Atlantic States Marine Fisheries Commission

Atlantic Menhaden Management Board

May 4, 2016
8:00 – 10:00 a.m.
Alexandria, Virginia

Draft Agenda

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

1.	Welcome/Call to Order (*R. Ballou*)	8:00 a.m.
2.	Board Consent • Approval of Agenda • Approval of Proceedings from February 2016	8:00 a.m.
3.	Public Comment	8:05 a.m.
4.	Consider Extension and Revision to Episodic Event Set Aside Program (*R. Ballou*) **Final Action**	8:15 a.m.
5.	Consider Draft Addendum I for Public Comment (*M. Waine*) **Action**	8:35 a.m.
6.	Provide Guidance to the Technical Committee Regarding Stock Projections (*R. Ballou*) • Review Stock Projection Methodology (*J. McNamee*)	9:20 a.m.
7.	Biological Ecological Working Group Progress Report (*S. Madsen*)	9:40 a.m.
8.	Consider Approval of 2016 FMP Review and State Compliance **Action** (*M. Waine*)	9:45 a.m.
9.	Elect Vice-Chair (*R. Ballou*) **Action**	9:55 a.m.
10.	Other Business/Adjourn	10:00 a.m.

The meeting will be held at The Westin Alexandria, 400 Courthouse Square, Alexandria, Virginia; 703.253.8600

MEETING OVERVIEW

Atlantic Menhaden Management Board Meeting
May 4, 2016
8:00 – 10:00 a.m.
Alexandria, Virginia

Chair: Robert Boyles Jr. (SC) Assumed Chairmanship: 8/13	Technical Committee Chair: Jason McNamee (RI)	Law Enforcement Committee Representative: Kersey
Vice Chair: Robert Ballou (RI)	Advisory Panel Chair: Jeff Kaelin (NJ)	Previous Board Meeting: February 3, 2016
Voting Members: ME, NH, MA, RI, CT, NY, NJ, PA, DE, MD, PRFC, VA, NC, SC, GA, FL, NMFS, USFWS (18 votes)		

2. Board Consent

- Approval of Agenda
- Approval of Proceedings from February 2016

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

4. Consider Extension and Revision to Episodic Event Set Aside Program (8:15 – 8:35 a.m.) Final Action

Background

- An episodic events set aside program, approved in May 2013, established 1% of the coastwide TAC as a set aside quota for the New England States (ME, NH, MA, RI, CT) to harvest Atlantic menhaden when they occur in higher abundance than normal.
- The set aside program was extended through 2015, so the Board needs to consider whether to extend the set aside again **(Briefing Materials).**
- Additionally, New York is experiencing episodic events of Atl. Menhaden and has requested to be added to the Episodic Event Set Aside Program (**Briefing Materials**).

Presentations

- Review Episodic Event Set Aside Program by M. Waine
- Review New York Request by J. Gilmore

Board actions for consideration at this meeting

- Consider extending episodic event set aside program and adding NY as an eligible state.

5. Consider Draft Addendum I for Public Comment (8:35 – 9:20 a.m.) Action

Background

- The Board initiated Draft Addendum I at its February 2016 meeting.
- The Draft Addendum considers allowing two individuals who are each authorized by their management jurisdiction to harvest 6,000 pounds of menhaden bycatch to harvest 12,000 pounds of menhaden bycatch when working from the same vessel fishing stationary, multi-species gear.
- The Plan Developed Team developed options to address this issue and will present it to the Board for their Review (**Briefing Materials**).

Presentations

- Review Draft Addendum I for Public Comment by M. Waine

Board actions for consideration at this meeting

- Consider approval of Draft Addendum I for Public Comment.

6. Provide Guidance to the Technical Committee Regarding Stock Projections (9:20 – 9:40 a.m.)

Background

- The Board has established a 187,880 metric ton total allowable catch for both 2015 and 2016 fishing years.
- The Board must discuss what projections are needed to inform the TAC setting discussion for 2017.
- The Technical Committee can provide updated projections with 2015 landings and assumed 2016 landings based on the current TAC, but would need until the August Board meeting to perform those projections.
- The Board will review the projection methodology previously used to set the 2015 and 2016 TAC and make decisions on what to include for projections for setting the 2017 TAC at its August meeting.

Presentations

- Review Stock Projection Methodology J. McNamee

7. Biological Ecological Working Group Progress Report (9:40 – 9:45 a.m.)

Background

- The Board has tasked the BERP WG to develop Ecosystem Based Reference Points (ERPs) for Atlantic Menhaden.
- Staff will provide an update on the development timeline for the ERPs.

Presentations

- BERP WG Progress Report by S. Madsen

8. Consider 2015 FMP Review and State Compliance (8:45 – 9:00 a.m.) Action
Background • State Compliance Reports are due on April 1 (**Meeting Room Table**) • The Plan Review Team reviewed each state report and drafted the 2016 FMP Review (**Supplemental Materials**)
Presentations • Overview of the 2016Fishery Management Plan Review by M. Waine
Board actions for consideration at this meeting • Accept the 2016 Fishery Management Plan Review, and approve *de minimis* requests.

9. Elect Vice-Chair (*R. Ballou*)

10. Other Business/Adjourn

DRAFT PROCEEDINGS OF THE

ATLANTIC STATES MARINE FISHERIES COMMISSION

ATLANTIC MENHADEN MANAGEMENT BOARD

The Westin Alexandria
Alexandria, Virginia
February 3, 2016

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

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INDEX OF MOTIONS

ATTENDANCE

Board Members

Terry Stockwell, ME, proxy for P. Keliher (AA)
Sen. Brian Langley, ME (LA)
Steve Train, ME (GA)
Doug Grout, NH (AA)
Cheri Patterson, NH, Administrative proxy
G. Ritchie White, NH (GA)
Dennis Abbott, NH, proxy for Sen. Watters (LA)
Jocelyn Cary, MA, proxy for Rep. Peake (LA)
Nichola Meserve, MA, proxy for D. Pierce (AA)
Bill Adler, MA (GA)
Eric Reid, RI, proxy for Sen. Sosnowski (LA)
Robert Ballou, RI, proxy for J. Coit (AA)
David Borden, RI (GA)
David Simpson, CT (AA)
James Gilmore, NY (AA)
Steve Heins, NY, Administrative proxy
Emerson Hasbrouck, NY (GA)
Pat Augustine, NY, proxy for Sen. Boyle (LA)
Tom Fote, NJ (GA)
Russ Allen, NJ, proxy for D. Chanda (AA)
Adam Nowalsky, NJ, proxy for Asm. Andrzejczak (LA)
John Clark, DE, proxy for D. Saveikis (AA)
Craig Pugh, DE, proxy for Rep. Carson (LA)
Roy Miller, DE (GA)
David Blazer, MD (AA)
Bill Goldsborough, MD (GA)
Ed O'Brien, MD, proxy for Del. Stein (LA)
John Bull, VA (AA)
Rob O'Reilly, VA, Administrative proxy
Kyle Schick, VA, proxy for Sen. Stuart (LA)
Louis Daniel, NC (AA)
W. Douglas Brady, NC (GA)
Robert Boyles, Jr., SC (AA)
Malcolm Rhodes, SC (GA)
Patrick Geer, GA, proxy for Rep. Burns (LA)
Jim Estes, FL, proxy for J. McCawley (AA)
Martin Gary, PRFC
Derek Orner, NMFS
Sherry White, USFWS

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

Ex-Officio Members

Jason McNamee, Technical Committee Chair
Jeff Kaelin, Advisory Panel Chair
Mark Robson, Law Enforcement Representative

Staff

Bob Beal
Toni Kerns
Mike Waine
Kirby Rootes-Murdy

Guests

Chris Wright, NMFS
Stew Michels, DE DFW
Leroy Young,
Loren Lustig, PA (GA)
J. Thomas Moore, PA
Lynn Fegley, MD DNR
John Bullard, NMFS/GARFO
Dan McKiernan, MA DMF
Brandon Muffley, NJ DFW
Peter Himchak, Omega Protein
Jimmy Kellum, Kellum Maritime
Shaun Gehan, Omega Protein
Ben Landry, Omega Protein
Patrick Paquette, MSBA
Drew Minkiewicz, KDW
Henry Dixon, Weems, VA
Mike Luisi, MD DNR
Kim Damon-Randall
Ken Hastings, Mason Springs
Greg Murphy, PA FBC
Arnold Leo, E. Hampton, NY
Robert Brown, MD Watermen Assn.
Burl Lewis, Cambridge, MD
Denise Lewis, Cambridge, MD
Joe Cimino, VMRC

The Atlantic Menhaden Management Board of the Atlantic States Marine Fisheries Commission convened in the Edison Ballroom of the Westin Hotel, Alexandria, Virginia, February 3, 2016, and was called to order at 10:20 o'clock a.m. by Chairman Robert Boyles.

CALL TO ORDER

CHAIRMAN ROBERT H. BOYLES, JR.: Good morning everybody my name is Robert Boyles; South Carolina Department of Natural Resources. It is my privilege and delight to serve as Chair of the Atlantic Menhaden Board. I would like to call the Menhaden Board to order.

APPROVAL OF AGENDA

CHAIRMAN BOYLES: The first item on the agenda is seeking your consent for the agenda, which was submitted with the meeting materials.

CHAIRMAN BOYLES: Are there any additions or changes to the agenda? I see none; the agenda is adopted by consent.

APPROVAL OF PROCEEDINGS

CHAIRMAN BOYLES: Also on the next item, approval of the proceedings from our November meeting down in St. Augustine, again meeting materials included the meeting minutes. Any suggested changes or edits to those notes, those meeting proceedings? I see none; those will be adopted by consent.

PUBLIC COMMENT

Now the time on the agenda for public comment for those items that are not on the agenda, and we have had one request to present to the board Shaun Gehan. Shaun, come on up; welcome.

MR. SHAUN GEHAN: Good morning. Thank you, Mr. Chairman, and I'll be brief; Shaun Gehan, here on behalf of Omega Protein. On the agenda today we'll be discussing a process for moving forward for establishing menhaden quotas for next year. What I would like to raise or have the board consider at this time at this meeting, would be putting on the agenda for May, 2016 meeting reconsideration of the current year quota.

As you recall last year at the May meeting this board decided to raise quota 10 percent last year and keep that steady for this year. Subsequent to that time however, we've seen an explosion in recruitment, numbers of adult menhaden up and down the coast in numbers that people can rarely remember.

In fact at this time herring fishermen, whiting fishermen up in southern New England are able to prosecute their fisheries. There is a huge school of menhaden parked there. People in fish traps can't catch their target species because they are choking up with menhaden. This is all new information.

By the May meeting you should have projections. There is not much new biological information, maybe the recruitment indices could be updated, but until we have a new stock assessment the projections are going to be very similar to what you saw last year and even with another 10 percent or higher increase this year there is a 0 percent chance of overfishing this stock. I would point out we're well, well under the management target; the target not the threshold. I urge this board to at least have that discussion. Vote to have the discussion. You can decide whether or not to reconsider this year's quota, but please put that on the agenda for May. Thank you.

CHAIRMAN BOYLES: That is all I have in terms of folks who have requested public comment, so we will go straight to the next item on the agenda.

CONSIDER CONSERVATION EQUIVALENCY MANAGEMENT PROPOSAL FROM MARYLAND AND PRFC

CHAIRMAN BOYLES: Agenda Item Number 4, Consider Conservation Equivalency Management Proposal from Maryland and PRFC. Let me at the outset say that we had a request to put this on the agenda as a conservation equivalency measure.

Upon further review, and I will apologize to the board. Upon further review it appears that the mechanism for a conservation equivalency is not allowed under our current plan. I would like, since it is on the agenda, an opportunity to afford PRFC and Maryland an opportunity to talk about their interest and at least present to the board what may be a potential path forward, should the board choose. Lynn, I will turn it over to you then.

MS. LYNN FEGLEY: Thank you, Mr. Chairman and thank you to the board for lending your ears and your consideration to this issue. The state of Maryland did file a conservation equivalence proposal to allow two, as did PRFC to allow two appropriately permitted pound netters who are permitted to harvest 6,000 pounds of bycatch to combine together and bring in 12,000 pounds when they're fishing their pound nets.

This is because we have a small group of fishermen who fish together in family groups and they commonly they share a vessel, they share crew, and they fish each other's nets from a common vessel. What we have done is force them to separate vessels, which increased their costs and in some instances it is a safety hazard; because they are using smaller boats.

The bottom line is, now having three years of data the first year with the combine bycatch and the second two years with 6,000 pounds; they're going to catch the fish. The bycatch situation we all know is problematic. We are not asking to catch more fish; we're simply asking to catch them more efficiently in the manner that our fishermen are accustomed to working as a group, fishing each other's nets together conserving resources.

We were not aware that we would have to do this through an addendum process. I really would like to appeal to the board that we need to keep our eye on the Amendment 3 ball. This is about a single problem, it is a problem of economy, and it is a problem of how we're handling bycatch. It is dramatically impacting people's lives. Our intent by doing this was simply to fix one problem while we are trying to get the whole system to the shop and fix it. That is the presentation, Mr. Chair. I will make a motion whenever.

CHAIRMAN BOYLES: Thank you, Lynn. Marty, you have anything you want to add?

MR. MARTY GARY: I think Lynn explained her rationale pretty clearly. The fishermen in PRFC jurisdictional waters for the very same reasons, cost efficiency, safety, feel the same way have made the same request to PRFC to our commission. Also because we're an adjoining jurisdiction there are the issues of regulatory and law enforcement consistency that we would like to apply to those. We're in lock step with Maryland.

TECHNICAL COMMITTEE REPORT

CHAIRMAN BOYLES: Folks, we had this on the agenda as a potential action item. With the agenda we had again as it was initiated as a conservation equivalency, we did ask the TC and the Law Enforcement Committees to take a look at this. I would like to beg your indulgence, and since those guys have done that work that we have asked them to do, I would like an opportunity for them to speak to this if that pleases the board. With that Jay, can you give us a sense of what the TC had to say about the proposed management action?

MR. JASON McNAMEE: Hello everyone, my name is Jason McNamee; I am the Chair of the Menhaden Technical Committee, so we had a conference call a couple weeks ago to review these. While you all just had a discussion about whether or not this may or may not be a viable action item. I think we still discussed a couple things during that call that warrant your attention.

I've got a quick presentation here. I am going to skip, Kirby to, I think it is Slide 4, to get right to the Technical Committee comments. My initial slides were just review of what we reviewed, which you've just gotten so I'll skip those. Basically the Technical Committee agreed by consensus that the Maryland – so during our call we had the proposal in front of us from Maryland, but we were informed on the call that a second proposal would come in that would be exactly the same from the Potomac River Fisheries Commission, which did happen.

We agreed by consensus that the Maryland and the PRFCs proposals would not adversely impact the biological status of Atlantic menhaden, so just an important caveat here is when we're doing a technical review we're talking specifically about the technical aspects of the proposal before us. Just keep that in mind.

We noted that the proposal would most likely not significantly change the harvest that is currently occurring; again talking about these two specific proposals. A couple other items that we noted that were considered protections within the proposal where the limited entry that is allowed into the pound net fisheries in these two jurisdictions. We expected that that would limit any potential expansion.

Then the final comment was, given the current status of menhaden, it is not overfished and not experiencing overfishing, and the limited amount of landings that are occurring under the bycatch allowance, which are right around 1 percent along the coast. The Technical Committee did not have biological concern with the contribution equivalent proposals.

Now we'll broaden out a little bit from talking about the specific proposals and speak a little bit more about the notion of the bycatch allowance as it stands. What we recommended as a Technical Committee was to continue monitoring the bycatch landings coast wide to ensure that an expansion of harvest can be addressed if it occurs.

The way the program works is you have a hard TAC that exists and then there is this soft part that exists so the bycatch allowance can go up, can go down; it is not locked in, in any way. It is again, a very small amount given the magnitude of the fishery. However, we just offer that it should be monitored because it could potentially expand.

The TC also recommended that the board consider further evaluation of the bycatch landings on a coastal scale as it develops Amendment 3, so you're currently in an amendment process. This might be an opportune time to think about this in a little more detail and figure out whether or not it warrants addressing. The points are that the bycatch portion of the harvest, it can expand; I just mention that. What we thought is it might be a useful exercise to have your state Technical Committee representatives or however you want to approach it. But to put an upper bound on what they think that expansion would be in that particular jurisdiction. That will kind of bound the problem, will help inform you as to whether or not it needs addressing or not. That is it. It was a pretty quick Technical Committee call and I am happy to take any questions that anyone has.

CHAIRMAN BOYLES: Questions for Jason?

MR. AUGUSTINE: Thanks for the report, Jason. It looks like Amendment 3 is not going to be ready for implementation until 2018. This seems like a special issue by itself. What I see it

means is that these fishermen who possibly could be combining their effort are going to be stymied for the next two or three years, '16, '17, and '18.

Would we not be better well served if we started a fast-track addendum to address that by itself, in view of the fact that Amendment 3 is going to be somewhat complex and that could drag out well beyond. From what Jason said and described, it looks like the Technical Committee had no real major concern about this; that it is doable.

The recommendation is that we would indeed have the Technical Committee track the bycatch to be on the safe side, so in fact if there is any issue that comes up it can be addressed as it occurs. I'm not sure which way you want to go with this, Mr. Chairman. It seems a critical issue here. I am not sure how many fishermen are involved. I don't remember what the number was that Lynn and Marty said were involved. But could we consider that and could we have some discussion on it from around the table to see what their interest might be?

CHAIRMAN BOYLES: Sure, yes we'll get to there but first right now let's get questions for Jason. We still want to hear from the Law Enforcement Committee as well. Further questions for Jay on the TC report?

MR. JAMES J. GILMORE: Jason, the conclusion of the TC essentially that this would not be an issue, essentially we would be still within all of our limits. Was that specific to if only this happens in the Chesapeake or if this was expanded to other places would that have to be an additional evaluation?

MR. McNAMEE: Good question and that was exactly the conversation that we had. We were talking about some very specific instances here. There were additional protections in these cases, they are limited entry; that sort of thing. For us to be able to evaluate it in a broader sense we would need more information from the different states as to whether or not these protections exist there, how this might work in the regulatory framework that they have in their state. It would need further evaluation from the Technical Committee.

LAW ENFORCEMENT COMMITTEE REPORT

CHAIRMAN BOYLES: Further questions? Jason, thank you. Mark, you had the Law Enforcement Committee looked at this as well. Would you give us the review of Law Enforcement's suggestions, comments?

MR. MARK ROBSON: I will be brief. We did have an opportunity during that teleconference call on January 7, to consider these proposals from Maryland. Again there were about 18 enforcement members from the committee present on the call. We reviewed the Maryland proposal specifically as it has been described here this morning. We got some later information regarding the PRFC proposal and had a chance to at least have those same individuals on the committee weigh in on that if they had any concerns.

We've also prepared and submitted to you a memorandum summarizing the LEC comments; just to quickly go to those comments. There really were no specific concerns raised about this proposal. It was noted that particularly from the Maryland enforcement representative that this was something that they had seen before and were able, they felt, to address any concerns with any enforcement issues of coping with two permitted individuals on the same vessel harvesting bycatch.

There was I guess, they couldn't put a finger during the call on any specific concern, and having PRFC join in on this was a matter of consistency that they would support certainly. There was, I guess I would describe it as kind of healthy enforcement skepticism about possible loopholes, the unforeseen possibility that this could somehow increase daily trip bycatch violations.

But there is really no specific case or circumstance that they could point to, so they simply asked that we have an opportunity to kind of take a look at how this is going within a year or two and if there are any unforeseen problems with this bycatch daily trip limit being exceeded or violated, then we could address that at that time. That is my comment, Mr. Chairman.

CHAIRMAN BOYLES: Questions on the Law Enforcement Committee report from Mark? Okay I see none. Lynn.

MS. FEGLEY: Again, this is really intended to fix what is a very serious problem for our fishermen until such time as Amendment 3 can be implemented, and with that **I will make a motion to initiate an addendum to allow two individuals who are each authorized by their management jurisdiction to harvest 6,000 pounds of menhaden bycatch to harvest up to 12,000 pounds when they are working aboard the same vessel; fishing, stationary, multispecies gear, limited to one vessel trip per day.**

CHAIRMAN BOYLES: Motion by Ms. Fegley, is there a second? Louis is that a second? Discussion on the motion?

MR. WILLIAM A. ADLER: I have no problem with this, but I did have a couple of questions. First of all I understand apparently this is a bycatch in another fishery. Then also, can we do this by conservation equivalency if you already said, or just by an addendum to something that is in an amendment. If you can that's great.

I was thinking about opening the can of worms, where they got 12,000 why can't we? I think the Technical Committee had that same fear, trepidation about it. I don't remember why we had the 6,000 in the first place. I'm sure there was a good reason for it. I have no problem with this if it can be done, and I'm assuming it is not just for two people it is for anybody that wants to put two guys on the same boat and get the 12 rather than just for two people? Is that what this is?

MS. FEGLEY: The intention is that the two individuals who are working together are each appropriately permitted by the state or the management jurisdiction. In Maryland we have limited entry. You have to apply for a permit to get the bycatch allowance. Those permits are non-transferrable. It is a fairly tight system. This motion is not crafted to be specific to Maryland and PRFC; it is crafted to be specific to multispecies gear. But the intent is that those people, those two individuals are appropriately permitted and preferably limited in number.

MR. ADLER: If I may. But are there other individuals that do have the permits in your states that could also apply for this? I have no problem with it, but I mean is it just two people or are there other sets of people that could take advantage of this?

MS. FEGLEY: It is just two people and it is only the people, there are a limited number of people who have a permit for 6,000 pounds. Any of those people could get on the same boat and fish one another's gear and combine their bycatch allowance to catch 12,000. They are working together harvesting one another's gear. A husband and wife each with nets, a father and son each with nets, they work together.

CHAIRMAN BOYLES: Bill, let me go back to your initial, again I have to beg the board's indulgence here. When the request was made PRFC and Maryland said here is a special case, a very specific case; and the intent was to pursue this under conservation equivalency. Being the bright guy that I am, I thought okay conservation equivalency, we'll ask the TC and we'll ask the Law Enforcement Committee to review.

Your Menhaden Board chairman didn't recognize it as specifically not allowed under

conservation equivalency. Let me be clear, Robert's fault. This kind of action is not allowed under conservation equivalency. The only avenue for PRFC and Maryland to pursue this is through an addendum, so that is why we're here.

MR. G. RITCHIE WHITE: I have no problem with this at all, but out of curiosity what species are they fishing for where this is a bycatch, and what kind of volume would they be catching of those species?

MS. FEGLEY: This is the very interesting question of the definition of bycatch. A Chesapeake Bay pound net sits in the water and fish swim to it and are entrapped. There are some nets that encounter menhaden. The other major fishery that is coming out of these nets is striped bass. We all know the dockside value of striped bass is significantly greater than that of menhaden. The issue though is that when a school of menhaden swims by a pound net, you are going to have more menhaden than anything else in that net on that day.

That is just the way it works, because of the schooling nature of menhaden. There is a debate to be had over what is directed and what is not directed. But I believe the state of Maryland provided to the board at some point a list of all the species coming out of these nets, which include menhaden, striped bass, spot, croaker, bluefish, flounder, and others.

CHAIRMAN BOYLES: Okay I'm getting a list of folks who want to ask questions about this or want to discuss it.

MR. BOB BALLOU: I think this is a question for Mike Waine. Mike, if the board were to enact this proposed addendum, would it be a return to the exact same provision that was in the original Amendment 2 regarding this issue? Do you happen to know that offhand? Is it the same wording or is there a slight nuance here?

MR. MIKE WAINE: The way the bycatch allowance provision is currently written, this is not permitted. The intent of the addendum would be to change the way the bycatch allowance provision is worded to accommodate those two permitted individuals aboard the same vessel landing up to 12,000 pounds. Right now they can land it separately from separate vessels, 6,000 pounds on each vessel; but they cannot land it together from one vessel up to 12,000 pounds.

MR. BALLOU: I'm sorry. I may have asked my question poorly. I think this is very similar to an original provision in Amendment 2 that sunsetted. It was in effect for at least a year if not two. I'm just wondering if this is a return to that exact same provision or if there is a slight nuance here; if you understand my question now.

MR. WAINE: Yes I do now, and there are like 30 pages of proceedings when we talked about this the last time, which was May of 2013. This came up in Maryland and PRFCs implementation plans when they were submitting their regulatory code that demonstrated they are adhering to all the new provisions of Amendment 2, and part of their implementation plan was to allow for this to happen.

What ended up happening was the board did allow for this to happen for 2013, which was the first year of the implementation, and then it reverted back to the way it is worded in Amendment 2. In order to change the bycatch allowance provision the plan requires an addendum that cannot be done through conservation equivalency. The short answer to your question is yes, this was already permitted for one year but the plan doesn't currently allow it, so that is why we're pursuing an addendum for this topic.

MR. RUSS ALLEN: First off I don't really have an issue with Maryland or PRFC helping out their pound net fishermen in this manner. My

question is, when we're talking about stationary multispecies gear and opening it up coast wide does that include anchored in state gillnets; because that changes the whole process for us in certain areas? Not that I think that the amount of bycatch would be anywhere near doing any damage to the resource itself, but it just opens up a can of worms for us. That is my only real question is, does that include gillnets?

CHAIRMAN BOYLES: My read Russ is this is a very specific jurisdictional specific, two jurisdictions, PRFC and Maryland addendum. Again, your chairman suggested we do this via conservation equivalency. I was corrected, so no. Maryland, PRFC would be where this would apply.

MR. DAVID V. BORDEN: You gave me the perfect lead in to my question. My interpretation of this, this was going to be a coast wide provision and not a state specific provision allowance. I personally can support the concept being developed as long as it is a coast wide provision, but if it is state specific I'll vote no.

MR. WILLIAM J. GOLDSBOROUGH: I would like to speak in support of the motion and the whole concept. I had a specific comment to make, but I'll first say to Dave Borden's point that certainly from my perspective this would be and should be a coast wide provision; the way I'm looking at it. But I wanted to speak to Bill Adler's comment where he couldn't recall where this bycatch allowance came from in the first place. Let me just recap, back when Amendment 2 was adopted in December, 2012.

