you have quotas, for example 1B that are in hundreds of metric tons and the catching capacity of our vessels is quite large, it can very easily go over and has even at higher catch levels in the past. It is going to be a challenge for NOAA Fisheries this year to try and keep on top of that.

CHAIRMAN KELIHER: Are there any additional comments, any additional items to be brought before the Board? Seeing none, I think we have concluded our business for the Herring Board for the day. We're ahead of schedule by eight minutes, so any comments?

EXECUTIVE DIRECTOR BEAL: I think we'll start the Striped Bass Board about five minutes early. I imagine there will be some public showing up for that. I don't want to get going too early on that.

ADJOURNMENT

CHAIRMAN KELIHER: A motion to adjourn would be in order. We've got all kinds of motions to adjourn, thank you very much.

(Whereupon the meeting adjourned at 9:52 o'clock a.m. on April 30, 2019)

Review and analysis of Atlantic herring (*Clupea harengus*) spawning on Georges Bank

2019 Discussion Document for the New England Fishery Management Council

Prepared by Dr. Graham Sherwood, Ashley Weston, and Aaron Whitman in consultation with the Herring Plan Development Team

Version 09/06/19

New England Fishery Management Council

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I. Preamble

The purpose of this document is to provide a comprehensive review of all available data pertaining to Atlantic herring spawning on Georges Bank, as well previous management actions or discussions related to spawning protections. This draft document outlines completed analyses of existing data sets that can be used to infer location and timing of herring spawning. The final version of this discussion document (pending) will expand further on the literature and historical aspects of this review, as well as a general overview of herring biology. While the literature review will be integral to this document, it is felt that analyses of existing rich datasets (many of which have not been examined in detail as indicators of herring spawning) will be invaluable for the purpose of inferring spawning of Georges Bank herring.

The existing data sets considered here include larval herring data collected as part of the long-standing NEFSC ichthyloplankton surveys (1971 – 2017) where spawning is inferred from distribution of early stage (< 9mm) herring larvae, Northeast Fisheries Science Center trawl survey data (spring and fall) where spawning location is inferred from location of later maturity stage herring (1987 – 2018), and dockside monitoring data where location of late maturity stage herring is also mapped and used to infer spawning; dockside monitoring data comes from both Maine Department of Marine Resources (DMR) and Massachusetts Division of Marine Fisheries (DMF) dockside monitoring programs (1971 – 2018) which, in addition to maturity stage, also provide data on gonadal somatic index (GSI), a more quantitative measure of potential spawning. Other sources of spawning information contained in this draft include early depictions of spawning grounds from Olsen et al. (1977) and Overholtz et al. (2004), as well as presence of herring eggs in the diet of groundfish from the NMFS Food Habits Data Base (limited instances). Information from observer programs was considered (e.g., mention of spawning herring in notes by observers) but proved not useful in terms of detail. Finally, we reached out to fishing industry members, primarily owners and captains of herring vessels operating on Georges Bank for their input with regard to spawning herring on Georges Bank.

Each of the above mentioned data sets is described more in detail below and results from each, as potential indicators of spawning, are presented individually where spatial and temporal trends in spawning can be visualized and explored. A summary of all of these depictions of spawning is made in “consensus” figures following the example of DeCelles et al. (2017) who considered multiple points of view, with a heavy reliance on fishermen’s ecological knowledge, for describing Atlantic cod spawning on Georges Bank (Figure I.1). Essentially, greater weight was given to areas of consensus or overlap where multiple sources identified spawning in the same area. A similar exercise is presented here where spawning areas may be inferred as areas where multiple data sources identify the same place (i.e., with high degree of overlap).

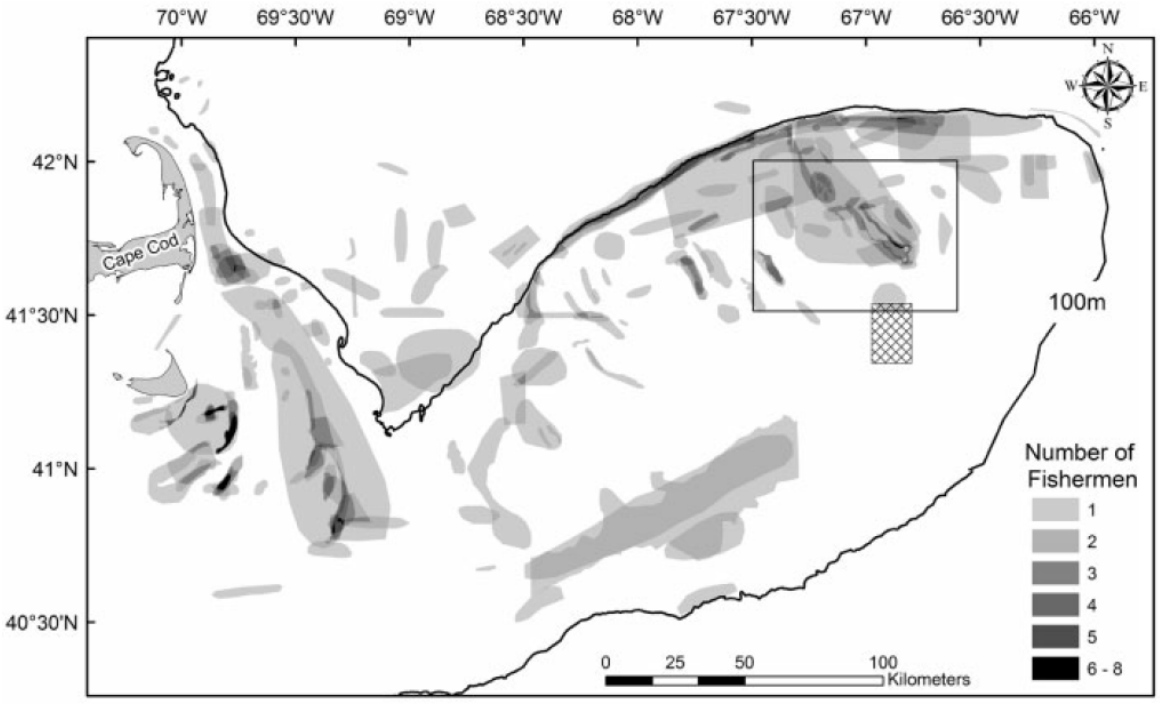

Figure I.1. From DeCelles et al (2017). "Cod spawning grounds that were identified by fishermen. Each polygon represents a spawning ground that was identified by a single fisherman. The shading is used to identify areas where there is overlap in the spawning locations reported by multiple fishermen. The rectangle outlined in black depicts the "Winter Fishing Grounds" that were described by Goode (1884) and Rich (1929). The hashed rectangle represents the cod spawning grounds that were reported by Bigelow and Schroeder (1953)."

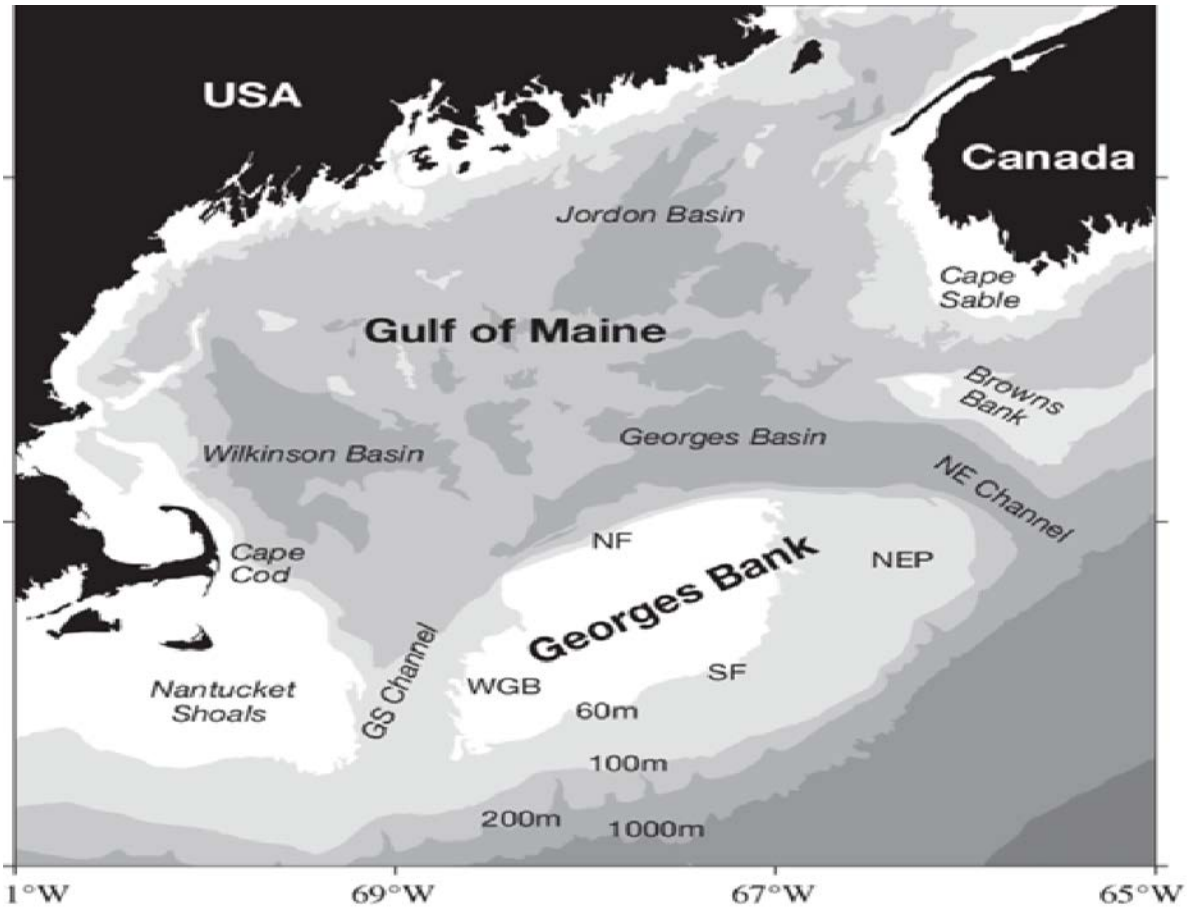

Figure I.2. Map of Gulf of Maine and Georges Bank showing place names referred to in this document: Nantucket Shoals, Great South Channel (GS Channel), Western Georges Bank (WGB), Northern Flank (NF), and Northeast Peak (NEP). From Lough et al. (2006).

1. Background

1.1. Herring Spawning Biology

(to be completed for final draft)

1.2. Previous Considerations of Herring Spawning in New England Fisheries Management

(to be completed for final draft)

1.3. Herring Spawning and Management Around the World

(to be completed for final draft)

2. Consideration of Existing Maps and Data Sets

Herring spawning on Georges Bank has been described in the past in various documents. The currently and frequently cited source is from Overholtz et al (2004). Here, they describe spawning as follows: "*Georges Bank (including Nantucket Shoals): Varied with time – contracted and protracted around Nantucket Shoals. Major grounds Northeast Peak (pre and post collapse), Cultivator Shoals and the Nantucket Shoals (Figure 1.5) (Melvin et al. 1996, Reid et al. 1999). Currently, spawning appears to be continuous from Massachusetts Bay into Great South Channel and along the northern fringe of Georges Bank to the Northeast Peak.*" Figure 2.1 depicts what Overholtz et al (2004) describe as continuous spawning from Massachusetts Bay to the Northeast Peak.

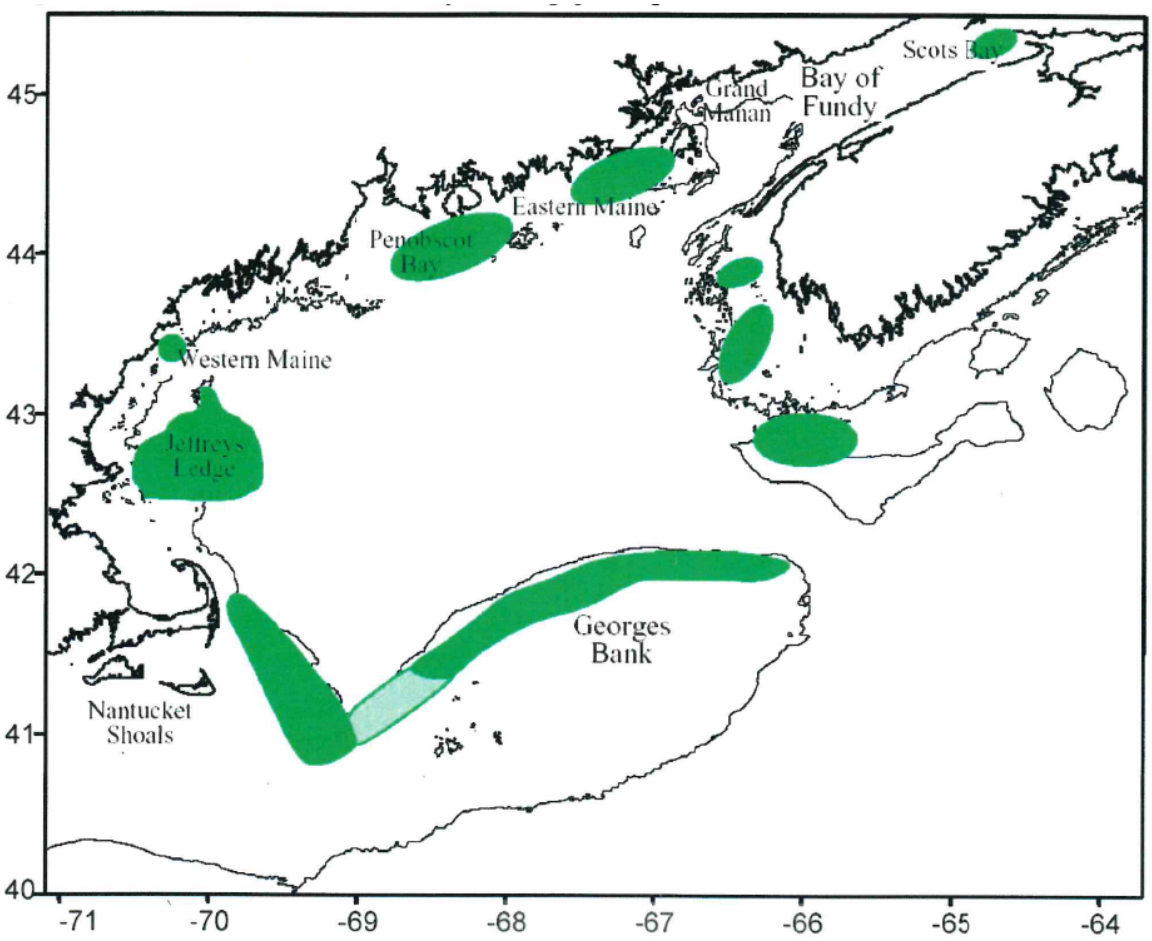

Figure 2.1. Generalized view of the current major herring spawning areas in the GOM and on GB (from Overholtz et al. 2004).

A previous publication showed more specific and limited spawning grounds on Georges Bank (Olsen et al. 1977) (Figure 2.2). These locations match well with egg essential fish habitat as shown in Amendment 5 to the Fishery Management Plan (FMP) for Atlantic Herring (NEFMC 2013) (Figure 2.3).

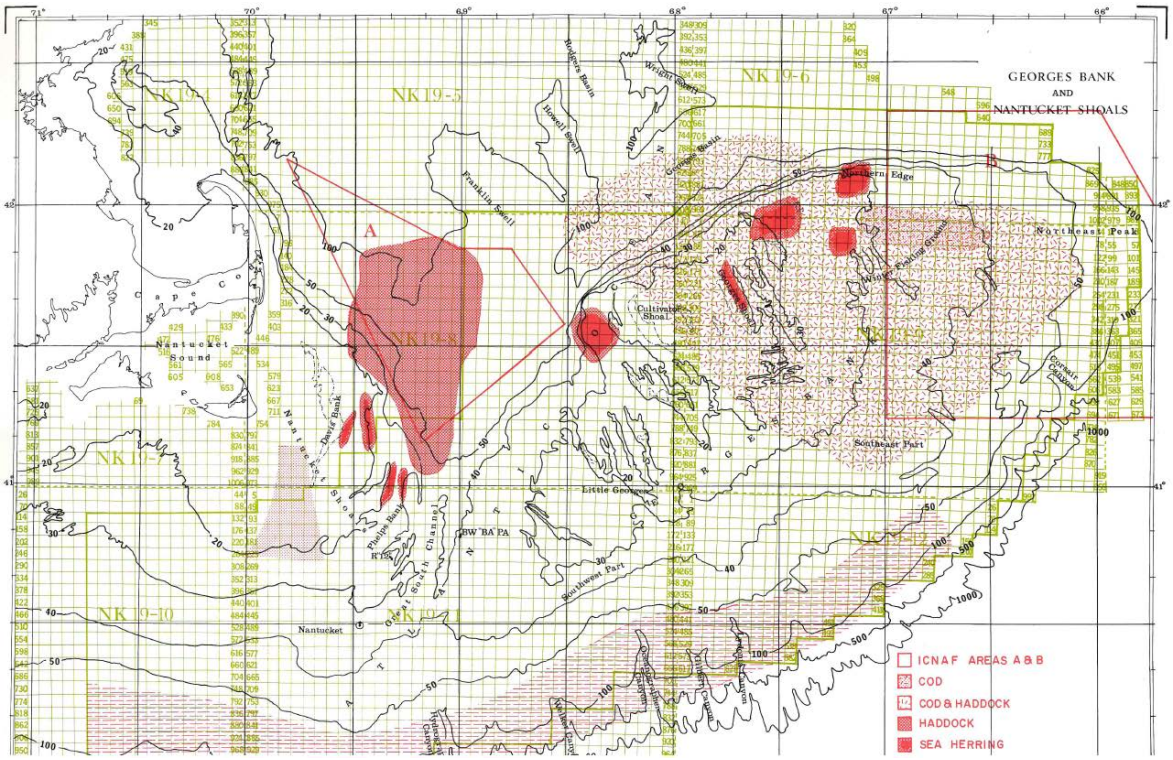

Figure 2.2. Known specific spawning grounds for various fishery species including Atlantic (sea) herring (dark red polygons; from Olsen et al. 1977).

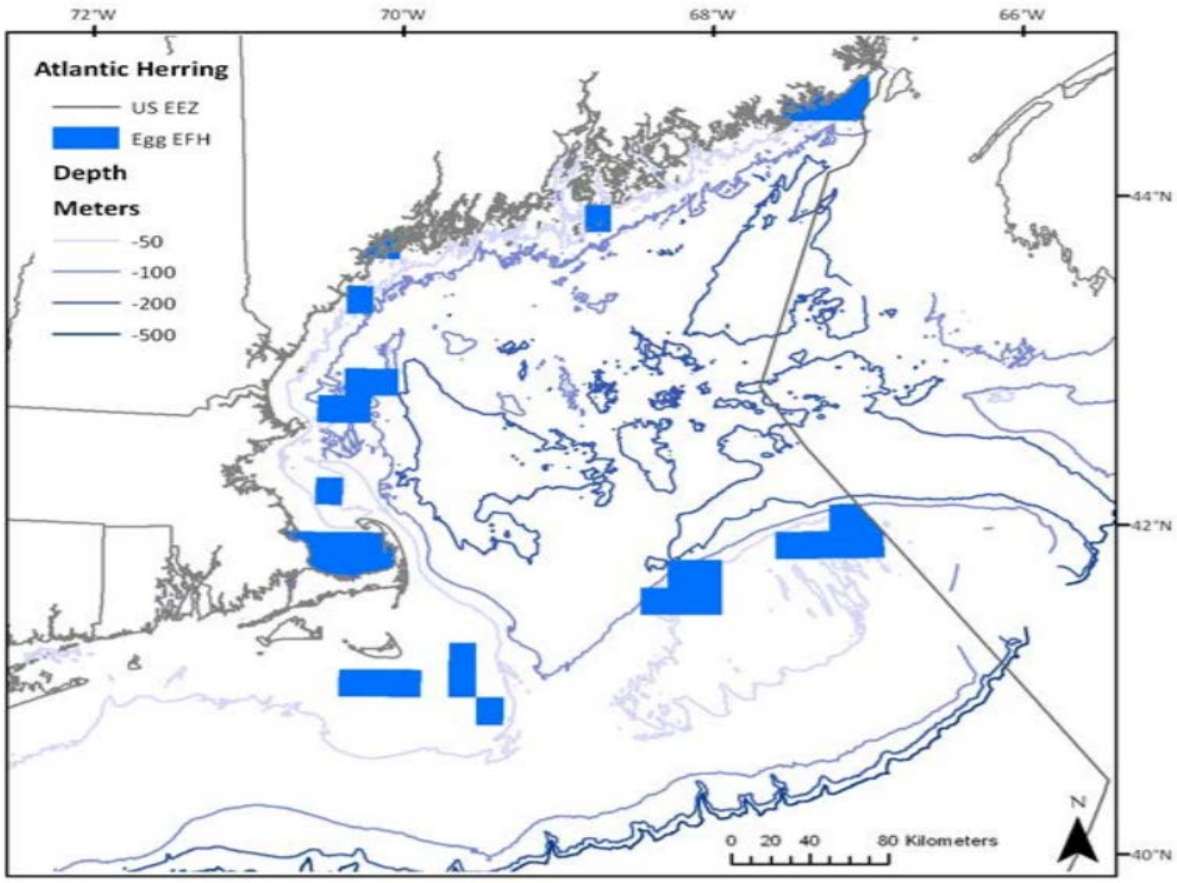

Figure 2.3. EFH for herring eggs from Amendment 5 to the Fishery Management Plan (FMP) for Atlantic Herring (NEFMC 2013).

2.1. Larval data

Fish larvae can be a valuable indicator of spawning locations in fish (reference), particularly for herring since eggs are demersal and not subject to dispersal (reference). Thus, young larvae, within a short time frame of hatching, may be spatially associated with where they were spawned. Herring larval data from Georges Bank monitoring have been presented in numerous publications and assessments (e.g., 54th Northeast Regional Stock Assessment Workshop; NEFSC 2012). For this review, larval data were accessed (D. Richardson, pers. comm.) and explored from the Northeast Fisheries Science Center ichthyoplankton sampling program from 1971-2017 (see Richardson et al. 2010 for description of monitoring program). Sampling was not conducted in every region every year during sampling cruises. During some sampling trips, there were ship time limitations, inclement weather, and other unforeseen circumstances leaving gaps in sampling. For our analysis, we summed abundance of Atlantic herring <9mm for each sample with unique locations. Larvae less than 9mm length are typically 10-15 days old (reference). We then used the '*MASS*' package in R to plot the data using 2-dimensional kernel density estimation (Venables and Ripley 2002). Most larval herring were observed in October and November. Over the entire time series, highest densities of larval herring occurred on the

northeast section of Georges Bank and Nantucket Shoals (Figure 2.1.1). These two areas had high densities in the 1970s and again in the 1990s, while Nantucket Shoals and Stellwagen Bank were prominent in the 1980s (Figure 2.1.2). Smith and Morse (1993) similarly found that the full extent of larvae herring contracted to only Nantucket Shoals and Stellwagen Bank after the fishery collapsed in 1976, but then expanded eastward on Georges Bank through 1990. Between 2000 and 2017 larval herring density has concentrated to the Northeast section of Georges Bank (Figure 2.1.2).