That special meeting we held in Baltimore for those of you that were there. We were grappling with the first time institution of a coast wide quota and of course basing it on historic baseline period. But we had a wide range of comfort level with the harvest data that we had for the baseline period, especially for the small scale fisheries like the pound netters.

Because of that we actually were contemplating different allocation scenarios between reduction and bait. If you recall, where we have excellent catch data for reduction as you know, questionable in some sectors of the bait fishery, and so if you will recall we actually had a motion on the floor at that meeting to consider an 80/20 breakdown between reduction and bait, which is what the data that we had from the baseline period suggested it was; a 70/30 breakdown and a 60/40 breakdown.

The wisdom of the board was that in a single meeting at that juncture, those kinds of changes were too big of a shift in allocation. Really we needed to give it more thought and so we backed off from that motion and decided instead and incorporated into Amendment 2, a plan to revisit allocation in three years and that is what we're doing under Amendment 3 right now.

But at the same time, we recognize that there was uncertainty with respect to the small scale gear catch history. To provide a buffer for that especially for these multispecies fisheries, for which shutting down in midseason really would be onerous, given that it would shut down the other target species as well.

We decided to adopt a bycatch allowance. That is where this came from. It really is a necessary measure to have in place to allow these fisheries to continue until such time as we have revisited allocation and gained more certainty with respect to the catch history in those fisheries.

CHAIRMAN BOYLES: Let me clarify. The seconder of the motion corrected me – I'm 0 for 2, you all – corrected me that the intent was for this to include, would be a coast wide addendum that would authorize jurisdiction, so Dave I apologize again. Man, I need help. Lynn, let me make sure that that is your intent as well is that this would be an ecumenical addendum and not necessarily apply only to PRFC and to Maryland.

MS. FEGLEY: Yes, Mr. Chairman. The intent was for it to be coast wide for the stationary multispecies gears.

CHAIRMAN BOYLES: Okay and with that I am going to turn to Mike and just again make sure that I don't mislead you a third time, in terms of what such an addendum might include. I've got Steve and then Terry and then Jim, so Mike can you talk us through what an addendum like this might entail?

MR. WAINE: Yes. Part of this is to hope to answer some of the concerns that were brought up. Russ had the question about how do we define a stationary fixed gear? What we could do is go into the bycatch data that we have over the last two years and look at the different gear types that are landing under the bycatch allowance, and bring the board back some options to look at, whether this provision would apply to just the pound nets or if it would apply to the state gillnets and any of the other gears that have been landing under the bycatch provision. Then the board during review of the public comment draft of this addendum could basically make the decisions about whether they want to take those multi gears out to public comment or whether they want it to be only specifically for pound netters.

I think that there is some flexibility that the PDT could work with the data to get a better sense for what this would look like in terms of the different gear types, and what different jurisdictions are taking advantage of the bycatch allowance. I think that we could do that absolutely for drafting the public comment draft for the May meeting.

CHAIRMAN BOYLES: With that clarification, again my apologies. I've heard from several of you that you could support the motion. I've got Steve and Terry and Jim. What I would like to do, is there anybody who would like to speak against the motion? I see none; so the motion before the body is to move to initiate an addendum to allow two individuals who are each authorized by their management jurisdictions to harvest 6,000 pounds of menhaden bycatch to harvest 12,000 pounds of bycatch when working from the same vessel, fishing stationary multispecies gear limited to one vessel trip per day. That motion was by Ms. Fegley, seconded by Dr. Daniel. Do we need to caucus?

DR. LOUIS B. DANIEL: I don't know if this is a point of order or not. But I would add, 12,000 pounds of menhaden bycatch. That could create a problem for us if you don't make that clarification.

CHAIRMAN BOYLES: Technical correction accepted.

EXECUTIVE DIRECTOR ROBERT E. BEAL: Just a question on intent of the motion. The last clause there, limited to one vessel trip per day. Does that mean each permit holder can only have one landing event per day? Is that the intent here so that you can't switch vessels, you can't put a new; it is one 6,000 pound landing per day per permitted person. Is that permitted fisherman, is that correct?

MS. FEGLEY: Yes thank you for bringing that up. The intent of this motion is for these permits. This happens once per day. I don't know what the appropriate wording is, but for the record for clarification, two people fishing together they can't split up and then go fish again in another couple and do this again. The intent is not to allow double dipping; the intent is for this to be a single day event. Sam and Joe fish together, they are each permitted. They bring home their catch. They are done for the day.

CHAIRMAN BOYLES: The question is before us. **All those in favor of the motion signify by raising your right hand; 16, all those opposed, no; raise your right hand, null votes, abstentions. Motion carries.**

MR. THOMAS P. FOTE: Yes since this is going to be coast wide, I want to make sure that we have no conservation equivalency to change this around later on. I made that mistake once. We want that included in the addendum that we can't do changes like that on it. That will stay the exact way it is written in the thing.

MR. WAINE: Tom that is already in the amendment. That is actually why PRFC and Maryland have to pursue this through an addendum, and I don't believe the intent is to change that language in this addendum.

DR. DANIEL: Just some comments that Mike made during one of his testimonies to us is going and looking at gillnets and having the Technical Committee or staff look at other options. I think the motion and the intent was just to deal with pound nets to avoid having to come back and address that.

I don't know that there is any interest. There is certainly none in my part to allow any other gear besides the stationary pound net gear. The record is replete with that discussion from the 2013 discussion, so I would hate for staff to spend time looking at that if that is not the intent of the board. It certainly was not my intent.

CHAIRMAN BOYLES: So noted. Next item on the agenda. Russ.

MR. ALLEN: The reason I brought up the issue is because there will be interest in New Jersey to do this. I would look forward to seeing what the Technical Committee could come up with on that issue in the PDT. I appreciate that. Thank you.

MR. ROY W. MILLER: If the Technical Committee is going to consider this issue that Russ raised, for instance. Will bycatch of other species be a factor in their analysis and in our deliberations? In other words, ostensibly other species, non-target species can be released from pound nets, perhaps with lower mortality than other species can be released from anchored or state gillnets. That is kind of what I was thinking, and I was wondering if that will be a consideration as well.

MR. WAINE: In our FMP reviews which we do annually; we've been looking at sort of this bycatch allowance provision and have been trying to get more data on it. That has recently included other species that are caught as part of those bycatch allowance trips for menhaden. It is something that we could try to pull together to include in the addendum as some background information that identifies what other species are being caught during these bycatch allowance trips.

From the two years of data that we have, to the extent that the state agency datasets for the trip level data would permit us to do that. I guess my point being is we can do what we can to incorporate some of that information for the addendum as sort of the background portion of the document.

MR. MILLER: Thank you for that explanation, Mike. What I was thinking is some of the states like our state, has closure periods as part of their weakfish management plan. When there is a closure period for a non-target species I could see directing additional effort on menhaden during those closure periods might be problematic.

EXECUTIVE DIRECTOR BEAL: One of the things that are pretty important is this was not included in the action plan or the budget for this year. I was going to say I think this is a pretty simple, straightforward issue and the states can do their own hearings. But I'm not sure that is the case.

Regardless, I think we had not budgeted for a staff person to travel up and down the coast and do a lot of hearings, so we may have limited finances to provide staff at these hearings. If states are able and willing to do one themselves it might be really helpful. That will be after, you

know it will be summertime, assuming this goes forward and the board approves it at the May meeting, but something we'll need to consider.

DR. DANIEL: Yes and I am sorry, Mr. Chairman for my confusion here. I am trying to reconcile what the motion says and now what we're discussing. The motion says stationary, multispecies gear. That would not include gillnets, trawls, cast nets, anything else. It only would include, as far as I know it would only include pound nets. If the direction is for the staff to look at other gear types that is inconsistent with the motion.

CHAIRMAN BOYLES: You're right, Louis. I was ready to move on to the next agenda item. The motion that carried and passed unanimously is there before you, so there we go; any further discussion?

MS. JOCELYN CARY: I just want to clarify something really fast. Is this limited to existing permit holders or will it sort of carry over to new people?

MR. WAINE: In these jurisdictions, and Lynn and Marty can correct me if I'm wrong, they have limited entry programs in place. It would follow their procedures of how entry into that fishery occurs under their limited entry program. I guess if this opens up to other jurisdictions that have pound netters but don't have limited entry then it would be a little bit different. I think we'll learn more about that as we sort of explore this issue through the addendum development process.

REVIEW OF DRAFT AMENDMENT 3 DEVELOPMENT TIMELINE

CHAIRMAN BOYLES: Is there further discussion on the motion that has passed this board unanimously? We will move on to the next agenda item, Mike; Draft Amendment 3 Timeline.

MR. WAINE: I just wanted to take a moment and remind the board about what happened at our last board meeting and give them, hopefully a clear indication of what I anticipate Draft Amendment 3s timeline to be. I am going to start by talking about the motion that passed, and that was move to proceed under Option 2, which initiates a public information document in 2017 and includes ecological reference points and allocation with the CESS report to be implemented in 2018.

That is the motion that passed at the last meeting. Let's break down what that motion actually means. The draft amendment is going to have two major topics. It is going to look at ecosystem reference points and it is going to revisit allocation. The amendment process has two rounds of public input.

The first is a scoping document that is a public information document that we planned to develop for early 2017, and then Amendment 3 would be developed from that scoping document in later 2017, aiming for implementation in 2018. Just drilling down a little bit more on what I plan or what I see there to be in terms of the topics included in the public information document. In terms of allocation considerations, remember that there was a board working group that was set up to create a potential list of allocation options, and that has been compiled.

It was distributed to the board. We have a really solid foundation of all the various allocation options that could be pursued in the menhaden fishery. Now the CESS at the same time, the CESS is completing an RFP for a socioeconomic analysis that is anticipated to be available in early 2017. The commission is working on finalizing a contract now.

We've received proposals and we're in the final selection process for doing that. We anticipate that that contractor will do the work over the next year. In very early 2017, probably late February, we will get that information from the

contractor regarding the socioeconomic analysis. The intent is for that information to help guide the allocation discussions, so keep that in the back of your mind for when we talk about the timeline.

ECOSYSTEM REFERENCE POINTS

MR. WAINE: Now in terms of ecosystem reference points, we currently are using biological reference points that came right out of the 2015 benchmark stock assessment. Those are reference points that were recommended by the peer review and accepted by the board for management use. They are not currently part of a management document.

The intent was to consider those reference points through the next management action. Ecosystem reference points are also being concurrently developed, and there are some ERPs available now but the BERP Working Group does not recommend using those for management. But the board could still consider putting those into Amendment 3.

Then at the same time the BERP is developing ERPs over a more extended timeframe of 2019 to 2020, and so although those won't be available for Amendment 3 on the current timeline, they could potentially be implemented through the adaptive management process as we intend to scope ecosystem reference points through the Amendment 3 process.

Let's look at a potential timeline to sort of summarize everything that I just talked about. PID stands for public information document that is that first round of scoping. The intent would be to develop that PID for public comment for the board to review at their basically annual meeting this year. We would draft those topics into sort of a scoping document, and allow the board to provide input on that information before it goes to the public for that comment period.

What would happen would be a public comment period from November through February of '17. We would conduct hearings, et cetera, collect all our comment and bring it back to the board at the February, 2017 meeting where the board would use the information and the input from that public information document to start drafting the actual Amendment 3.

FISHERY ALLOCATION AND SOCIOECONOMIC ANALYSIS

MR. WAINE: At the same time that the board is providing guidance to the Plan Development Team for drafting specific options in Amendment 3, the socioeconomic analysis that I talked about would be coming out; and the PDT could be using the socioeconomic analysis and the different allocation options that were scoped to try to help, basically materialize information that would help solicit input on the different allocation scenarios. That PDT would develop the Draft Amendment 3 over two meetings. It would be provided guidance in February on the drafting. The PDT would work between February and the May meeting, we would likely probably come back to the board and say, hey here is where we're at with the amendment. This is just a check in, does the board want to give more guidance on a few areas here and there? Then we would go back and continue drafting to have a draft for public comment at the August meeting next year.

Assuming that draft passes the boards review we would then send it out for public comment and input. We would conduct another round of public hearings, bring all of that comment back for the boards final review in November of 2017, so that would be our annual meeting next year. Then at that time the board would then establish an implementation date for whatever final options were selected in the management document, and that would be anticipated to be 2018. I'll just say this.

Amendment 2 took quite some time, so we will continue to sort of think through these issues at a staff level so that we're prepared to deliver on these timeframes. We've already started working on some of the habitat sections in the document, et cetera. We will continue to do that so that some of the more background level information will be compiled by the time we get to that information document.

Now my last slide here just talks about where we're at in terms of our total allowable catch and our quotas for the coming years. The board has set a TAC for both 2015 and 2016. They already did that through a specification process in early '15. We have a stock assessment update that will occur in 2017, but none of that information will be available until later in 2017, and so there won't be any more biological information in terms of fishing mortality or fecundity estimates relative to the reference points until late in 2017.

Ultimately in the interim the board needs to set fishery specifications for 2017**.** As I mentioned the timeline for Amendment 3 isn't until implementation in '18, so '17 is the year that needs some attention right now. That is the next agenda topic that we plan to talk about is when to actually set those 2017 specs. I would be happy to answer any questions on the timeline.

CHAIRMAN BOYLES: Questions for Mike on the timeline for Amendment 3?

MR. BALLOU: Mike, could you go back to I think it was your second to last slide. It was a detailed slide with a range of milestones associated with the PID through Draft Amendment 3 process. I'm sorry; I guess I'm talking to Kirby here. Thank you, Kirby. There it is. That timeline clearly pertains to the revisiting allocation issue. Does it also pertain to ERPs at all?

MR. WAINE: Yes. There are two major topics for this amendment. One is revisiting allocation and the other is ecosystem reference points. Now as I mentioned in my presentation the BERP Working Group, which is a technical group working on ecosystem reference points, is working on a longer timeframe for reference points through some of the modeling processes that the board received information on at our last meeting.

However, there are some ecosystem reference points that are available now and could be scoped through the Amendment 3 process. The idea of ecosystem reference points is something that the board has been moving through for quite some time. As of now I see the two major topics in Amendment 3 to be ecosystem reference points, the ones that are available that are conducive with the timeframe for the amendment, and revisiting allocation.

MR. ADLER: Very quickly, explain why the PID won't be ready until November, 2016. Why not in August? I mean is there some other thing you're waiting for on that?

MR. WAINE: Not really. The intent was just to have a more continuous timeline for the PID leading into the development of the draft amendment. To bring the comment back to the board for February so that they could then guide the Plan Development Team on what to include in the actual draft amendment.

If we changed the timeline of the PID to August, which we could do if the board so pleased. Then there would be a slight disconnect I think in drafting the amendment from the PID, meaning if we took it out in August for comment, we would come back in November for the board to give more guidance on the amendment.

But we're not going to have that socioeconomic analysis until February, so I assumed that the board sort of wanted to combine those two items into giving direction to the Plan Development Team, and that is why I was suggesting this timeframe as opposed to an

earlier public information document. But absolutely, if the board wanted to see this earlier we could start working on this after. We would be working on this other addendum that just got initiated this morning again, but we could probably deliver for August if we wanted to change the timeline.

CHAIRMAN BEALS: Further questions on the timeline? Jeff?

MR. JEFF KAELIN: I just wanted to ask if it is planned for the AP to meet to review the PID and the Amendment 3 document at appropriate time during this process.

TIMELINE FOR SETTING THE 2017 FISHERY SPECIFICATIONS

CHAIRMAN BEALS: Sure. Further questions on the timeline? We'll go right into the discussion about the timing for setting the 2017 Fishery Specifications. Eric, I think you brought this up at the tail end of our meeting in St. Augustine. The question really before the board is as you know; the last action we took back last May is we specified the fishery for 2015 and 2016.

The question is of course, when do we wish to specify the fishery for 2017? As I understand it, if we want updated projections incorporating 2015 landings data, then we will want to do that specification in August. If we wish to make that specification prior to then in May, it will not incorporate the 2015 landings. What is the pleasure of the board? Mike, did I characterize that accurately?

MR. O'REILLY: I guess I would have a question as to what else would be intended to accompany the update from the landings, what other information? We heard from Mike about what won't be available because of the timing of the assessment, but are there other types of information that would go along with the landings projections?

MR. WAINE: Jay can jump in if I don't cover it, but basically when the board set the 2015 and 2016 TAC, they received projections from the 2015 stock assessment, which had 2013 as the terminal year. Those projections made assumptions on what the harvest would be in 2015 and 2016, because we didn't have the information at that point to tell us what the actual harvest was.

This would simply be updating those projections, the same ones that we completed the last time the board looked at them with the actual landings that occurred in 2015. We could also assume that the landing in 2016 will be what the TAC is in 2016, assuming no substantial overage and then project to '17 what the status would be with the different TAC options that were explored the last time by the board.

MR. ADLER: In other words if we put off doing this until let's say May, you would have more information I guess, or even August. My question would be, if you wait until then to get the more information and then we set the specifications, you don't see a problem in implementation; you've got plenty of time, right to put it into 2017? Correct?

CHAIRMAN BOYLES: Yes that is correct.

MR. ADLER: Then I would think that the logical thing to do would be to wait, get that information and then make our decision and we do still have time.

MR. AUGUSTINE: The downside is, if we find that we're under harvest we have an impact and the upside is the opposite or maybe it's just reverse; we have an impact and again we're using old data. Do we want to be out of sync by another year and another stock, and I agree with what Bill Adler says. I think we need to go ahead and incorporate that information.

CHAIRMAN BOYLES: Any alternative perspectives? Is there a sense that we will do

specifications 2017 in August? Okay. That will be it. Any other business, okay Jay actually has some additional information here. Jay.

MR. McNAMEE: It is not necessarily information. This just popped into my head as Mike was answering Mr. O'Reilly's question. This was stated, but it would be helpful to get clear guidance on the projections, and so I think the easiest – so I'm thinking about the folks who are going to perform the projections in the Technical Committee review.

There are a number of assumptions in those projections. We had a long, rigorous discussion about those assumptions, so it would be helpful to have the guidance if it was the board's desire to only change the catch stream for the projections and maintain all of the other assumptions as they were defined previously. I just think it would be helpful if that clear guidance came from the board to the technical folks.

MR. WAINE: Yes thanks, Jay. If the board, it is actually up to the board, but if the board wanted to sort of see what those projections were and all the different assumptions that the Technical Committee made, we could show the board that information in May; because remember in order to update the catch information we'll need until August, because we won't' have that information until May as it is. If the board would feel more comfortable in us showing them and giving them a little bit more information before making that decision, we have time to do that and could do that in May.

MR. DAVID G. SIMPSON: The catch stream would be one thing. The other important thing would seem to be recruitment. If we don't have recruitment since 2013 or 2012, you know you've got a lot of new fish coming into the population so that seems to be at least as important as the catch stream to inform us on quota setting for '17.

MR. McNAMEE: I appreciate your comment, Dave and you're exactly right. That is one of the other major assumptions that I'll say the other big one that is at the top of my head is natural mortality that you assume. But the recruitment is an estimated entity from the model and so we there won't be an update of the assessment, it will be taking that terminal year again and just updating the catch assumptions. There won't be new information on recruitment.

MR. SIMPSON: Okay so the recruitment assumed would be the recent average or what would it actually be? I'm not familiar with the details of the menhaden model.

MR. McNAMEE: I am hesitant to give you that specific answer. We could look that up, but it was an assumption. I can't remember the number of years, but yes you have the gist of it.

MR. O'REILLY: If I understood the discussion from a few moments ago and what Jay said. It would seem that the board should hold to the assumptions that were present with the assessment that was finished up in late 2014. This is somewhat of a quasi-update of an assessment, partial; and I would think that those assumptions should hold until the benchmark. I mean that might be one way of looking at it, even though it is not an updated assessment until later on. But I think if we're going to have the projections, I think the assumptions that were held should stay there.

CHAIRMAN BOYLES: Further comments?

ADJOURNMENT

CHAIRMAN BOYLES: Okay, any other business to come before the Menhaden Board? Seeing none; thank you all. The meeting will adjourn. Bob Ballou, looking forward to passing the baton; so get ready for May. Thank you all, we're adjourned.

(Whereupon, the meeting was adjourned at 11:26 o'clock a.m., February 3, 2016.)

Atlantic States Marine Fisheries Commission

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MEMORANDUM

TO: Atlantic Menhaden Management Board

FROM: Michael Waine, Senior Fishery Management Plan Coordinator

DATE: April 19, 2016

SUBJECT: Considering Extension and Revision to Episodic Event Set Aside Program

Through Amendment 2 to the Fishery Management Plan for Atlantic Menhaden the Board agreed to set aside 1% of the coastwide total allowable catch (TAC) for an Episodic Event Set Aside Program. Amendment 2 allowed the flexibility for the Board to develop a mechanism for state(s) to use the set aside through Board action that included a qualifying definition of episodic events, required effort controls to scale a state's fishery to the set aside amount, and a timely reporting system to monitor the set aside.

At its May 2013 meeting, the Board (through action) further established the episodic events set aside program and specified that it would be for the New England States (ME, NH, MA, RI, CT) because episodic events (menhaden occurring in larger abundance than they occur normally) were historically common to that region. At that time, the Board also established mandatory provisions to participate in the set aside (i.e., daily reporting, 120,000 pound trip limit, and restricting harvest to state waters). Although the details of the set aside program were decided through Board action, staff documented provisions of the plan through Technical Addendum I to Amendment 2.

At its October 2013 meeting, the Board reviewed the performance of the Episodic Event set aside program and extended it through 2015 (through Board action). At that time, the Board also added a re-allocation provision, meaning any unused set aside as of October 31 of each year will be re-allocated to the coastwide states based on the same allocation percentages included in Amendment 2.

Considering the Episodic Events Set Aside program sunset in 2015, the Plan Review Team is asking if the Board would like to consider extending the set aside program especially considering the program was used in previous years by the State of Rhode Island.

Additionally, ASMFC has received a request from the State of New York regarding consideration of adding New York as an eligible state to harvest from the Episodic Event Set Aside. Although they are not a part of the original program, they are experiencing episodic events of Atlantic menhaden abundance and are located in geographical proximity to the New England Region. Enclosed is a proposal from the State of New York that details its request.

Enc: Menhaden Episodic Event in New York

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

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Episodic Fish Kill of Menhaden Documented in 2015

During April of 2015, a massive amount of adult menhaden were reported in the Peconic Estuary in New York. In May and June, a series of large fish kills, consisting of hundreds of thousands of Atlantic menhaden, occurred in the Peconic River on the east end of Long Island. A combination of factors led to the fish kills, including: increasing water temperatures; algal blooms that increased nighttime oxygen demand through algal respiration; and sediment decay processes that depleted oxygen levels[1]. These conditions resulted in asphyxiation of the menhaden[1]. Additionally, the menhaden were trapped within the river by actively feeding bluefish, which prohibited the menhaden from escaping and contributed to the magnitude of the die off[1].

Current Risk of Another Episodic Fish Kill of Menhaden

Early in April of 2016, substantial schools of adult menhaden began pouring into the Peconic River. There appears to be a much higher biomass than last year. There is major concern by the Town of Riverhead and NYS DEC that conditions are ripe for another large fish kill in the same area. These large fish kills result in enormous clean-up efforts/costs, public concern, and loss of public recreational opportunities. It would be prudent for us to avoid a repeat of last year's fish kill, or worse.

New York's Request to Harvest from Menhaden Episodic Event Set Aside

In order to avoid another large menhaden fish kill, New York is requesting a one-time harvest in 2016 of these menhaden under the Episodic Events Set Aside Program, as described in the ASMFC Technical Addendum I to Amendment 2 of the Interstate Fishery Management Plan for Atlantic Menhaden. This program was put in place in order to allow harvest of menhaden when they are available in a greater abundance than they normally occur, as is the case now in the Peconic River.

New York's menhaden quota (104 mt) is expected to be reached by May or June (i.e., prior to September 1). Due to the small quota New York receives, our directed fishery will likely be closed by time the menhaden are harvested from the Peconic River. Without the Episodic Events Set Aside Program, we have no way of removing these menhaden as part of our normal fishery to prevent another fish kill.

The Episodic Events Set Aside Program is currently only eligible to the New England states (Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut). That

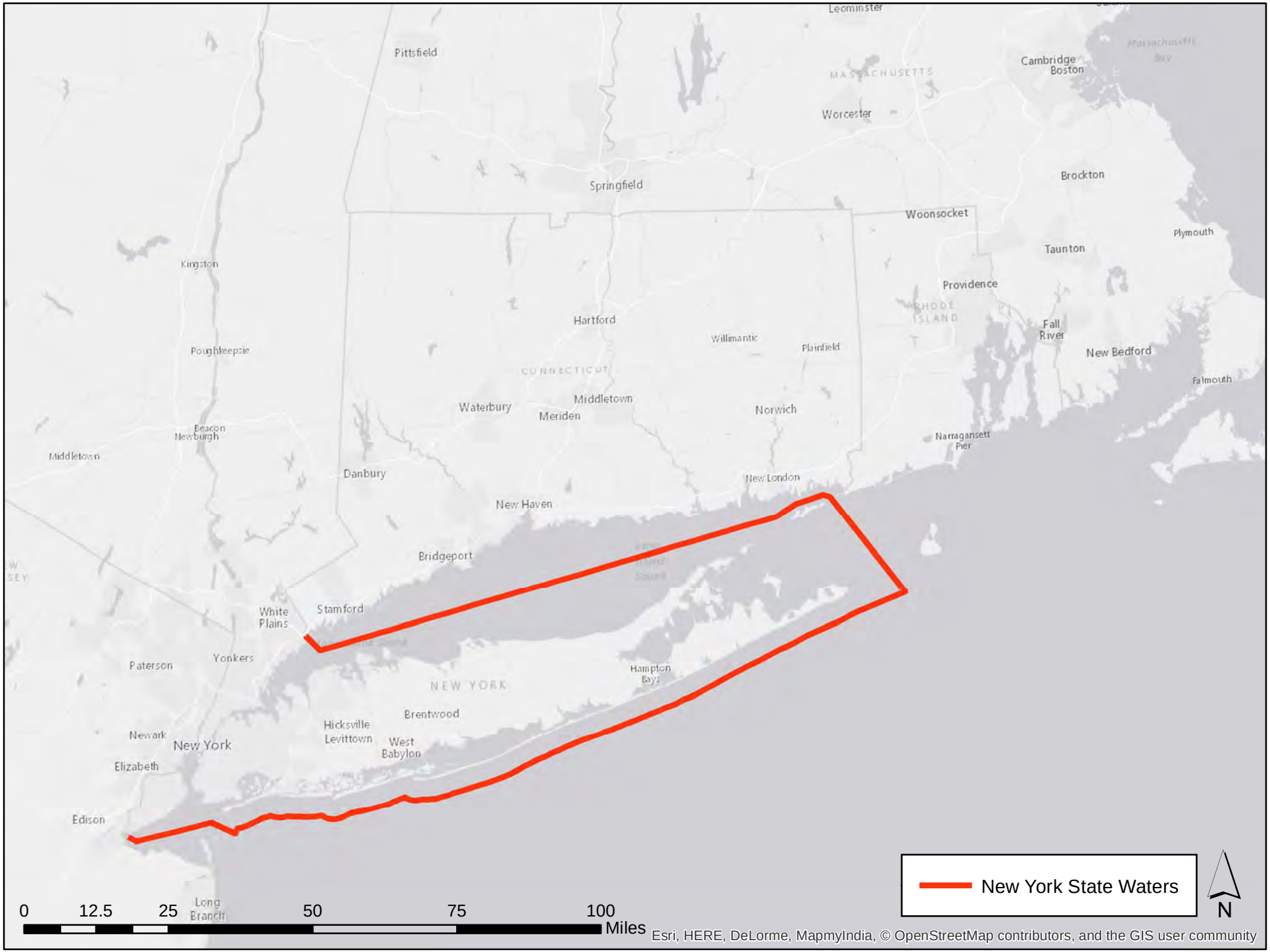
[1]. Suffolk County Department of Health Services, New York Department of Environmental Conservation, Stony Brook University. January, 2016. Investigation of Fish Kills Occurring in the Peconic River-Riverhead, N.Y. Spring 2015. 41 pp.

decision was because historically episodic events were more common in New England, but New York is clearly documenting episodic events currently as described above. Additionally, New York is in very close geographic proximity to Connecticut especially considering New York State waters around Fisher's Island at the eastern end of Long Island overlap with Connecticut's state waters (see Figure 1).