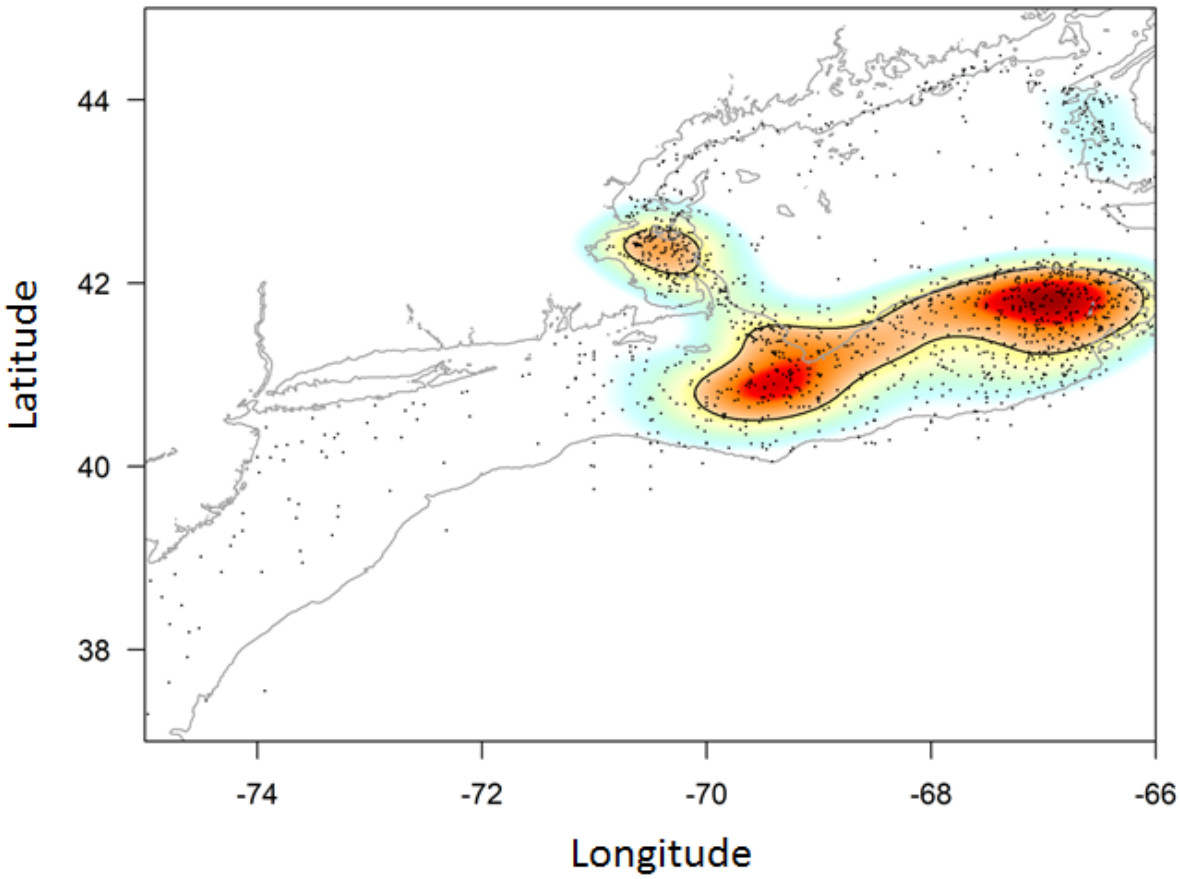

Figure 2.1.1. 2-dimensional kernel density estimates of larval herring (<9 mm) abundance per sample 1971-2017 with all sample location points overlaid. Red areas indicate higher densities. Total sample size = 2371.

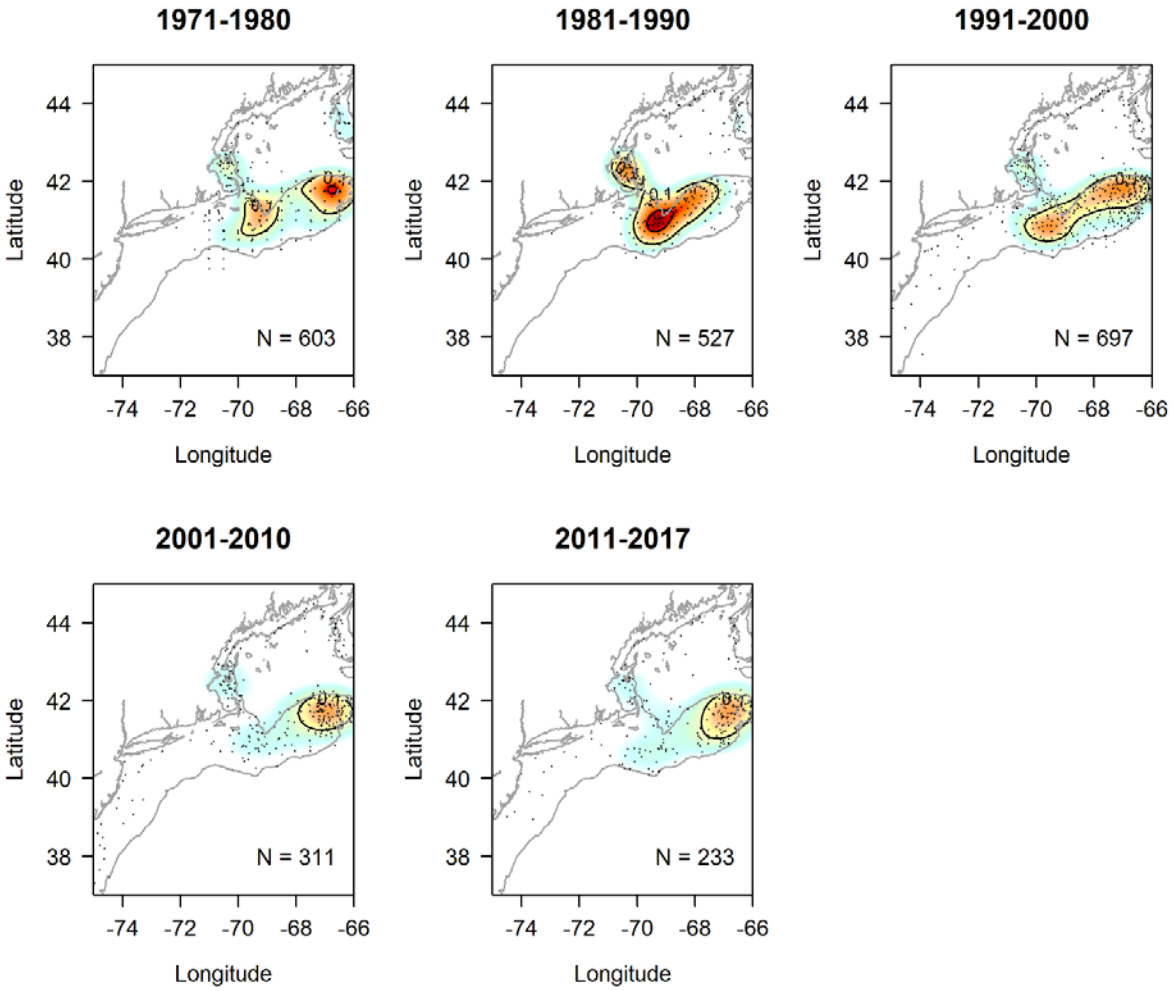

Figure 2.1.2. 2-dimensional kernel density estimates of larval herring (<9mm) per sample by decade as seen in SAW 54 with all sample location points overlaid. N = sample size and red areas indicate higher densities.

2.2. Adult Data: DMR and Mass DMF Dockside Monitoring Data (spatial patterns)

The Maine Department of Marine Resources (DMR) has been the lead agency for monitoring the US Atlantic herring fishery and has collected and processed commercial catch samples using a consistent methodology since 1960. Herring samples are collected from all commercial gear types; purse seine, single mid-water trawl, pair mid-water trawl, small mesh bottom trawl, and fixed gear. Two types of samples are collected, catch-at-age and spawn samples. Catch-at-age samples are collected throughout the entire range of the US fishery, year-round, including all four management areas, 1A, 1B, 2, and 3. Ports utilized for sample collection are from north to south. Starting in Maine at Jonesport, Prospect Harbor, Stonington, Rockland, New Harbor, Boothbay Harbor, and Portland. In NH, at Portsmouth, Newington, and Seabrook. In Massachusetts, at Gloucester, Fall River, and New Bedford. In Rhode Island, at Point Judith,

Davisville, and Newport. Lastly, in Cape May, New Jersey. Catch-at-age sampling requires n=50 randomly selected herring per gear type, per NMFS statistical area, per week. Spawn samples require n=150, adult sized herring per sample (>=23cm) during the spawn season (August – October) per week from all three spawn areas within Area 1A, only. Whole lengths, weights, age via otoliths, gender, spawn condition via staging (see Table 2.2.1) and stomach fullness, and additionally, GSI calculation for spawn samples are collected (J. Becker, Maine DMR, pers. comm.). The Massachusetts Department of Marine Fisheries (DMF) has additional data from 1998 – 2018 which were also included in this review.

Table 2.2.1. Maturity stages/codes used in DMR dockside monitoring and NMFS trawl surveys. Rows in bold are stages of interest for this review (i.e., closest to spawning condition).

DMR	Description	NMFS	Description
1	immature	I	immature
2	starting		
3	developing	D	developing
4	maturing		
5	**mature**	**R**	**ripe**
6	**ripe/running**	**U**	**ripe/running**
7	spent	S	spent
8	resting	T	resting
		X	unknown

The DMR data set included 17,529 samples from areas 1B, 2 and 3. Additional samples for area 1A exist but were not included in this review. Other data included length, weight and sex. This rich data set allowed for explorations of spatial and temporal patterns in maturity and GSI, both of which can be used to infer location of spawning. In other words, spawning could be assumed to occur at or near areas with high mean GSI values or high densities of later stage maturity fish (i.e., stages 5 and 6; Table 2.2.1).

We examined spatial patterns using both GSI and maturity stage. For GSI, we used the '*MBA*' and '*fields*' packages in R (Finley et al. 2017, Nychka 2019) to interpolate mean GSI per sample using multilevel B-spline approximation. This was done for the entire data set (all years and sexes combined) as well as by decade and with just females (Figures 2.2.1 to 2.2.7). The progression of GSI figures is as follows. Figure 2.2.1 shows mean GSI over the sample area (Areas 1B, 2 and 3) for all years. Overall, the highest GSI values tended to follow the northern edge of Georges Bank from Cape Cod to off of the bank near the Northern Flank. Some higher values were also associated with on the Bank (between Northern Flank and Southern Flank) but were associated with only 2 sample locations. The highest density of fishing locations was along the northern edge and was associated with relatively low GSI values. Figure 2.2.2 is the same as the previous but includes only females. The spatial pattern in GSI is similar with slightly higher mean GSI values (i.e., darker reds). Two areas in particular stand out as having higher GSI values: the Great South Channel and to the north of the Northern Flank. Figure 2.2.3 is the same

as figure 2.2.1 except that instead of applying the spline to the raw data (with multiple individuals per sample), the spline was applied to summarized data per sample (i.e., mean GSI per sample). The spatial pattern was again the same as in previous figures. Since spatial patterns were relatively consistent regardless of sex or whether samples were averaged or not, the following are both sexes and for whole data set (i.e., not averaged by sample). Figure 2.2.4 shows mean GSI over sample area by decade. Note that there was not continuous sampling between 1971 and 2018. There was a major gap in sampling between 1983 and 1995. As such data was pooled between 1971 and 2000, whereas the last two decades had relatively complete sampling and therefore were considered separately. The spatial pattern among decades/time periods was relatively consistent with previous figures. Figure 2.2.5 shows the Mass DMF data separately. This figure shows that the Mass DMF data set is relatively limited compared to the DMR data set. Finally, for the splines, figures 2.2.6 and 2.2.7 show the DMR and Mass DMF data combined for both sexes and for females alone. Given the limited size of the Mass DMF data the figures are not different than figures 2.2.1 and 2.2.2.

Figures 2.2.8 and 2.2.9 show 2-D kernel density estimates of the distribution of ripe and ripe and running herring, respectively (maturity stages 5 and 6 or R + U; see Table 2.2.1). In this case, ripe herring are most associated with the Northern Flank for the entire data set, whereas ripe and running herring are associated with both the Great South Channel and the Northern Flank. Figure 2.2.10 shows the distribution of herring with GSI values greater than 0.3. This value is significant since it is the threshold for initiation of spawning closures in the Gulf of Maine (reference). In this case, the highest density of high GSI herring for all years is at the Northern Flank.

Figures 2.2.11 to 2.2.13 show 2-D kernel density estimates of ripe + ripe/running (R + U), ripe/running only (U), and GSI > 0.3 herring, respectively by decade. Densities of R + U stage herring were relatively high at both the Northern Flank and Great South Channel in all decades. Densities of U stage herring were high in both Northern Flank and Great South Channel in 1991 – 2000 and were highest in the Great South Channel in the decade 2001 – 2010. No ripe and running herring were sampled in the decade 2011 – 2018. Finally, densities of high GSI herring were generally highest at the Northern Flank for all decades but areas of high density also existed at the Great South Channel. Consistent with all of these depictions of spawning (figures 2.2.1 to 2.2.13) is the relatively high importance of the Northern Flank and Great South Channel for harboring spawning condition (or near spawning condition) herring.

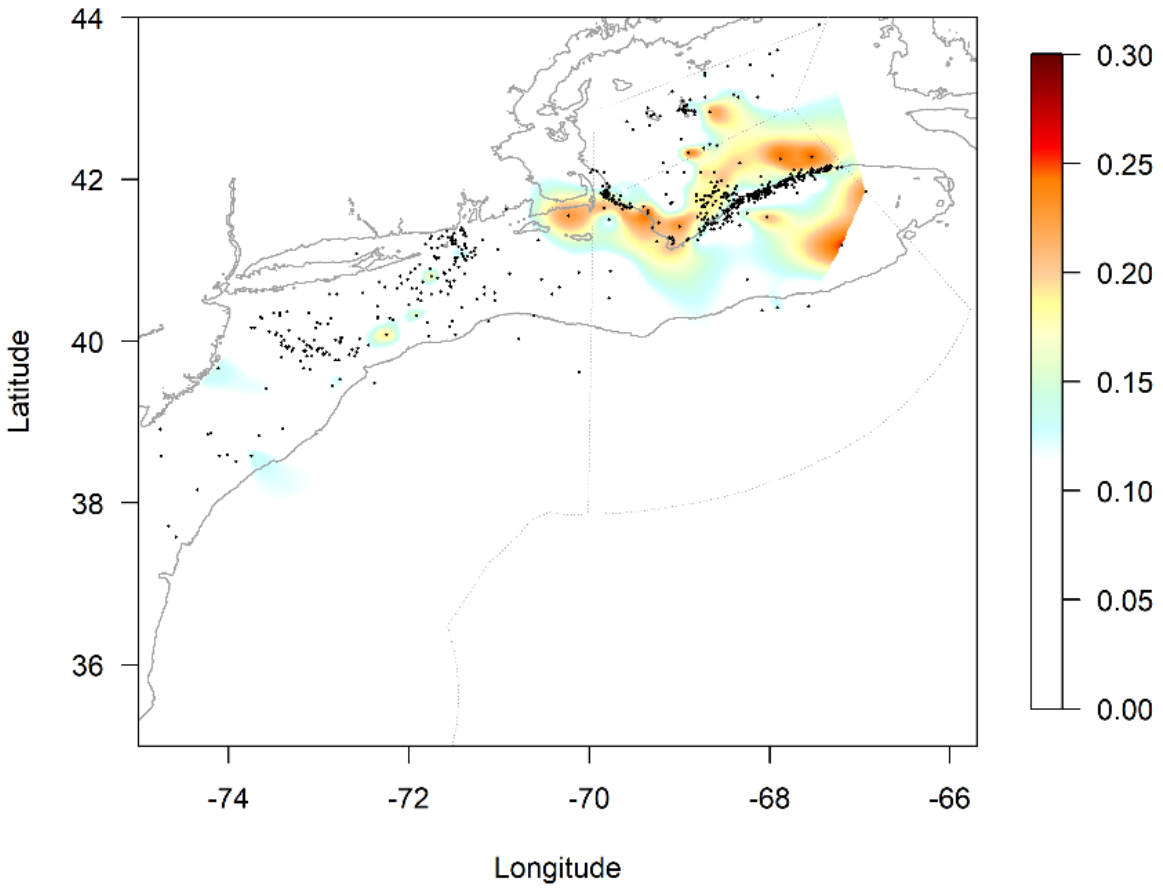

Figure 2.2.1. Surface spline interpolation of mean male and female GSI from DMR dockside monitoring data (1971-2018)

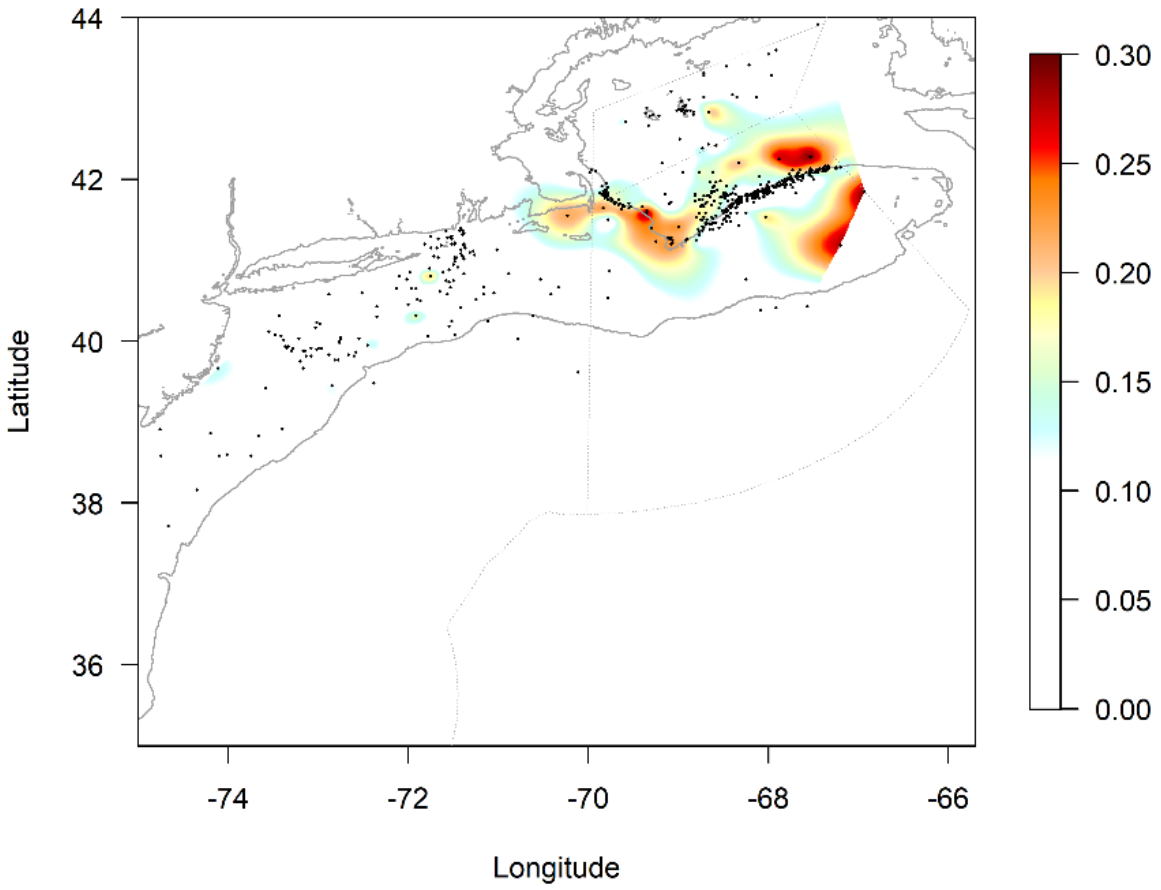

Figure 2.2.2. Surface spline interpolation of mean female GSI from DMR dockside monitoring data (1971-2018)

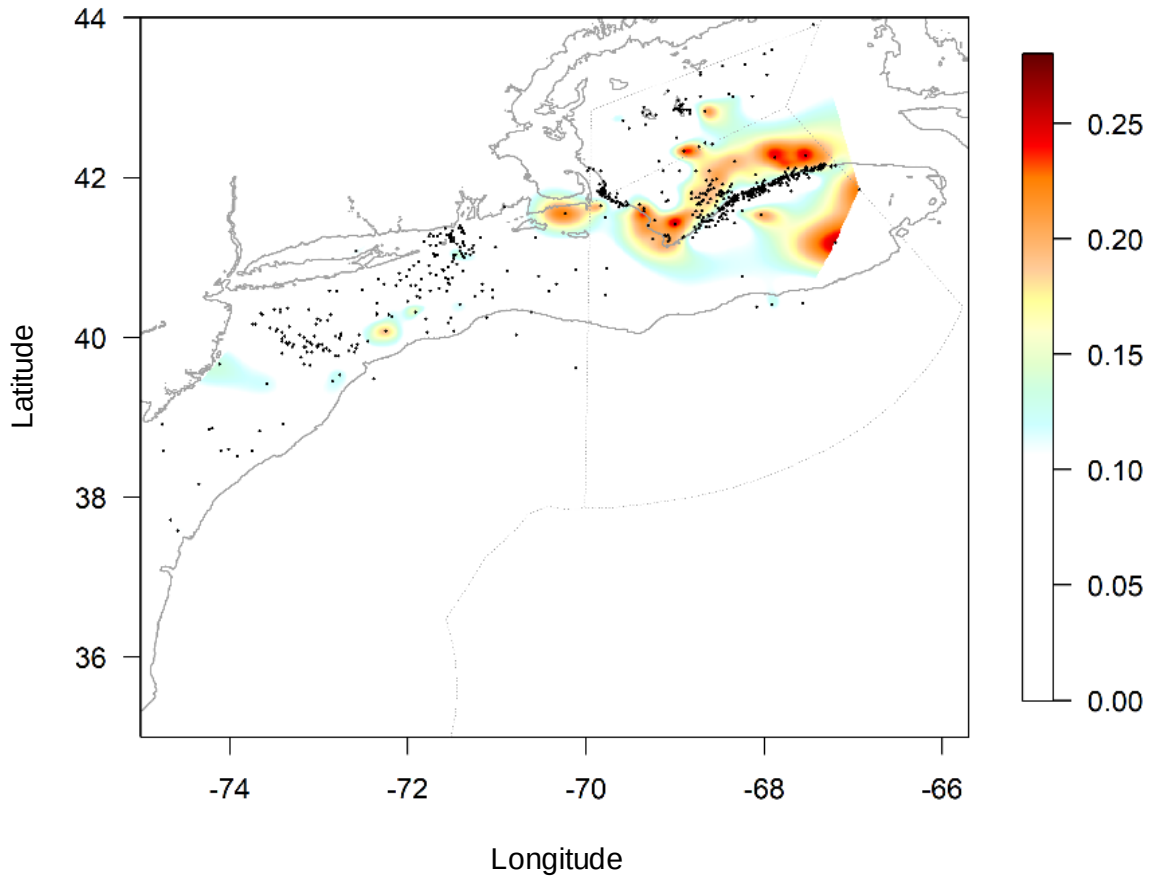

Figure 2.2.3. Surface spline interpolation of mean male and female GSI/sample from DMR dockside monitoring data (1971-2018). Samples were defined as unique date/locations (i.e., values were averaged for each sample).