Lastly, all other criteria have been met to merit a harvest of these menhaden under the set aside program. Specifically, the episodic event harvest will be restricted to New York waters, under a maximum daily trip limit less than 120,000 pounds per vessel. Participating vessels will be required to report daily trip level harvesting. New York will track landings and submit weekly reports to ASMFC staff.

Addressing Potential River Herring Interaction

There is some concern about harvesting menhaden during the river herring spawning season. A retired DEC Biologist is currently monitoring alewives in a major tributary to the Peconic River as part of a Long Island volunteer alewife survey. Blue back herring spawn later in the year, usually beginning in June. In order to mitigate any negative impacts on river herring and avoid them as bycatch, New York will monitor the river herring abundance in a tributary of the Peconic River in the vicinity of the menhaden biomass. Harvest of menhaden will not occur until river herring spawning runs are almost over or environmental conditions suggest that a fish kill is likely to occur. We will also independently sample the menhaden using a cast net to help characterize any potential river herring bycatch and/or we will send staff on board harvesting vessels to monitor for river herring bycatch. Any river herring caught will be returned to the water. If the menhaden are not harvested, river herring loss from asphyxiation is a higher risk than from incidental loss as bycatch.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Investigation of Fish Kills Occurring in the Peconic River - Riverhead, N.Y. Spring 2015

Suffolk County Department of Health Services
James L. Tomarken, M.D., M.P.H., M.B.A., M.S.W.
Commissioner

New York State Dept. of Environmental Conservation
Marc Gerstman, Acting Commissioner

Stony Brook University
School of Marine and Atmospheric Sciences
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January, 2016

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Abstract

This investigation was undertaken to identify factors that may have contributed to three fish kill events involving adult Atlantic Menhaden (*Brevoortia tyrannus*), that occurred in the tidal portion of the Peconic River during the spring of 2015. In a collaborative multi-agency effort, extensive monitoring was conducted to document existing physical, chemical and biological conditions in the river that may have been associated with the events. Data on historical water quality conditions as well as past fish kills was also examined to provide possible clues to the occurrences.

Staff from the Suffolk County Department of Health Services (SCDHS) collected samples for the analysis of standard water quality parameters as well as constituents that may be toxic if present in sufficient quantities (organic solvents, pesticides and radiological residues) from a number of sites in and adjacent to the river. Additionally, sanitary conditions at the closest bathing beach (South Jamesport Beach) were periodically evaluated to insure that public health impacts from dead and decaying fish were not occurring, and an advisory issued to warn those recreating throughout the impacted area of potential conditions. Researchers from the School of Marine and Atmospheric Science (SoMAS) at Stony Brook University analyzed water samples to characterize the phytoplankton (micro-algae) community in the river and to determine if any harmful algal blooms (HABs) were impacting the fish. Staff from the New York State Department of Environmental Conservation (NYSDEC) recorded observations and collected moribund menhaden from several locations for pathological examination, and communicated with local commercial fisherman regarding conditions in and around the Peconic River.

The weight of findings suggests that rapidly rising water temperature, the timing and magnitude of algal blooms and an unusually large biomass of adult menhaden confined in the river, were all contributing factors that resulted in prolonged periods of extremely low dissolved oxygen (DO) levels and ultimately caused large numbers of the menhaden to expire. Results for other water quality measures (nutrients, bacteria, VOCs, pesticides and radiological constituents), showed results within normal ranges,

discounting the possibility that illegal discharges, spills and/or the presence of toxic substances were contributing factors. On a local scale, the presence of HAB species known to be ichthyotoxic may have been an important factor acting in combination with declining DO levels. The HAB *Gymnodinium instriatum* was also present during all three fish kill events and during the initial 16-May fish kill, two HABs (*Prorocentrum minimum* and *Karlodinium veneficum*) were noted in the river immediately preceding the event. The effect of the HABs was also evidenced by the pathology report for the fish specimens collected, which indicated the fish died of asphyxiation but also suggested that gill damage due to exposure to harmful algae was a likely contributing factor.

The Peconic River has a long history of degraded water quality, particularly with respect to nitrogen inputs, algal blooms and diminished DO concentrations. What seems to have made 2015 different from other years, is that spring algal blooms were more intense and the oxygen decline occurred much earlier than usual. Only two other years since 2003 showed similar early oxygen declines, 2008 and 2009, both years when major menhaden fish kills also occurred. Explanations for the enhanced blooms in 2015 are not apparent in the monitoring data collected, but what can be certain is that given the current state of eutrophication in the river, algal blooms and diminished oxygen levels will continue to be the norm. If the waters are warm enough for anoxia to develop and a body of fish are present, another fish kill is likely to occur.

Introduction

A series of fish kills involving Atlantic Menhaden (*Brevoortia tyrannus*) occurred in the tidal portion of the Peconic River (Figure 1) during May and June of this year. Masses of dead and dying fish were reported in various locations along the river, with areas of highest concentrations varying from the mouth of the river off of Indian Island County Park, to the waters between the Suffolk County Route 105 (CR105) Bridge and the Riverhead Yacht Club. The initial kill occurred in the area of the Atlantis Aquarium on 16-May, and was reported to be comparatively minor in terms of numbers. This event was followed on 27-May by a major fish kill involving what was estimated to be 100,000s (hundreds of

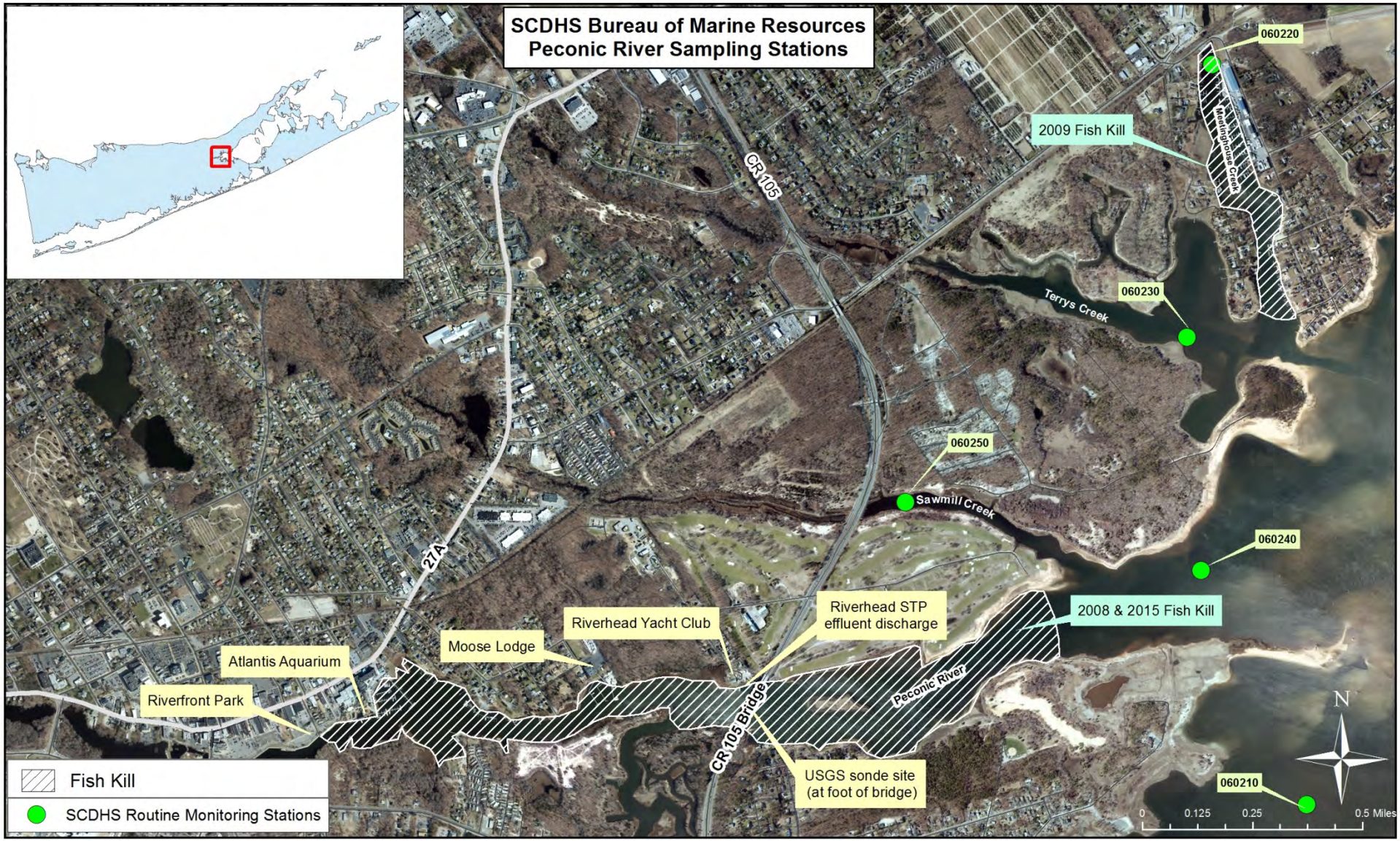

Figure 1. Peconic River Sampling Stations

thousands) of menhaden. A third, also relatively minor menhaden kill (estimated at 10,000s fish), followed on 14-June. Causes of the kills were quickly identified by researchers and involved agencies as low oxygen levels in the river. An ongoing algal bloom (*Prorocentrum*), increasing water temperatures and limited tidal flushing were also noted to be associated factors.

Causes of Fish Kills

Fish kills can occur for a variety of reasons, including insufficient DO, extreme water temperatures, sudden changes in water temperature and/or salinity, the discharge or spill of a toxic substance, the presence of diseases, parasites or harmful algal blooms, or from bodily injury. In the literature, past studies involving menhaden fish kills have noted predation, parasites, disease and low DO as potential causes (Smith, 1999).In laboratory experiments, menhaden showed 100% mortality in 2-6 hours at 0.6 mg/L DO, with large fish found to be less tolerant to hypoxia than small fish (Shimps, 2003). Other studies have shown that many fish, including menhaden, will actively avoid hypoxic waters if an escape route is available (Wannamaker and Rice, 2000). Of the menhaden kills that have occurred in the Peconic River over the past two decades, including major kills in September of 1999 (estimated at 1-3 million fish), August of 2000 (~750,000 fish), May of 2008 (100,000s) and May of 2009 (100,000s), low DO was identified as the main contributing factor. For the 2009 event, results of pathological examinations done on fish samples submitted to the Aquatic Diseases and Immunology Lab at SUNY Stony Brook, suggested that reduced fitness from parasitism and damage from either predation or avoidance behavior that reduced the animals' ability to escape the event, were possible secondary factors (M. Fast, email communication).

Low oxygen levels in surface waters may be associated with a number of factors, several of which periodically exist in portions of the lower Peconic River:

- Rising water temperatures – because the solubility of gasses in water (including oxygen) decreases with increasing temperature, DO levels tend to decline as waters warm up in the spring and summer.

- Algal blooms – although algae produce an excess of oxygen during the day through the process of photosynthesis, they consume oxygen during the night through respiration. This results in a day-night cycle of fluctuating DO, as is shown in the USGS graphic below (Figure 2).
- Excess nitrogen – although not a direct cause of low DO, anthropogenic nitrogen loading from point and non-point sources, including septic systems, residential and agricultural fertilizers, sewage treatment plant effluents and atmospheric deposition, stimulates the algal production that subsequently acts to diminish oxygen levels. A spike in nitrate was noted prior the late May and mid-June fish kills.
- Excessive biochemical oxygen demand (BOD) - the organic compounds contained in wastewater discharges, decaying algal blooms, and sediments washed into surface waters during heavy rainfall events, all exert an oxygen demand as they are decomposed by aerobic bacteria. In a study of the Neuse River Estuary in North Carolina, Paerl et al. (1998) noted that hypoxic events can be triggered in a matter of days by increased organic matter contained in stormwater runoff.
- Sediment oxygen demand (SOD) - oxygen consumed by sediment micro-organisms can affect water column DO levels in areas subject to significant organic deposition. Previous studies of benthic fluxes in the Peconic Estuary noted high levels of SOD in areas in the western portion of the system, including the lower Peconic River, Reeves Bay and Meetinghouse Creek (Howes et al., 1998). The highly organic nature of the upper sediments in these areas is the legacy of the many duck farms that once operated there, as well as the current wastewater discharges from the Riverhead STP and Atlantis Aquarium, and residues contained in stormwater runoff from roads and parking lots in the adjacent downtown Riverhead area.

Historic Water Quality

Although DO levels throughout much of the Peconic Estuary have historically been very

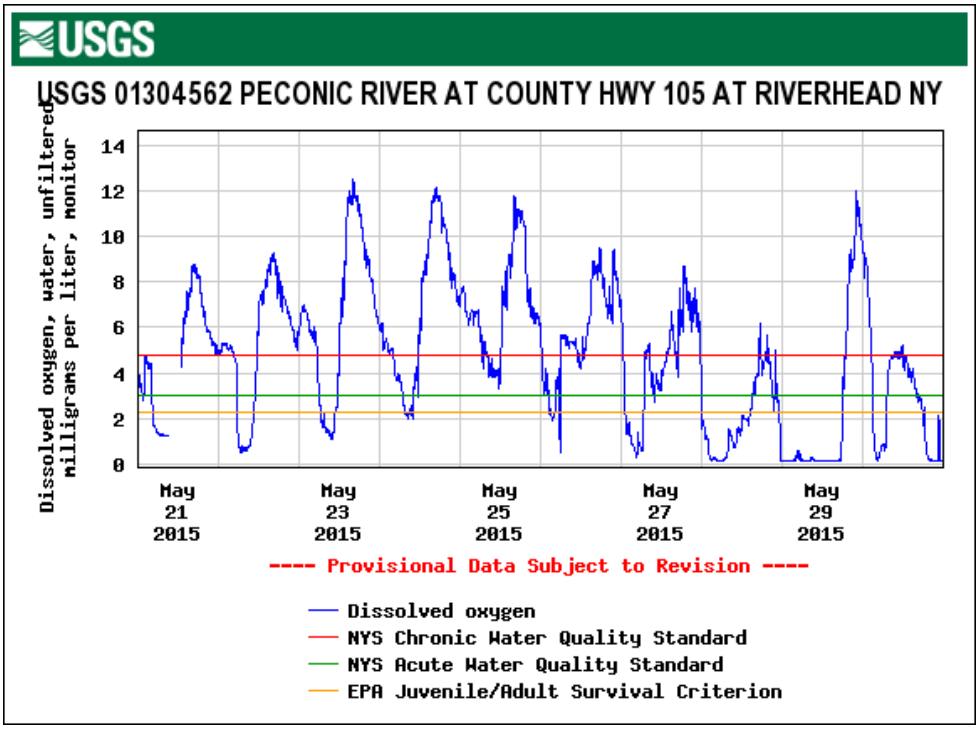

Figure 2. Daily Fluctuations in Dissolved Oxygen Concentrations During an Algal Bloom in the Peconic River

good, a number of sites in the western portion of the estuary, including the tidal portion of the Peconic River, have experienced periodic excursions below acceptable DO criteria (CCMP, 2001). These DO declines have been attributed to excessive algal growth that is associated with increased nitrogen loading. The box-plot graphic in Figure 3, depicting results of past DO monitoring done in the Peconic Estuary, illustrates an east to west pattern of declining DO concentrations as well as the significant degree of oxygen stresses that is characteristic of the CR105 Bridge location.

An examination of historic results from continuous monitoring water quality sondes deployed at the bridge by the SCDHS (2003 through 2011), similarly illustrates the magnitude of depressed oxygen levels in the river. The data consistently show oxygen levels declining rapidly through the spring as water temperatures increase, with mean levels during summer months rarely above the 4.8 mg/L NYS chronic DO criteria and

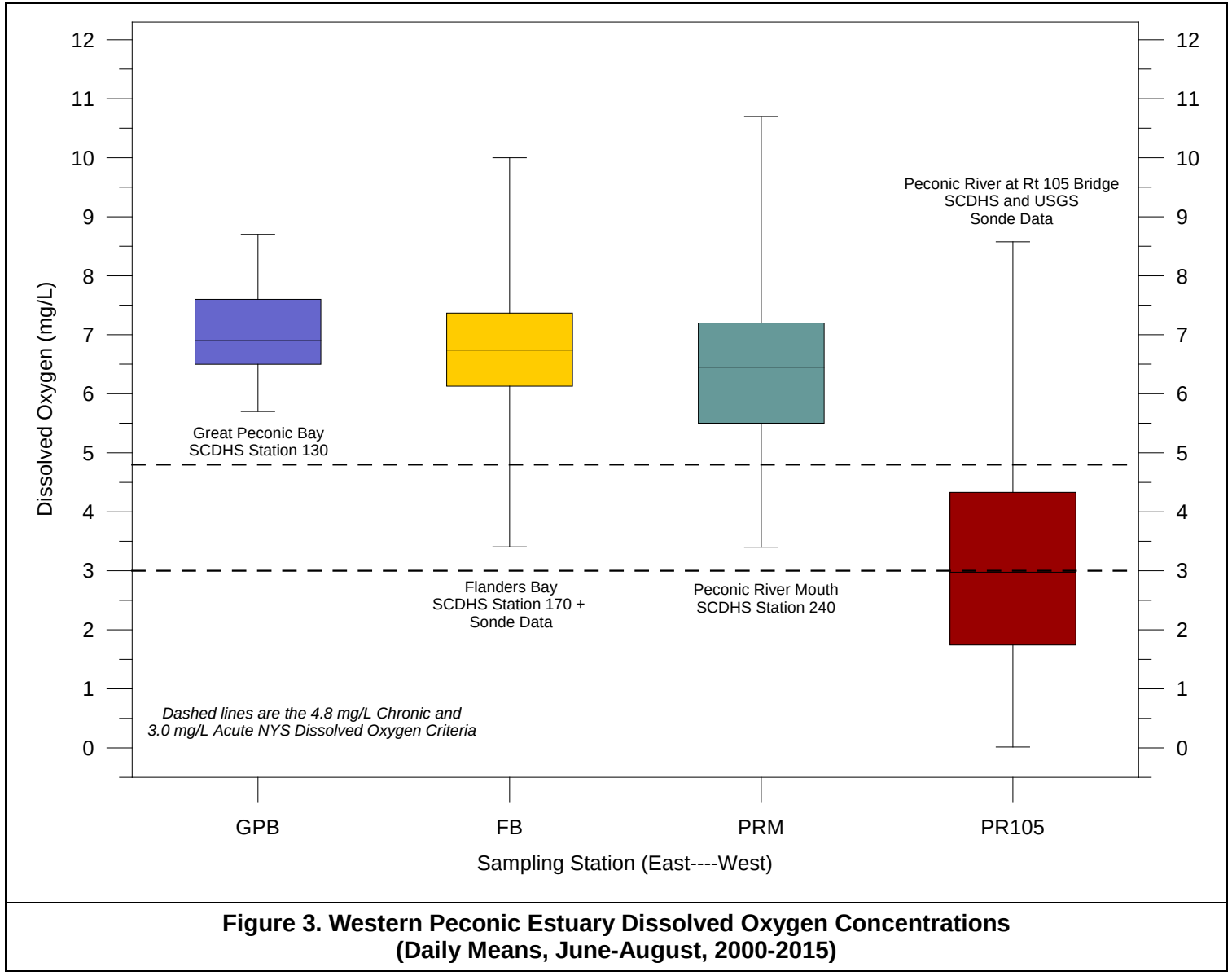

Figure 3. Western Peconic Estuary Dissolved Oxygen Concentrations (Daily Means, June-August, 2000-2015)

frequently below the 3.0 mg/L acute criteria (Table 1). As an example of a year when oxygen levels were particularly stressed in the river, Figure 4 shows the DO and temperature time series for 2008 (May-August), a year when a major fish kill also occurred in the river. As the graphic illustrates, from June through much of August, daily DO means were often in the hypoxic range (<2.0 mg/L) with episodes of anoxia (no oxygen) a frequent occurrence. An extended period during which daily oxygen minima were at or near anoxic levels started in mid-June, a typical occurrence for the site although unusually early compared to other years. A similar pattern was evident in 2009, another year when a major menhaden fish kill occurred. Conditions showed signs of improvement in 2011 (Table 1), when the number of days DO means were below the 3.0 mg/l NYS criteria and the 2.0 mg/l hypoxic benchmark, as well as the number of samples near anoxic levels, declined considerably. More recent data collected by the USGS at the bridge (site #01304562, data provisional), showed the level of summer hypoxia continuing to improve during 2013 and 2014.

Table 1. The Historic Occurrence of Depressed DO Levels at the CR105 Bridge Water Quality Sonde Site (June-August)

Year	The Percentage of Days the DO Daily Mean Was Below Benchmarks			% Results Near Anoxia (< 0.5 mg/L)
	< 4.8 mg/L	< 3.0 mg/L	< 2.0 mg/L	
2003	75	42	24	14
2004	76	61	38	13
2005	80	55	37	19
2006	98	63	35	10
2007	87	40	24	16
2008	97	73	46	16
2009	99	75	42	19
2010	97	74	52	20
2011	71	28	16	4
2013	70	30	8	0.2
2014	67	16	9	0.4
2015	79	28	17	8

2003-2011: SCDHS deployment
2013-2015: USGS deployment (site 01304562, provisional data)

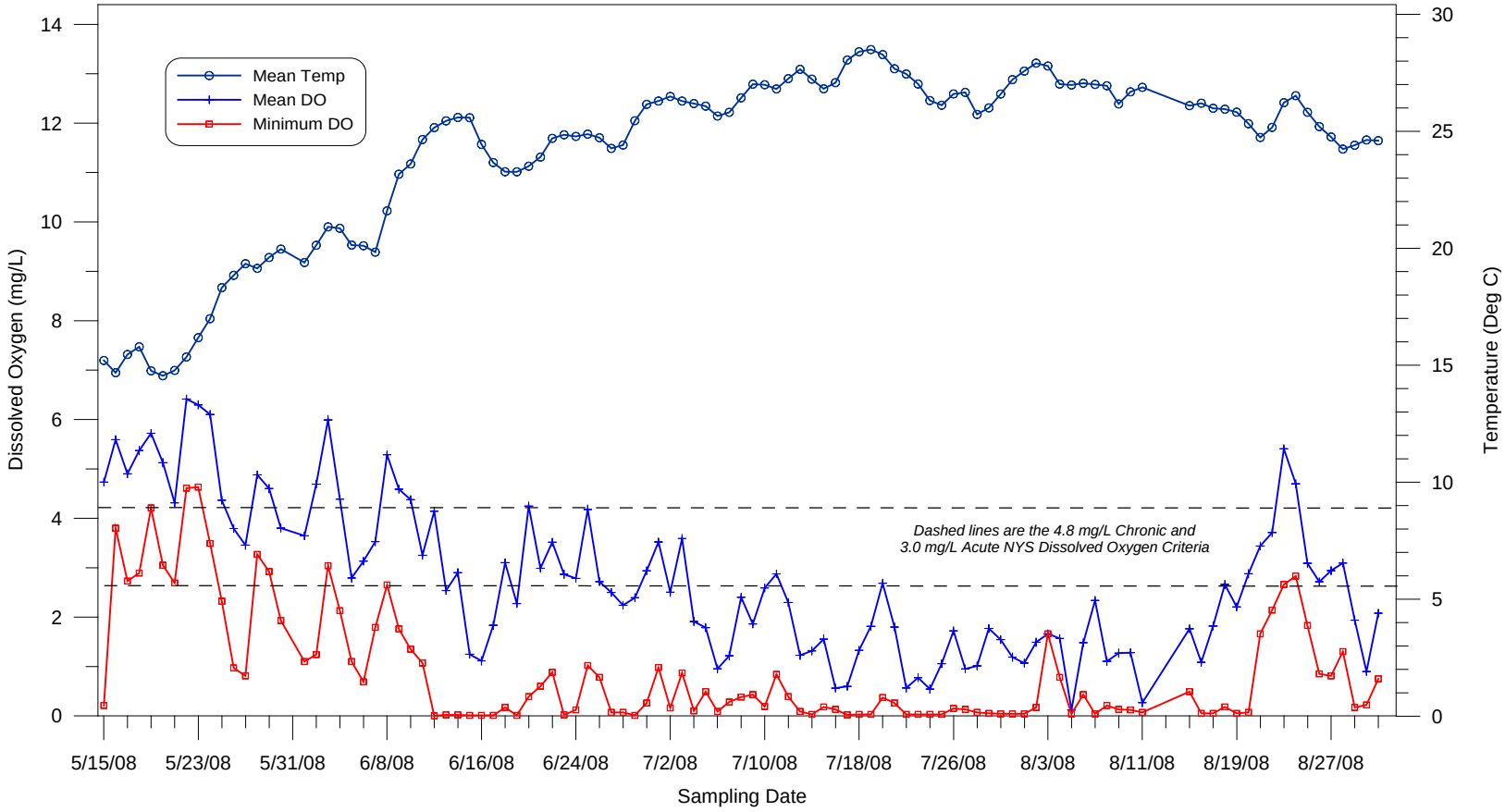

Figure 4. Dissolved Oxygen and Temperature Levels at the Peconic River CR105 Bridge
SCDHS Water Quality Sonde Data, May-August, 2008

The 2015 Peconic River Fish Kills

In an effort to identify factors that may have contributed to the 2015 Peconic River fish kills, and in response to public health concerns regarding the possible involvement of toxic substances, the SCDHS Office of Ecology initiated water quality monitoring at a number of sites in the Peconic River and in neighboring creeks and embayments in the days following the 27-May event. In addition to five locations in the river, sites monitored included Meetinghouse Creek, Terrys Creek, Sawmill Creek, Reeves Bay, Flanders Bay, East Creek and the Riverhead STP discharge (Figure 1). Sampling parameters included standard analytes such as salinity, temperature, DO, coliform bacteria, nitrogen and phosphorus nutrients and chlorophyll-a, as well as constituents that may be toxic if present in sufficient quantities, such as organic solvents (VOCs), pesticides and radiological residues. At the South Jamesport bathing beach, located approximately four miles to the east of the river, sanitary surveys and bacteriological sampling to evaluate beach water quality were also conducted immediately following the 27-May fish kill. Results from this sampling, as well as routine monitoring since the fish kill, has displayed very good water quality at the beach. In addition, the beach operator was instructed to keep the beach free of dead fish carcasses if any washed ashore. All available sampling are included in Appendix I. A copy of a recreational advisory issued by the Suffolk County Department of Health Services is included in Appendix II.