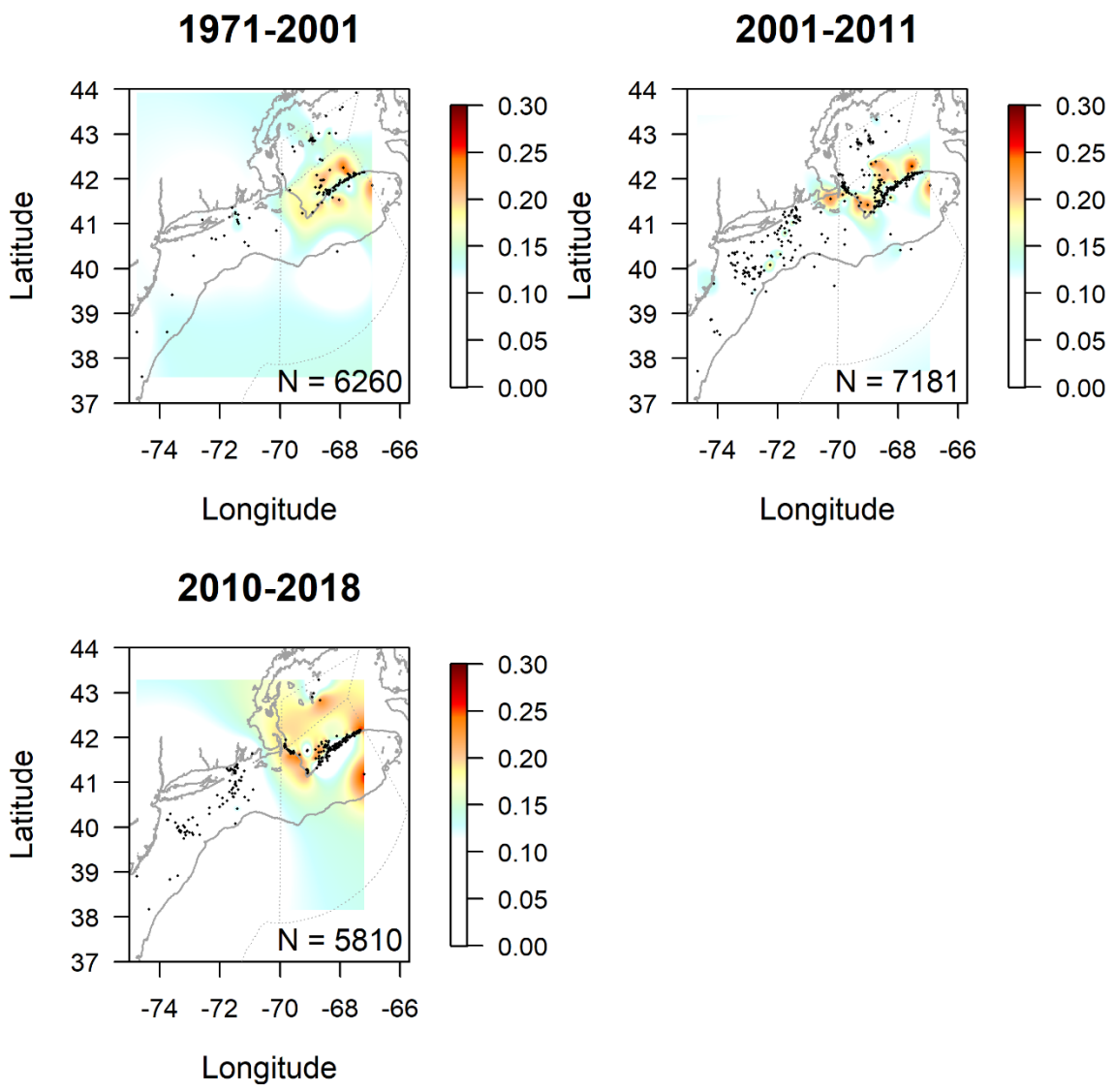

Figure 2.2.4. Surface spline interpolation of mean male and female GSI from DMR dockside monitoring data by decade (1971-2018). Note that 1971 – 2001 was pooled due to data gaps.

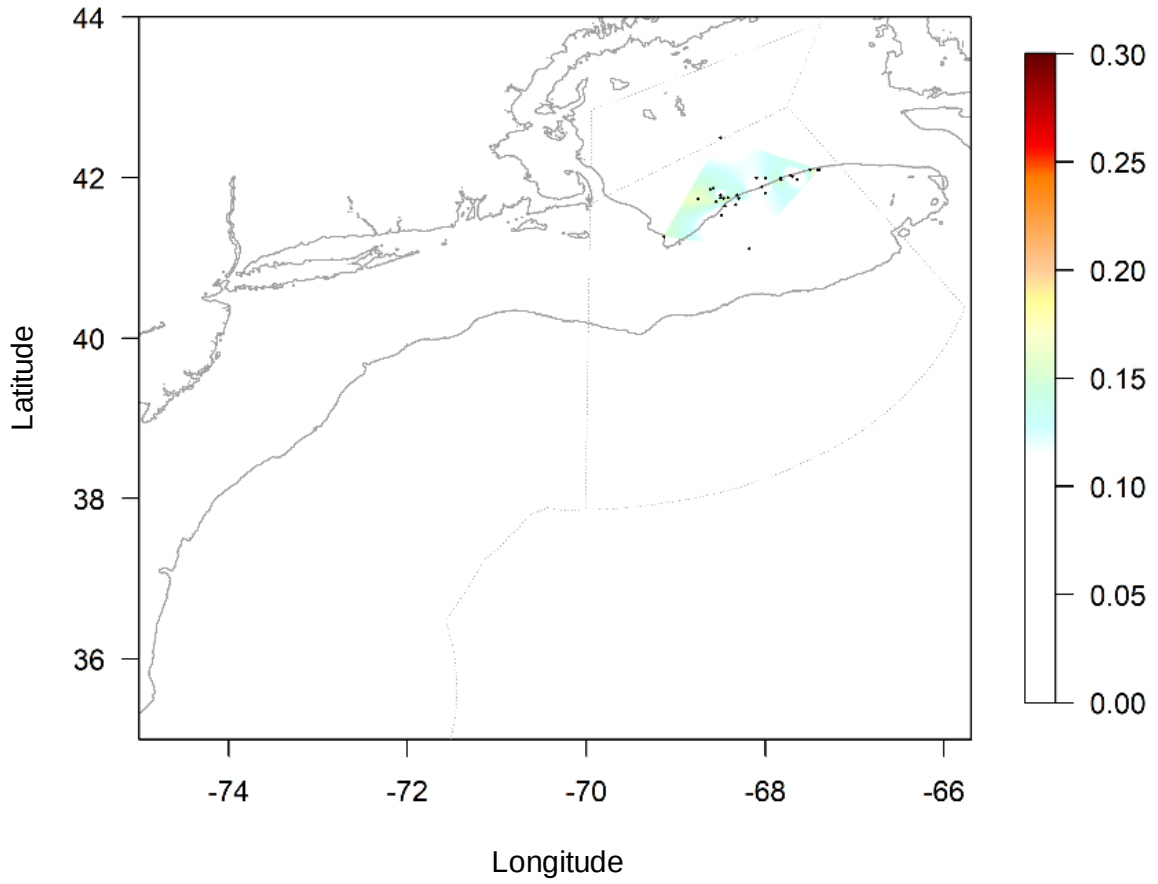

Figure 2.2.5. Surface spline interpolation of mean female GSI from Massachusetts Division of Marine Fisheries data (1998-2018); note: only female observations were available.

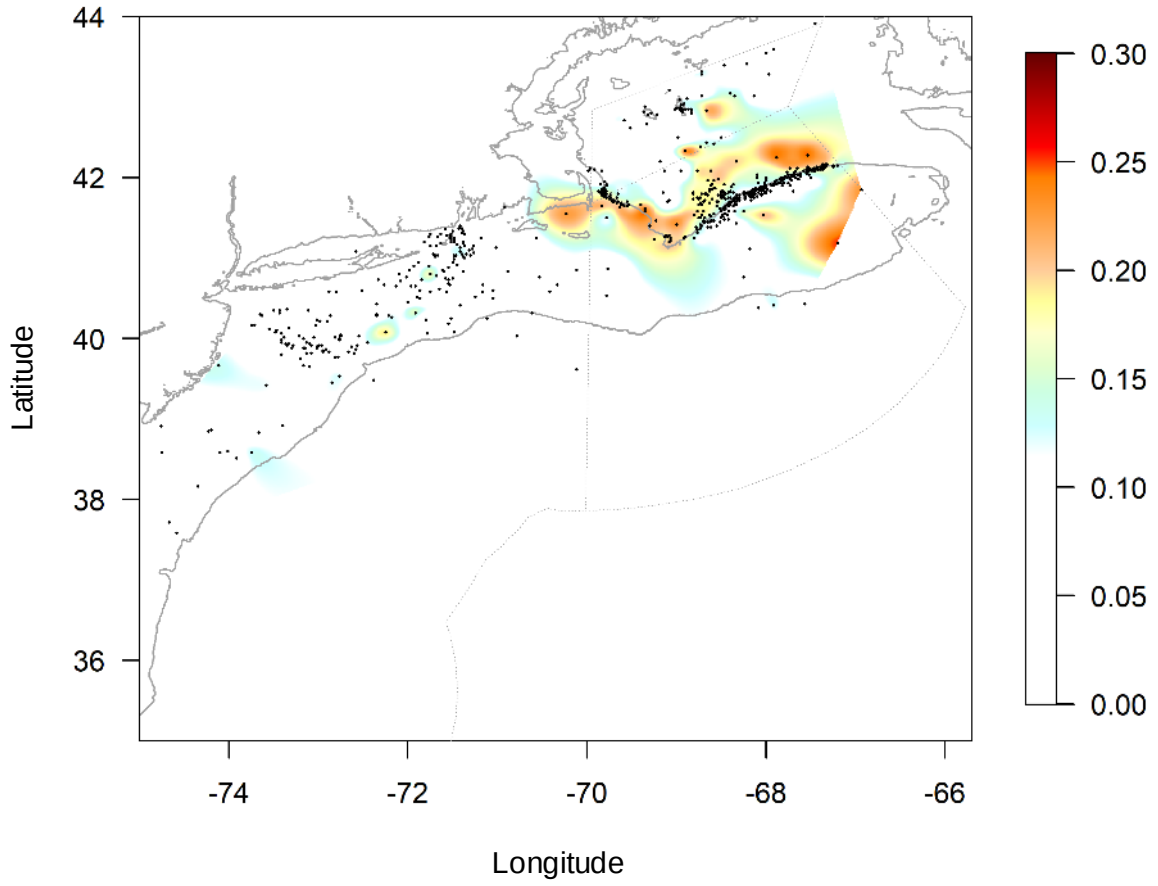

Figure 2.2.6. Surface spline interpolation of mean male and female GSI from combined DMR dockside monitoring data (1971-2018) and Massachusetts DMF data (1998-2018).

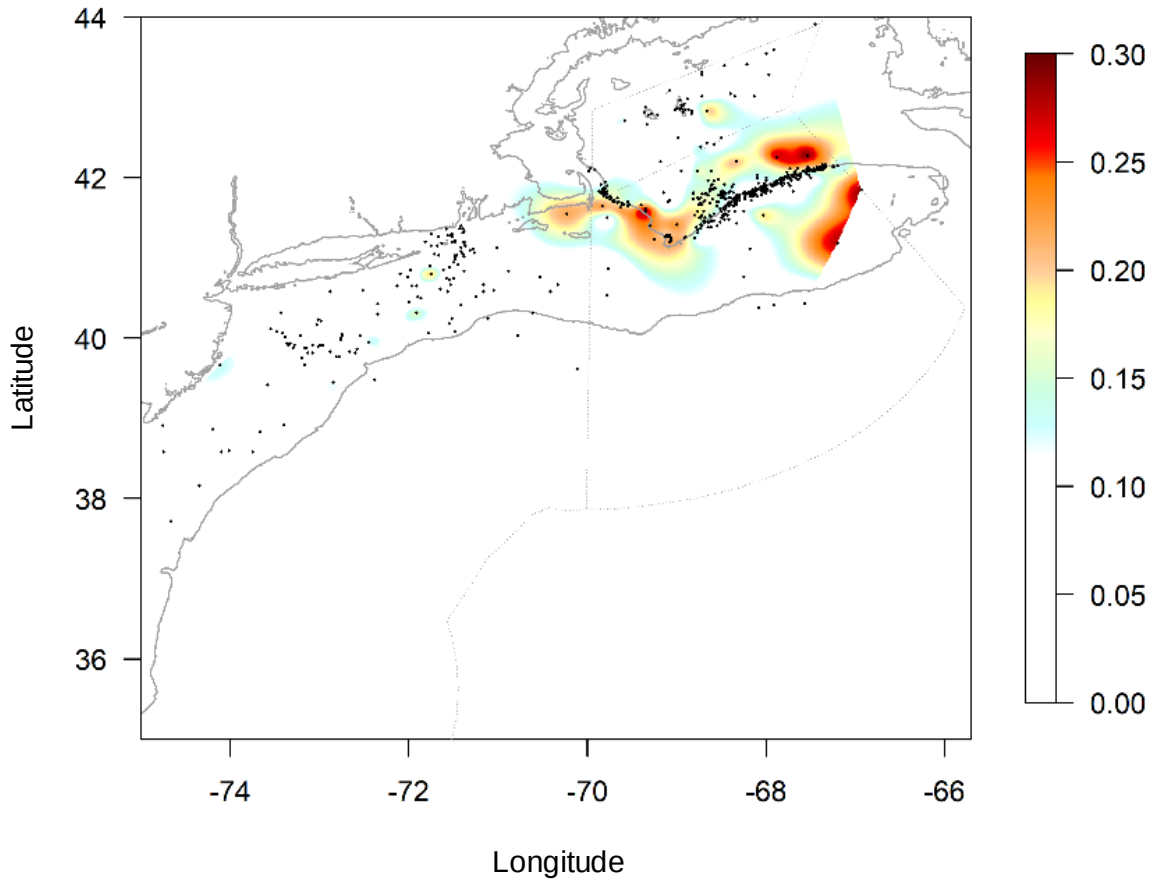

Figure 2.2.7. Surface spline interpolation of mean female GSI from combined DMR dockside monitoring data (1971-2018) and Massachusetts DMF data (1998-2018).

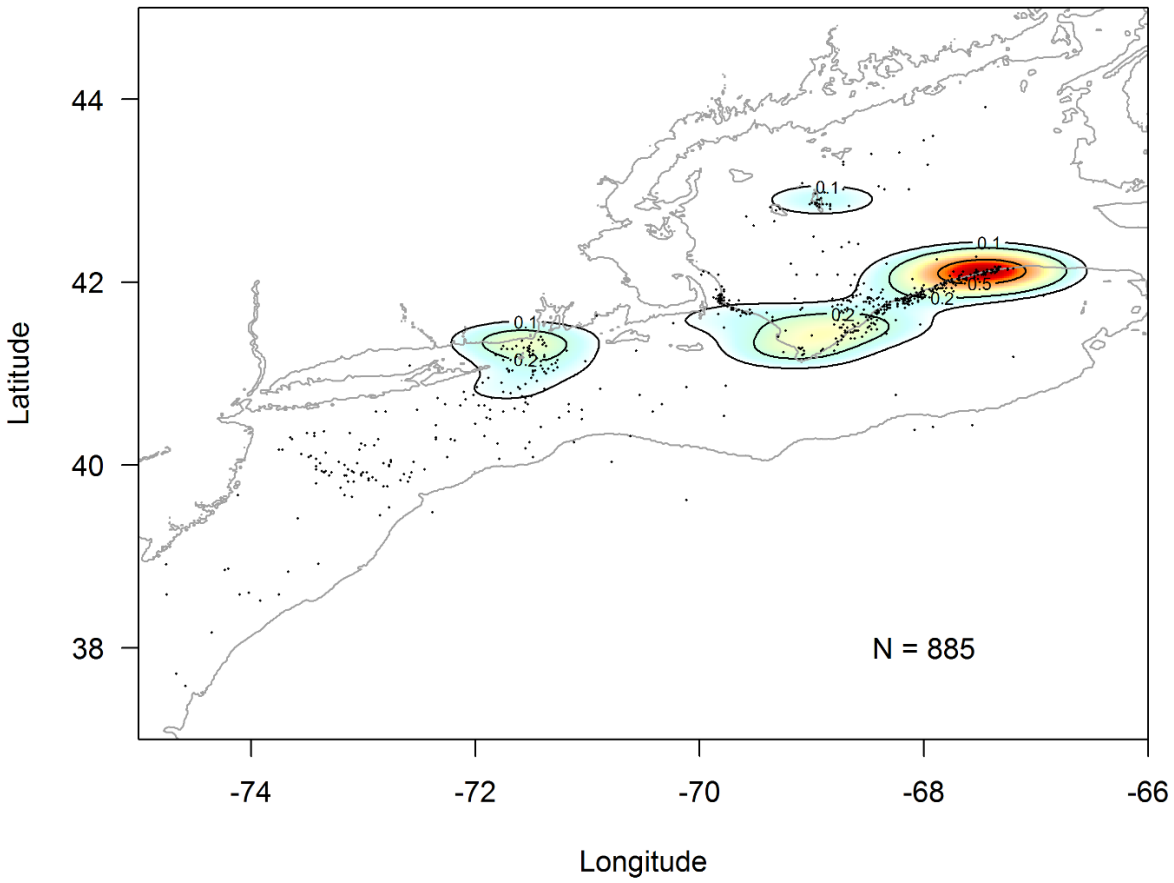

Figure 2.2.8. 2-dimensional kernel density estimates of DMR dockside monitoring data (1971-2018) of male and female “ripe + ripe/running” herring.

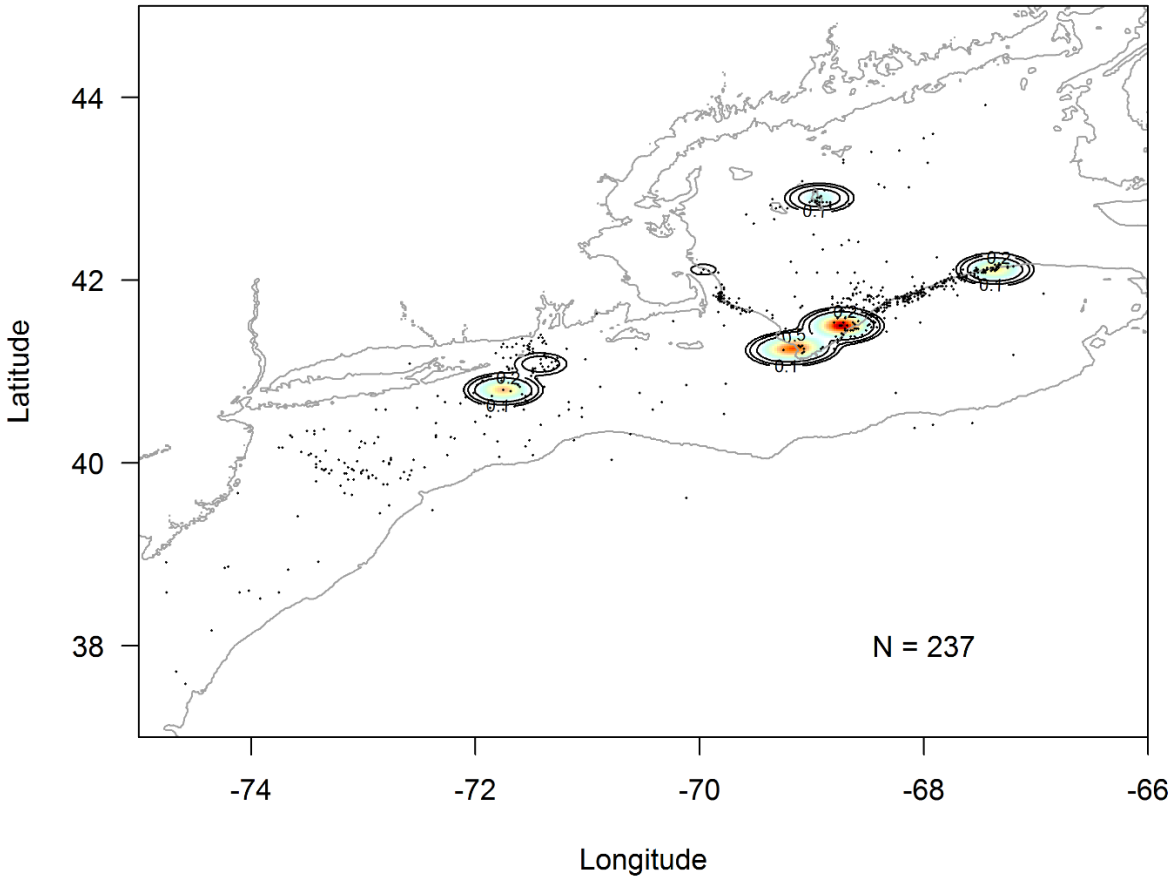

Figure 2.2.9. 2-dimensional kernel density estimates of DMR dockside monitoring data (1971-2018) of male and female “ripe and running” herring.

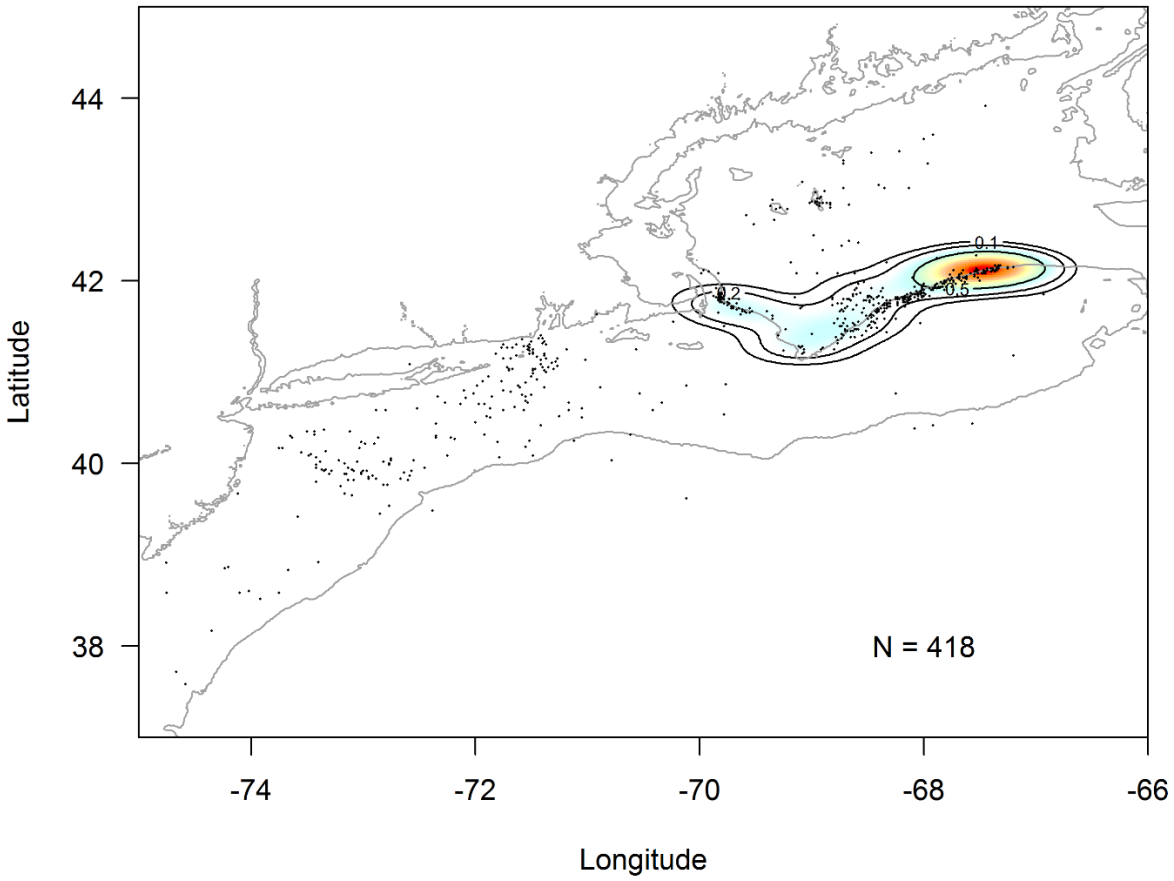

Figure 2.2.10. 2-dimensional kernel density estimates of DMR dockside monitoring data (1971-2018) of male and female herring with GSI values >= 0.3.

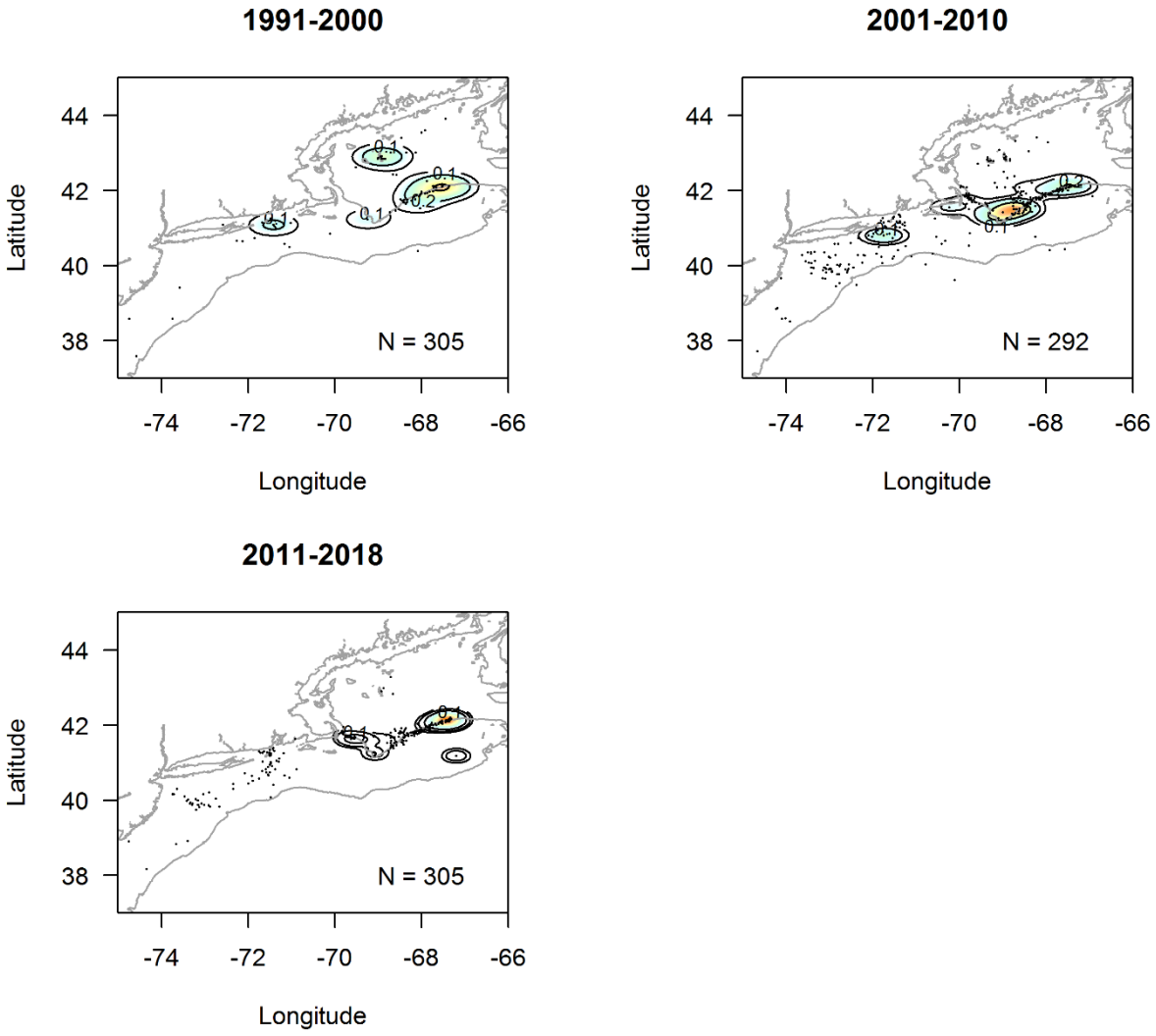

Figure 2.2.11. 2-dimensional kernel density estimates of DMR dockside monitoring data by decade of male and female "ripe + ripe/running" herring. Decades began at 1991 because there were no observations of ripe + ripe/running fish prior to this. This was likely due to sampling timing during the year (see figure 2.3.1).

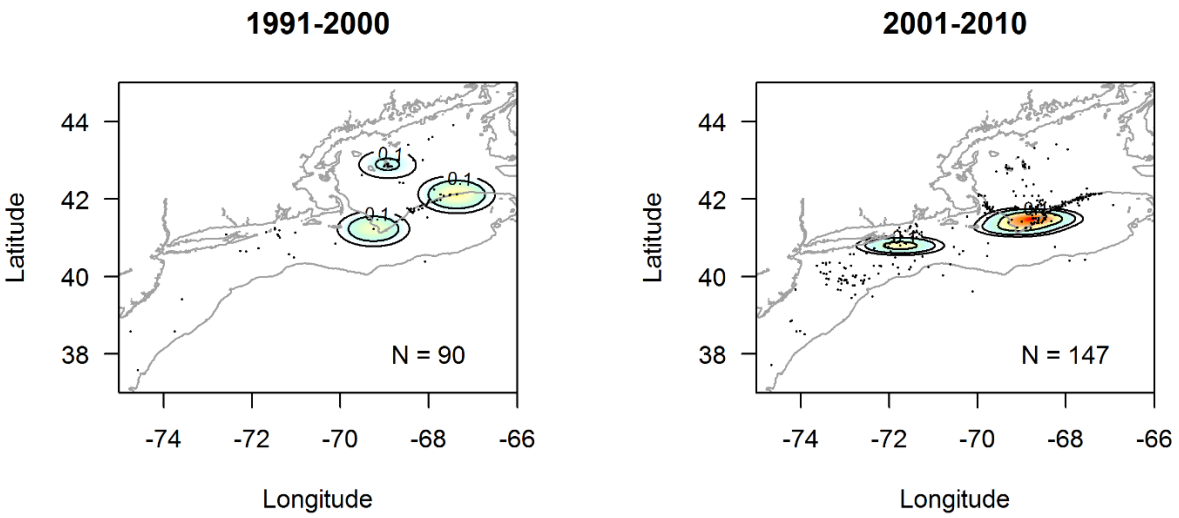

Figure 2.2.12. 2-dimensional kernel density estimates of DMR dockside monitoring data by decade of male and female "ripe and running" herring. Decades cover only 1991-2010 because there were no observations of ripe and running fish outside of that time frame.

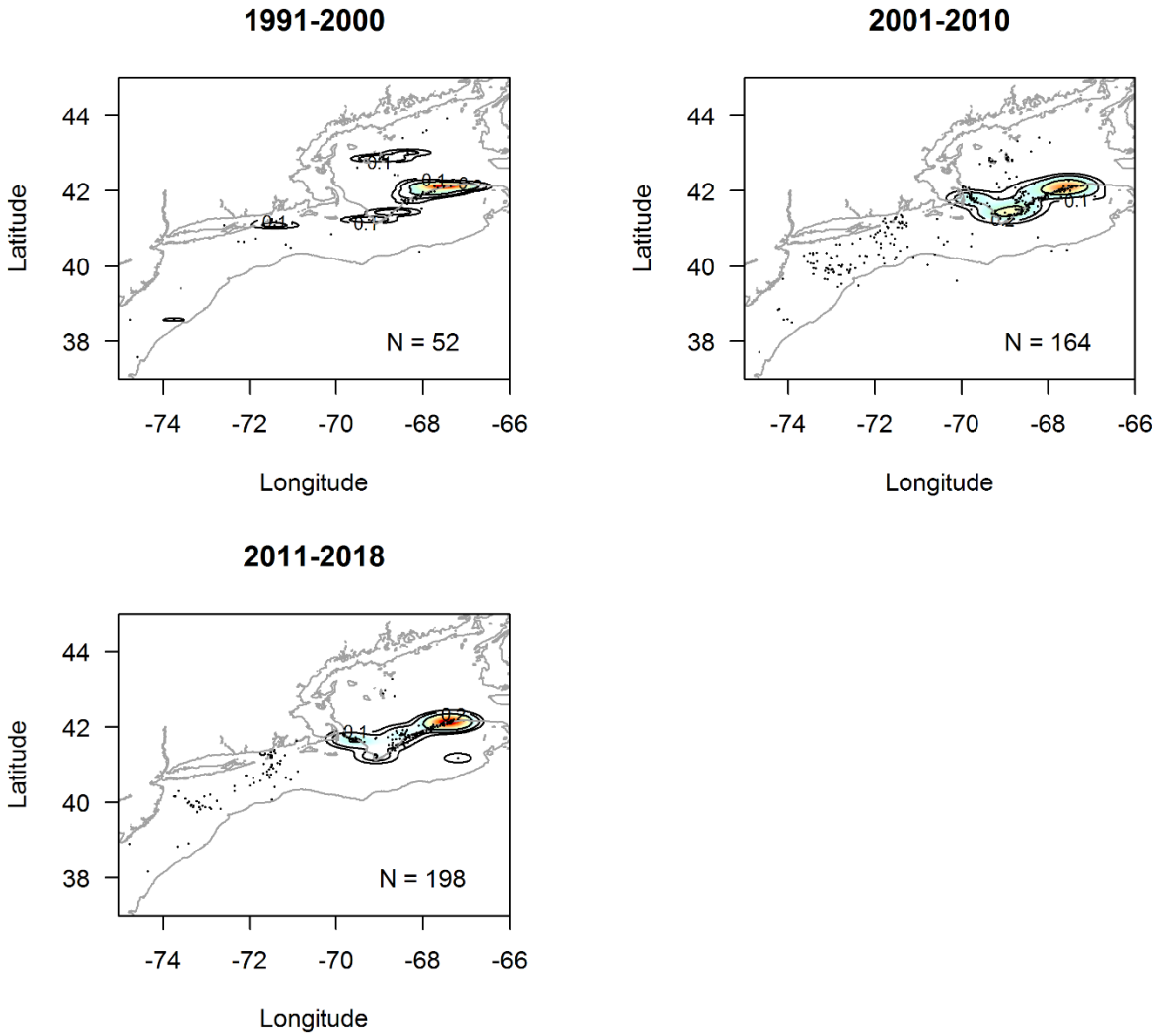

Figure 2.2.13. 2-dimensional kernel density estimates of DMR dockside monitoring data by decade of male and female herring with GSI values >= 0.3.

2.3. Adult Data: DMR Dockside Monitoring Data (temporal patterns)

The DMR dockside monitoring data was comprehensive enough to allow for temporal comparisons using GSI values. Here, mean GSI values were calculated by month and by year and are presented as heat maps using the '*ggplot2*' package in R (Wickam 2016). Figure 2.3.1 shows mean GSI by month and year for the entire data set. This figure shows the temporal distribution of sampling effort. Particularly, sampling was confined to the early months (January – April) for the first half of the data set. It was not until the mid to late 90s that sampling occurred year-round. From the 1990s on, the highest mean GSI values occurred in September and October. The limited sampling that took place in November suggests that spawning is completed by October, although only 3 years had data for November. There did appear to be

some higher GSI values in March in the early half of the data set. However, these values did not approach those seen in the fall.

Since management actions for spawning herring in the Gulf of Maine are based on the appearance of fish (any number) with GSI values greater than 0.3 (reference), we considered patterns in GSI at the high end of the distribution (the 90th quantile; i.e. the value at which 90% of the values are smaller). This exercise had the effect of revealing herring in spawning condition earlier than if mean GSI is considered (i.e., in August of some years; Figure 2.3.2). Figures 2.3.3 and 2.3.4 show the 90th quantiles by month and year for females and males separately. In this representation, females had higher quantile values and shorter periods during which values are elevated. We also explored whether the timing of peak GSI values differed between regions. The spatial analyses suggest that there are eastern and western components to spawning on Georges Bank (i.e., Northern Flank versus Great South Channel; previous section). We chose -68.7 degrees longitude to divide Georges Bank from Nantucket Shoals and the Great South Channel. We also considered Southern New England separately from these two. In this case, the cutoff between SNE and Georges Bank/Nantucket Shoals was -70.5 degrees longitude. There did not appear to be any difference between the timing of spawning between Georges Bank (eastern region) and Nantucket Shoals/Great South Channel (western region). Peak values for females were in September and October for both regions. Southern New England samples were clustered earlier in the year and showed no obvious sign of a spawning period; although higher GSI values in males in February and March in the 1970's may be indicative of spring spawning during this time.

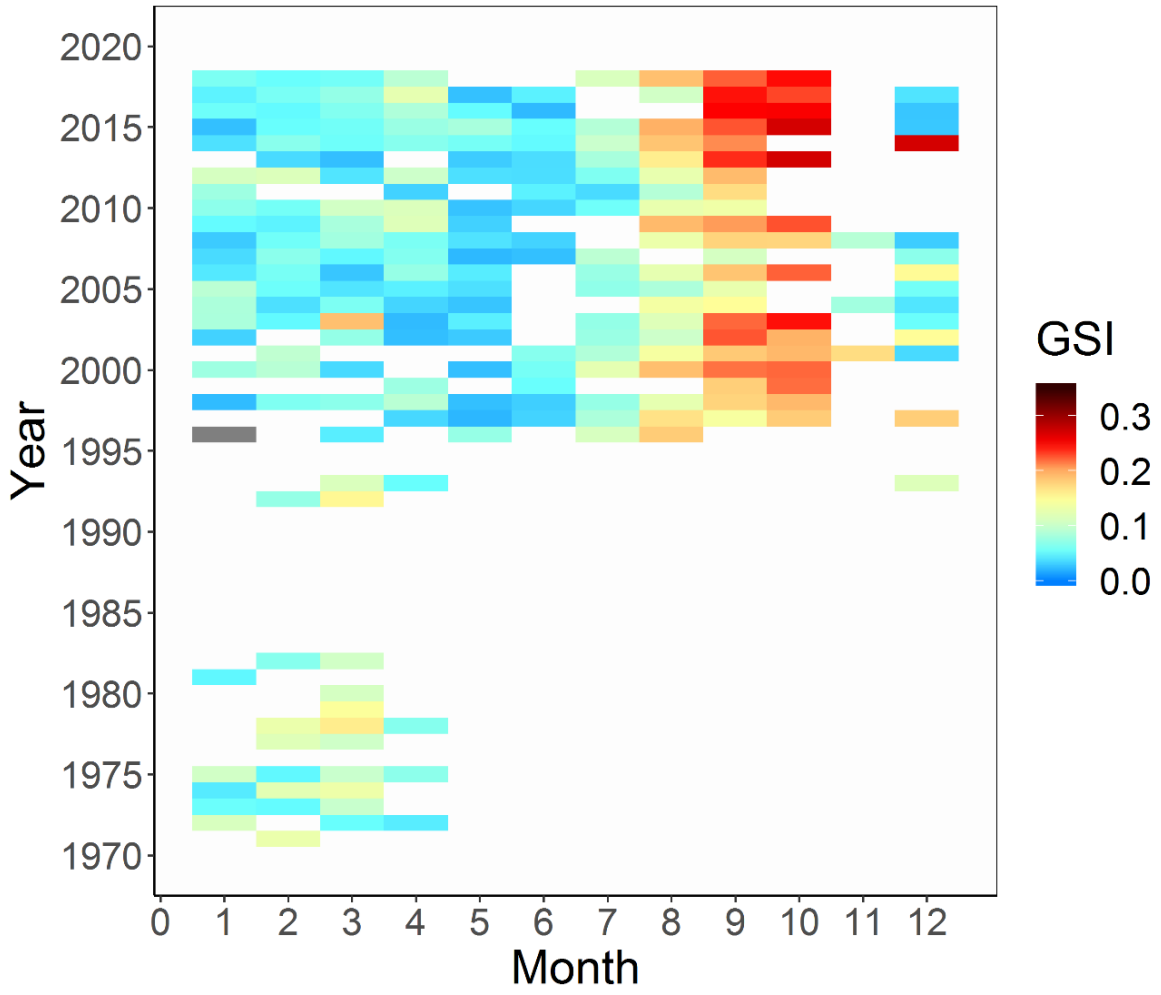

Figure 2.3.1. Mean GSI by month and year for entire DMR data set (both sexes).

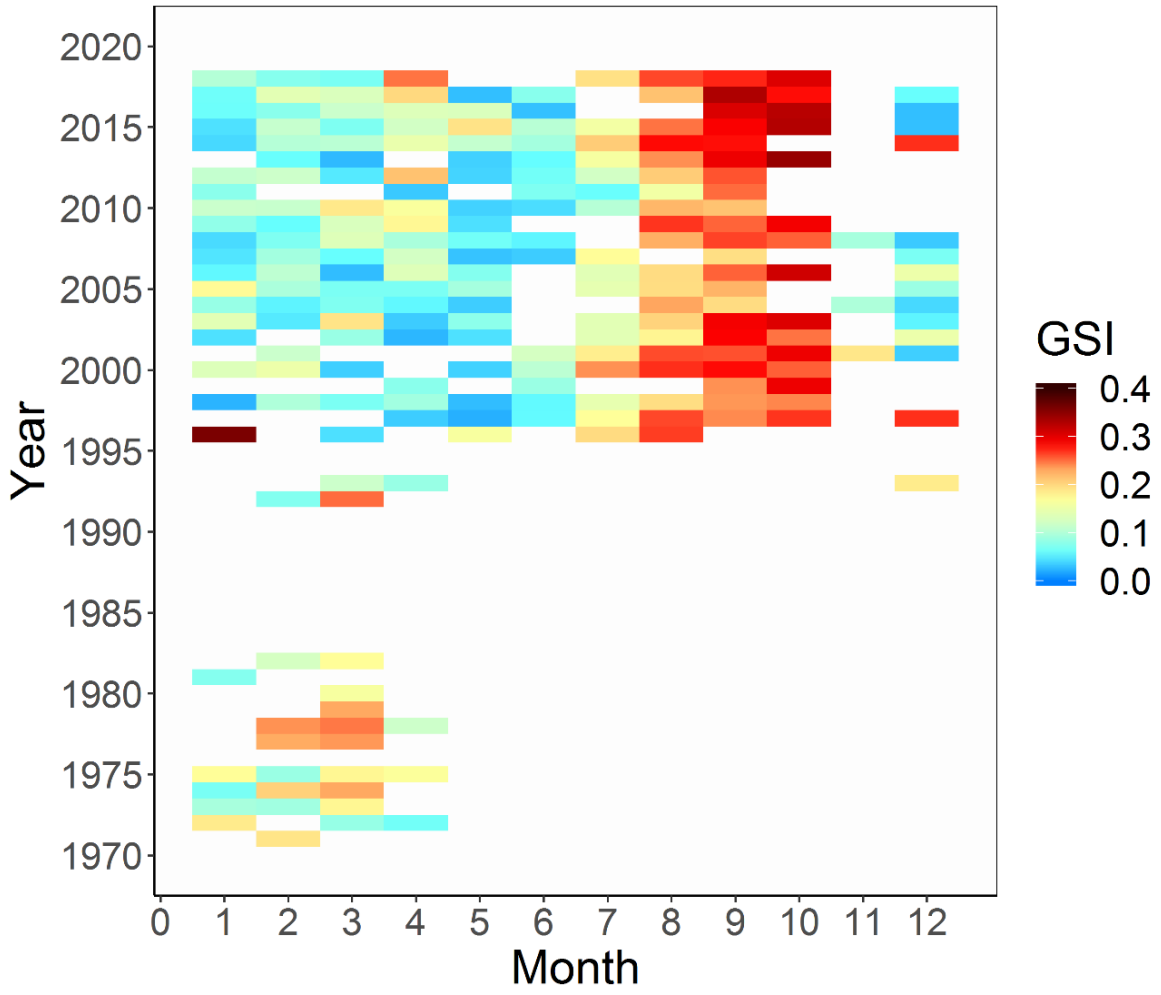

Figure 2.3.2. 90th quantile of GSI values by month and year for entire DMR data set (both sexes).

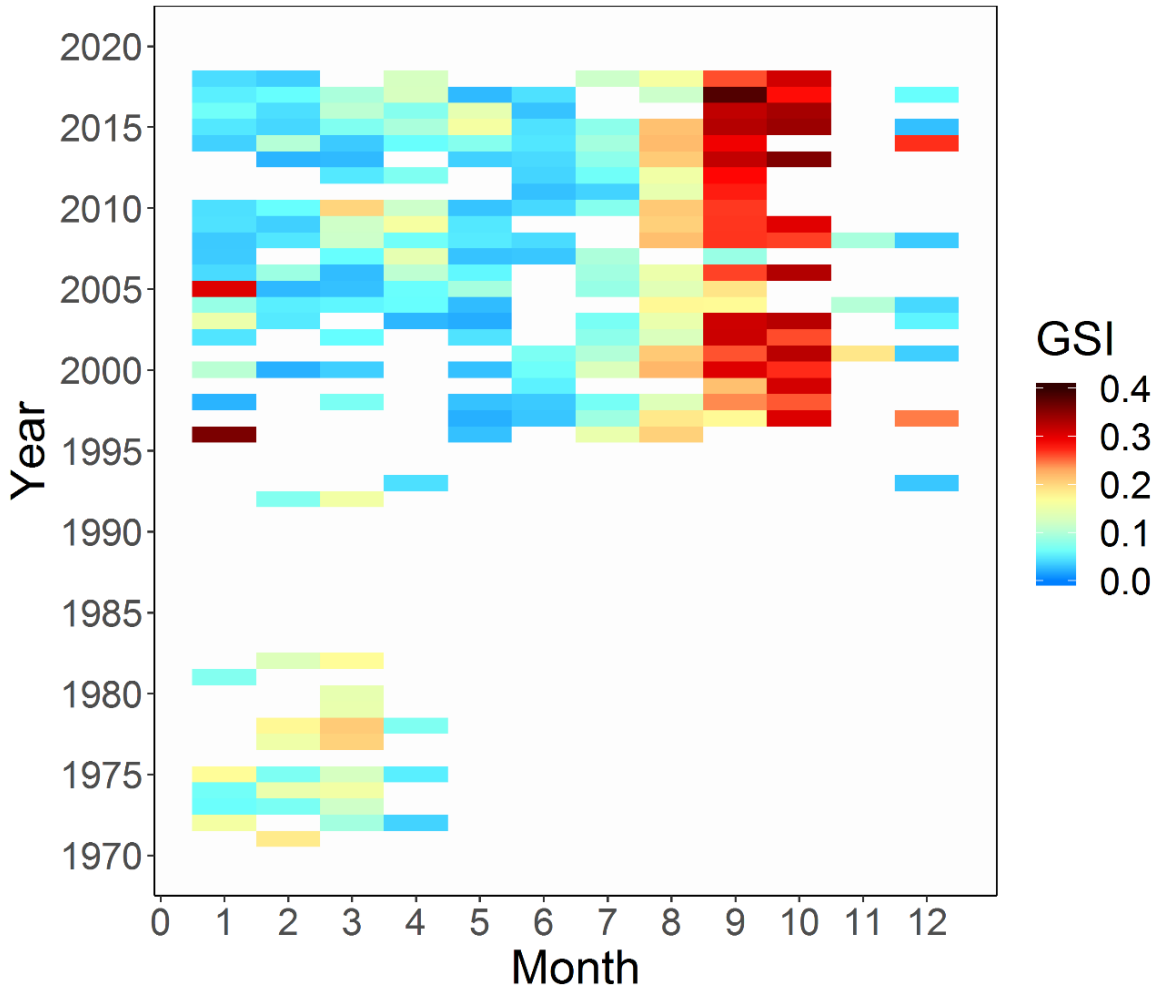

Figure 2.3.3. 90th quantile of GSI values by month and year for females.