Supporting initial theories that low DO was the main contributing cause of the fish kills, results of samples collected in early June showed near-anoxic DO levels at mid-depth and bottom waters of the river extending from the Moose Lodge to Riverfront Park (Figure 1), with those at the CR105 bridge and nearby Sawmill and Meetinghouse Creeks at or marginally above hypoxic levels. Concentrations in better flushed waters to the east (the Peconic River mouth, Reeves Bay and Flanders Bay) were much improved (although less than ideal) in the 6.0-6.5 mg/L range. Subsequent monitoring done following the 14-June fish kill, similarly pointed to oxygen stress as the main contributing factor. Samples collected between 15-June and 17-June showed hypoxic to near anoxic DO levels present from the CR105 Bridge to the Atlantis Aquarium. Results for other water quality measures (nutrients, bacteria, volatile organic compounds, pesticides and

radiological constituents), showed results within normal ranges, discounting the possibility that illegal discharges, spills and/or the presence of toxic substances were contributing factors.

A closer look at recent sonde data (2013-2015) collected by the USGS at the CR105 Bridge site, similarly implicates low DO as a main contributing factor in the fish kills and suggests that water temperature in addition to the timing and magnitude of algal blooms (as indicated by chlorophyll levels) are key factors in oxygen dynamics in the river. As is shown in the time-series plots in Figures 5 to 7, a series of spring algal blooms occurred during each of the three years represented. During 2013, blooms with daily mean chlorophyll levels peaking in the 25-35 ug/L range, occurred in early April when water temperatures were relatively cool (10-15ºC). Hypoxia didn't occur until 10-June, when temperatures had risen to ~23ºC. After a bloom in late June, when water temperatures were in the 25-30ºC range, daily minimum DO levels rarely rose above 3.0 mg/L, were frequently hypoxic (<2 mg/L) and occasionally approached anoxia. Had fish been present, conditions from June through August of 2013 were ideal for a fish kill.

During 2014, algal blooms occurred periodically from late April through May, with mean chlorophyll levels peaking in the 35-60 ug/L range (Figure 6). Daily oxygen minima fluctuated above and below hypoxic levels through August, but sustained periods of near-anoxia did not develop and no fish kills were reported. During the following year (2015) however, conditions were much different. An algal bloom with daily mean chlorophyll levels peaking at >125 ug/L, persisted for two weeks in early April (Figure 7). Oxygen minima subsequently showed periods of precipitous decline but quickly rebounded as water temperatures were still cool (5-10ºC). In the following weeks, a rapid increase in temperature coincided with an algal bloom (>50 ug/L chlorophyll) that lasted approximately ten days (9-May to 19-May) and resulted in oxygen minima falling into the hypoxic range for the first time that year (on 16-May), the same day the initial 2015 menhaden fish kill was reported. Over the next three week period (late May through mid-June), a series of intense algal blooms occurred (with daily mean chlorophyll levels peaking at >75 ug/L) that resulted in daily periods of extended anoxia and the second and third fish kills.

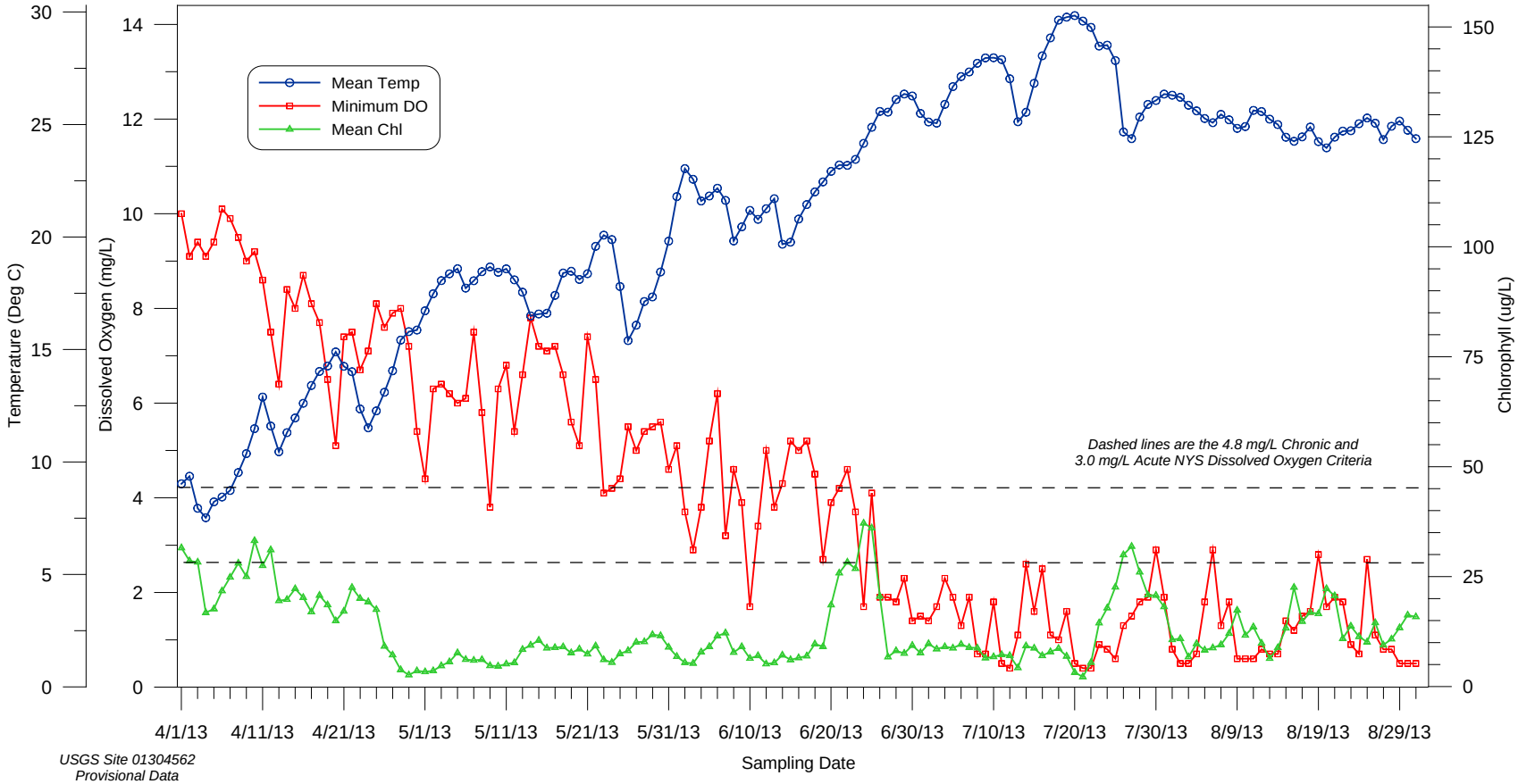

Figure 5. Dissolved Oxygen, Temperature and Chlorophyll Concentrations at the Peconic River CR105 Bridge USGS Water Quality Sonde Data, April-August, 2013

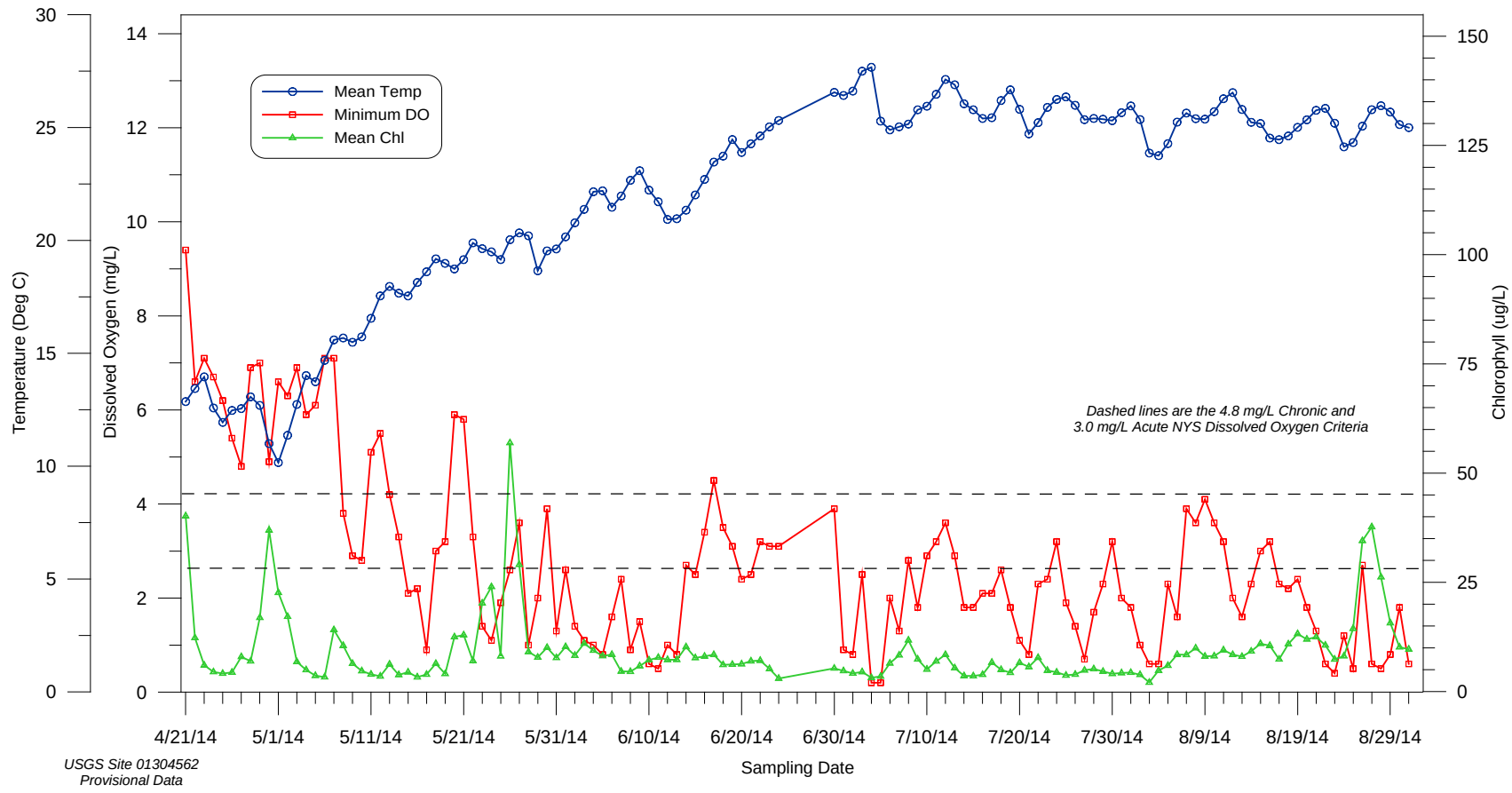

Figure 6. Dissolved Oxygen, Temperature and Chlorophyll Concentrations at the Peconic River CR105 Bridge USGS Water Quality Sonde Data, April-August, 2014

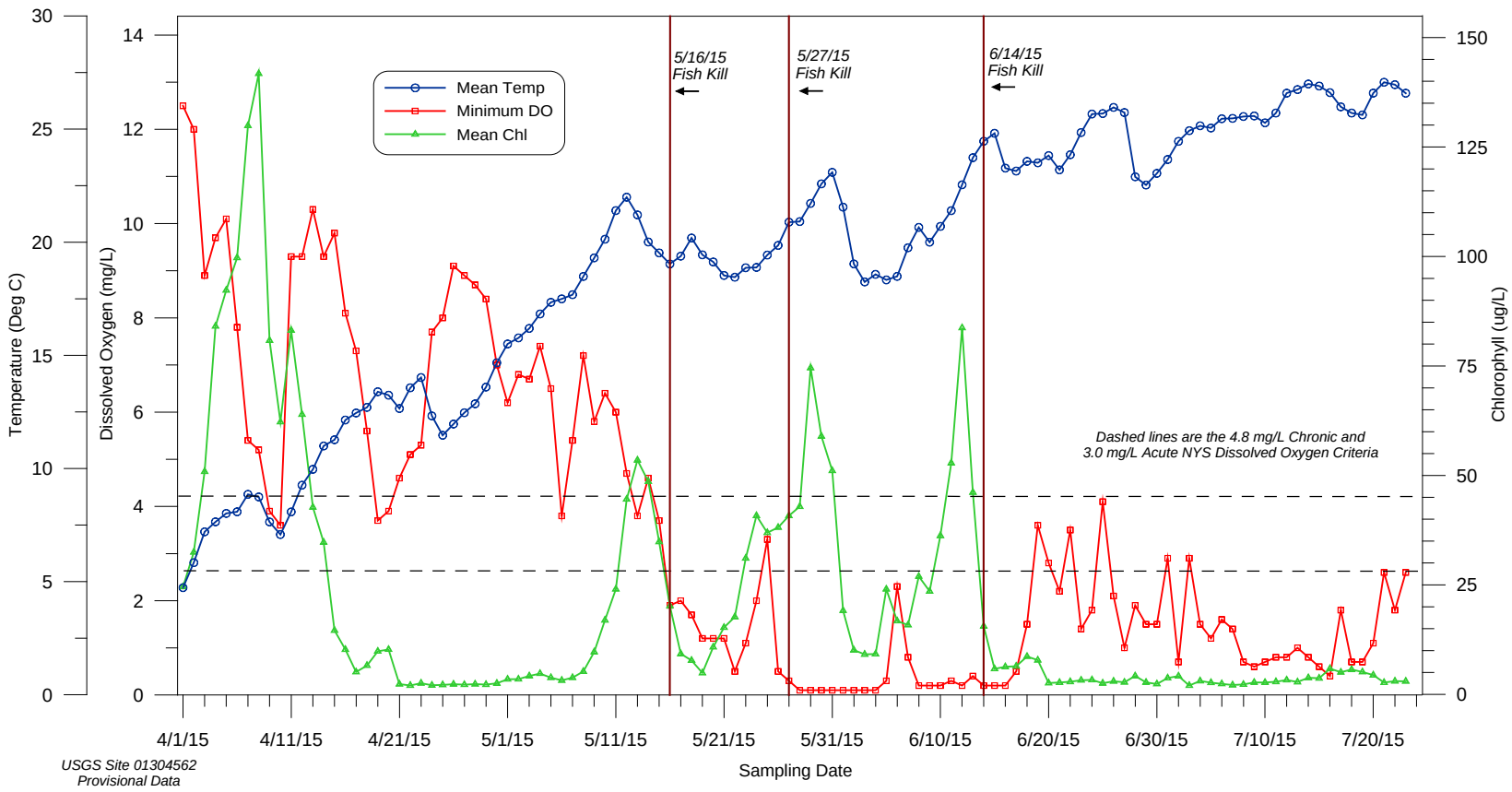

Figure 7. Dissolved Oxygen, Temperature and Chlorophyll Concentrations at the Peconic River CR105 Bridge USGS Water Quality Sonde Data, April-July, 2015

While phytoplankton are a pivotal component of the marine food web, algal blooms can be both harmful to humans through the production of shellfish poisoning toxins and/or considered ecologically destructive by disrupting ecosystem function (Sunda et al., 2006). During the fish kills that occurred in the Peconic River estuary a series of what can be considered ecologically destructive blooms were present in the water column, namely blooms of *Prorocentrum* spp., *Gymnodinium instriatum*, *Heterocapsa* spp., and *Karlodinium veneficum,* with maximal densities reaching 25,000, 760, 8,200, and 1,290 cells mL^{-1}, respectively, during May through June of 2015 (Fig. 8, Table 2). *Heterosigma akashiwo*, an ichthyotoxic raphidophyte known to cause death of fish from asphyxiation via an undefined mechanism (Cochlan et al., 2013), was a smaller component of the phytoplankton community reaching >2,000 cells mL^{-1} on 2-June and was not associated, in appreciable abundances, with any of these fish kills. *Prorocentrum minimum*, or mahogany tide, has been associated with fish kills in the Chesapeake Bay estuary at concentrations $>10^4$ cells mL^{-1} with the Maryland Department of Natural Resources defining >3000 cells mL^{-1} as a “threshold above which living resource” are impacted (Tango et al., 2005). While these blooms are typically considered ecologically destructive due to the association with hypoxic events and fish kills, there is also recent evidence for potential toxin production by *P. minimum*, specifically neurotoxins (Vlamis et al., 2015). The dinoflagellate *Karlodinium veneficum* and its associated toxins, karlotoxins, which have hemolytic and cytotoxic properties, and whose mechanism of action is disrupting gas transport across the gills of fish, has long been implicated in fish kills at densities $>10^4$ cells mL^{-1} (Place et al., 2012). To our knowledge, however, *Gymnodinium instriatum* and *Heterocapsa rotundata* do not produce toxins but can contribute to biological oxygen demand at night and upon decay of high biomass blooms and have been associated with prior fish kills (Heil et al., 2001; Wang et al., 2005).

The first fish kill which occurred on 16-May was associated with a dense (>25,000 cells mL^{-1}) *Prorocentrum minimum* and *Karlodinium veneficum* (>1000 cells mL^{-1}) bloom (Fig. 8, Table 2). During this time mean DO levels dropped to <5mg L^{-1} from >7 mg L^{-1} just

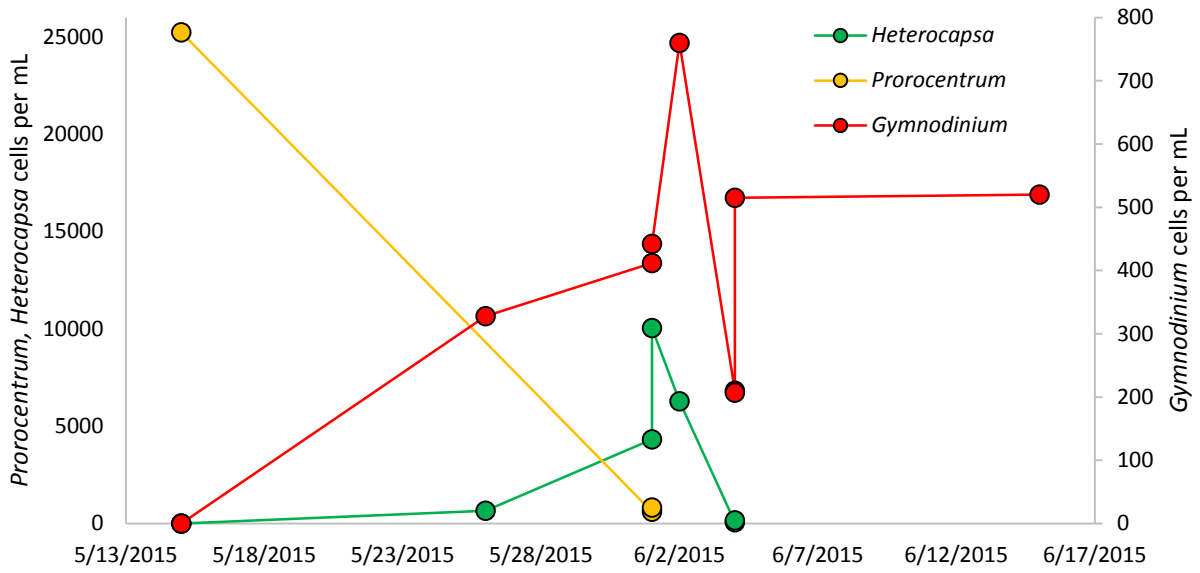

Figure 8. Maximal densities (cells mL^{-1}) of the most abundant dinoflagellates in the lower Peconic River region during May - June of 2015.

Table 2. Densities of the most abundant phytoplankton species (groups) found in the water column in the Peconic River region during May - June of 2015.

Date	Site	Diatoms (cells mL^{-1})	*Oxyrrhis marina* (cells mL^{-1})	*Prorocentrum minimum* (cells mL^{-1})	*Gymnodinium instriatum* (cells mL^{-1})	*Mesodinium* (cells mL^{-1})	*Heterocapsa rotundata* (cells mL^{-1})	*Heterocapsa arctica* (cells mL^{-1})	*Heterosigma akashiwo* (cells mL^{-1})	*Karlodinium veneficum* (cells mL^{-1})	*Prorocentrum gracile* (cells mL^{-1})	Other Dinoflagellates (cells mL^{-1})
15-May-15	Peconic River			25240						1290		
15-May-15	Meetinghouse Creek	1520		745				1120				1680
18-May-15	Meetinghouse Creek	2920	9720	10360								1240
1-Jun-15	Moosehead Lodge	840	5520	616	412	880	2680	1650				2640
1-Jun-15	105 Bridge	1760	1760	820	442	1270	8200	1840				1240
1-Jun-15	Aquarium	1080	1120	522		246	642	488				760
2-Jun-15	Moosehead Lodge Surface	202	560		158		1620					381
2-Jun-15	Moosehead Lodge Mid	228	1205		67	212	480					515
2-Jun-15	105 Bridge Surface	1120			760		6280					520
2-Jun-15	105 Bridge Mid	524	316		242		1525					585
2-Jun-15	Aquarium Surface	143										7
2-Jun-15	Aquarium Mid	160	428				482		2840			19
4-Jun-15	Moosehead Lodge Surface	167	141		210	72	68					133
4-Jun-15	Moosehead Lodge Mid	282	1020		207	86	163					264
4-Jun-15	105 Bridge Surface	1720	76		49	94						83
4-Jun-15	105 Bridge Mid	4280	85		422	153						127
4-Jun-15	Aquarium Surface	193										13
4-Jun-15	Aquarium Mid	186	436		515	94						224
15-Jun-15	105 Bridge		1620		520							
26-Jun-15	105 Bridge									6680	2120	1360

prior to the fish kill while minimum DO levels dropped from <4mg L^{-1} to <2 mg L^{-1} (Figure 7). *P. minimum* densities were within the range of those known to be associated with fish kills. Two weeks later a larger and more extended fish kill occurred from 27-May through 4-June in the same region. By this time the phytoplankton community

shifted (samples from 1-June) and was comprised mostly of *Prorocentrum minimum* (>500 cells mL^{-1}), *Gymnodinium instriatum* (>400 cells mL^{-1}), *Heterocapsa rotundata* (<10,000 cells mL^{-1}), *Heterocapsa arctica* (>500 cells mL^{-1}), and *Oxyrrhis marina* (>1000 cells mL^{-1}), while lower densities of *Heterosigma akashiwo* and *Chattonella* spp. were also present (Fig. 8, Table 2). Data collected from a USGS probe deployed in the Peconic River showed that while chlorophyll *a* levels were already elevated (>50µgL^{-1}; 27-May), they increased dramatically (>350 µgL^{-1}) following a spike in nitrate concentrations (Fig. 10). Just prior to the fish kill, mean DO levels were 6 mg L^{-1} while the DO minimum approached 0 mg L^{-1} (Fig. 7) with both of these values declining even further post 27-May likely due to a combination factors including increasing temperatures and increased water column oxygen demand due to decaying fish, and the dense algal blooms present. While these algal blooms occasionally pushed daytime DO concentrations above 5mg L^{-1} in most cases daytime concentrations were <5mg L^{-1} and nighttime DO concentrations were <2mg L^{-1} and often times close to 0 mg L^{-1}, demonstrating that high phytoplankton biomass also contributed (respired) towards a larger nighttime oxygen demand (Fig. 10). Phytoplankton samples taken in response to the fish kill that occurred in the Peconic River on 14-June demonstrated that the phytoplankton community was dominated by *Gymnodinium instriatum* and the heterotrophic dinoflagellate, *Oxyrrhis marina* (Fig. 8, Table 2). Again, fish were exposed to a combination of factors, including increasing temperatures, minimum DO levels that were <1mg L^{-1} for extended periods, increased oxygen demand (both water column and sediment) due to a decaying algal bloom (peaked on 12-June; Fig. 7) and the presence of heterotrophic dinoflagellates that likely acted to exacerbate the oxygen demand, especially at night.