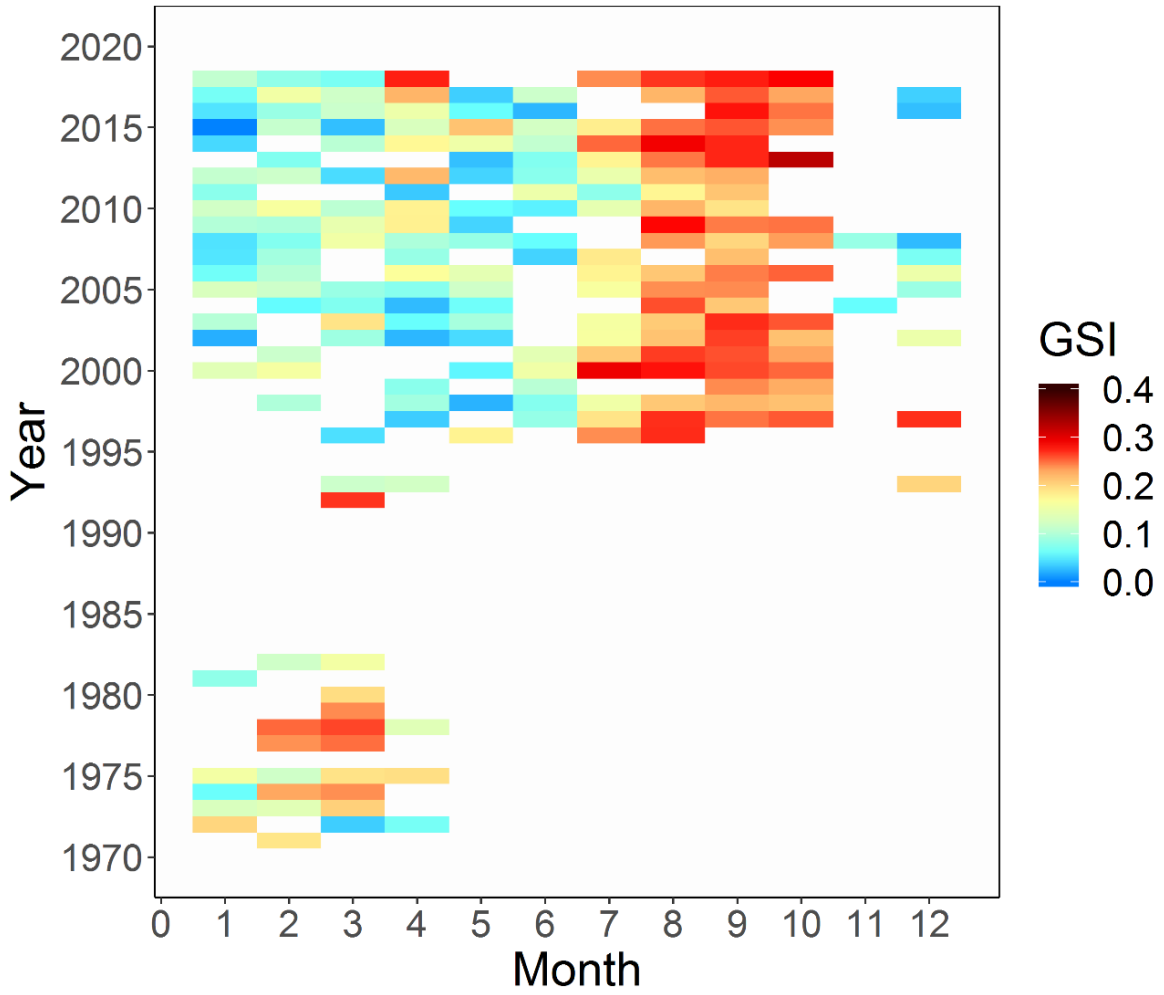

Figure 2.3.4. 90th quantile of GSI values by month and year for males.

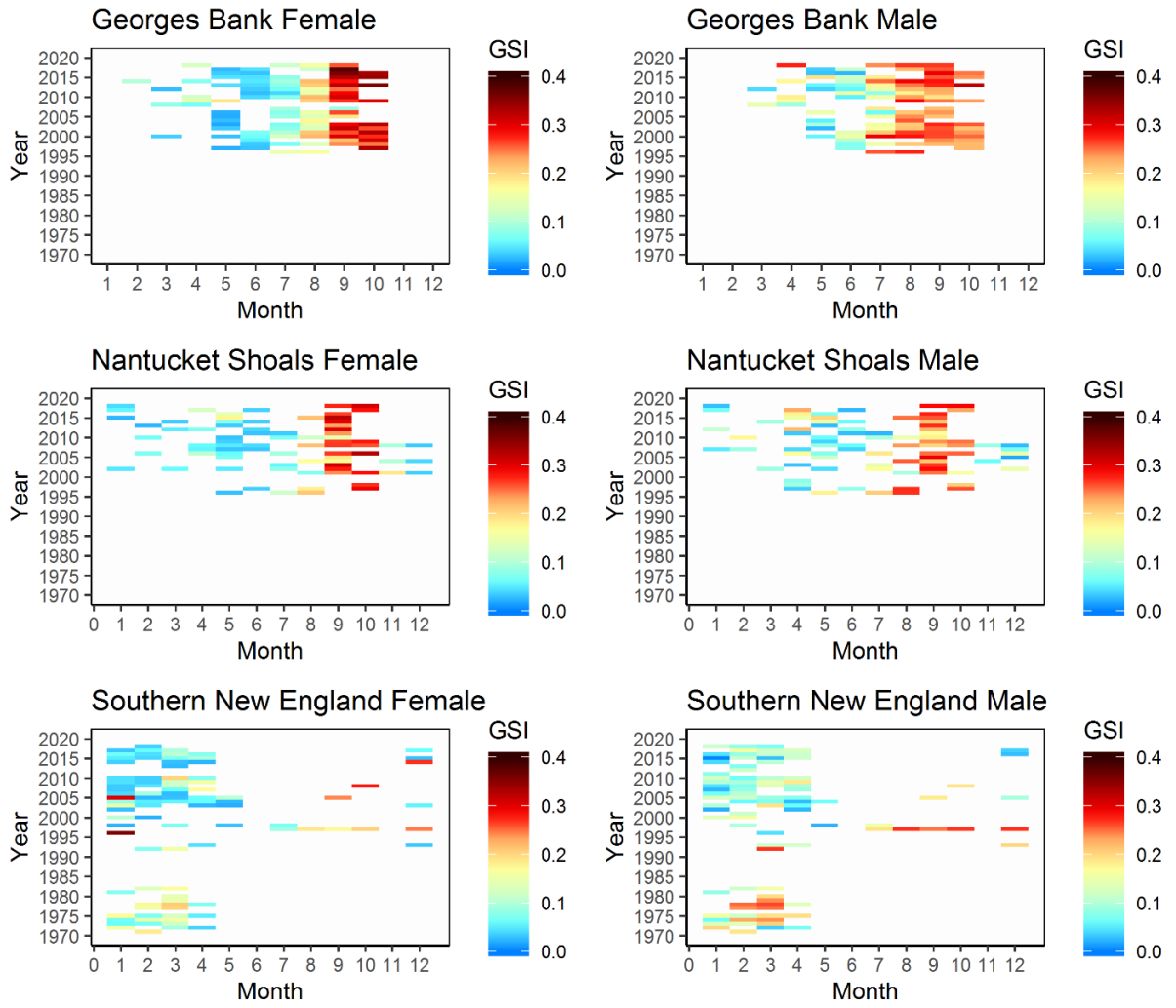

Figure 2.3.5. 90th quantile of GSI values by month and year and by location and sex. See text for description of locations.

2.4. Adult Data: Trawl Survey

We examined spatial and temporal patterns in maturity for herring sampled as part of biological processing during the Northeast Fisheries Science Center's spring and fall trawl surveys [Description of trawl survey sampling methodology pending]. While the trawl surveys have been operating since the 1960's, biological sampling for herring did not begin until 1987. Thus, our sample period includes the years 1987 – 2018. During this time, a total of 46,242 (28,878 spring and 17,364 fall survey) herring were sampled for length, weight, age, sex and maturity from 6,650 trawl sets. Thus, an average of 7.0 herring were sampled per set. Sampling intensity was higher in the spring than in the fall (8.5 versus 5.4 herring per set). The parameter of interest for this review was maturity stage. Maturity stages were as follows: immature (I), developing (D), ripe (R), ripe and running (U), spent (S), and resting (T). See table 2.2.1 for how these codes translate to DMR codes. We considered two stages as potentially indicative of spawning

locations. That is, if herring in spawning stages R or U were captured, they were inferred as being close to spawning grounds since they were in near or actual spawning condition. In reality, herring in maturity stage U would be the closest to spawning and therefore most likely to be near spawning grounds.

The location of herring in maturity stages R and U were mapped using a 2-D kernel density estimator in the package '*MASS*' (Ripley et al. 2019) in R (R Core Team 2019). This was done for all samples combined by season (i.e., spring and fall separately), and for different decades (by season). In this case, 'decades' were as follows: 1987 – 1990, 1991 – 2000, 2001 – 2010, and 2011 – 2018. For eventual incorporation of spatial depictions of spawning condition herring as layers in our consensus figures (see below), we considered polygons containing density values of 0.2 or greater (arbitrary).

For all the fall data combined, the location of ripe and ripe/running (R + U) herring was throughout the northern edge of Georges Bank with higher densities near the Great South Channel and the Northern Flank (Figure 2.4.1). Figure 2.4.2 shows the same data over different decades. Higher densities of R + U herring were found primarily on the western side of Georges Bank in the 1980's and 1990's. The distribution of R + U herring appeared to shift to the eastern side in the 2000's and in the most recent decade there are two areas of high density in both the east and the west. Figure 2.4.3 shows just maturity stage U herring from the fall survey from all years. Two areas of high density are evident in the Great South Channel (western side) and the Northern Flank (eastern Georges). The areas of high density of U stage herring shifts from decade to decade. It was highest in the west in the 1980's and 1990's, highest in the east in the 2000's and in the most recent decade it appears to have shifted back to the west, although densities were quite low. The density of spawning herring (maturity stage U) from the spring trawl survey are shown in figure 2.4.5. Only 9 of 28,878 samples were in maturity stage U confirming that spawning does not take place on Georges Bank in the spring. Similarly, only 179 herring were in maturity stage R in the spring (all years combined; not plotted).

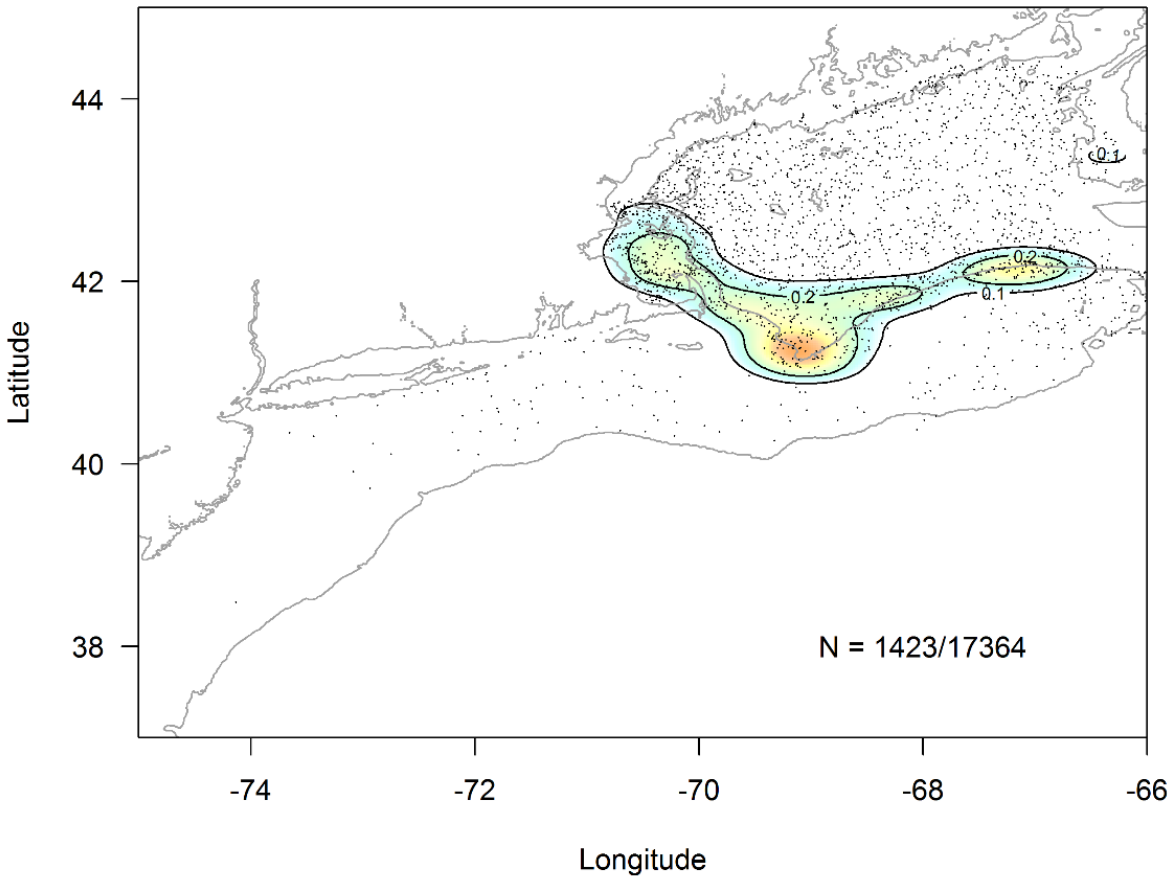

Figure 2.4.1. 2-dimensional kernel density estimates of ripe (mat stage R) and ripe/running (mat stage U) herring from fall trawl survey. Sample size is indicated; smaller number for samples in mat stage R + U and larger number for total sample size.

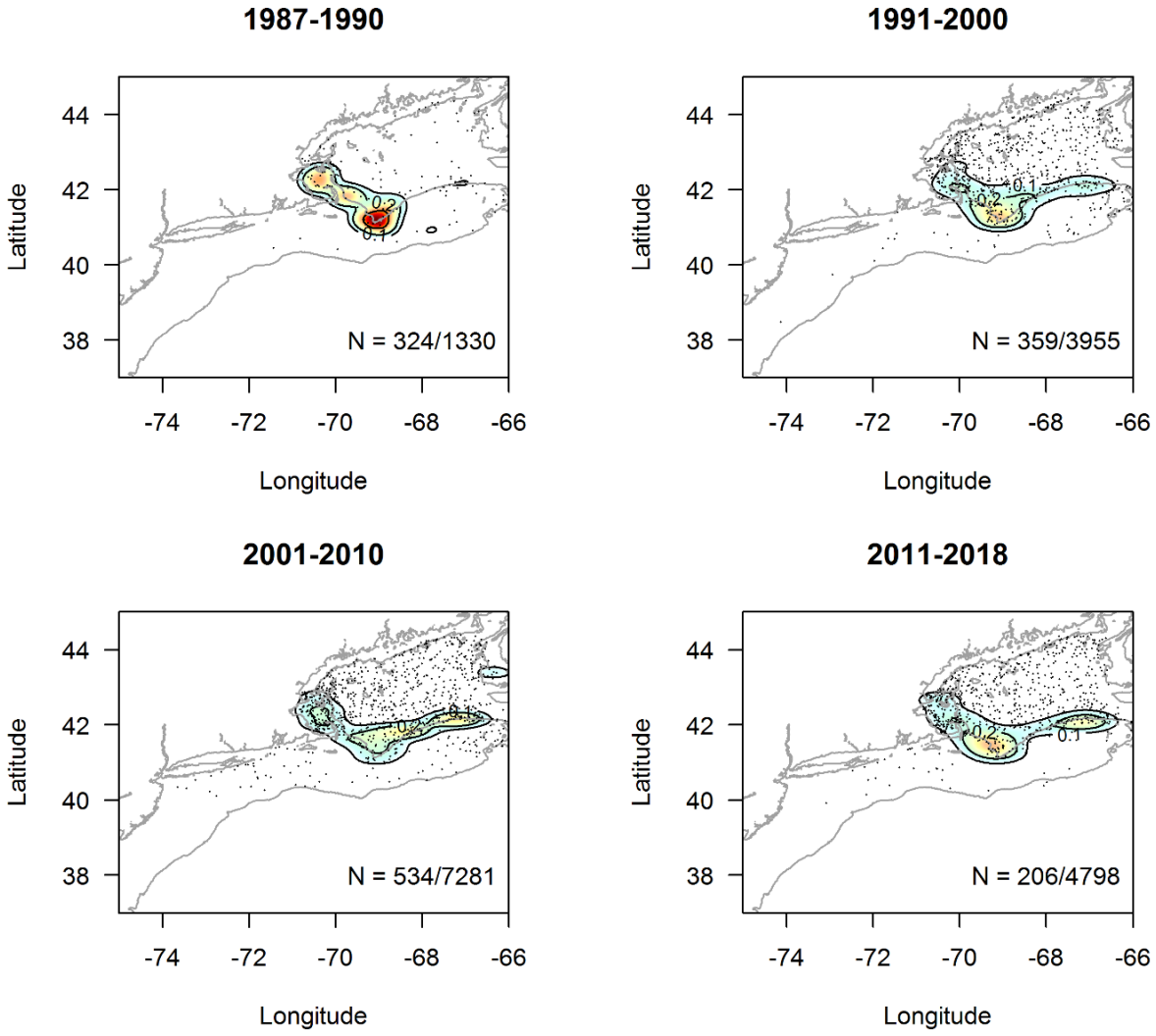

Figure 2.4.2. 2-dimensional kernel density estimates of ripe (mat stage R) and ripe/running (mat stage U) herring from fall trawl survey by decade. All sample locations are shown as points. Sample size is indicated; smaller number for samples in mat stage R + U and larger number for total sample size by decade.

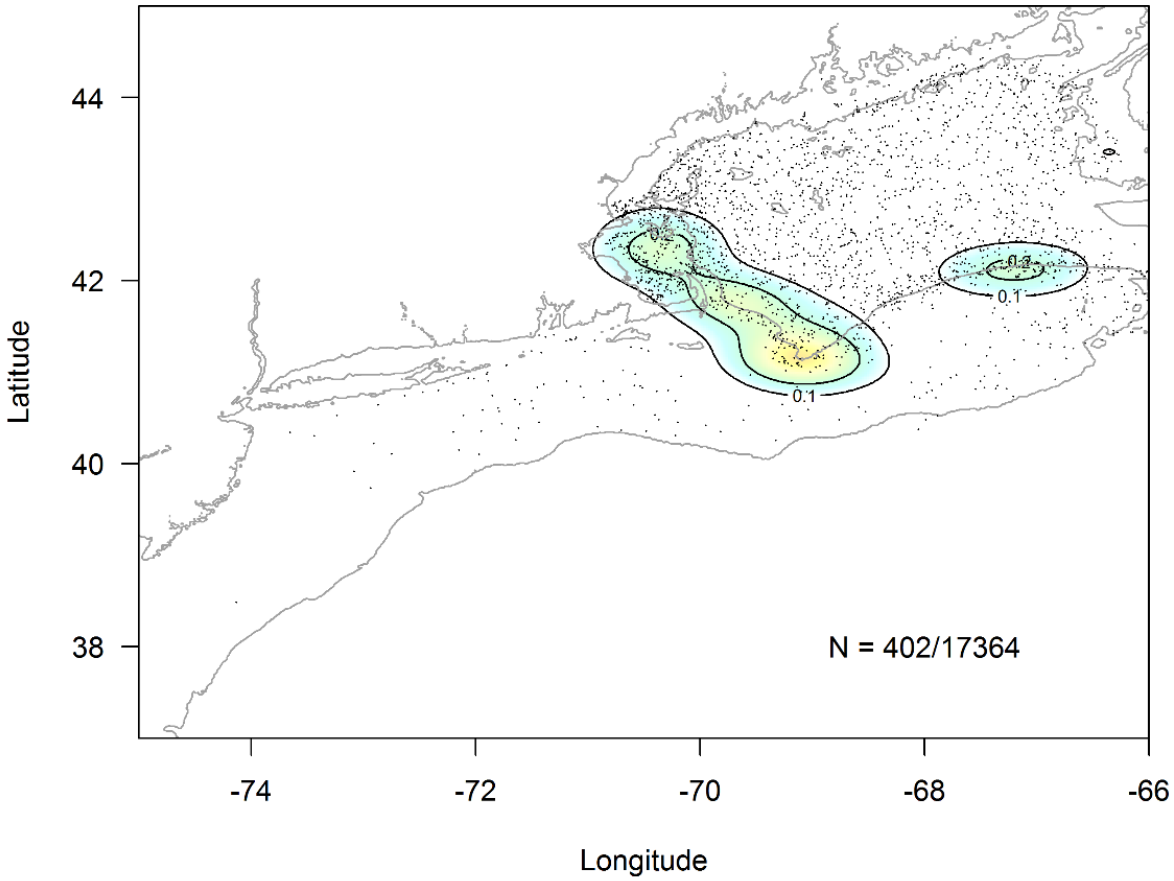

Figure 2.4.3. 2-dimensional kernel density estimates of ripe/running (mat stage U) herring from fall trawl survey. Sample size is indicated; smaller number for samples in mat stage U and larger number for total sample size.

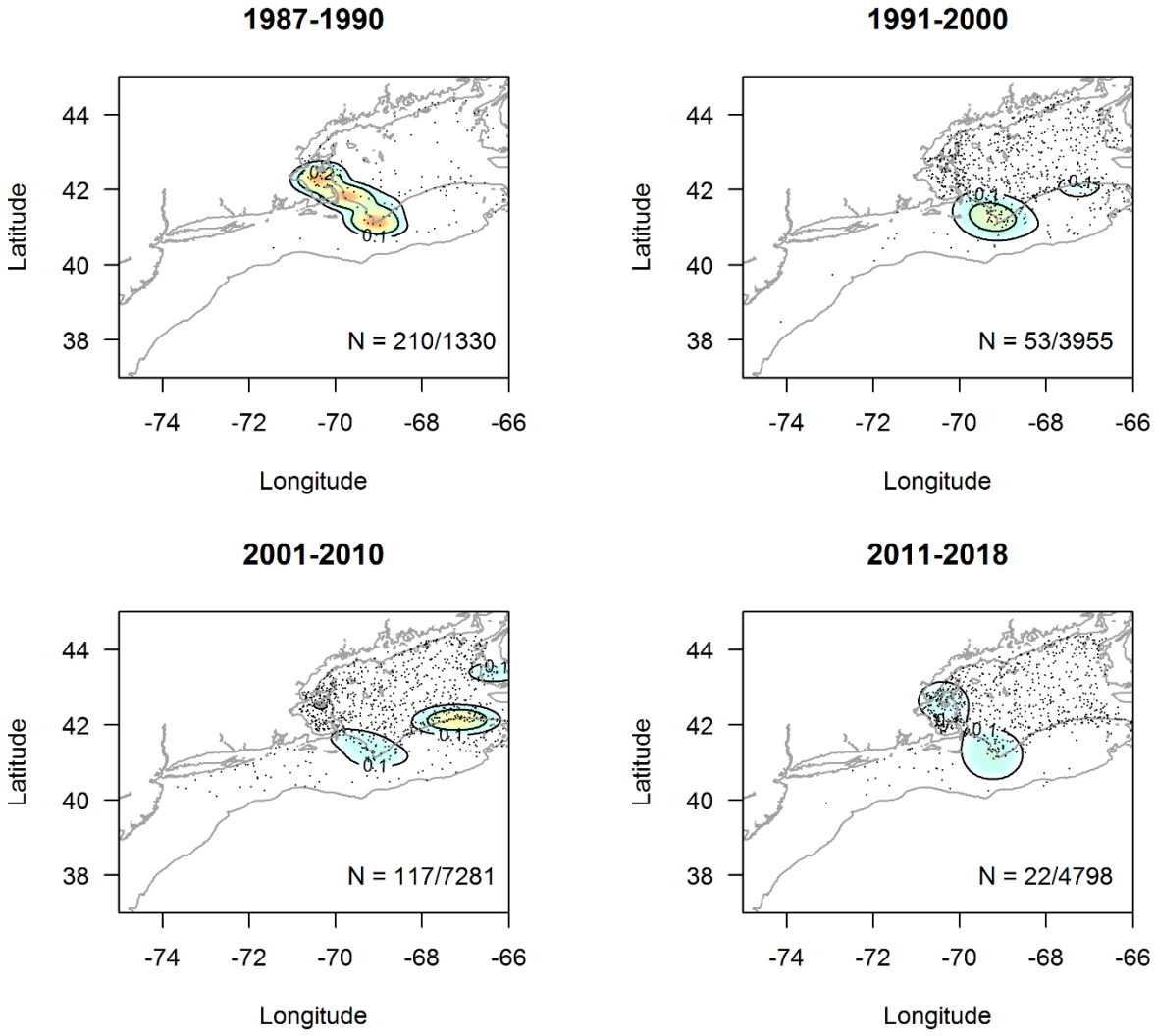

Figure 2.4.4. 2-dimensional kernel density estimates of ripe/running (mat stage U) herring from fall trawl survey by decade. All sample locations are shown as points. Sample size is indicated; smaller number for samples in mat stage U and larger number for total sample size by decade.

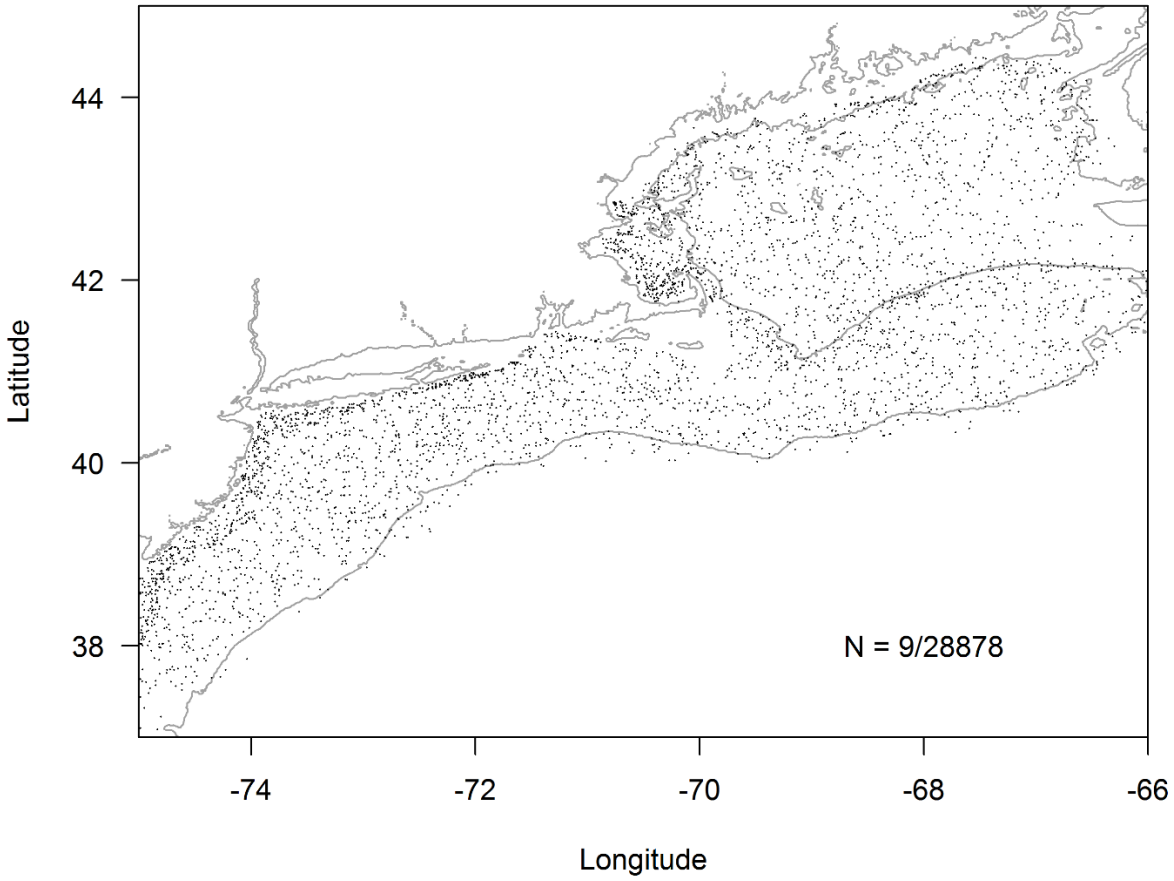

Figure 2.4.5. 2-dimensional kernel density estimates of ripe/running (mat stage U) herring from spring trawl survey (all years combined). Sample size is indicated; smaller number for samples in mat stage U and larger number for total sample size.

2.5. Food Habits Database (Herring Eggs in Diet of Groundfish)

Food habits data from the Northeast Fisheries Science Center Food Web Dynamics Program were explored for occurrences of *Clupeidae* eggs and *Clupea harengus* eggs as prey between 1973 and 2017 (B. Smith, pers. comm.). These data covered the entire Northeast US continental shelf and consist of approximately 650,000 total samples. There were only 113 observations from 10 hauls that contained herring eggs. Most of these samples were *Clupeidae* eggs and only a few were identified to the level of *Clupea harengus* eggs. All observations occurred between late September and early November. Years where herring eggs were identified included 1989, 1993, 1994, 1995, 1997, 1998, and 2005. Due to the limited amount of data we only explored the locations where these herring eggs were present, most of which were in the northeast section of Nantucket Shoals and a few occurances on the northeast edge of Georges Bank (figure 2.5.1).

These locations are generally consistent with herring egg essential fish habitat identified in Ammendment 5 to the herring fishery management plan (figure 2.3).

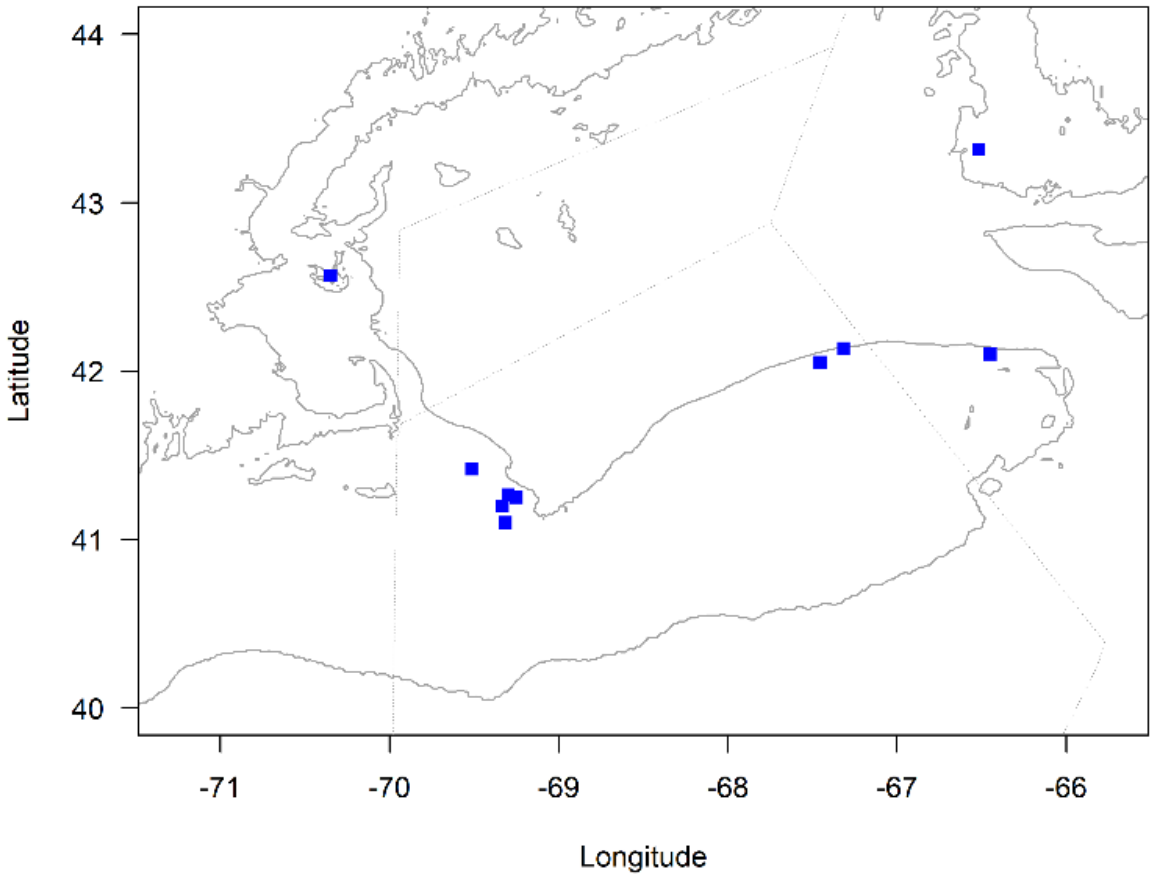

Figure 2.5.1. Locations of herring eggs observed in 113 NEFSC diet samples from 10 hauls (1989, 1993, 1994, 1995, 1997, 1998, 2005).

2.6. Industry Interviews

We conducted interviews with a representative of each of the mid-water pair trawls to gain a perspective from industry on where spawning takes place for herring and their overall thoughts on the topic. In general, industry felt that there was not one specific area that you would catch spawning herring and that it varies year to year. One group could not envision how a closure would work on George's Bank due to the variability from year to year in spawning and cautioned that a closure on GB would cripple the midwater fleet. Another group did not believe that the midwater fleet is interacting with spawning herring on GB; in their experience, it is a rare event to catch spawning herring. This coincides with some of the data we analyzed (particularly the

DMR data) where a large percentage of trips resulted with no spawning herring being sampled (figure 2.6.1).

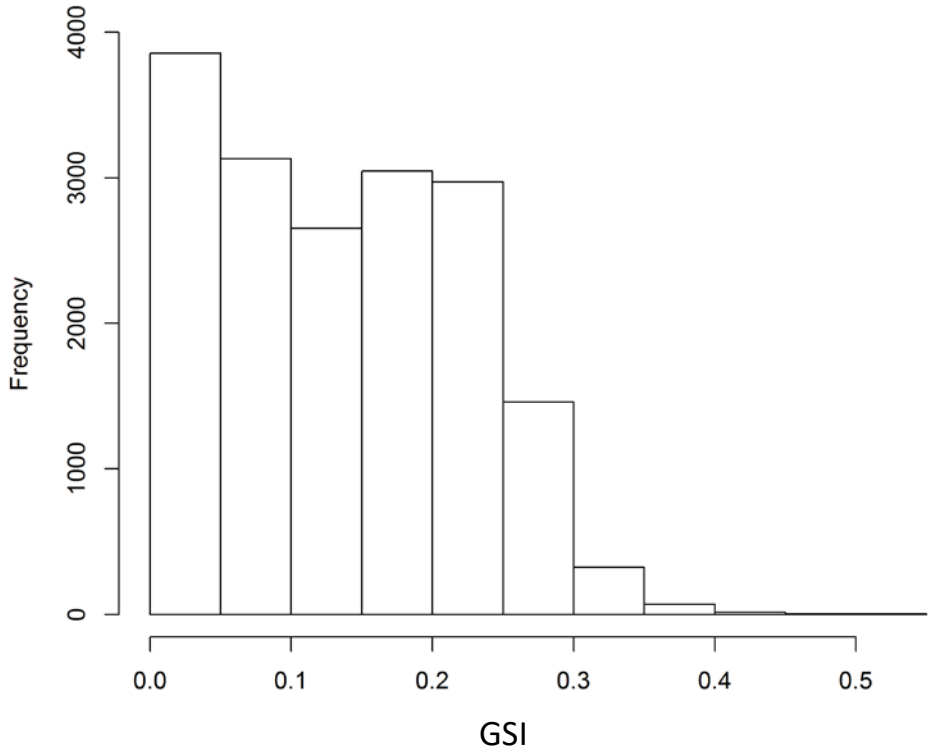

Figure 2.6.1. Histogram of GSI values from DMR dockside monitoring data. Only 418 of the 17,529 (2.4%) samples had GSI values > 0.3. This agrees with fishermen's experience of not seeing many spawning herring on Georges Bank.

The fishermen interviewed believe that the bottom type where they fish (sandy bottom with no structure and a tide of 2 knots) is not conducive to spawning. They believe that fish are spawning more along the shoal waters along the Northern edge of GB where the habitat is better suited for spawning (as is supported by the data; e.g., figure 3.3). They do not fish in that area of GB due to the possibility of tearing up their nets. There was one group of fishermen who informed us of the general areas where you can catch herring that have roe and where they spawn. Fish with roe can occur along the whole edge of GB from Canada to the Cape between August and November. There were a couple areas where they have caught spawning fish including the Northern edge east of the 1300 line in 50 fathoms, near the "BB" buoy south of Chatham, and when there are small fish (non-spawning) to the east you can find the large spawning fish near Cultivators Shoal. They used to find spawning fish inside the channel but have not seen any in a while. It was noted that all the spawning fish were large and of very good quality.

Each representative had their own explanations on the issue and offered ways to remedy the issue. Many would like to see more sampling including tagging programs, otolith work, surveys

that include multiple gear types and have industry data included in assessments. They believe that the small fish are present and that we will see this with more sampling. One group was worried about herring shifting where they spawn. Until about ten years ago, they would catch herring from Virginia up to Long Island while targeting mackerel. One captain has heard reports that there have been eight trips to Georges Bank with no herring and fears that they have shifted to Canadian waters where there have been reports of herring landed in large quantities.

One of the groups highlighted that when they catch spawning herring, they are also catching a larger amount of haddock than they have ever previously caught. He used to find only a couple haddock mixed in with spawning herring, but with the rebound of haddock he is finding more and more haddock mixed in with the spawning herring. He believes that the haddock are consuming the herring as well as the eggs and either lowering the recruitment or possibly forcing the herring to spawn in new areas that may not be as suitable. It was also raised by a group of captains (who are also able to purse seine) that if they were allowed to target mackerel using a 3 inch brailer instead of the normal 1 inch brailer, it would reduce the amount of small mackerel as well as limit the herring bycatch. Both changes in target fish would reduce the pressure on herring while allowing them to fish on a healthy stock. The abundance of river herring is another area of concern, one captain has seen more than ever before and believes that the river herring are taking over prime areas. Historically, the large balls of herring were able to push the river herring away from the prime feeding areas but with the smaller amounts of herring he doesn't believe they are able to compete with the river herring for the prime areas. All of the groups we interviewed were appreciative that we reached out to industry and welcome more science and research into the issue.

2.7. Observer Data

Northeast Fisheries observer comments from all gear types and fisheries were explored for accounts of spawning Atlantic herring (1989-2019) and herring eggs (2008-2019) (G. Chamberlain, pers. comm). There were very few entries of hauls where captains classified catch as spawning herring. A large amount (> 5,000) of comments recorded by observers contained unclassified fish eggs or unclassified eggs, but observations could not be classified as Atlantic herring eggs with confidence. These comments were too limited to make inferences about location and timing of spawning herring or herring eggs.

3. Building a Consensus

Similar to DeCelles et al (2017) we applied a consensus approach to identifying spawning areas on Georges Bank and Nantucket Shoals. We layered polygons from multiple sources to examine areas of overlap which are inferred as more consistent areas of spawning. Data layers for this exercise included historical data layers from Olsen et al (1977) (figure 2.2), egg EFH (NEFMC 2013) (figure 2.3), eggs in diet of groundfish (i.e., food habits database; figure 2.5.1), larval data (figure 2.1.1), DMR dockside monitoring data (specifically, maturity stage 6; figure 2.2.9), and trawl survey data (maturity stage U; figure 2.4.3). Maps were georeferenced in Google Earth where polygons were created and saved as KML files which were layered on top of each other in R (citation). The resultant map is shown in figures 3.1 (colored by data source) and 3.2

(monochrome). In general, all spawning associated activity, from ripe and running adults to evidence of eggs, occurred along the northern edge of Georges Bank from Cape Cod to the northern flank. However, there were also areas of high overlap of multiple data sources that may indicate more consistent spawning. These include an area to the west of the great south channel (northern Nantucket Shoals) and an area on the northern flank. Note how adults tend to aggregate to the north of putative spawning areas (in deeper water or near the edge of the bank), egg areas tend to be up on the bank and larval areas tend to be downstream of these areas. Figure 3.3 shows the areas of highest overlap (i.e., where 3 or more sources agreed). In this case, two distinct areas emerged; one to the west of the Great South Channel and the other on the Northern Flank.

Figure 3.4. shows overlap of data sources by decade. Here, only larval, DMR and trawl survey data were used since these had records that spanned multiple decades. While harder to infer consensus areas due to smaller data sets, spawning appeared to move from the west in the 1980's, to across the northern edge of the shelf in the 1990's and 2000's to distinctly west and east areas in the 2010's.

We also considered overlap of areas of high density of maturity stage R + U herring from both DMR data and the trawl survey over each decade (figure 3.5). Similar to other depictions, this showed areas of high overlap, among decades and data sets, at the Great South Channel and the Northern Flank. Consensus areas from this figure are shown in figure 3.6 (where 4 or more polygons overlapped). Figure 3.7 shows how this compares to the consensus areas shown in figure 3.3. Again, it appears that the adult spawning condition herring tend to aggregate slightly to the north and off the bank compared to consensus areas that include eggs and larval herring (more on the bank).

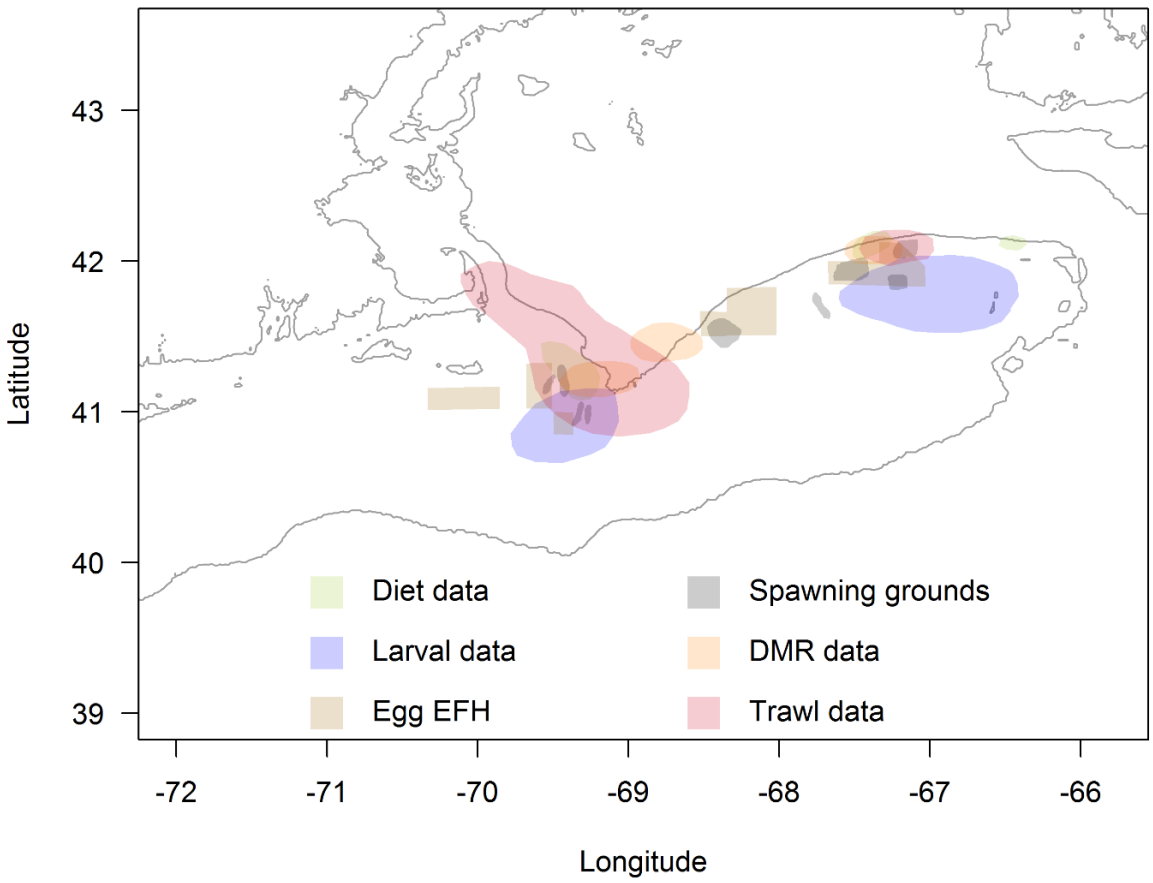

Figure 3.1. Areas of overlap between multiple data sources including data from food habits database (diet data; figure 2.5.1), larval monitoring (figure 2.1.1), egg EFH (figure 2.3), historical spawning grounds (figure 2.2), DMR dockside monitoring (mat stage U; figure 2.2.9), and fall trawl survey (mat stage U; figure 2.4.3).

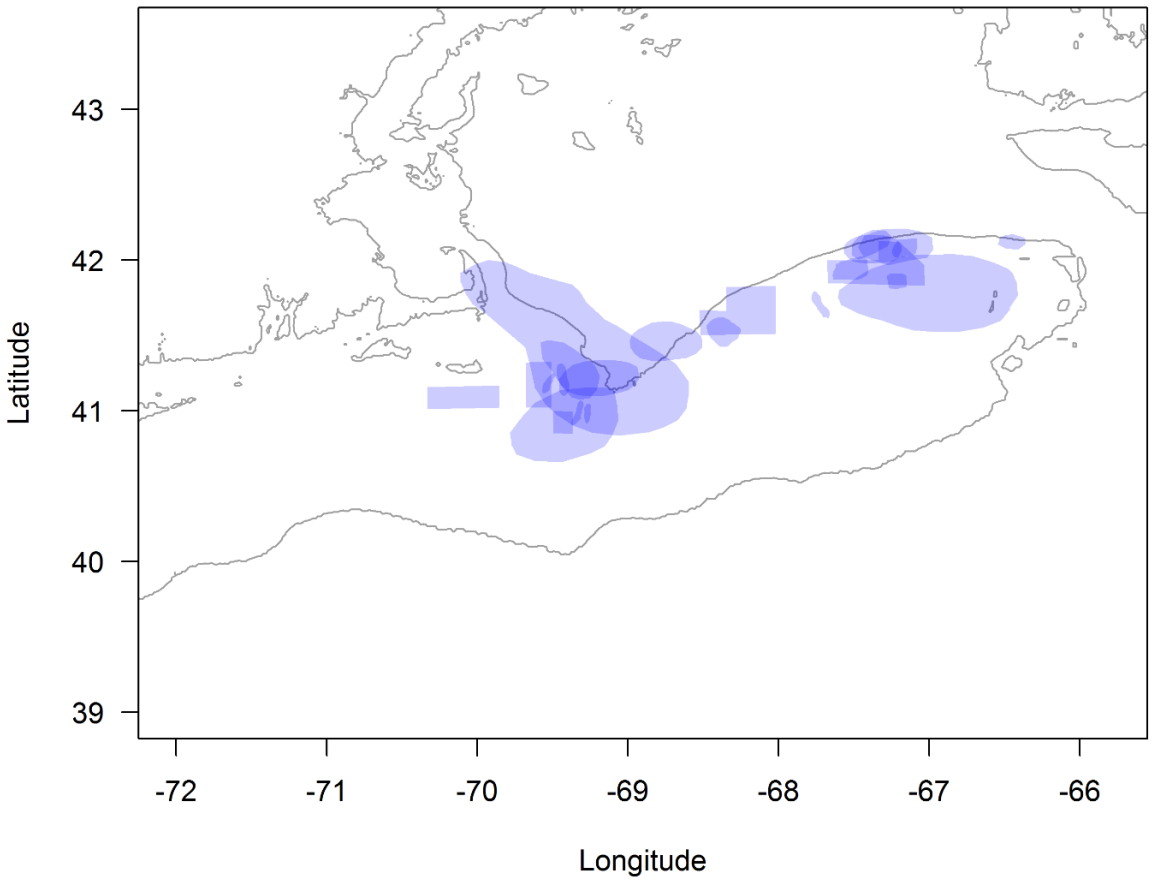

Figure 3.2. Same as figure 3.1 but all in same color to highlight areas of overlap through shading.