To better illustrate water quality conditions in the Peconic River that were likely associated with the 2015 fish kills, and to accentuate the impact that algal blooms can have of DO levels in the river, Figure 9 presents an overlay of the daily mean chlorophyll concentrations and daily minimum DO levels at the CR105 Bridge site for May-July of the last three years (2013-2015). As can be seen from the graphic, 2015 was unusual in that a series of algal blooms (as represented by chlorophyll levels) occurred during

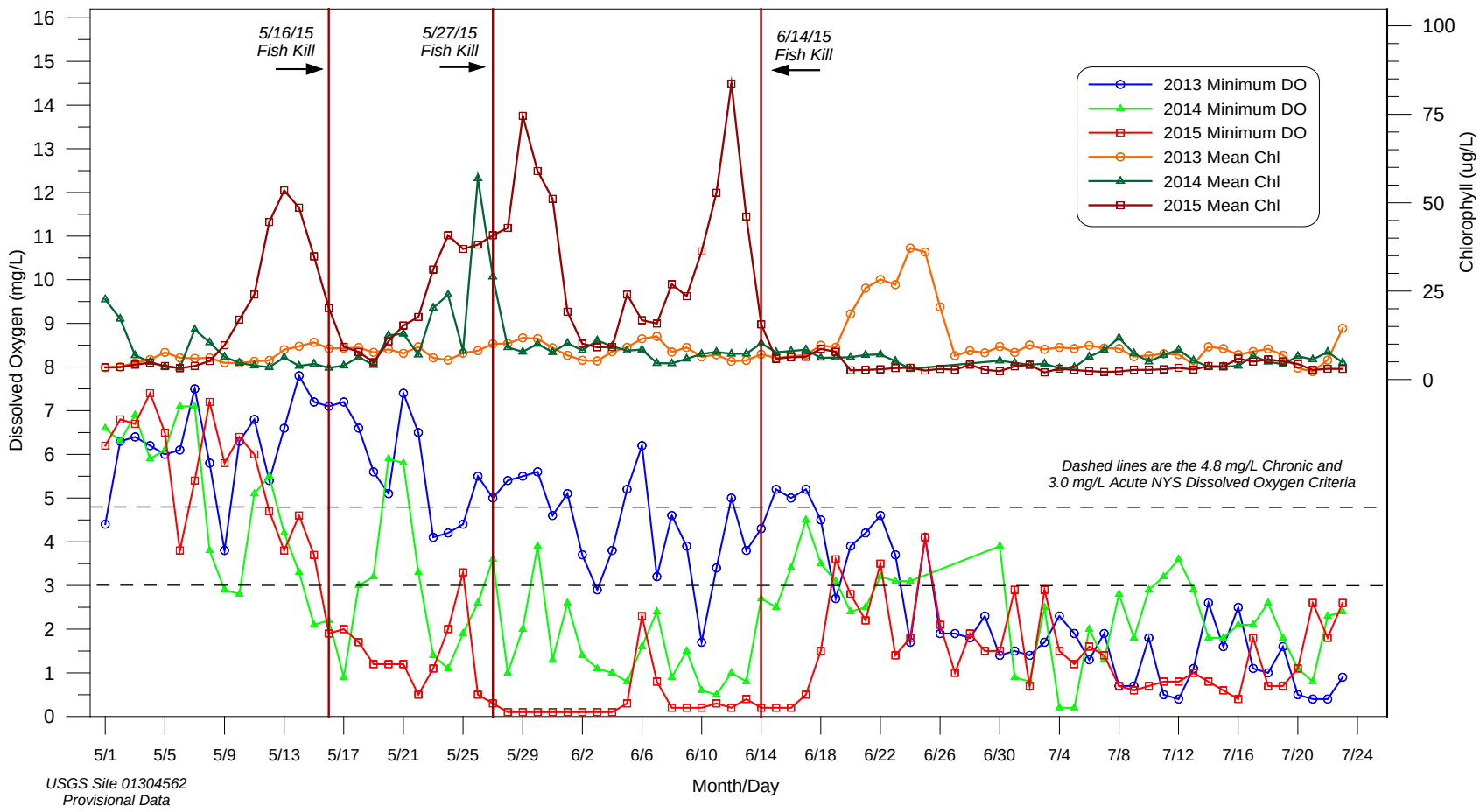

Figure 9. Minimum Dissolved Oxygen and Mean Chlorophyll Concentrations at the Peconic River CR105 Bridge USGS Water Quality Sonde Data, May-July, 2013-2015

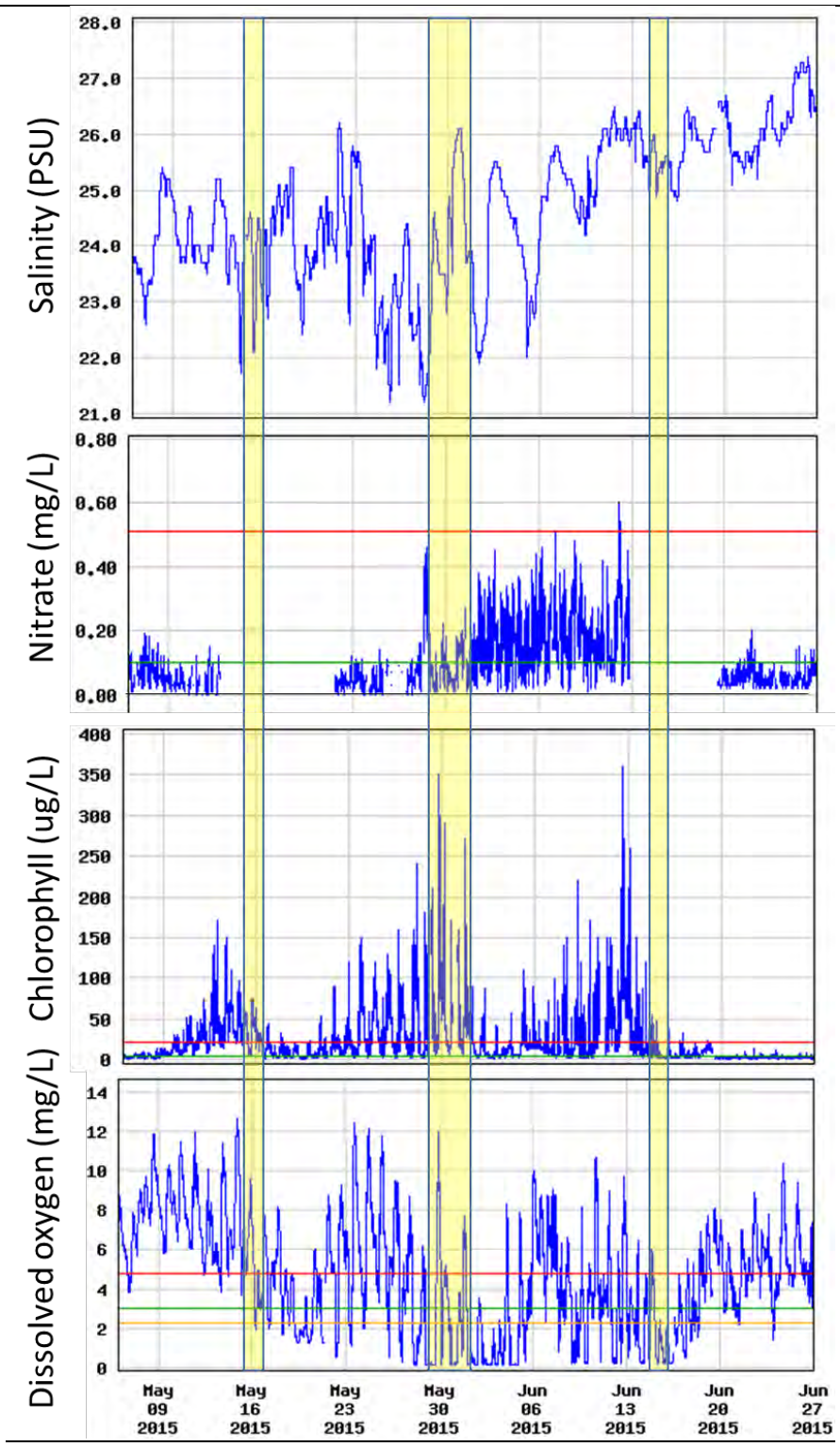

Figure 10. Salinity, nitrate, dissolved oxygen and chlorophyll concentrations at the Peconic River CR105 Bridge - USGS water quality sonde data, May-June, 2015. (*yellow bars indicate time of fish kills*)

the spring, resulting in an extended period where daily DO minima were near-anoxic. By the time the system began to recover (around 20-June) three fish kills had occurred.

Conditions that are conducive to fish and other kills have existed in the river for some time: an ample nutrient supply leading to a succession of algal blooms, subsequent stresses on oxygen levels as the blooms respire and die, and organics in the sediments and water column exerting an additional oxygen demand. As temperatures increased in the spring, all that was needed was a large body of panic-driven menhaden trapped by predators to finish off whatever oxygen was left.

Indeed, an unusually large body of adult menhaden was reported by commercial fishermen to enter the Peconic Estuary at the end of April, 2015, followed almost immediately by large schools of bluefish ranging in size from 5 to 15 pounds. On 7-May, NYSDEC observations in the Peconic River revealed surface activity indicative of the presence of large numbers of menhaden from Riverfront Park in downtown Riverhead to just east of Colonels Island (S. Heins, personal observation). Based on the sheer volume of large adult menhaden within the confines of the River, there was speculation among NYSDEC staff that a mass kill could occur later in the year if the fish did not leave the area. Bluefish feeding activity from the mouth of the River and Flanders Bay was also reported by commercial fishermen during that time period. On 29-May, two days into the second, largest kill, NYSDEC observed bluefish feeding on live menhaden at the edge of a floating mass of dead fish just west of the mouth of Sawmill Creek. This bluefish activity was clearly preventing menhaden from escaping the River. Dead and dying menhaden were estimated to number over 200,000 fish.

Fish Pathology

At the time of the fish kills in the Peconic River, other kills of adult menhaden were being reported throughout the marine district of New York. Kills were also being reported from the Hudson River, New Jersey, Connecticut and Rhode Island. It was commonly reported by witnesses that some of the dying fish exhibited a “spinning” behavior at the water’s surface. Connecticut DEEP released a statement saying they believed the

deaths in their area were caused by a virus and referred to it as “whirling disease.” It was later learned that DEEP had not sampled the dying fish, but were relying on descriptions of fish behavior in published literature (Stephens et. al., 1980). In response, NYSDEC collected moribund menhaden for pathological examination from several locations, including the Peconic River and Meetinghouse Creek. At the time of the collections (6/10), the fish in the Peconic River were not exhibiting the “spinning” behavior that had been previously noted and reported from other kill sites. They were swimming lethargically, but managed to evade capture when approached. Only a single specimen was obtained from the River, so the remaining samples were obtained from Meetinghouse Creek where dying fish were exhibiting the “spinning” behavior (J. Maniscalco, personal observation) and easily collected. Collected specimens were shipped on ice overnight to the Aquatic Animal Health Program at Cornell University’s College of Veterinary Medicine. A preliminary pathology report is attached (Appendix III).

The pathology report stated that the fish died of asphyxiation, also showing excessive mucus in the gills and damage to the gill lamellae (see Appendix III), likely from exposure to harmful algae described previously. The evidence supports the diagnosis provided earlier in this document. In addition, viral pathology yielded positive results, though the virus has yet to be identified. Similar results were obtained in samples from the Hudson River and Manhasset Bay. It is unlikely the virus had any major role in the Peconic River fish kills, as the hypoxia/harmful algal blooms combination would explain 100% of the mortalities in this case. NYSDEC will continue to investigate the nature of the virus infection

Summary

- A series of fish kills involving Atlantic Menhaden (*Brevoortia tyrannus*) occurred in the tidal portion of the Peconic River (Figure 1) during May and June of 2015.
- Masses of dead and dying fish were reported in various locations along the river, with areas of highest concentrations varying from the mouth of the river near In-

dian Island County Park to the waters between the CR105 Bridge and the Riverhead Yacht Club.

- At least three separate fish kills were reported to have occurred, with comparatively minor events noted on 16-May and 14-Jun (10,000s of fish) and a major event on 27-May that involved an estimated 200,000 fish.
- Based on real-time data recorded by a water quality probe deployed at the CR105 Bridge by the USGS, low levels of DO in the river was identified as the primary cause of the kills. Factors that were likely associated with the events included rising water temperatures, limited tidal flushing and the coincident occurrence of a succession of algal blooms.
- Dips in salinity coincident with a spike in nitrate in late May and a steady rise in nitrate in early June suggest that the delivery of nitrate via a pulse of riverine or run-off may have intensified algal blooms that thus contributed to low DO (Figure 10).
- To provided data on other potential contributing factors, and in response to public health concerns regarding the possible involvement of toxic substances, staff from the SCDHS Office of Ecology initiated water quality monitoring at a number of sites in the river as well as in neighboring creeks and embayments. In addition to standard water quality parameters, samples were collected for constituents that may be toxic if present in sufficient quantities, including organic solvents (VOCs), pesticides and radiological residues.
- As a precaution, bacteriological monitoring of the only nearby bathing beach (South Jamesport Beach) was conducted as well, and an advisory issued to warn those recreating throughout the impacted area of potential conditions.
- Additional sampling done by researchers from the School of Marine and Atmospheric Science (SoMAS) at Stony Brook University provided key data on the identification and temporal variations of phytoplankton (micro-algae) at a number of locations in the river, including species that are potentially toxic to fish.
- To evaluate the potential role of diseases as a contributing factor in the fish kills, staff from the New York State Department of Environmental Conservation

(NYSDEC) collected moribund menhaden from several locations for pathological examination by staff from Cornell University's College of Veterinary Medicine.

- Results of SCDHS sampling done proximate to the 27-May and 14-Jun fish kills found hypoxic to near anoxic conditions existing throughout much of the lower river, echoing the initial conditions noted at the CR105 deployment site.
- Samples for other water quality measures (nutrients, bacteria, volatile organic compounds, pesticides and radiological constituents), showed results within normal ranges, discounting the possibility that illegal discharges, spills and/or the presence of toxic substances were contributing factors.
- Analysis of phytoplankton samples by the SoMAS lab revealed that a series of "ecologically destructive" algal blooms, some involving species that are potentially ichthiotoxic, were present in the water column during the fish kills.
- Algal blooms act to diminish dissolved oxygen levels through nighttime respiration and via the oxygen demand exerted by decaying cells as the bloom declines. The association of algal blooms with excess nitrogen inputs, and subsequently depressed DO levels, has been well documented for areas of the western estuary, including portions of the lower Peconic River and adjacent creeks.
- The initial fish kill on 16-May was associated with a dense bloom of two algal species, *Prorocentrum minimum* and *Karlodinium veneficum*, both known to cause fish kills when present in sufficient quantities. As such, it is plausible that this fish kill occurred due to the combined effects of bloom induced hypoxia and the toxicity of the involved species.
- Subsequent blooms, involving multiple algal species, increased in intensity through mid-June and periodically rose to dramatic densities (as indicated by chlorophyll-a levels >350 ug/L at the USGS probe).
- As a result, the set of environmental conditions that developed in the river, including elevated water temperature and an increasing level of oxygen demand from nighttime algal respiration as well as water column and sediment decay processes, quickly led to frequent periods of hypoxia and extended periods where minimum DO levels were near-anoxic.

- At the same time, large numbers of adult menhaden were present in the river, their escape blocked by aggressively feeding bluefish. The activity of the panic-driven fish eventually depleted the already low DO levels, resulting in massive menhaden mortality on 27-May.
- Pathological analyses of fish specimens confirmed the cause of death as asphyxiation, and noted that effects from harmful algal toxicity and possibly an unidentified virus, were possible secondary contributing factors.

Conclusions

The primary cause of the fish kills in the Peconic River was asphyxiation, as a large school of menhaden, trapped in the river by predator bluefish, consumed what was left of an already diminished oxygen supply. The presence of toxic algae may have been a contributing factor, particularly in the initial 16-May fish kill, with the role of an unidentified virus still uncertain.

The low DO levels found in the river resulted from multiple factors acting in combination, including rising temperatures, elevated nitrogen inputs, a succession of algal blooms, the oxygen demand exerted by increased biological activity in the water column and sediments, and a limited degree of tidal flushing. The Peconic River has a long history of degraded water quality, particularly with respect to nitrogen inputs. The enriched nature of the river has enabled various algal species to flourish, has promoted the growth of a number of opportunistic harmful algae and has been responsible for periodic excursions of DO concentrations below standard criteria. What made 2015 different from previous years, was the timing of the oxygen decline. As historical data (2003-2011) collected by the SCDHS at the CR105 Bridge indicates, prolonged periods where DO minima approach anoxic levels typically doesn't occur in the river until sometime in July. In 2015, it happened during the last week in May when large numbers of adult menhaden were present. The only other years since 2003 when the onset of extended anoxia occurred prior to July (in 2008 and 2009 it occurred in mid-June), were also the only years when major menhaden fish kills occurred.

Although chlorophyll data for the 2003-2011 period isn't available, data collected by the USGS during the last three years (2013-2015) illustrate that the magnitude and timing of algal blooms in relation to water temperature, are key factors in the DO dynamics in the river. Unlike 2013 and 2014, a succession of major algal blooms occurred during the spring of 2015 that were undoubtedly associated with the early onset of hypoxia in the river. What was different about the water quality in 2015 that enabled the blooms to proliferate is uncertain. Data for the Riverhead STP discharge, located directly adjacent to the CR105 Bridge, showed nitrogen levels for April through June that were well within permit specifications, and routine monitoring data collected at nearby creeks and embayments by the SCDHS (under the Peconic Estuary Program) similarly did not suggest any anomalies.

What can be certain however, is that given the current state of eutrophication in the river, algal blooms and diminished oxygen levels will continue to be the norm. If the waters are warm enough for anoxia to develop and a body of fish are present, another fish kill is likely to occur.

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Appendix I. Suffolk County Dep't. of Health Services (Bureau of Marine Resources) Fish Kill Sampling Results

Location	Date Collected	S/M/B[1]	Station No.	Temp (C)	DO (mg/L)	Total Coliform (mpn/100 ml)	Fecal Coliform (mpn/100 ml)	TN (mg/L)	NH3-N (mg/L)	NOx-N (mg/L)	Organics[2]	Gross Alpha	Gross Beta	Tritium
Peconic River at Rt. 105 Bridge	6/2/2015	S	PR-105	17.9	3.5	---	---	---	---	---	---	---	---	---
	6/2/2015	M	PR-105	17.8	3.1	---	---	---	---	---	---	---	---	---
	6/16/2015	S	PR-105	23.6	2.2	---	---	---	---	---	---	---	---	---
	6/16/2015	B	PR-105	23.1	2.8	---	---	---	---	---	---	---	---	---
Peconic River at Atlantis Aquarium	6/2/2015	S	PR-AQ	16.7	4.8	---	---	---	---	---	---	---	---	---
	6/2/2015	M	PR-AQ	21.3	< 0.05	---	---	---	---	---	---	---	---	---
	6/16/2015	S	PR-AQ	23.2	1.2	---	---	---	---	---	---	---	---	---
	6/16/2015	B	PR-AQ	23.9	0.2	---	---	---	---	---	---	---	---	---
Peconic River at Moose Lodge	6/2/2015	S	PR-ML	17.5	3.5	---	---	---	---	---	---	---	---	---
	6/2/2015	M	PR-ML	20.1	< 0.05	---	---	---	---	---	---	---	---	---
	6/16/2015	S	PR-ML	23.5	0.9	---	---	---	---	---	---	---	---	---
	6/16/2015	B	PR-ML	23.4	0.1	---	---	---	---	---	---	---	---	---
Peconic River at Riverfront Park	6/1/2015	S	PR-RFP	19.5	5.5	1,100	800	0.68	---	---	**ND**	**ND**	12.2 ± 0.6	**ND**
	6/1/2015	B	PR-RFP	22.2	0.2	---	---	---	---	---	---	---	---	---
	6/15/2015	S	PR-RFP	22.3	5.6	---	---	---	---	---	---	---	---	---
	6/15/2015	B	PR-RFP	23.2	7.0	---	---	---	---	---	---	---	---	---
Peconic River at Riverhead YC	6/15/2015	S	PR-RYC	22.5	1.1	---	---	---	---	---	---	---	---	---
	6/15/2015	B	PR-RYC	22.5	1.0	---	---	---	---	---	---	---	---	---
	6/16/2015	S	PR-RYC	23.4	1.1	---	---	---	---	---	---	---	---	---
	6/16/2015	B	PR-RYC	23.2	0.8	---	---	---	---	---	---	---	---	---
Riverhead STP Discharge	6/17/2015	---	200-009	---	---	800	< 20	15.8	9.95	---	---	---	---	---

[1] Sample location: Surface (S), Mid-depth (M) or Bottom (B)
[2] Organic parameters included numerous volatile organic compounds (VOCs) and pesticides
ND = "Not Detected"

Appendix I. Suffolk County Dep't. of Health Services (Bureau of Marine Resources) Fish Kill Sampling Results														
Location	**Date Col-lected**	**S/M/B[1]**	**Station No.**	**Temp (C)**	**DO (mg/L)**	**Total Coli-form (mpn/100 ml)**	**Fecal Coli-form (mpn/100 ml)**	**TN (mg/L)**	**NH3-N (mg/L)**	**NOx-N (mg/L)**	**Organics[2]**	**Gross Alpha**	**Gross Beta**	**Tritium**
Peconic River Mouth	5/27/2015	S	060-240	20.5	7.2	< 20	< 20	0.51	< 0.02	< 0.005	---	---	---	---
	5/27/2015	B	060-240	20.2	7.6	---	---	---	---	---	---	---	---	---
	5/31/2015	S	060-240	24.4	12.5	80	40	1.23	---	---	**ND**	---	---	---
	6/2/2015	S	060-240	17.8	5.9	40	40	0.74	0.10	0.012	**ND**	**ND**	65.0 ± 9.2	**ND**
	6/2/2015	B	060-240	17.6	6.0	---	---	---	---	---	---	---	---	---
	6/4/2015	S	060-240	18.1	10.5	< 20	< 20	0.85	0.05	0.020	**ND**	---	---	---
	6/4/2015	B	060-240	18.3	8.4	---	---	---	---	---	---	---	---	---
	6/16/2015	S	060-240	23.3	8.0	---	---	---	---	---	---	---	---	---
	6/16/2015	B	060-240	22.7	5.2	---	---	---	---	---	---	---	---	---
	6/17/2015	S	060-240	23.1	7.2	40	< 20	0.42	< 0.02	< 0.005	---	---	---	---
	6/17/2015	B	060-240	23.1	7.1	---	---	---	---	---	---	---	---	---
Meetinghouse Creek	5/27/2015	S	060-220	21.0	2.6	40	40	1.60	0.46	0.723	---	---	---	---
	5/27/2015	B	060-220	20.7	2.1	---	---	---	---	---	---	---	---	---
	5/31/2015	S	060-220	23.0	9.2	210	110	3.64	---	---	**ND**	---	---	---
	5/31/2015	B	060-220	22.7	3.6	---	---	---	---	---	---	---	---	---
	6/1/2015	S	060-220	23.0	5.1	220	220	0.93	---	---	**ND**	---	---	---
	6/1/2015	B	060-220	23.0	2.3	---	---	---	---	---	---	---	---	---
	6/2/2015	S	060-220	20.0	1.1	20	20	1.02	0.30	0.190	**ND**	---	---	---
	6/2/2015	B	060-220	20.1	1.2	---	---	---	---	---	---	---	---	---
	6/4/2015	S	060-220	19.0	6.6	300	170	3.56	0.83	3.42	**ND**	---	---	---
	6/4/2015	B	060-220	19.0	5.2	---	---	---	---	---	---	---	---	---
	6/17/2015	S	060-220	23.3	3.1	20	< 20	0.80	0.24	0.177	---	---	---	---
	6/17/2015	B	060-220	23.0	3.9	---	---	---	---	---	---	---	---	---

Appendix I. Suffolk County Dep't. of Health Services (Bureau of Marine Resources) Fish Kill Sampling Results														
Location	**Date Col-lected**	**S/M/B[1]**	**Station No.**	**Temp (C)**	**DO (mg/L)**	**Total Coli-form (mpn/100 ml)**	**Fecal Coli-form (mpn/100 ml)**	**TN (mg/L)**	**NH3-N (mg/L)**	**NOx-N (mg/L)**	**Organics[2]**	**Gross Alpha**	**Gross Beta**	**Tritium**
Terry's Creek	6/2/2015	S	060-230	18.1	6.7	90	90	0.73	< 0.02	0.007	---	---	---	---
	6/2/2015	B	060-230	18.2	5.0	---	---	---	---	---	---	---	---	---
	6/16/2015	S	060-230	24.0	9.0	---	---	---	---	---	---	---	---	---
	6/16/2015	B	060-230	22.7	4.7	---	---	---	---	---	---	---	---	---
Sawmill Creek	6/2/2015	S	060-250	17.8	2.0	2,400	1,300	1.25	0.39	0.145	---	---	---	---
	6/2/2015	B	060-250	19.0	0.7	---	---	---	---	---	---	---	---	---
Flanders Bay	6/2/2015	S	060-170	18.0	6.3	< 20	< 20	0.37	0.02	< 0.005	---	---	---	---
	6/2/2015	B	060-170	18.1	6.2	---	---	---	---	---	---	---	---	---
Reeves Bay	6/1/2015	S	060-210	19.6	6.6	< 20	< 20	0.59	---	---	**ND**	---	---	---
	6/1/2015	B	060-210	19.8	6.4	---	---	---	---	---	---	---	---	---
	6/2/2015	S	060-210	17.3	6.6	< 20	< 20	0.50	< 0.02	< 0.005	**ND**	---	---	---
	6/2/2015	B	060-210	17.3	6.4	---	---	---	---	---	---	---	---	---
	6/4/2015	S	060-210	17.0	12.8	< 20	< 20	0.53	< 0.02	< 0.005	**ND**	---	---	---
	6/4/2015	B	060-210	17.0	12.6	---	---	---	---	---	---	---	---	---
East Creek (So. Jamesport)	5/27/2015	S	060-101	20.1	5.0	140	80	0.84	0.29	0.231	---	---	---	---
	5/27/2015	B	060-101	19.6	4.6	---	---	---	---	---	---	---	---	---
	6/2/2015	S	060-101	17.6	4.5	80	80	0.60	0.19	0.061	---	---	---	---
	6/2/2015	B	060-101	17.6	4.6	---	---	---	---	---	---	---	---	---
	6/15/2015	S	060-101	22.6	6.0	---	---	---	---	---	---	---	---	---
	6/15/2015	B	060-101	22.7	4.5	---	---	---	---	---	---	---	---	---
	6/17/2015	S	060-101	21.8	3.2	20	20	0.62	0.18	0.123	---	---	---	---
	6/17/2015	B	060-101	21.8	3.3	---	---	---	---	---	---	---	---	---
	6/19/2015	S	060-101			40	40	0.98	0.10	0.250	---	---	---	---
South Jamesport Beach	6/19/2015	S	R14	---	---	< 20	< 20	---	---	---	---	---	---	---

Appendix II.

Health Officials Issue Peconic River Recreation Advisory

Department: Health Services | Posted: 6/18/2015 |

Following the amassing of thousands of dead bunker fish on the shores of the Peconic River on May 29, 2015 and June 14, 2015, health officials are warning residents and visitors who choose to recreate near these waters to follow some common-sense recommendations.

Swimming/Bathing

Swim only at regulated bathing beaches. Regulated beaches are monitored and usually safe for swimming. When the waters at any regulated beach reveal the presence of bacteria at levels that exceed New York State standards, the department closes that beach. Beaches that are not permitted for swimming are not monitored by the department and the waters may be unsafe for swimming. The status of regulated bathing beaches can be found at the beach program web page http://gis2.suffolkcountyny.gov/bathingbeaches/

Wading, Fishing, Boating, Kayaking, Canoeing

Recreating in water, even on a raft or boat, poses some potential for the skin and face to come into contact with water that may contain bacteria, parasites and other microorganisms. If you are exposed to water that may be unsafe, you can help protect yourself by following the advice below:

- Avoid water with accumulations of dead fish.
- Avoid recreating in cloudy or discolored water, as it may contain more microorganisms that might make people sick and affect a person's ability to see underwater hazards.
- Don't swallow water and keep your face and head out of the water.-This reduces exposure to bacteria, parasites, and other microorganisms that might make people sick by entering the body by swallowing, and through eyes, ears and nose.
- Wash your hands when you leave the water and before eating. Do not touch your eyes, nose or mouth before washing your hands.
- Shower as soon as you are finished with your activities for the day.

Contact with Dead Fish

Do not handle or eat fish that are found dead, dying, acting abnormal or seem sick. If you must handle dead or decaying matter, make sure your hands are covered with disposable nitrile, rubber or plastic protective gloves or a plastic bag before touching the fish. If your skin is exposed to the dead fish, wash your hands thoroughly with soap and water. If you accidentally ingest any decaying matter, seek medical attention immediately.

Eating Fish Caught from Waters Where the Dead Fish were Found

Fish can be contaminated with bacteria, viruses or parasites that can cause illness. It is difficult to determine the risks from eating live fish caught from areas where there are large masses of dead fish. If you have caught a live fish and choose to eat it, be sure to cook the fish thoroughly to kill bacteria, parasites and other microorganisms, as is always good practice.

suffolkcountyny.gov

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Appendix III.

Cornell University

Aquatic Animal Health Program
Dept. of Microbiology and Immunology
College of Veterinary Medicine
Cornell University
Ithaca, NY 14853-6401
Tel: (607) 253-4028 Fax: (607) 253-3384

Case number:	FPL2015-011	**Report Date:**	7/2/2015
Date received:	6/11/2015	**Diagnosticians:**	Marquis, Sams, Getchell

Client Name:	Steve Heins	**Type of sample:**	3 whole fish
		Species:	Menhaden (*Brevoortia tyrannus*)

History: An unusual number of fish kills involving primarily Atlantic menhaden ("bunker") have been reported from around Long Island, NY; CT and RI. Following detection of a virus in bunker from the Hudson River, we attempted to collect distressed fish from Peconic River/Flanders Bay. Two large kills had occurred and it is possible that conditions were right for another. Initial belief has been that these large kills are due to low DO. Bottom water DO was very low (1-2 mg/l) on morning of collection but surface water was significantly higher. Note: the marine dinoflagellate *Akashiwo sanguinea* was present in large numbers from plankton tows conducted in the Peconic River concurrent w/ fish collection on 6/10/2015. Submitted samples were collected on 6/10/15 from Peconic River/Flanders Bay by John Maniscalco NYSDEC BMR. Water temperature at time of collection (12:15 PM) was 20.6 C with a DO of 7.21 ppm at the surface of Meetinghouse Creek (23.21 ppt salinity). Bottom water data from Meetinghouse Creek was 19.98 C, 25.69 ppt salinity, and 6.3 ppm DO). Specimen number 1 was dropped by an osprey and recovered by DEC staff still alive near the 105 bridge on Peconic Bay. Other fish were seen acting strangely (swimming alone, slowly, at surface) but still capable of avoiding capture by dipnet from the boat. Specimens 2&3 were dipnetted from Meetinghouse Creek by DEC staff in a tight space against the bulkhead. Fish were at surface with gills flared. No "whirling" was seen. Large schools of fish were seen behaving normally, large numbers of large bluefish were also present.

Presentation: Three fish were delivered on ice to Cornell AAHP on 11 June 2015.

Gross examination: The menhaden ranged in size from 295 mm to 333 mm in length and weighed from 270 grams to 321 grams (fish #1-#3). The condition of the fish were good. The gills all had a thick mucus layer and detritus adhering to this mucus (see photo).
External and internal gross pathological lesions of fish #1 were as follows:
Fish #1 had ecchymosis around the vent, and left operculum and a puncture wound on right side presumably from osprey (see photo). Internally fish #1 had hemorrhagic ascites, erythema of pyloric caeca, and hemorrhagic brain. No obvious parasites were observed in any of the fish. Fish #2 had a slight hemorrhage in the left eye and caudal fin, as well as a puncture wound on left operculum, (see photo). Internally there was hemorrhagic ascites, darkened, inflamed, possibly necrotic pyloric ceca and intestines and dark green/black liquid for stomach contents. The brain, stomach, gonads were also hemorrhagic. Fish #3 had similar internal appearance with less hemorrhagic gonads.

Histological examination: Two of the sets of gill filaments appeared normal, while the third set had significant necrosis present (see photos). Severe congestion of red blood cells was observed in the liver, brain, and heart (see photos) suggesting possible anoxia. Hemorrhaging was noted in the posterior kidney (see photo). The inner walls of the pyloric cecae appeared necrotic (see photo).

Laboratory results:

Bacteriology: Kidney loop samples were inoculated onto TSA/5%SB and marine agar. No significant growth after 14 days incubation was observed.

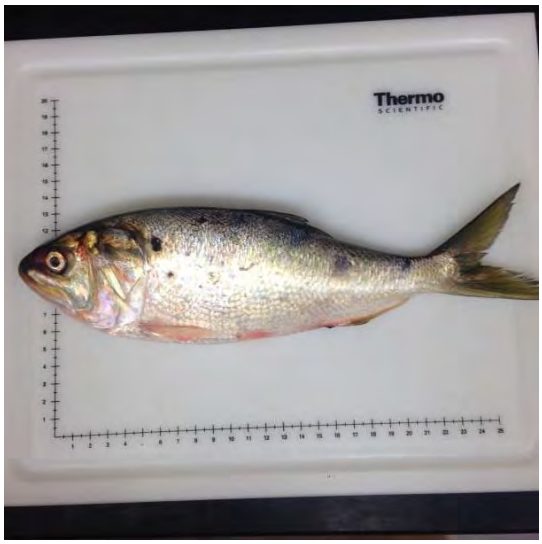
Toxicology: None performed.

Virology: Viral isolation was performed with CHSE, EPC, KF1, FHM and BF-2 cell lines. Filtered homogenates were prepared from pooled tissues (kidney, spleen, heart) or from the brain, and tissues collected on 6/10/15 were prepared separately. These tissue homogenates were used to inoculate cells. Cytopathic effects were observed in CHSE (see photo), KF1, and BF-2 cells inoculated with the filtered homogenate from pooled tissues, but not from the brain. These results are suggestive of viral replication. Further work is underway to identify these isolates including EM and genome sequencing.

Diagnosis: Viral infection may have contributed to these die-offs, but clearly the predator induced anoxia that was measured during these events and the algal blooms that were documented played a bigger role in these die-offs.

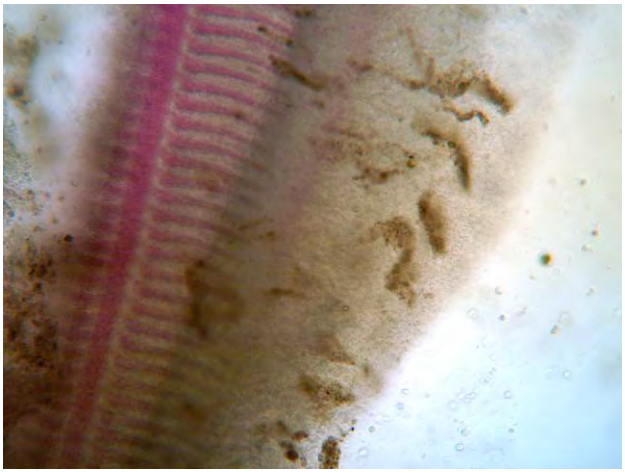
Comments: The histology slides were similar to those from Manhasset Bay (Case FPL2015-010). Pathological changes were again evident in multiple tissues including the pyloric ceca, and the gills from one of these specimens. The severity of the fish kills may be due to the cumulative effects of all three of these stressors on these menhaden schools, anoxia, algal blooms, and viral infection.

Images:

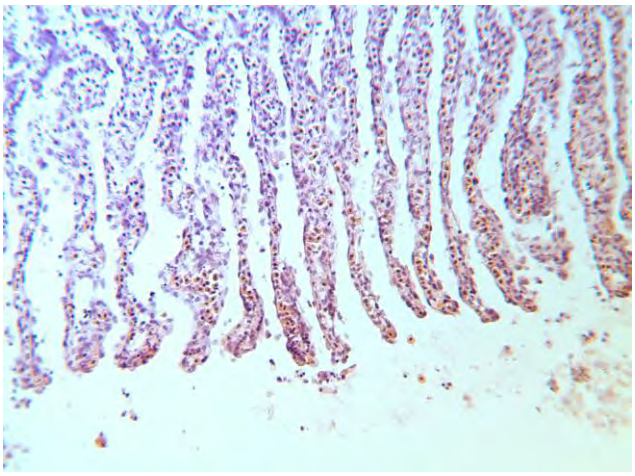


Fish #1 with some hemorrhaging of the fins.

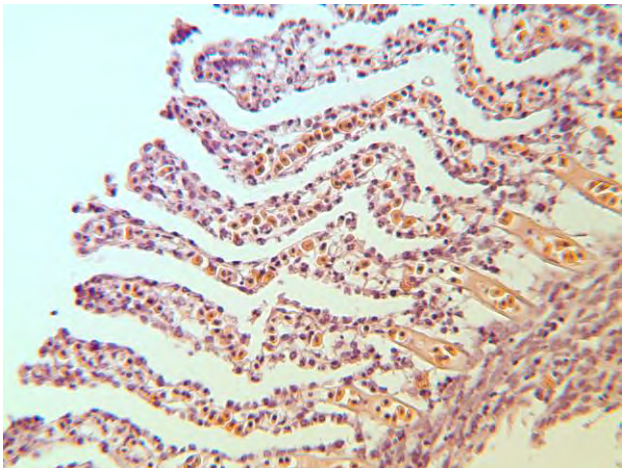
Fish #2 with hemorrhages in eye.



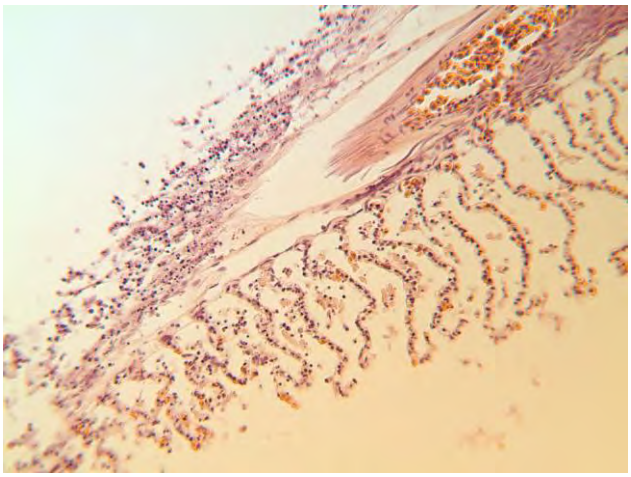
Gills with mucus and detritus



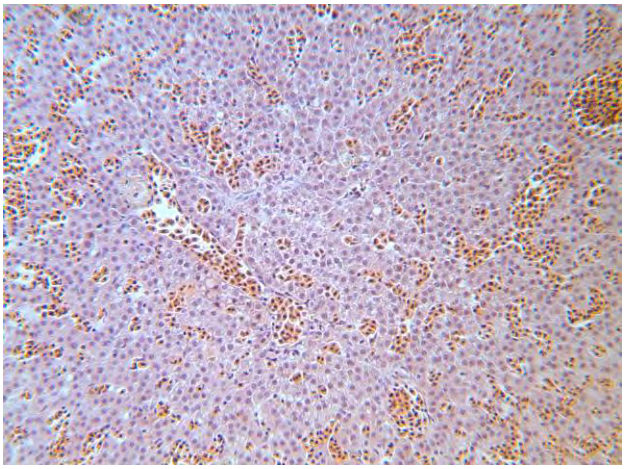
Menhaden gills (H&E 25X).



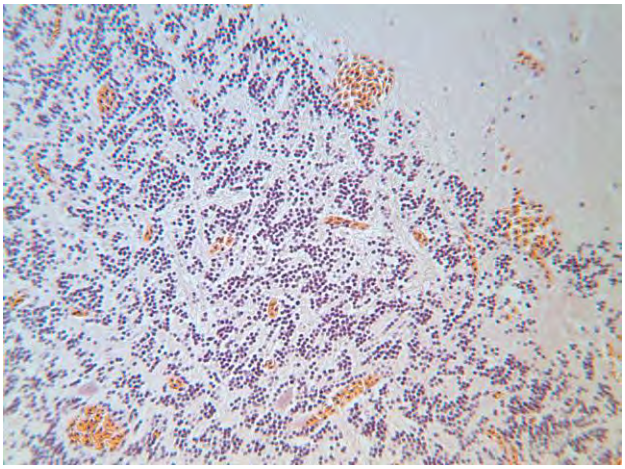
Menhaden gills (H&E 40X).



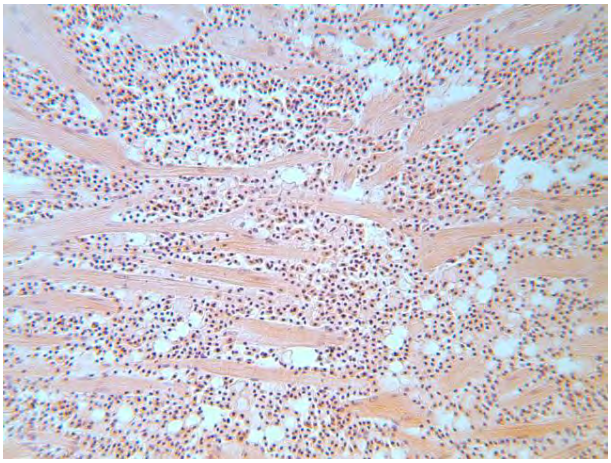
Menhaden gills with necrosis (H&E 25X).



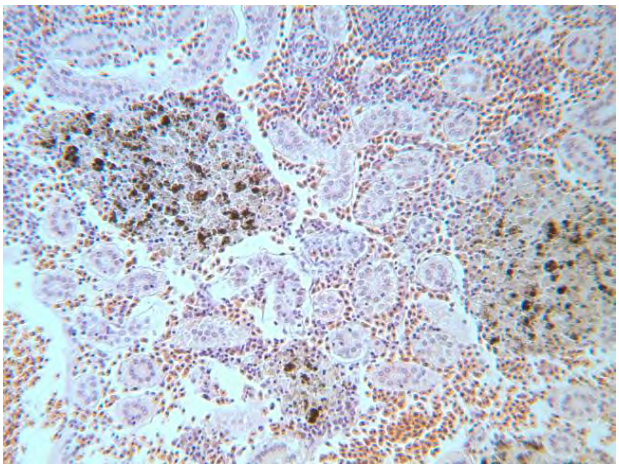
Red blood cell congestion in liver (H&E 25X)



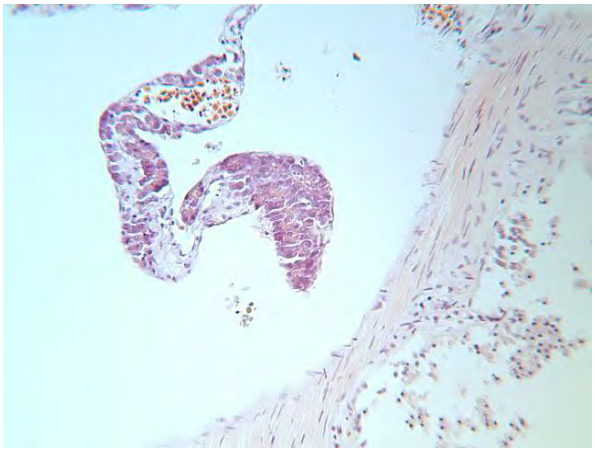
Red blood cell congestion in brain congestion



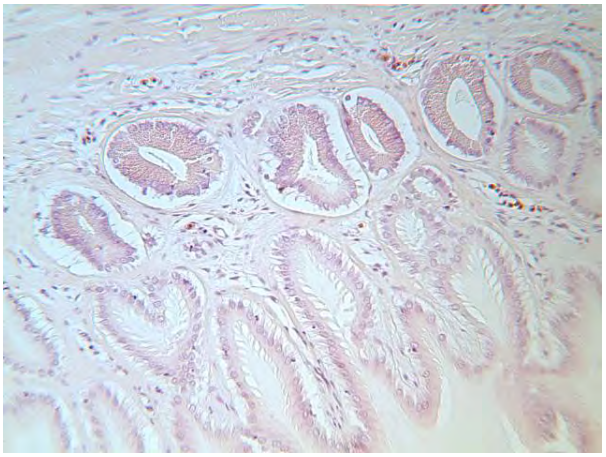
Red blood cell congestion in heart (H&E 25X)



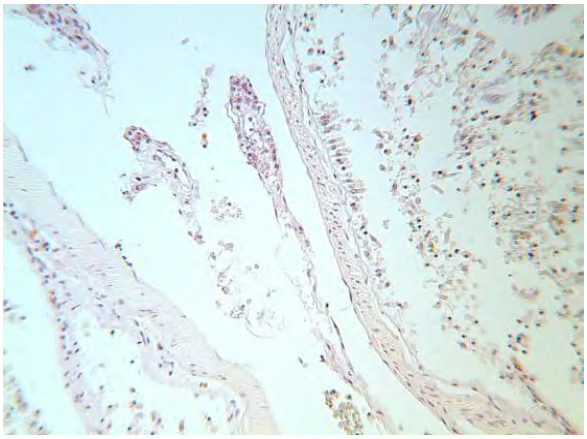
Posterior kidney hemorrhages (H&E 25X)



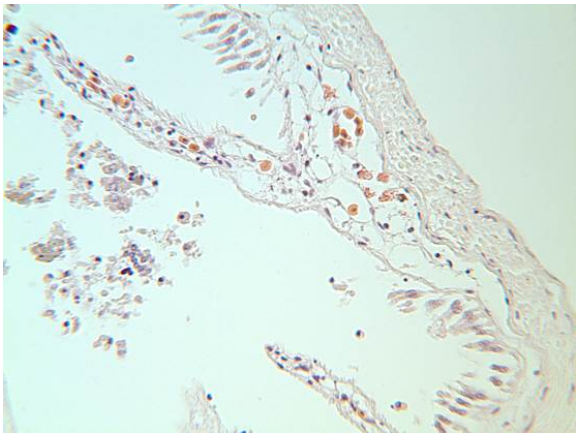
Pancreas with zymogen granule depletion (25X)



Menhaden intestine (H&E 25X)

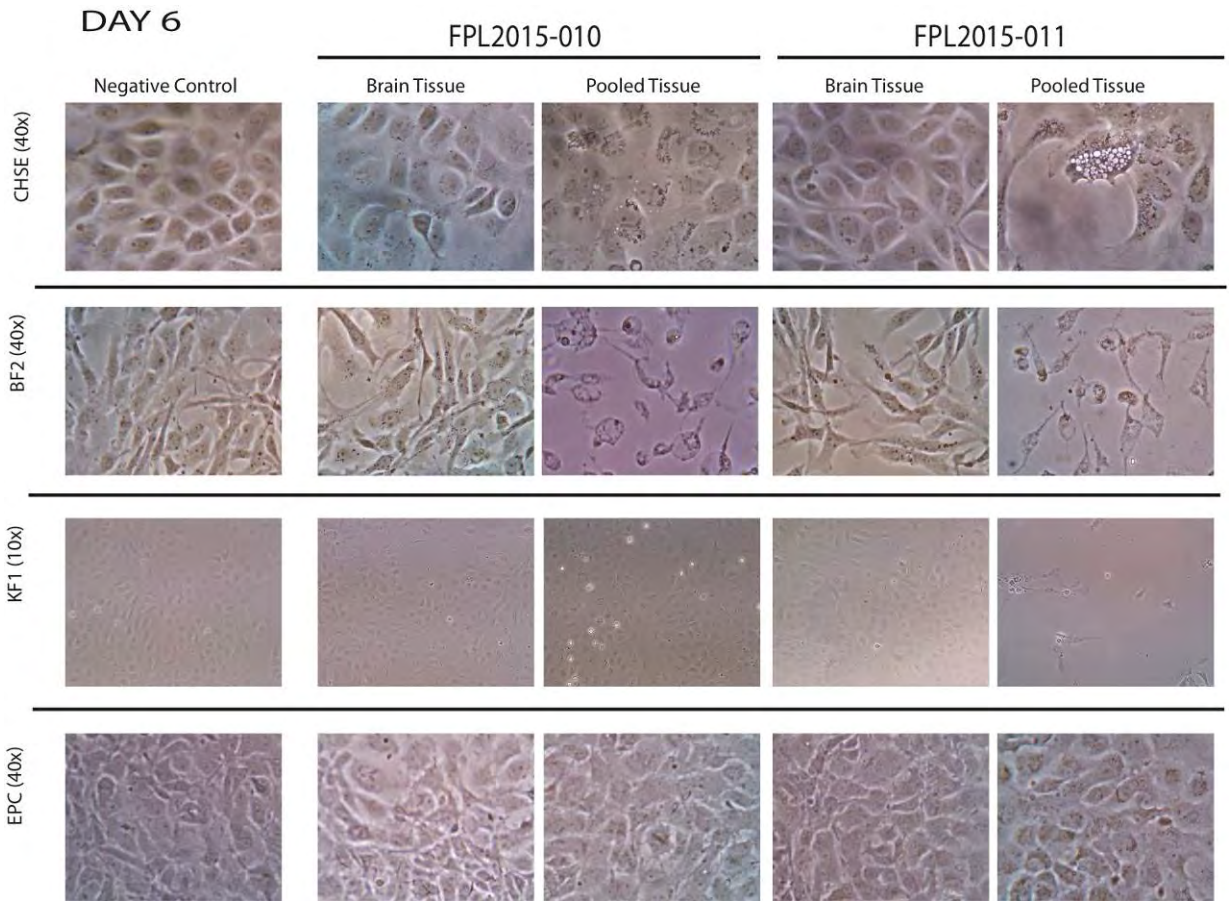


Pyloric ceca necrosis (H&E 25X)



Pyloric ceca necrosis (H&E 40X)

Panel of Viral CPE images from FPL2015 010 and 011



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Atlantic States Marine Fisheries Commission

DRAFT ADDENDUM I TO AMENDMENT 2 OF THE ATLANTIC MENHADEN INTERSTATE FISHERY MANAGEMENT PLAN FOR PUBLIC COMMENT

This draft document was developed for Management Board review and discussion. This document is not intended to solicit public comment as part of the Commission/State formal public input process. Comments on this draft document may be given at the appropriate time on the agenda during the scheduled meeting. If approved, a public comment period will be established to solicit input on the issues contained in this document.

ASMFC Vision Statement:
Sustainably Managing Atlantic Coastal Fisheries

Public Comment Process and Proposed Timeline

In February 2016, the Atlantic Menhaden Management Board initiated an addendum to Amendment 2 to the Interstate Fishery Management Plan for Atlantic Menhaden. This addendum considers a revision to the bycatch allowance provision and contains background on the Atlantic States Marine Fisheries Commission's management of Atlantic menhaden, the addendum process and timeline, a statement of the problem, and proposed management options.

The public is encouraged to submit comments regarding this document at any time during the addendum process. **The final date comments will be accepted is 5pm on [INSERT DATE]**. Comments may be submitted by mail, email, or fax. If you have any questions or would like to submit comment, please use the contact information below.