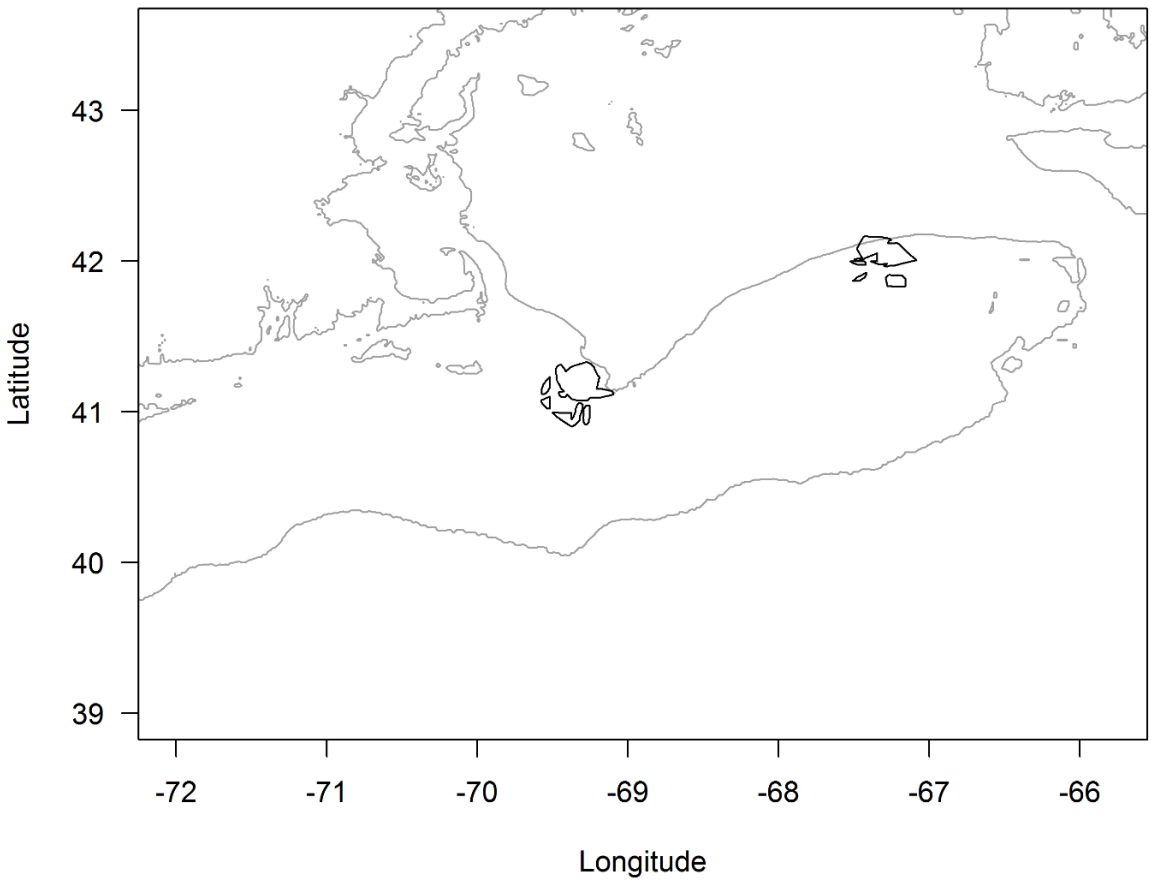

Figure 3.3. Consensus areas from figure 3.2 where 3 or more overlaps occurred between different data sources

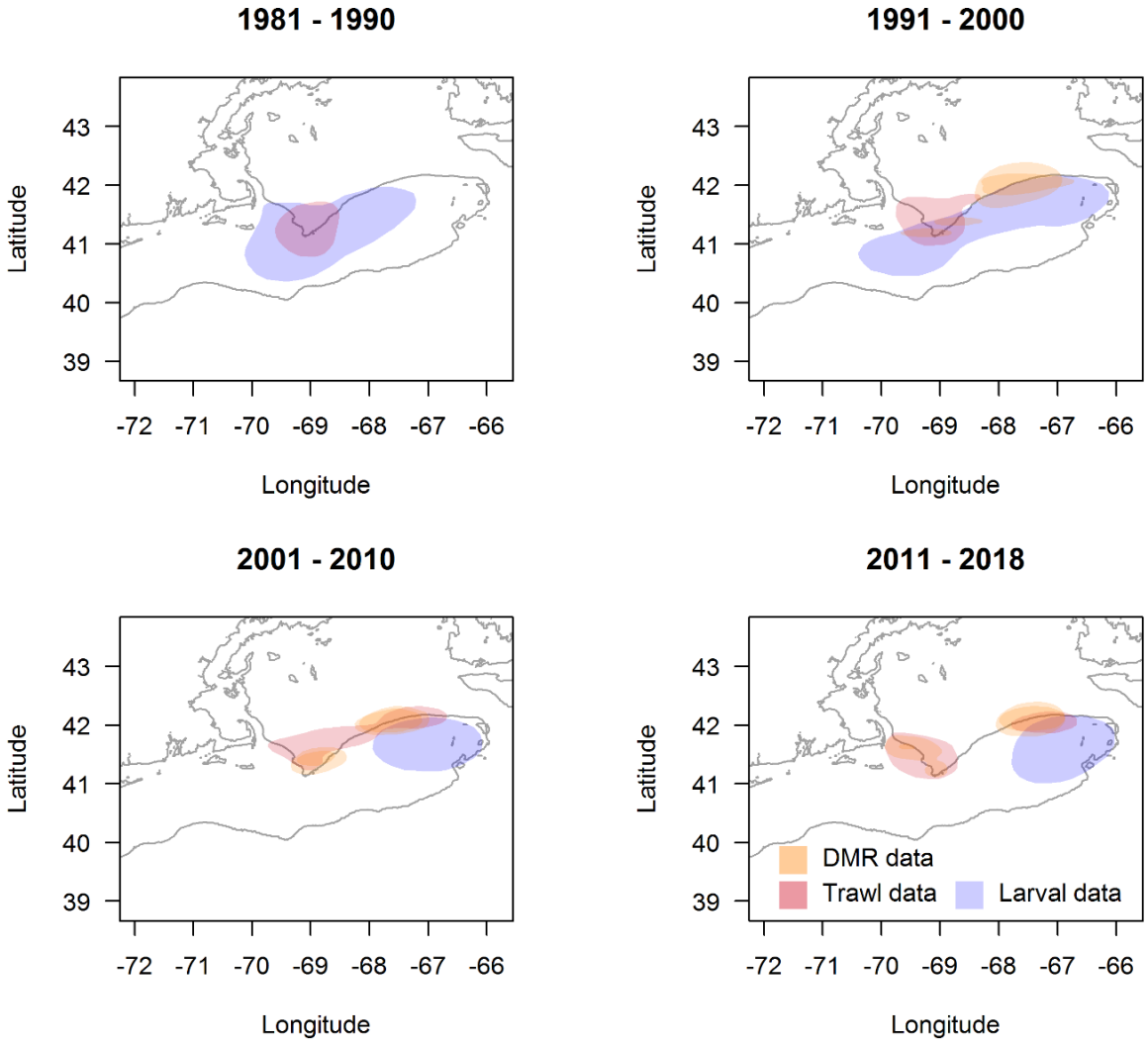

Figure 3.4. Overlap areas of spawning between different data sources by decade.

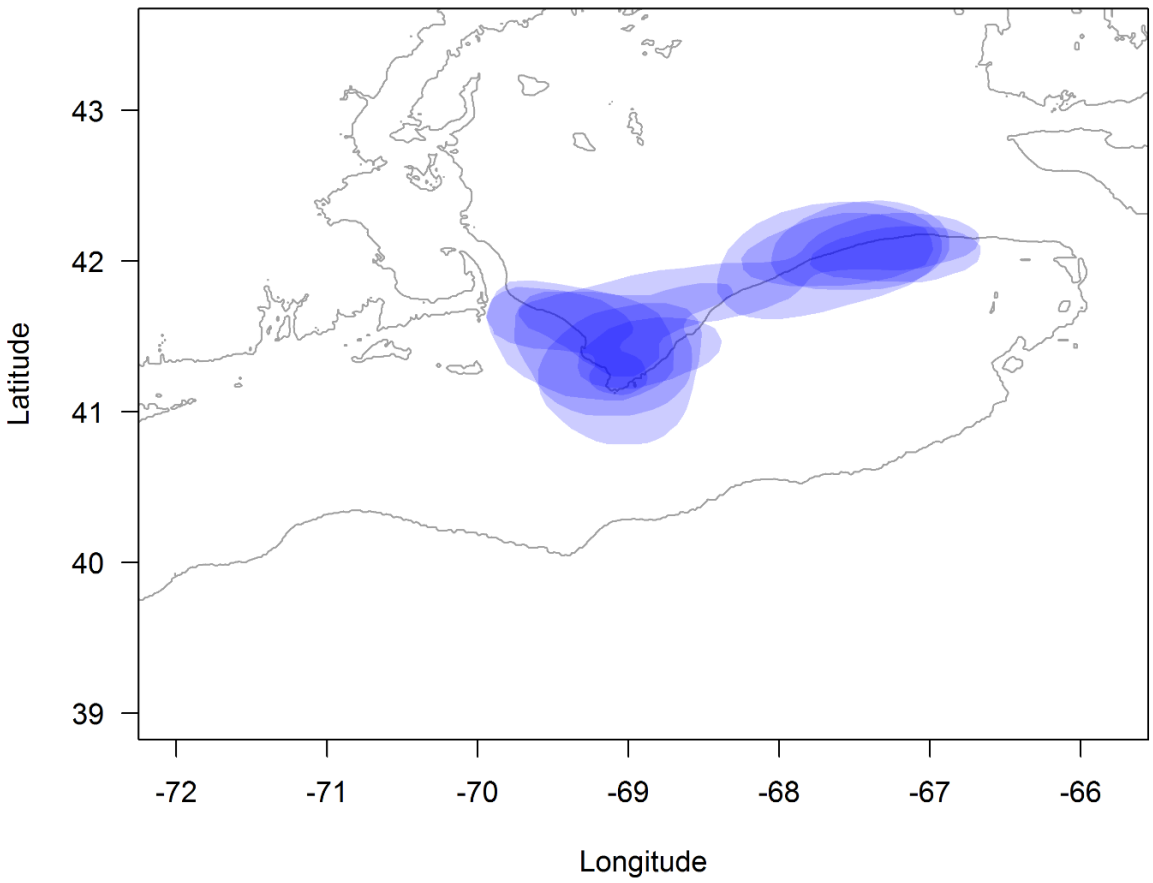

Figure 3.5. Overlap areas for maturity stage R+U herring from both DMR and trawl survey data sets for multiple decades (see figure 3.3).

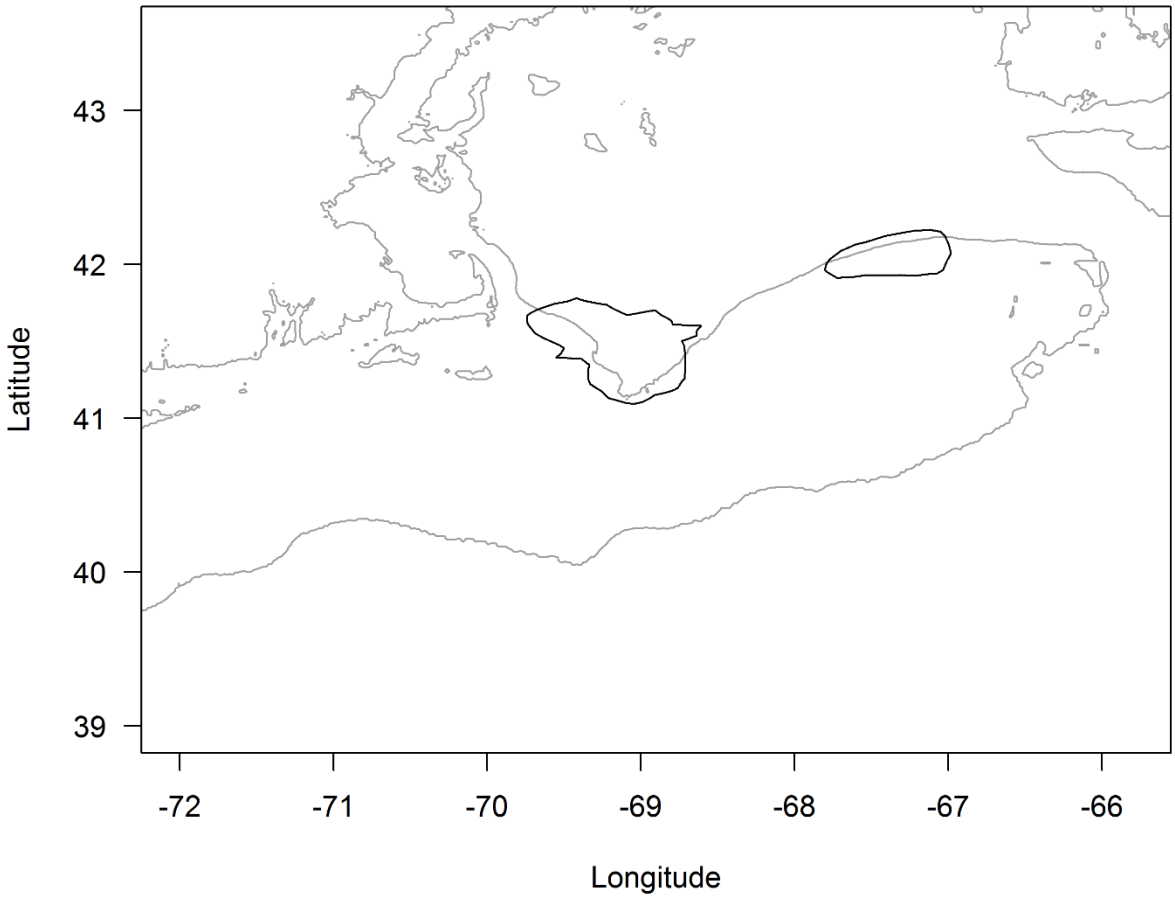

Figure 3.6. Consensus areas from figure 3.3 where 4 or more overlaps occurred between different data decades and data sources (DMR and trawl survey data).

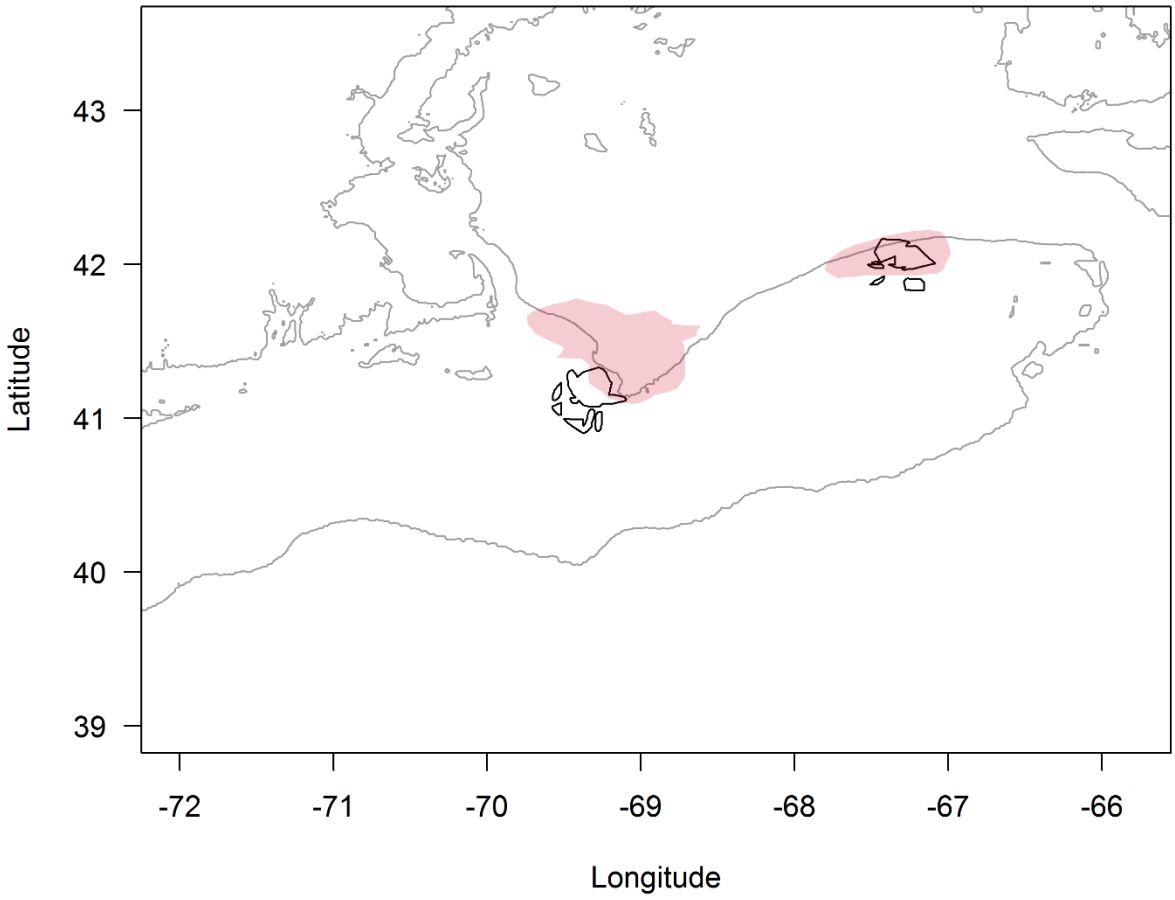

Figure 3.7. Comparison between consensus areas using all data sources (areas with black borders) and those from multiple decades using mature fish (mat stage R+U) only (red shaded areas).

4. Fishing Effort

Consensus spawning areas were compared to maps of fishing effort. The DMR dockside monitoring database was used as a first layer since this approximates fishing effort in space. Figure 4.1 shows the 2-D kernel density estimates of sample locations from the whole DMR dataset. Fishing effort was concentrated along the northern edge of Georges Bank with high densities seen near the Northern Flank which overlapped partially with an area of high spawning activity. Another area of high sample density was seen to the east of the Great South Channel and did not overlap with the area of high spawning activity in that region. Figure 4.2. shows effort variation among decades from the DMR data. In every decade, there was some overlap

with the spawning area at the Northern Flank and little to no overlap with the spawning area near the Great South Channel.

Effort data was also provided in the form of raster layers of herring fishing revenue for the years 2007-2017 (Benjamin et al 2018). A similar picture emerged from this data. Particularly, fishing effort was concentrated along the northern edge of Georges Bank and overlapped somewhat with the spawning area on the Northern Flank (Figure 4.3). Figure 4.4. shows how effort varies among sets of years. In the most recent years (2016/2017), herring revenue was concentrated near the Northern Flank spawning area and less spread out along the edge as in previous years.

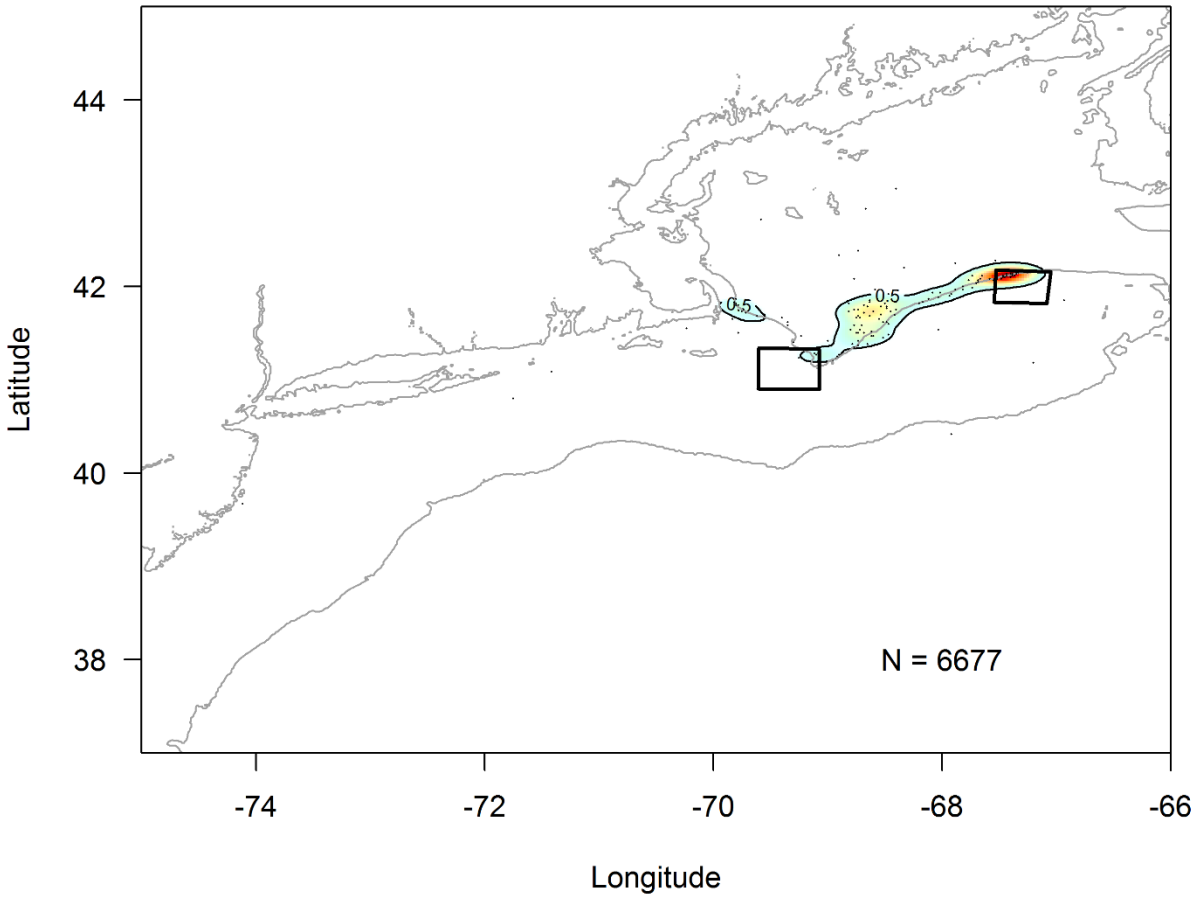

Figure 4.1. 2-dimensional kernel density estimates of fishing effort during spawning season (September and October; see figure 2.3.1) for all years from DMR dockside monitoring (i.e., location of industry samples). Total sample size is shown. Boxes enclose consensus spawning areas from figure 3.3.