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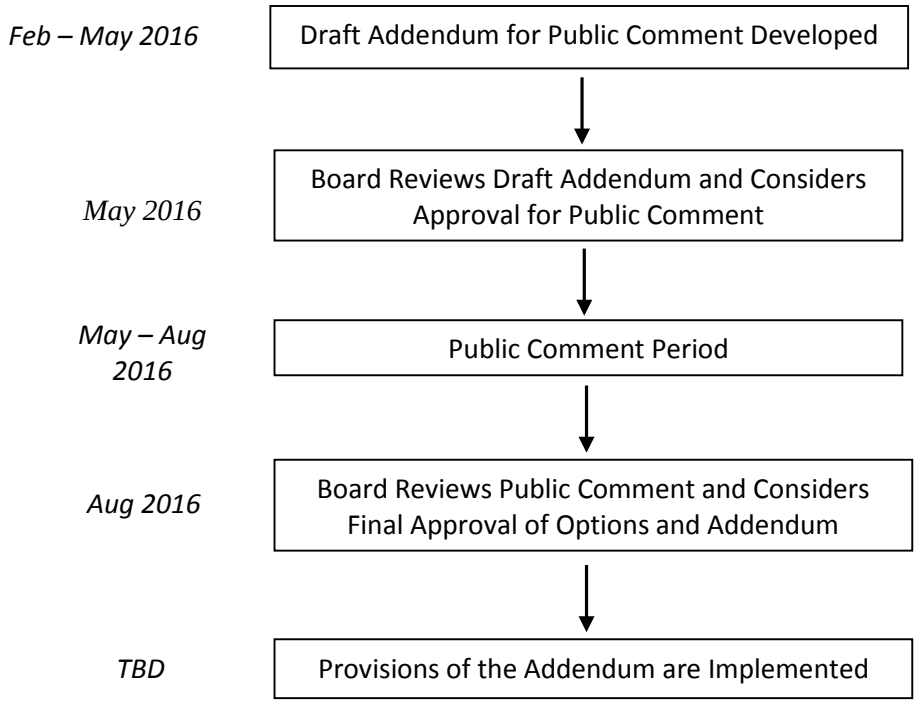

1.0 Introduction

The Atlantic States Marine Fisheries Commission (ASMFC), through the coastal states of Maine through Florida, is responsible for managing Atlantic menhaden (*Brevoortia tyrannus)*, under the authority of the Atlantic Coastal Fisheries Cooperative Management Act (ACFCMA). ASMFC has coordinated interstate management of Atlantic menhaden in state waters (0–3 miles) since 1981. Atlantic menhaden are currently being managed under Amendment 2 (2012) to the Interstate Fishery Management Plan (FMP).

Amendment 2 implemented a coastwide commercial total allowable catch (TAC) for the first time in 2013. The TAC is allocated into state-specific quotas based on the average landings from 2009–2011. States are responsible for managing their quotas through the implementation of state-specific management measures and are also required to have timely reporting with accountability for quota overages.

Amendment 2 also includes a bycatch allowance provision to provide flexibility for harvest of Atlantic menhaden by non-directed fisheries after a state has reached its quota and closed its directed fishery. Although the bycatch allowance is intended for non-directed fisheries, Amendment 2 does not require a certain percent catch composition of menhaden per trip as is commonly used to define bycatch trips in other fisheries. Additionally, all landings under the bycatch allowance do not count towards the overall TAC. The Board included this flexibility because at the time of Amendment 2 implementation little was known about the magnitude and timing of bycatch fisheries for Atlantic menhaden. However, since implementation, states have improved their monitoring programs in order to stay within their allocated quota and better define gear types utilizing the bycatch allowance. Refer to Appendix 1 for a summary of state bycatch management approaches.

The purpose of this Draft Addendum is to consider further accommodating bycatch fisheries for Atlantic menhaden. More specifically, the Atlantic Menhaden Management Board (Board) approved the following motion at its February 2016 meeting:

"*Move to initiate an addendum to allow two individuals who are each authorized by their management jurisdiction to harvest 6,000 pounds of menhaden bycatch to harvest 12,000 pounds of menhaden bycatch when working from the same vessel fishing stationary, multi-species gear – limited to one vessel trip per day."*

As a result, Draft Addendum I proposes to change the bycatch allowance provision in Amendment 2 (*Section 4.2.1.7*) to address the intent of this motion.

2.0 Overview

2.1 Statement of the problem

Under Amendment 2, all landings that occur until a state's quota is reached are defined as directed landings regardless of whether they are targeted or caught as bycatch. After

a state has achieved its quota, a bycatch provision allows individuals to land 6,000 pounds of Atlantic menhaden as bycatch per vessel per day. Under the bycatch provision, Amendment 2 does not allow multiple individuals to fish from the same vessel and each land the bycatch limit. Individuals must instead land 6,000 pounds separately from different vessels. This creates inefficiencies because in the Chesapeake Bay it is common during the open directed fishery for harvesters to pool resources and fish together which they can no longer do once a state transitions to the bycatch allowance.

2.2 Background

The history of multiple individuals working together from the same vessel to harvest Atlantic menhaden traditionally exists in the Chesapeake Bay. More specifically, many Chesapeake Bay pound netters work in groups of two, fishing nets owned by each group member from the same vessel. These groups are typically composed of family members. Fishing in this way enables them to pool resources for fuel and crew.

Considering this may be a technique used in other states/jurisdiction within the management unit, the Plan Development Team (PDT) evaluated the performance of the fishery from 2013 through 2015 to identify other stationary multi-species gears that may also benefit from the ability to work together to pool resources.

Fishery Performance

From 2013 through 2015, the Atlantic menhaden commercial directed fishery landed 98–99% of its coastwide commercial TAC[1]. Atlantic menhaden landings under the bycatch allowance averaged approximately 5.63 million pounds annually and ranged from 4.38 to 6.58 million pounds. For reference, bycatch landings represent approximately 1–2% of the total coastwide landings, but do not count towards the TAC.

Average bycatch landings from 2013 through 2015 have been highest in the Chesapeake Bay region with Maryland, the Potomac River Fisheries Commission (PRFC), and Virginia comprising approximately 81% of the total. The states of New York, New Jersey, Florida, Delaware, and Rhode Island accounted for the remaining 19% (Table 1). The predominant stationary gear types[2] landing under the bycatch allowance were pound nets[3] (61%) and anchored/staked gill nets (24%), with pots and fyke nets accounting for less than 1% of the total (Table 1). The landings data also identified several mobile gear types harvesting menhaden under the bycatch allowance. The predominant mobile

[1] The coastwide commercial TAC was 376.5 million pounds for 2013 and 2014, and 414.2 million pounds for 2015.

[2] For the purpose of this draft addendum, the PDT defined "stationary" gear types as those that are stationary *while fishing*. Further distinction could be made between gears set on the same (often licensed) site for the entire fishing season (e.g., pound nets, staked gill nets) and gears that can be moved throughout the fishing season to follow resource distribution (e.g., pots, anchored gill nets, fyke nets).

[3] Pound nets include floating fish traps and fishing weirs. This clarification applies throughout the document including the management options.

gears were cast nets (6%) and drift gill nets (5%) with haul/beach seines, trawls and hook and line accounting for the remaining 4% of the total (Table 1).

Table 1. Average landings under the bycatch allowance from 2013–2015 by gear type (stationary and mobile) and jurisdiction. Highlighted cells represent the gear type with the highest landings within a jurisdiction. (C) = confidential landings, and (-) = no landings. Total confidential landings were 209,277 pounds (i.e., the sum of all C's in the table below). Note that sum of pounds and percent of total columns do not include confidential data.

State/Jurisdiction	MD	VA	PRFC	NY	NJ**	FL	DE	RI*	Sum lbs (NonConf)	% of Total
Stationary Gears While Fishing										
Pound net	2,306,552	122,913	884,843	128,854	C	-	-	57,231	**3,500,393**	60.6%
Anchored/stake gill net	5,131	1,276,633	-	-	100,202	C	28,998	C	**1,410,965**	24.4%
Pots	10,001	-	-	C	-	C	C	-	**10,001**	0.2%
Fyke nets	C	C	-	-	C	-	-	-	**918**	0.0%
Mobile Gears While Fishing										
Cast Net	C	-	-	183,137	C	163,776	-	C	**346,913**	6.0%
Drift Gill net	16,082	57,794	-	18,175	129,620	-	66,117	-	**287,788**	5.0%
Seines Haul/Beach	C	5,119	-	206,587	-	-	-	-	**211,706**	3.7%
Trawl	-	-	-	9,733	C	-	-	C	**9,733**	0.2%
Hook & Line	C	-	-	-	-	C	-	C	**278**	0.0%
Sum lbs (NonConf)	**2,337,766**	**1,462,460**	**884,843**	**546,485**	**229,822**	**163,776**	**95,116**	**57,231**	**5,778,694**	
% of Total	40.5%	25.3%	15.3%	9.5%	4.0%	2.8%	1.6%	1.0%		

NJ** an ad hoc method was used to split gill net data between stationary and mobile gears
RI* trips do not include those landed under the episodic event set aside because those landings are counted as part of the directed fishery.

From 2013 through 2015, a total of 12,617 trips landed Atlantic menhaden under the bycatch allowance. Of those trips, 8,979 trips (71%) were from stationary gears which were the focus of the PDT analysis given the stated intent of this addendum.

The Chesapeake Bay jurisdictions account for 88% of all stationary gear bycatch trips from 2013–2015 (Table 2). Of those trips in the Bay, approximately 40% are from pound nets in Maryland and PRFC, and approximately 59% are from anchored/staked gill nets in Virginia. These two main gear types in the Bay also emerge when looking at the sum of all bycatch trips from 2013–2015 divided into 1,000 pound landings bins. More specifically, 60% of all stationary gear trips landed less than 1,000 pounds which was predominantly driven by anchored gill nets in Virginia. Additionally, pound nets were the only notable gear type that accounted for trips exceeding 3,000 pounds with 44% of trips in Maryland and 33% of trips in PRFC exceeding that level (Table 2).

Table 2. Total number of bycatch allowance trips landing menhaden by stationary gears only from 2013–2015 by jurisdiction and percent of total trips by 1,000 pound landing bins. (C) = confidential landings

Bins (LBS)	VA	MD	PRFC	NJ	NY	DE	RI*	FL	Total Trips	Total Bin%
1-1000	71%	35%	31%	85%	88%	91%	53%	100%	**5,350**	59.6%
1001-2000	13%	12%	21%	10%	9%	4%	14%	0%	**1,176**	13.1%
2001-3000	7%	8%	15%	3%	C	4%	18%	0%	**716**	8.0%
3001-4000	3%	7%	10%	1%	3%	1%	4%	0%	**426**	4.7%
4001-5000	3%	7%	13%	C	C	1%	3%	0%	**441**	4.9%
5001-6000	2%	14%	10%	C	C	0%	6%	0%	**519**	5.8%
6000+	0%	16%	0%	C	C	0%	3%	0%	**351**	3.9%
Total Trips	**4672**	**2057**	**1138**	**477**	**345**	**165**	**102**	**23**	**8,979**	
Total Trips %	52.0%	22.9%	12.7%	5.3%	3.8%	1.8%	1.1%	0.3%		

RI* trips do not include those landed under the episodic event set aside because those landings are counted as part of the directed fishery.

In summary, landings under the bycatch allowance from 2013 through 2015 are largely attributed to the stationary multi-species pound net fisheries in Maryland, PRFC and anchored gill net fishery in Virginia. Pound net trips are landing menhaden in amounts that would lend to the cooperative fishing behavior considered in this addendum. However, there are other stationary multi-species gear types in all other jurisdictions that land Atlantic menhaden under the bycatch allowance.

Stationary Bycatch Gear and Landings Composition

The PDT examined catch composition by gear for trips landing Atlantic menhaden under the bycatch allowance provision from 2013 through 2015. Atlantic menhaden averaged approximately 71% of the catch in weight for all gears combined (stationary and mobile). This was expected since only trips catching Atlantic menhaden were used, and large individual catches are common in species that travel in large schools, such as Atlantic menhaden. More specifically, stationary gears accounted for 61% of total Atlantic menhaden bycatch landings, and pound net catches comprised 71% of the stationary gear total in weight.

Pound nets, the predominant gear in the bycatch landings, are a large staked or anchored multispecies fish trap that is very rarely moved within season. Pound nets are not selective for a particular species, and therefore, undesirable or controlled species trapped in pound nets must be either discarded or harvested as bycatch. Because menhaden travel in schools, when a pound net traps menhaden, the numbers are generally large. Examination of other species landed from pound nets during Atlantic menhaden bycatch trips indicated striped bass, Atlantic croaker, spot, bluefish, channel catfish and gizzard shad were most commonly encountered. Other than gizzard shad, these species have a much higher ex-vessel value than Atlantic menhaden.

Anchored and staked gill nets accounted for most of the remaining stationary gear landings. Staked gill nets constitute a net attached to fixed stakes, whereby the stakes remain in the same location each time the gill net is fished, and capture any variety of

species that may be occupying the area being fished. Anchored gill nets are stationary while set, but can be (and usually are) moved on a daily basis. These nets are sometimes set to catch multiple species and at other times to target individual species, depending on the areas being fished. Most fish and crustacean pots are targeting specific species, and Atlantic menhaden are a very small incidental bycatch. Most pots are not multispecies gear (e.g., crab pots).

Stock Status

Based on the 2015 benchmark stock assessment, Atlantic menhaden are not overfished and are not experiencing overfishing. The 2015 assessment includes data through 2013. The estimated fishing mortality rate for 2013 (0.22) is below both the threshold (1.26) and target (0.38), whereas fecundity in 2013 (170 trillion maturing or ripe eggs) is well above the threshold (86.8 trillion) but below the target (189 trillion). The 187,880 metric ton (414.2 million pound) TAC set by the Board for 2015 and 2016 has less than a 2% risk of overfishing.

The Atlantic Menhaden Technical Committee previously reviewed a conservation equivalency proposal from the State of Maryland and Potomac River Fisheries Commission to allow two licensed pound net fishermen aboard the same vessel to each land 6,000 pounds of menhaden as bycatch (Appendix 2). The Technical Committee agreed that the proposal, limited to pound nets in Maryland and PRFC, would not adversely impact the biological status of menhaden given: 1) current stock status; 2) the limited amount of landings occurring under the bycatch allowance (1-2% of total coastwide landings); and 3) Maryland and PRFC pound net bycatch landings of menhaden would be unlikely to significantly increase due to these fisheries being subject to limited entry (Appendix 3). The Technical Committee recommended continued monitoring of bycatch so that if an unexpected expansion of harvest occurs, it can be addressed. (Amendment 2 stipulates an annual Board review of bycatch landings.)

The conservation equivalency proposal reviewed by the Technical Committee was deferred by the Board to be considered in this Draft Addendum because conservation equivalency cannot be used to adjust the bycatch allowance provision as written in Amendment 2.

3.0 Management Options

The following section considers modifying Section 4.2.1.7 of Amendment 2 (Bycatch Allowance). Section 4.2.1.7 of Amendment 2 reads as follows:

> *4.2.1.7 Bycatch Allowance*
> *An incidental bycatch allowance is strictly for non-directed fisheries. States are not eligible to submit alternative state management regimes (Section 4.5) in lieu of the bycatch allowance as written.*

No directed fisheries for Atlantic menhaden shall be allowed when the fishing season is closed. An incidental bycatch allowance of up to 6,000 pounds of Atlantic menhaden per trip for non-directed fisheries shall be in place during a season closure. The amount of Atlantic menhaden landed by one vessel in a day, as a bycatch allowance, shall not exceed 6,000 pounds (this prohibits a vessel from making multiple trips in one day to land more than the bycatch allowance). The use of multiple carrier vessels per trip to offload any bycatch exceeding 6,000 pounds of Atlantic menhaden is prohibited. A trip shall be based on a calendar day basis.

Bycatch Reporting

Bycatch landings by non-directed fisheries are required to be reported through the timely reporting system approved by the Board in Section 3.6.1.2. All bycatch from non-directed fisheries during a closed season must be reported separately from directed harvest in annual compliance reports. Bycatch landings that occur during a state designated open season will count towards a state's quota. Bycatch landings will be reviewed on an annual basis by the Board to monitor the appropriateness of the bycatch allowance.

Option A: Status Quo

The amount of Atlantic menhaden landed by one vessel in a day, as a bycatch allowance, shall not exceed 6,000 pounds.

Option B: Working together permitted for all stationary multi-species gears.

The bycatch allowance provision would be adjusted to include the following exception to the 6,000 pounds per vessel limit:

Two authorized individuals, working from the same vessel fishing stationary multi-species gear, are permitted to work together and land up to 12,000 pounds from a single vessel – still limited to one vessel trip per day. Stationary multi-species gears are defined as pound nets, anchored/staked gill nets, and fyke nets.

This option is included based on the Board motion to include all stationary, multi-species gears. The PDT defined "stationary" as gears that are stationary while fishing. The PDT removed pots from this option because it was determined not to be a multi-species gear as described earlier and current bycatch landings from pots are very small (Table 1).

Option C: Working together permitted for all stationary multi-species gears, operating in limited-entry fisheries.

The bycatch allowance provision would be adjusted to include the following exception to the 6,000 pounds per vessel limit:

Two authorized individuals, working from the same vessel fishing stationary multi-species gear in a limited entry fishery, are permitted to work together and land up to 12,000 pounds from a single vessel – still limited to one vessel trip per day. Stationary multi-species gears are defined as pound nets, anchored/staked gill nets, and fyke nets.

This option is included based on the Board motion to include all stationary, multi-species gears and the Technical Committee's review of Maryland and PRFC proposals, where they acknowledged the importance of a limited entry management in restricting an expansion of harvest. Refer to Appendix 1 for a listing of current limited entry, stationary gear fisheries, by jurisdiction. The PDT removed pots from this option because it was determined not to be a multi-species gear as described earlier and current bycatch landings from pots are very small (Table 1).

Option D: Working together permitted for pound nets only.
The bycatch allowance provision would be adjusted to include the following exception to the 6,000 pounds per vessel limit:

Two authorized individuals, working from the same vessel fishing pound nets, are permitted to work together and land up to 12,000 pounds from a single vessel – still limited to one vessel trip per day.

This option is included because two individuals fishing together and reaching the current bycatch limit is most commonly documented for pound net trips and supported by the 2013–2015 bycatch landings data.

4.0 Compliance
States may implement any applicable changes to their bycatch allowance management programs immediately upon final Board approval of this addendum.

Of note, the Management Board has also initiated the development of Amendment 3 to consider ecosystem-based reference points and revisit the state-by-state allocations of the TAC. Bycatch management may also be addressed, meaning that any option selected as part of this addendum, has the potential to be replaced as part of Amendment 3, currently scheduled for implementation in 2018 if all components remain on schedule.

5.0 Literature Cited
Atlantic States Marine Fisheries Commission. 2012. Amendment 2 to the Atlantic Menhaden Fishery Management Plan. ASMFC, Arlington, VA 114 pp.

SEDAR. 2015. SEDAR 40 – Atlantic Menhaden Stock Assessment Report. SEDAR, North Charleston, SC. 643 pp.

Appendix 1: State Management of Bycatch Landings that occur under Amendment 2 Bycatch Allowance Provision as well as defined non-directed fisheries and stationary gear types that are limited entry as they relate to Atlantic menhaden. Note that the table may not be all inclusive and is subject to change.

State/Jurisdiction	Bycatch Trip Limit (lbs)	State further define non-directed fisheries?	Stationary Gear Types that are Limited Entry
ME	6,000	All gears allowed	None that catch menhaden
NH	6,000	All trips all year regardless of gear type limited to <6,000 lbs	None that catch menhaden
MA	1,000	Menhaden harvest not to exceed 5% of trip's entire harvest, by weight	Lobster pot, fish pot, gillnet
RI	6,000	Non-direct gear are defined as cast nets, floating fish traps, and rod and reel	Floating fish traps, lobster pots, and gillnets are limited entry
CT	6,000	All trips all year regardless of gear type limited to <6,000 lbs	None that catch menhaden
NY	6,000	All gears except purse seine and hook and line	None that catch menhaden
NJ	6,000	All gears allowed	Cap on license numbers for all gears; non-license holders limited to 100 lb per day
DE	N/A	bycatch fishery only. no capacity for >6,000 lbs	
MD	6,000 PN, 1,500 other	Pound nets, but 1,500 limit for other gears	All gear is limited entry, no anchor gillnets are allowed in MD portion of Chesapeake Bay
PRFC	6,000	Pound nets only	Pound nets
VA	6,000	All non-purse seine bait gears	Cap on the number of pound nets that can be set. Gill net permits are limited entry to allow individuals to set more than 6,000 feet of gill nets per vessel.
NC	6,000	Through proclamation when needed	None that catch menhaden
SC	N/A	No notable landings history	N/A
GA	N/A	No notable landings history	N/A
FL	1,000	Trap, hook & line, gill net	Trap

Appendix 2: Maryland and PRFC Conservation Equivalency Proposals

MARYLAND
DEPARTMENT OF
NATURAL RESOURCES

Larry Hogan, *Governor*
Boyd Rutherford, *Lt. Governor*
Mark Belton, *Secretary*
Joanne Throwe, *Deputy Secretary*

November 23, 2015

Under the Management Program Equivalency section (4.5.2) of Amendment 2 of the Interstate Fishery Management Plan for Atlantic Menhaden, the state of Maryland is requesting to implement a conservationally equivalent management program to the 6,000 pound bycatch allowance beginning in 2016. Maryland is requesting that two appropriately permitted individuals aboard a single vessel fishing pound net gear may each land 6,000 pounds of menhaden after the fishery is closed. Under this provision the vessel could carry up to 12,000 pounds of menhaden bycatch.

Under Amendment 2, individuals may land 6,000 pounds of menhaden per vessel per day after the state has achieved its quota and closed the 'directed' fishery. In Maryland this bycatch provision applies only to pound net fishermen who lack the ability to control the composition of fish within their stationary nets, and who posses a Maryland menhaden bycatch permit. Bycatch permits are only available to individuals who had a registered pound net site before February 18, 2013. Permits are non transferable and must be on board the vessel with the fisherman.

Most of Maryland's menhaden harvest is taken by a small number (10) of pound netters who traditionally work in family groups: fishing nets owned by family members (father and son) from the same vessel. Fishing in this way, they can pool resources for fuel and crew. Maryland provided for these individuals to continue working together in its implementation plan submitted to ASMFC in April of 2013. The plan was accepted by the Atlantic Menhaden Management Board. However, the ability for two fishermen working together to each land the 6,000 pounds of bycatch was removed for all states in 2014. This has caused undue hardship for Maryland pound netters.

Data are indicating that Maryland harvest remains consistent despite the removal of dual bycatch allowance (Table 1). However, the fishery is operating in a less efficient manner. In 2013, the fishery closed on June 29th resulting in 181 days of bycatch and the possibility to have 12K pounds on the vessel. In 2014, the fishery closed on August 23rd resulting in 131 days of bycatch. Despite having 29% fewer days of bycatch and the 6,000 pound allowance, the total bycatch amount decreased by only 500,000 pounds and total harvest declined by 256,000 pounds. In Maryland, harvest reports are tied to an individual, not a vessel so we cannot quantify the change in the number of vessels.
However, watermen have informed us that they are putting additional boats on the water. In some cases, this is a safety threat and in all cases it reduces the efficiency of this fishery in terms of cost for fuel and crew.

This proposal will not result in an increase in the number of menhaden harvested in Maryland. It will simply allow harvesting in a more efficient manner.

Maryland has authority to alter the bycatch allowance within 48 hours by public notice. Hence Maryland stands committed to monitoring harvest occurring under the bycatch provision and adjusting the provision downward if necessary. The intent would be allow this provision for 2016 and leave it in place until the implementation of Amendment 3.

Table 1. Menhaden harvest in Maryland 2013, 2014 and 2015. In 2013 a vessel could land 12,000 pounds of menhaden after the fishery closed in the case where two permitted individuals were working together. This provision was removed in 2014 and 2015. Note 2015 landings are preliminary as the fishery is still ongoing.

Year	Total Harvest (lbs)	Pre-closure Harvest (lbs)	Bycatch (lbs)	Closure Date
2013	6,908,913	4,122,830	2,786,083	6/29
2014	6,653,297	4,413,360	2,270,810	8/23
2015*	6,973,028*	5,604,855*	1,368,143*	8/29

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MARYLAND - VIRGINIA
"Potomac River Compact of 1958"
Potomac River Fisheries Commission
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January 8, 2016

Under the Management Program Equivalency section (4.5.2) of Amendment 2 of the Interstate Fishery Management Plan for Atlantic Menhaden, the Potomac River Fisheries Commission (PRFC) is requesting to implement a conservationally equivalent management program to the 6,000 pound bycatch allowance beginning in 2016. The PRFC is requesting that two PRFC pound net licensees aboard a single vessel fishing pound net gear may each land 6,000 pounds of menhaden per day after the fishery is closed. Under this provision, a single vessel could land up to 12,000 pounds of menhaden bycatch per day when there are two PRFC pound net licensees on board who each have at least one of their pound nets set and fishing (prior to the fishery being closed and the bycatch provisions being implemented) and no more than 6,000 pounds of Atlantic menhaden are harvested from either of the licensees nets.

Under Amendment 2, individuals may land 6,000 pounds of menhaden per vessel per day after the PRFC has achieved its quota and closed the 'directed' fishery. On the Potomac, this bycatch provision applies only to PRFC licensed pound net fishermen who lack the ability to control the composition of fish within their stationary nets. The Potomac River pound net fishery is a limited entry fishery, with a low number of licensed nets actually set and fished.

Most of the Potomac's menhaden harvest is taken by a small number (less than 15) of pound netters who traditionally work in family groups: fishing nets owned by family members (father and son) from the same vessel. Fishing in this way, they can pool resources for fuel and crew. The PRFC provided for these individuals to continue working together in its implementation plan submitted to ASMFC in April of 2013. The plan was accepted by the Atlantic Menhaden Management Board. However, the ability for two fishermen working together to each land the 6,000 pounds of bycatch was removed for all states and jurisdictions in 2014. This has caused undue hardship for Potomac River pound netters.

Data from 2013 and 2014 are indicating that Potomac River harvest remains consistent despite the removal of dual bycatch allowance (Table 1). However, the fishery is operating in a less efficient manner. In 2013, the fishery closed on August 22 resulting in 115 days of bycatch and the possibility to have 12K pounds on the vessel. In 2014, the fishery closed on August 27 resulting in 110 days of bycatch. In some cases, this is a safety threat and in all cases it reduces the efficiency of this fishery in terms of cost for fuel and crew.

This proposal will not result in an increase in the number of menhaden harvested in the Potomac River. It will simply allow harvesting in a more efficient manner. The PRFC has authority to alter the bycatch allowance by Order of the Commission, effective ten days after its

adoption, or immediately by Emergency Order. Hence the PRFC stands committed to monitoring harvest occurring under the bycatch provision and adjusting the provision downward if necessary. With our weekly commercial reports we have tighter temporal resolution on our harvest tracking and projections for quota attainment than MD (or VA) with their monthly reports. The intent would be allow this provision for 2016 and leave it in place until the implementation of Amendment 3.