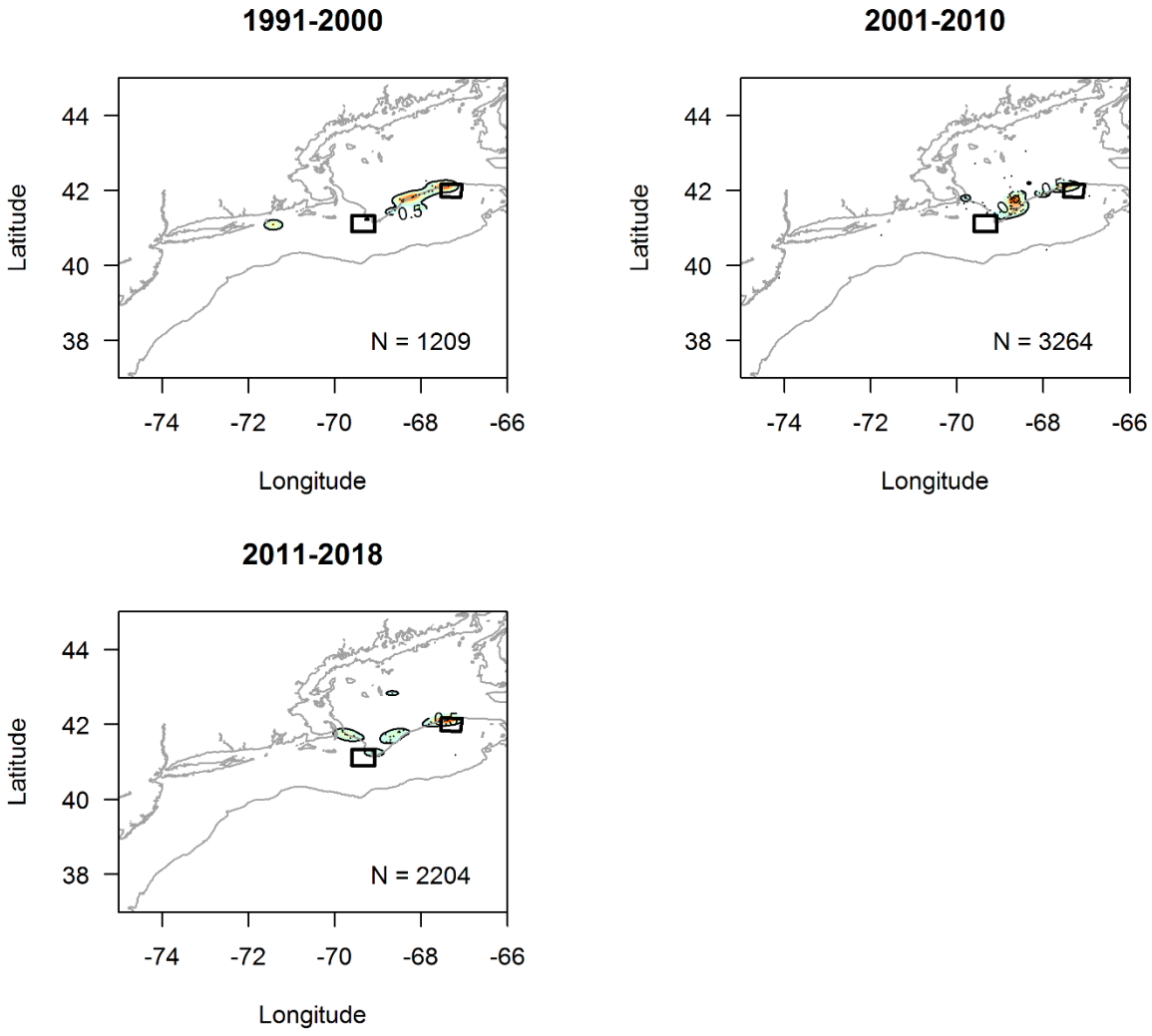

Figure 4.2. 2-dimensional kernel density estimates of fishing effort during spawning season (September and October; see figure 2.3.1) by decade from DMR dockside monitoring (i.e., location of industry samples). Sample sizes are shown. Boxes enclose consensus spawning areas from figure 3.3.

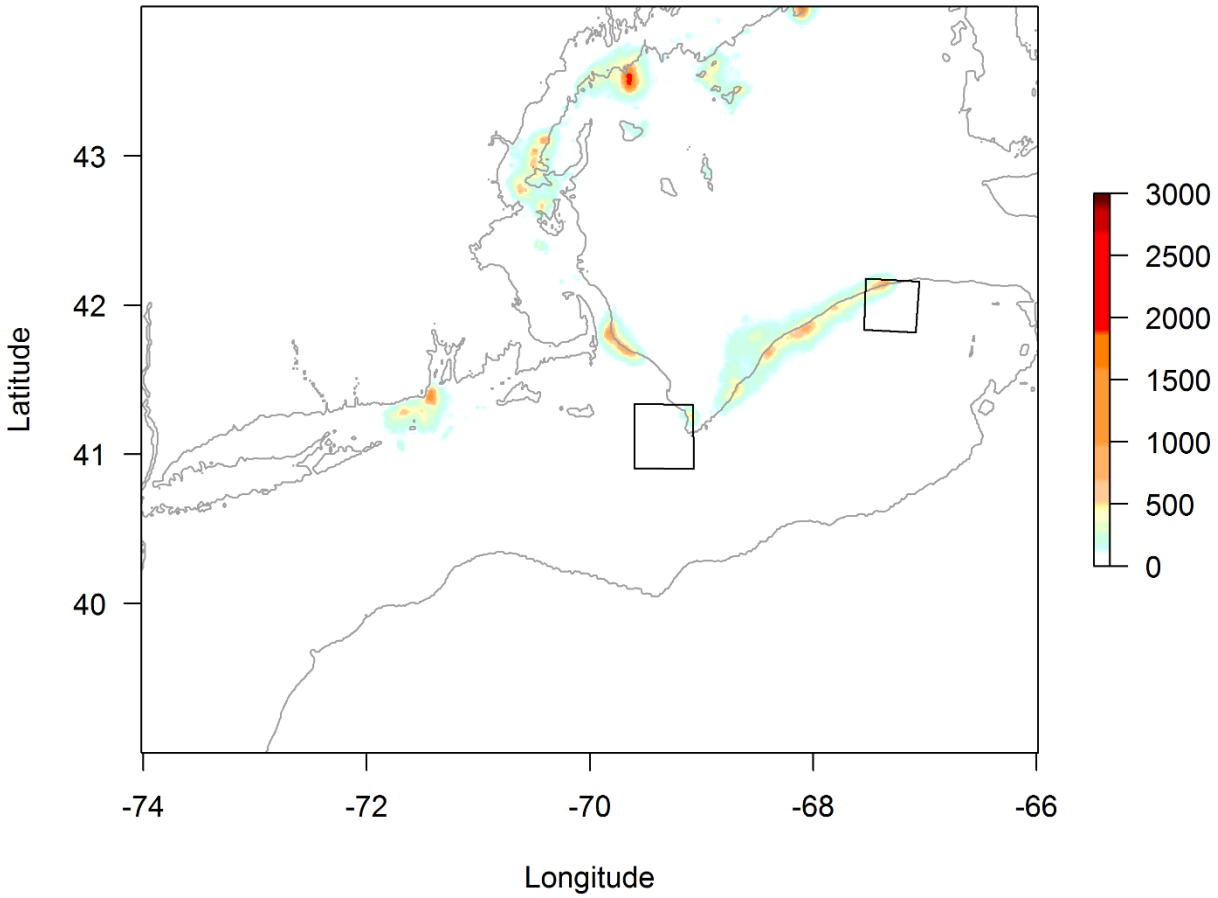

Figure 4.3. Fishing effort as herring revenue ($/0.25km2) for the period 2007-2017. Data from Benjamin et al (2018). Boxes enclose consensus spawning areas from figure 3.3.

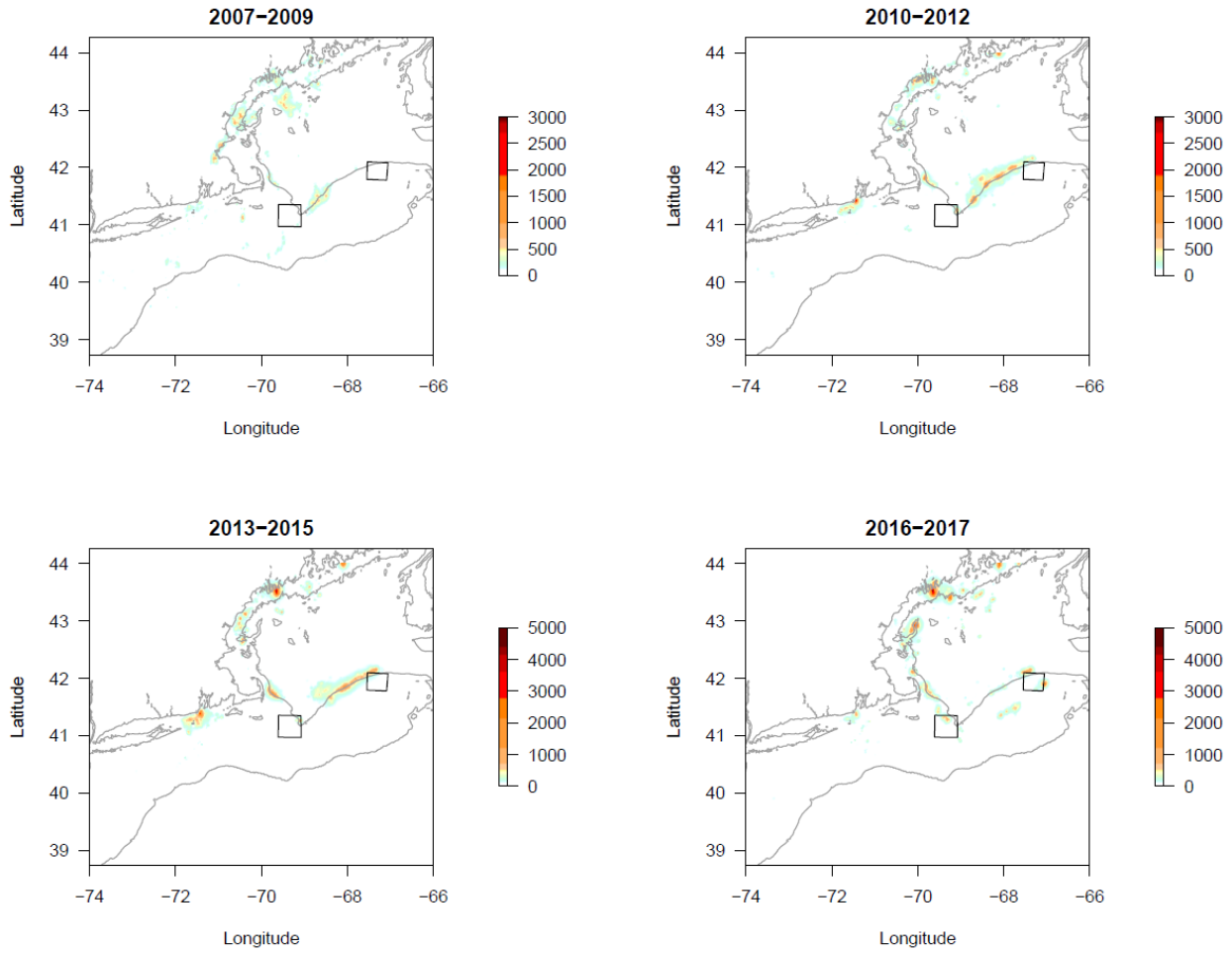

Figure 4.4. Fishing effort as herring revenue ($/0.25km2) for 4 3-year periods from 2007-2017. Data from Benjamin et al (2018). Boxes enclose consensus spawning areas from figure 3.3.

4. Research Recommendations

The following research recommendations were developed by the Herring PDT during review of this draft report. The Herring PDT includes all the members of the ASMFC Atlantic Herring Technical Committee. These recommendations are provided in this document as input on any future research that may be developed in the region on this topic.

Overall PDT input: Overall, the easiest and most cost effective approach is likely enhancing portside sampling efforts, followed by potentially enhancing collection of spawning data by at-sea observers and ASM. A fishery independent survey would be costly, and would take five or so years to complete; however, it would provide data from the entire area and season, not just where and when the fishery operates. Finally, it is important to note that the herring stock is currently at low abundance; therefore, research conducted now may not be representative of spawning behavior when herring biomass is larger.

1. Enhance portside sampling efforts

There is currently portside sampling occurring throughout the fishery, including herring trips from Georges Bank. However, the total number of trips from that region is much lower than the GOM for a variety of reasons, e.g. seasonality of the fishery, increased costs to fish offshore, sampling efforts are more concentrated in Maine and Massachusetts, etc. Therefore, while the current system is capable of sampling trips from GB, the current level is insufficient to track spawning activity on GB. The current portside sampling provides some information on seasonality of spawning on Georges Bank, but given how much this can change annually (approx. 5-6 weeks), there is a need for dedicated processing of portside samples over multiple years. An enhanced program could be designed to specifically target trips from GB during the spawning season. More resources could be used to increase the number of future samples, targeting trips from GB as described above. If there are any samples that have not been processed those should be prioritized first, and then efforts to increase the number of samples from trips on GB.

2. Develop a new spawning survey of Atlantic herring on GB

A fishery independent sampling of herring and spawning condition on GB would be useful, but may be cost prohibitive, i.e. $200,000 a year or more. Specific stations and seasons would need to be identified in advance, and could be sampled using fishing gear, survey gear, and/or acoustics. The overall design could be similar to the acoustic survey previously conducted by NEFSC on GB. The survey should probably span about five years to capture annual variability, with multiple stations targeting herring during spawning season across the area including places the fishery does not operate. While somewhat dated and limited, there is previous research and published literature on this topic that will hopefully be part of the NEFMC discussion document. Due to the relatively large expense of this approach, it may be prudent to fully evaluate past literature and research first, and then identify any knowledge gaps specific to management needs before a large spawning survey is funded.

3. Examine the feasibility of collecting spawning data at-sea by observers and ASMs, and on land by portside samplers

The Fisheries Sampling Branch (FSB) could examine the possibility of collecting spawning data at sea on observed trips (NEFOP and ASM) if conditions allow. If it is feasible to collect these data at sea then new data fields could potentially be added or even a separate data collection sheet (e.g. total weight of fish, gonad weight, and spawning condition). Information like this could provide complementary spawning data, at a superior spatial scale (tow by tow vs averaging location in stat area), to what is being collected through portside sampling efforts. It’s understood that adding fields would likely slow down the work of observers, and may require some post processing of fish samples taken at sea. It could cost more to have portside samplers do this work dockside, so it may even be possible for portside samplers to send NEFOP samples that could be worked up by NMFS at a later time instead.

The federal Atlantic herring fishery (midwater trawl) portside sampling program is scheduled to begin in April 2020. The collection of spawning data is not currently part of that sample design

and was not included in draft regulations. Therefore, there would be additional costs and details that would need to be considered. The federal portside program may be a potential source of spawning data from landed catch in the future, but many details would need to be considered first.

5. References

To be completed

New England Fishery Management Council

FOR IMMEDIATE RELEASE
June 11, 2019

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Atlantic Herring: Council Approves Framework 6 Containing 2019-2021 Specifications and Revised Overfishing Definition

The New England Fishery Management Council has approved Framework Adjustment 6 to the Atlantic Herring Fishery Management Plan (FMP), which contains 2019-2021 specifications for the fishery and a new overfishing definition for herring that is more consistent with the 2018 benchmark stock assessment.

The Council took several steps during its April meeting that helped guide the development of Framework 6. Here at its June meeting in So. Portland, ME, the Council made three additional decisions to complete the package:

- **Overfishing Limit (OFL) and Acceptable Biological Catch (ABC):** The Council voted to set OFL and ABC based on the ABC control rule that's proposed in Amendment 8 to the Atlantic Herring FMP while using the original projections made by its Scientific and Statistical Committee. This was referred to as "Alternative 2 Original" in the draft framework.
- **Management Uncertainty Buffer:** The buffer is the difference between ABC and the Annual Catch Limit (ACL) and is factored into specifications to help ensure that the ABC is not exceeded primarily due to Canadian catch in the New Brunswick weir fishery. Management uncertainty previously was set at 6,200 metric tons (mt). This time, the Council supported using a 10-year average of Canadian catches, which resulted in an uncertainty buffer of 4,560 mt.

2019-2021 Atlantic Herring Specifications
(in Metric Tons)

Specification	2019	2020	2021
Overfishing Limit (OFL)	30,668	41,830	69,064
Acceptable Biological Catch (ABC)	21,266	16,131	16,131
Management Uncertainty	6,200	4,560	4,560
Optimum Yield / Annual Catch Limit (OY/ACL)	15,065*	11,571*	11,571*
Domestic Annual Harvest	15,065	11,571	11,571
Border Transfer	0	100	100
Domestic Annual Processing	15,065	11,471	11,471
U.S. At-Sea Processing	0	0	0
Area 1A Sub-ACL (28.9%)	4,354	3,344	3,344
Area 1B Sub-ACL (4.3%)	647	498	498
Area 2 Sub-ACL (27.8%)	4,188	3,217	3,217
Area 3 Sub-ACL (39%)	5,876	4,513	4,513
Fixed Gear Set-Aside	39	30	30
Research Set-Aside as % of Sub-ACLs	3%	3%	3%

* If the New Brunswick weir fishery catch through October 1 is less than the associated "trigger," then 1,000 mt of the management uncertainty buffer will be added to the Area 1A sub-ACL.

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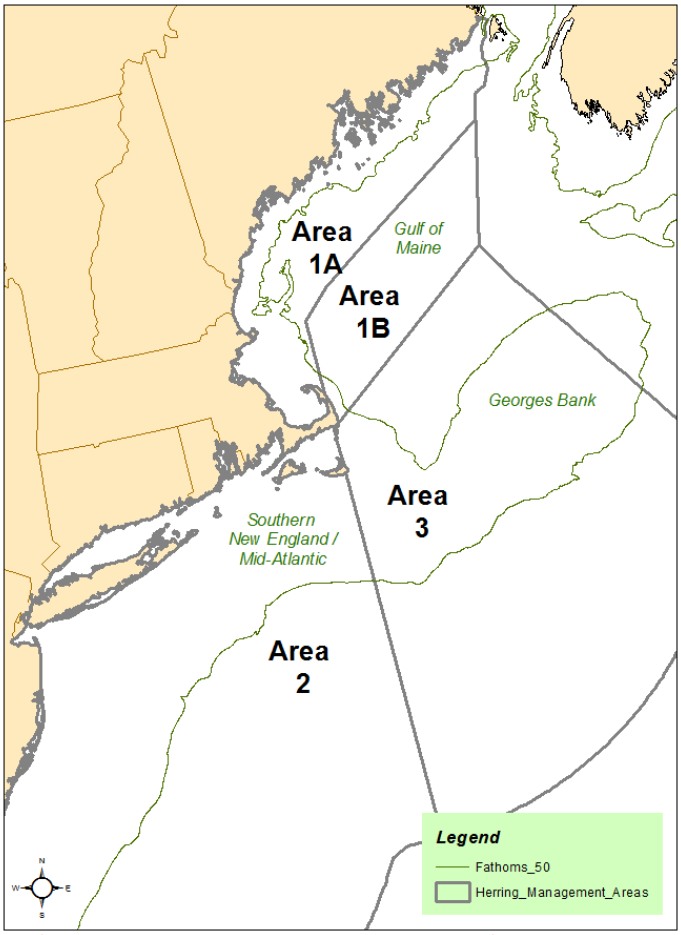
If the New Brunswick weir catch through October 1 is less than the 4,000-mt trigger in 2019 or the 2,942-mt trigger in 2020 and 2021, then 1,000 mt will be subtracted from the buffer and added to Area 1A.

- **Border Transfer:** This specification applies to fish caught in Area 1A by U.S. fishermen that is transferred to Canada via a Canadian carrier. The fish must be used for human consumption. Until 2019, the border transfer allocation was set at 4,000 mt annually. In 2019, however, it was zero. For 2020 and 2021, the Council voted to set it at 100 mt. The specification has not been utilized in recent years.

Once the Council made these decisions, the specific management area sub-ACLs could be determined because catch limits all flow down from the ABC. The Council kept the same spatial percentage splits for the available quota: Area 1A – 28.9%; Area 1B – 4.3%; Area 2 – 27.8%; and Area 3 – 39%. The resulting catch limits are show in the table on page 1. The Council also kept the same Area 1 seasonal splits:

- Area 1A January through May – 0%
- Area 1A June through December – 100%
- Area 1B January through April – 0%
- Area 1B May through December – 100%



Atlantic Herring Management Areas 1A, 1B, 2, and 3. – NEFMC graphic

Important Factors to Remember

- The Council approved Framework 6 for submission to the National Marine Fisheries Service (NMFS/NOAA Fisheries). The agency still needs to review and approve the framework before implementing it.
- The target implementation date is January 1, 2020, the start of the new fishing year for Atlantic herring.
- 2019 specifications already are in place through a NMFS in-season adjustment. These catch limits have been folded into Framework 6.
- The framework contains catch limits for both the 2020 and 2021 fishing years. However, the 2021 specifications likely will be revisited following a new stock assessment that is scheduled to take place in 2020.
- Although provisions are in place to allow for the carryover of unharvested catch from one year to the next by up to 10% of an area's sub-ACL, the Council voted to "temporarily prohibit carryovers" for 2020 and 2021 given the current condition of the resource, which is resulting in the low quotas.

A copy of the summary report from the 2018 stock assessment for Atlantic herring is available HERE

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NEW REFERENCE POINTS

The Council approved the following updated overfishing definition as part of Framework Adjustment 6 to the Atlantic Herring FMP.

- *The stock will be considered **overfished** if stock biomass is less than 1/2 the stock biomass associated with the maximum sustainable yield (MSY) level or a proxy (e.g., SSB_{MSY} or $SSB_{MSY\ proxy}$). SSB is spawning stock biomass.*
- *The stock will be considered **subject to overfishing** if the estimated fishing mortality rate exceeds the fishing mortality rate associated with the MSY level or a proxy (e.g., F_{MSY} or $F_{MSY\ proxy}$).*

The Council maintained the current 2019 river herring and shad catch caps for 2020 and 2021 in Framework 6. Here are the allocations.

River Herring/Shad Catch Caps	Allocation in Metric Tons
Midwater Trawl Gulf of Maine	76.7 mt
Midwater Trawl Cape Cod	32.4 mt
Midwater Trawl Southern New England and Mid-Atlantic	129.6 mt
Bottom Trawl Southern New England and Mid-Atlantic	122.3 mt

The Council also discussed two other herring-related issues: (1) the Management Strategy Evaluation (MSE) process it used to develop the Amendment 8 control rule; and (2) a discussion document on Atlantic herring spawning on Georges Bank.

1. The Council is conducting a debriefing on the MSE process to identify perceptions, pros and cons, and lessons learned to help inform the Council about the potential use of MSE in other applications and whether or not it should be used again for herring. The debriefing will focus on collecting input from Council members and MSE participants, as well as summarizing how the process worked in other areas.
2. The Council has issued a contract to the Gulf of Maine Research Institute (GMRI) to review the literature and summarize previous discussions and data related to herring spawning activity on Georges Bank. A report will be presented to the Council in September. GMRI's Dr. Graham Sherwood is leading this effort. Anyone with related information should contact him at (207) 228-1644, gsherwood@gmri.org.

Questions? Contact Deirdre Boelke, the Council's Atlantic herring plan coordinator, at (978) 465-0492, ext. 105, email dboelke@nefmc.org.

- All herring documents and the presentation used during this meeting are available at Council meets June 11-13, 2019 in So. Portland, ME.

Atlantic herring. – School for Marine Science and Technology (SMAST) photo