Table 1. Atlantic menhaden harvest in the Potomac River 2013, 2014, and 2015. In 2013, a vessel could land 12,000 pounds of menhaden after the fishery closed, in the case where two licensed pound netters were working together. This provision was removed in 2014 and not in effect in 2015. *Note 2015 landings are preliminary.

Year	Total Harvest (lbs.)	Pre-closure Harvest (lbs.)	Bycatch (lbs.)	Closure Date	Revised Quota (lbs.)
2013	3,295,295	2,207,895	1,087,400	8/22/2013	2,337,508
2014	3,175,893	2,063,550	1,112,343	8/27/2014	2,335,719
2015*	2,694,055*	2,263,465	430,590*	9/26/2015	2,559,617

Atlantic States Marine Fisheries Commission
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MEMORANDUM

Appendix 3

January 19, 2016

To: **Atlantic Menhaden Management Board**
From: **Atlantic Menhaden Technical Committee**
RE: **TC Review of Maryland and PRFC's Conservation Equivalent Management Proposals**

The Technical Committee (TC) met via conference call to review an alternative management proposal submitted by the State of Maryland and the Potomac River Fisheries Commission (PRFC) regarding the 6,000 pound bycatch allowance. In brief, the proposals are requesting to allow two permitted/licensed pound net fishermen aboard the same vessel to each land 6,000 pounds of menhaden as bycatch (i.e., 12,000 pounds total from one vessel). Currently, two permitted/licensed individuals can land 6,000 pound each of menhaden bycatch on separate vessels, but not 12,000 pounds if they are fishing from the same vessel. This proposed management alternative only applies to pound net fishermen who must possess a menhaden bycatch permit or menhaden license. Both Maryland, and PRFC have a limited entry pound net fishery for menhaden, thus limiting the opportunity for expansion of the bycatch fishery. Maryland and PRFC conclude that this proposal will not result in an increase in the number of menhaden harvested, and it will allow harvesting in a more efficient manner.

TC Recommendation

The TC agreed by consensus that Maryland and PRFC's alternative management proposals will not adversely impact the biological status of Atlantic menhaden. The TC acknowledges that the proposed alternative would most likely not significantly change the amount of harvest occurring in Maryland or PRFC. Furthermore, the established limited entry program for the pound net fisheries is expected to limit the expansion of landings under these proposed management alternatives.

Given the current stock status of Atlantic menhaden (not overfished or experiencing overfishing), and the limited amount of landings occurring under the bycatch allowance (approximately 1% coastwide), the TC does not have biological concern with the proposed conservation equivalent proposals. The TC recommends continued monitoring of bycatch landings coastwide to ensure an expansion of harvest can be addressed if it occurs.

The TC also recommends the Board consider further evaluation of the bycatch landings on a coastal scale as it develops draft Amendment 3 to the FMP for Atlantic menhaden. The TC discussed that the bycatch portion of the harvest is currently able to expand. Assessing the upper bound of this expansion and its potential impacts to the fishery should be undertaken during the development of Amendment 3 as the Board considers the bycatch allowance provision.

From: Chris Shater [mailto:CShater@rltelecom.net]
Sent: Thursday, February 11, 2016 11:10 AM
To: Robert Beal <Rbeal@asmfc.org>
Subject: Menhaden in Virginia

Your study is referenced often by Saving Seafood, Inc. in regards to the health of Menhaden.
I doubt that was its intent, but seems to be the case.

The fishing in the Chesapeake Bay has been deplorable the past several years and seems to be getting worse.
I don't know if I am barking up the correct tree, but I am desperate.

I do not know that Omega Protein is the main cause of the lack of game fish, but it certainly cannot be helping. There is again a push being
made to increase their quota in Virginia. I just can't believe it. They seem to be the only people in the bay catching fish anymore.

It is very disheartening. I hope there is more thought given to fish higher in the food chain when these easements are published.
Or smaller individual habitats rather than discussing the Atlantic coast as a whole, people tend to cherry pick data to suit their own
interests.

Thanks for your time.

Chris Shater
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Richmond, VA 23230

April 1, 2016

The Fate of an Atlantic Menhaden Year Class

By Peter Himchak

ABSTRACT

The following analysis tracks a hypothetical year class, using the number of individuals at each age from the SEDAR Assessment Document, averaged over the ten year period 2004-2013 to account for inter-annual variability in year class size. The losses at each age due to fishing mortality, both reduction and bait, are similarly averaged for the same 10 year period for consistency in the analysis. What the analysis sets out to demonstrate and what the calculations convincingly show is that the losses from fishing mortality are very small in comparison to the number of fish in the population and equally minimal in comparison to the losses of billions of fish to natural mortality, as a year class ages from 0 to 6 years of age. The reduction fishery harvest, 0.807 billion fish, as a percentage of the starting year class size of 15.264 billion fish is 5.3%, and the bait fishery harvest, 0.165 billion fish, as a percentage is 1.1%.

The reduction fishery harvested only 5.3% of a hypothetical year class derived from averaging numbers of fish at each age over the 2004-2013 time period. The bait fishery harvested another 1.1%. The total fishing mortality amounted to only 6.4% of the year class during the recent 10 year time period.

INTRODUCTION

The Atlantic menhaden, *Brevoortia tyrannus,* is an important forage fish species, ranging from Maine through to Florida, which serves as an important food item for many predator species and supports important commercial fisheries for reduction and bait. Typical of most forage fish species, the Atlantic menhaden forms dense schools of fish which are comprised of extraordinarily large numbers. Spawning occurs during the winter months in offshore areas generally ranging from New Jersey to North Carolina. The eggs and larvae produced from these mass spawning events are then dispersed by ocean and wind currents and are advected into the estuaries along the Atlantic coast for development and growth. The size of an Atlantic menhaden year class, also called a cohort of that year's spawning, is greatly influenced by environmental factors and only to a limited extent by the size of the spawning stock biomass or number of eggs produced. Once within the Atlantic coastal estuaries, the success of any year's spawning can be measured in the number of Age-0 fish (also called young-of-year) that survive and become recruits to the stock.

Most forage fish species experience high naturally occurring variations in spawning success due to the complexities of environmental factors affecting survival of fertilized eggs and larvae. In the most recent peer reviewed SEDAR 40 benchmark assessment, the Beaufort Assessment Model (BAM) estimates the size of each year class in billions of fish being recruited into the stock each year from 1955 through 2013. Each year class can be tracked from Age-0 through Age-6 to examine the survivability of a year class of fish and can be estimated at each age after landings to determine their impact on the stock over time. Natural mortality losses, such as those due to predation, naturally occurring fish kills, power plant impingement and entrainment, etc. can also be estimated by subtracting the fishing mortality losses from the number of fish that die each year as its numbers decrease from Age-0 to Age-6. Losses each year to natural mortality depend on age, being extremely high at Ages 0 and 1 in particular, and dropping to lower numbers for older menhaden.

It can be difficult for fisheries managers to keep due perspective on the numbers, the numbers of fish at age, usually presented in billions of individual fish, with the numbers of fish lost to natural and fishing mortality each year, in the context of the size of the stock. Fishing mortality losses from the reduction fishery are usually presented in metric tons, but also can be expressed in millions of pounds. The commercial bait fishery landings, on a smaller scale, are more commonly presented in millions or thousands of pounds. However, the largest source of mortality by far, the natural mortality, is rarely mentioned or depicted in direct comparison with fishing mortality losses.

The following analysis attempts to demonstrate the multiple losses at age for a hypothetical, though not atypical, year class as it grows from Age-0 through Age-6. The analysis depicts the magnitude of losses for the year class as it ages, keeping the losses of natural mortality and both types of fishing mortality, reduction and bait separately, so they can be seen in proper perspective.

METHODS AND MATERIALS

Since the size of an Atlantic menhaden year class varies annually so much from year to year, the average number of individuals starting out each year as Age-0 fish for the 10 year period, 2004-2013, was calculated to represent the prototype of a year class, a hypothetical year class, to be followed throughout most of its life. The average number of individuals from the ten year period, 2004-2013, was selected to account for inter-annual variability in the strength of the age-0 year classes and represents the hypothetical year class. The time period, 2004-2013, also was selected because 2013 was the terminal year of data analysis for the most recent peer reviewed benchmark assessment.

The analysis uses data from the BAM Table 3. Numbers at age in billions of fish estimated from the base run of the BAM Model, 1955-2013. For example, for Age-0 fish, the size of a year class for this 10 year period ranges from 6.889 billion fish in 2013 to 26.954 billion fish in 2010, with the mean of 15.264 billion fish and a standard deviation of 6.370 billion fish. Similarly, the number of fish at Age-1 is averaged for the same 10 year period, with a mean of 5.216 billion fish and a standard deviation of 1.855 billion fish. Ages-2, 3, 4, 5, and 6 are all calculated in the same manner

Table 3, Assessment Addendum Document, January 2015
Number at age in billions of fish estimated from the base run of the BAM Model, 2004-2013

Year	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6+
2004	15.602	4.641	2.314	0.296	0.152	0.093	0.076
2005	24.053	5.053	1.913	0.757	0.127	0.078	0.100
2006	16.325	7.848	2.061	0.692	0.304	0.062	0.105
2007	13.483	5.327	3.298	0.815	0.269	0.141	0.097
2008	17.081	4.399	2.236	1.346	0.340	0.132	0.139
2009	13.482	5.573	1.866	0.952	0.588	0.171	0.160
2010	26.954	4.399	2.330	0.762	0.418	0.302	0.197
2011	10.151	8.795	1.807	0.877	0.298	0.199	0.291
2012	8.623	3.312	3.651	0.703	0.340	0.139	0.289
2013	6.889	2.814	1.393	1.507	0.287	0.163	0.256
SUM	152.643	52.161	22.869	8.707	3.123	1.480	1.710
MEAN-10 years	15.264	5.216	2.287	0.871	0.312	0.148	0.171

The fishing mortality losses at each age (in millions of fish), i.e. the catch at age, while not as variable from year to year as the size of the year class, are nonetheless averaged for the same 10 year period for consistency in this analysis and have been obtained from the BAM assessment document, Table 4.1.3.3.2 Estimated reduction landings of Atlantic menhaden in numbers at age (in millions), 1955-2013, and as a personal communication (bait landings), from the NOAA Beaufort Laboratory.

Table 4.1.3.3.2 Estimated reduction landings of Atlantic menhaden in numbers at age (in millions), 2004-2013

Year	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6
2004	17.970	213.950	652.090	75.700	17.410	0.900	0
2005	12.100	78.860	382.890	154.190	18.680	1.820	0
2006	9.160	298.910	300.130	121.650	23.620	0.480	0
2007	1.140	239.200	609.240	69.430	12.970	0.680	0
2008	7.900	52.370	394.870	106.640	14.650	1.030	0
2009	4.390	352.410	228.950	130.820	19.920	1.840	0
2010	15.480	409.500	501.110	68.100	28.310	0.570	0
2011	0.000	418.470	493.060	65.140	8.860	1.720	0
2012	4.670	127.240	626.950	33.610	3.890	0.000	0
2013	22.130	240.010	284.840	76.260	10.110	0.250	0
SUM	94.940	2430.920	4474.130	901.540	158.420	9.290	0
MEAN-10 years	9.494	243.092	447.413	90.154	15.842	0.929	0

Estimated bait landings of Atlantic menhaden in numbers at age (in millions), 2004-2013

Year	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6+
2004	0	7.5	84.7	29.7	7.9	0.9	0.1
2005	0	1.7	55.2	51.7	6.9	0.8	0.1
2006	0	19	41.1	30.2	5.8	0.2	0
2007	0	34.5	112.1	34.7	8.1	0.5	0.1
2008	0	4.1	98.6	54	11.2	1.3	0
2009	0.3	23.4	46.2	59.9	13	0.9	0
2010	0	32.4	82.8	38.3	19.9	2	0.2
2011	0	39.2	63.8	66.1	36.9	4.9	0
2012	0	10.3	155.9	66	16.9	1.1	0.3
2013	0.9	60.3	46.6	48.6	11.2	1.8	0
SUM	1.2	232.4	787	479.2	137.8	14.4	0.8
MEAN-10 years	0.12	23.24	78.7	47.92	13.78	1.44	0.08

Thus, the number of fish alive at Ages 0, 1, 2, 3, 4, 5, and 6 and the losses in numbers of fish due to the reduction and bait fisheries, can be calculated, as well as the number of fish at each age remaining after fishing.

RESULTS

The objective of the analysis is to calculate the numbers of fish harvested at each age in comparison to the number of fish present at each age at the beginning of a year. Age-specific exploitation rates are calculated as well as the overall exploitation rate of the commercial fisheries (reduction and bait) on the available resource.

Using the 10 year average (2004-2013) of number at age in billions of fish estimated from the base run of the BAM Model as an estimate of abundance at each age, and the ten year averages (2004-2013) for number of individual fish harvested by both the reduction and bait fisheries, the number of fish not harvested at each age, but rather “left in the water” can be calculated. The numbers of fish in both the reduction and bait fisheries are then expressed as a percentage of the number of individual fish alive at the beginning of each year to estimate an age specific exploitation rate.

Table 1. Average number of fish from 2004-2013 listing abundance at age, reduction fishery harvest at age, bait fishery harvest at age, total harvest at age, and abundance at age not harvested (includes both the number surviving to the next age and the number lost to natural mortality.

Ages	Abundance	Reduction Harvest	Bait Harvest	Total Harvest	Abundance Remaining after Fishing
0	15,264,300,000	9,494,000	120,000	9,614,000	15,254,686,000
1	5,216,100,000	243,092,000	23,240,000	266,332,000	4,949,768,000
2	2,286,900,000	447,413,000	78,700,000	526,113,000	1,760,787,000
3	870,700,000	90,154,000	47,920,000	138,074,000	732,626,000
4	312,300,000	15,842,000	13,780,000	29,622,000	282,678,000
5	148,000,000	929,000	1,440,000	2,369,000	145,631,000
6	171,000,000	0	80,000	80,000	170,920,000
Total	24,098,300,000	806,924,000	165,200,000	972,124,000	23,126,176,000

The average annual reduction fishery harvest, 806,924,000 fish, as a percentage of the starting (age-0) year class size of 15,264,300,000 fish is 5.3%

The average annual bait fishery harvest, 165,200,000 fish, as a percentage of the starting (age-0) year class size of 15,264,300,000 fish is 1.1%.

The average annual total harvest at age including both reduction and bait fisheries, 972,124,000 fish as a percentage of the starting (age-0) year class size of 15,264,300,000 is 6.4%.

Age	Reduction Fishery Exploitation Rate	Bait Fishery Exploitation Rate	Total Exploitation Rate
0	0.1%	0.0%	0.1%
1	4.7%	0.4%	5.1%
2	19.6%	3.4%	23.0%
3	10.4%	5.5%	15.9%
4	5.1%	4.4%	9.5%
5	0.6%	1.0%	1.6%
6	0%	<0.05%	<0.05%

What the analysis sets out to demonstrate and what the calculations convincingly show is that the losses from fishing mortality are very small in comparison to the number of fish in the population and very small in comparison to the losses of billions of fish to natural mortality as a year class ages from 0 to 6 years of age. **From this analysis, it is evident that the reduction fishery harvested only 5.3% by number of the population each year averaged over the 2004-2013 time period, the bait fishery 1.1%, and the fishery as a whole only amounted to 6.4% of the hypothetical year class.**

Recognizing the inter-annual variability in year class strength due to environmental factors, as well as the variability of landings in any given year, five separate year classes, 2003-2007, were analyzed according to the above methods to estimate an annual exploitation rate for each year class. Each of the five year classes was followed from Age-0 through Age-6+ and the corresponding landings for those year classes were calculated to estimate an annual exploitation rate for the separate year classes. The analysis was limited to these five year classes since the terminal year of the BAM data base is 2013 and the 2008 year class, as well as those year classes that followed, could not be tracked completely through six years of landings.

Table 2. Annual exploitation rates for five separate year classes, 2003-2007.

Year Class	Number of Age-0 Fish at beginning of the year	Reduction Harvest on the Year Class Over 6 Years (number of fish)	Bait Harvest on the Year Class Over 6 years (number of fish)	Year Class Exploitation Rate (based on the number of fish)
2003	14,397,000,000	793,230,000	102,300,000	6.22%
2004	15,602,000,000	482,880,000	89,800,000	3.67%
2005	24,053,000,000	1,047,380,000	200,100,000	5.19%
2006	16,325,000,000	804,080,000	218,100,000	6.26%
2007	13,483,000,000	359,420,000	126,600,000	3.60%

The estimated annual exploitation rates on the five separate year classes above ranged from 3.60% to 6.26% losses in numbers of fish, with an average annual exploitation rate of 4.99%. These estimates are of the same order of magnitude with the 6.4% exploitation rate calculated for the 10 year hypothetical year class.

DISCUSSION

The interstate management of the Atlantic menhaden resource has always generated contentious discussions amongst fishery managers, even more so in recent years when, for the first time in 2012, a Total Allowable Catch (TAC) was implemented by the Atlantic States Marine Fisheries Commission (ASMFC) with an allocation for each Atlantic coastal State based on the average of each State's landings for the 2009-2011 period.

The analysis is designed to estimate the number of individual fish harvested by both the reduction and the bait fisheries with the balance of the individuals in a year class not taken but "left in the water". This analysis cannot partition elements of natural mortality that are attributed individually to predation, impingement and entrainment in power plants, naturally occurring fish kills, disease, or some other factor. However, with the greatest majority of natural mortality occurring on Age-0 and Age-1 year old fish, it is a fair assumption to identify predation as a major contributor to the natural mortality of these small fish.

Whatever way you wish to calculate the impact of fishing, both reduction and bait, on the size of the standing stock, the overall percentage remains very small. In this 10 year averaged approach, the total exploitation rate was only 6.4% over recent times. Yet, this very small (when viewed relative to abundance and natural mortality) amount of landings is at the heart of current Atlantic menhaden management that has become even more contentious within recent years.

About the Author

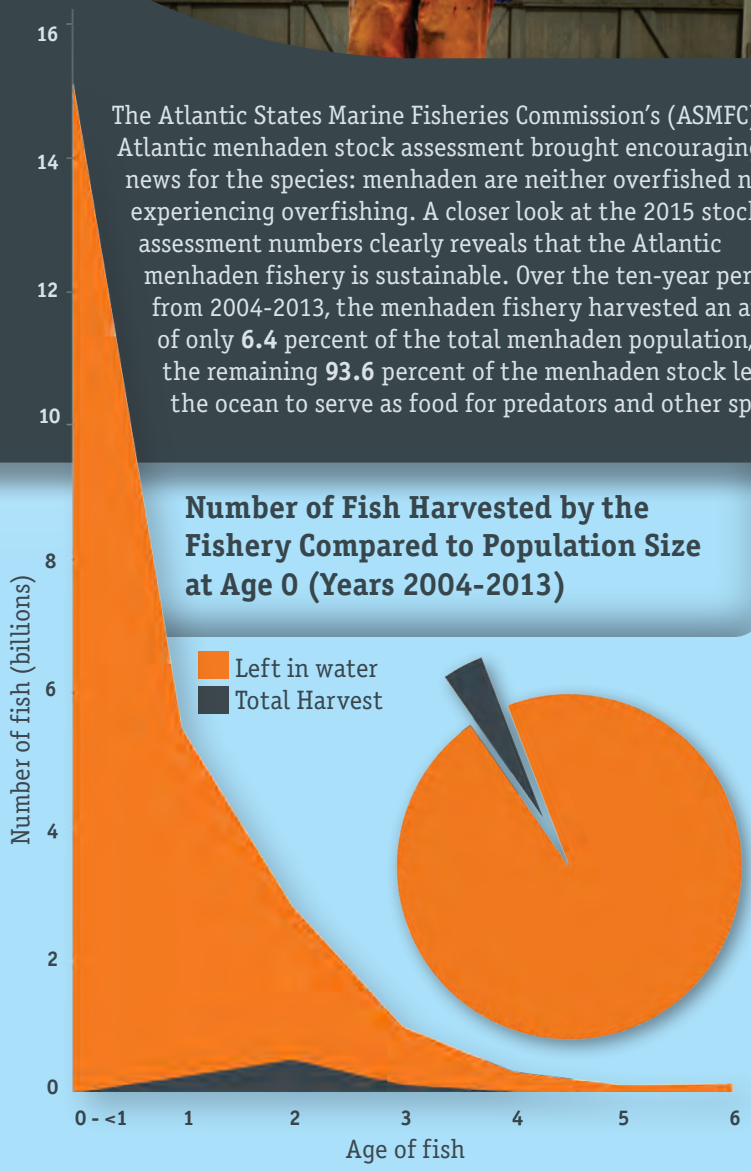
Peter Himchak has over 39 years of experience in fisheries science and management. For much of his career, Peter worked for the New Jersey Department of Environmental Protection (NJDEP), Division of Fish and Wildlife (DFW), Marine Fisheries Administration (MFA) Bureau of Marine Fisheries (BMF), where he was Supervising Fisheries Biologist at the time of his retirement in 2013. Peter also served as a member of the Atlantic Menhaden Technical Committee from 1988-2006, as well as on the Striped Bass Technical Committee from 1981- 1994. Peter currently serves as Senior Fisheries Scientist for Omega Protein and acts as a consultant to the Menhaden Fisheries Coalition.

MFC
MENHADEN FISHERIES COALITION

Atlantic Menhaden:
Fishing By the Numbers

The Atlantic States Marine Fisheries Commission's (ASMFC) 2015 Atlantic menhaden stock assessment brought encouraging news for the species: menhaden are neither overfished nor experiencing overfishing. A closer look at the 2015 stock assessment numbers clearly reveals that the Atlantic menhaden fishery is sustainable. Over the ten-year period from 2004-2013, the menhaden fishery harvested an average of only **6.4** percent of the total menhaden population, with the remaining **93.6** percent of the menhaden stock left in the ocean to serve as food for predators and other species.[1]

Number of Fish Harvested by the Fishery Compared to Population Size at Age 0 (Years 2004-2013)



Atlantic Menhaden Approximate Plants and Menhaden Vessels, 1956-2016

1956 at least 150 vessels

2016 at least 12 vessels

1956 23 plants

2016 1 plant

(= 12 vessels)

(= 1 plant)

Menhaden Fishing Terms

Fishing Mortality measures the rate at which fish are removed from the stock by the fishery. Excessive levels of fishing mortality lead to overfishing

Fecundity is a metric of the reproductive capacity of a fish stock, measured by the number of eggs being produced by the stock. It is a key measure of whether or not a stock is able to sustain itself and potentially increase its numbers.

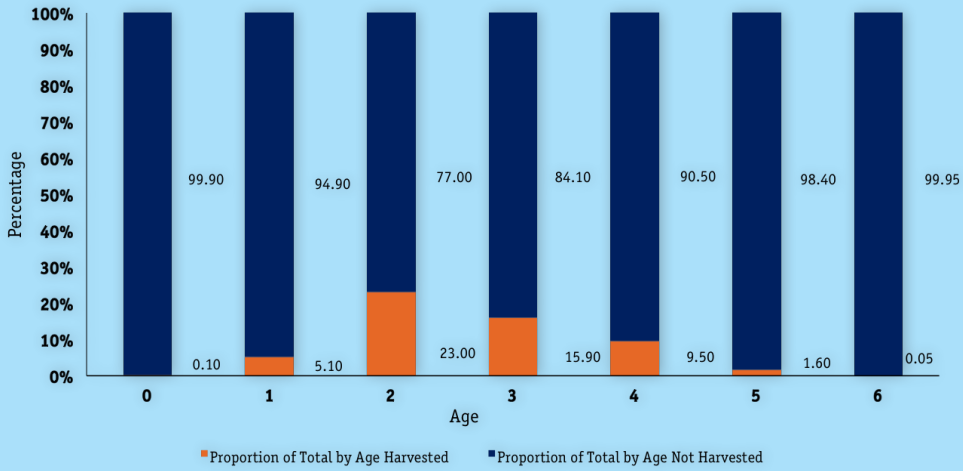
Overfishing occurs when fishing mortality is too high, and too many fish are being removed from a stock. Overfishing levels are determined by fisheries managers like the ASMFC. **Atlantic menhaden is not experiencing overfishing.**

Overfished is a stock status used when a stock is below the minimum population size set by fisheries managers.

Atlantic menhaden is not overfished.

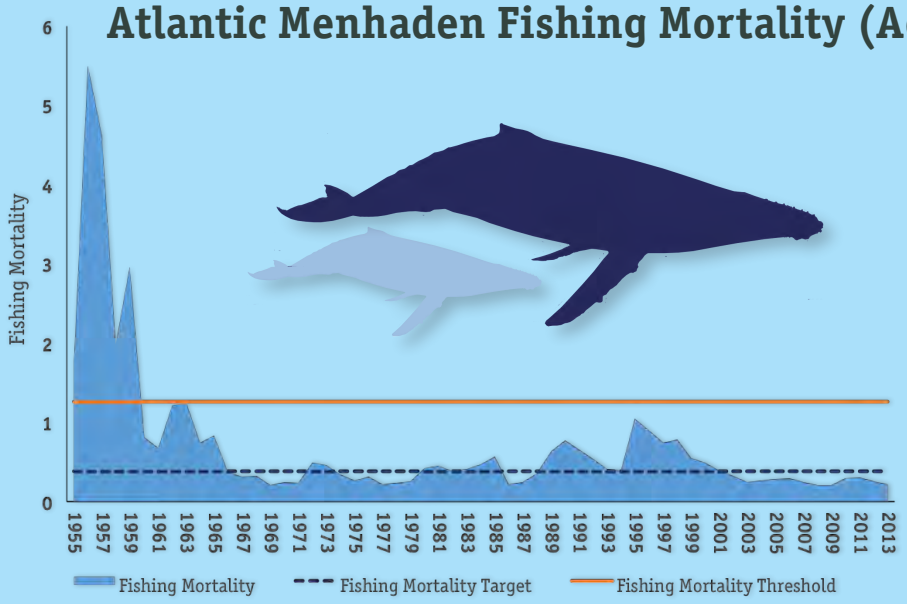
Spawning occurs when menhaden reproduce, which can occur as early as age 1. The measure of the spawning success of the stock is known as *Recruitment*.

Proportion of Total Population by Age Harvested vs Not Harvested (Years 2004-2013)



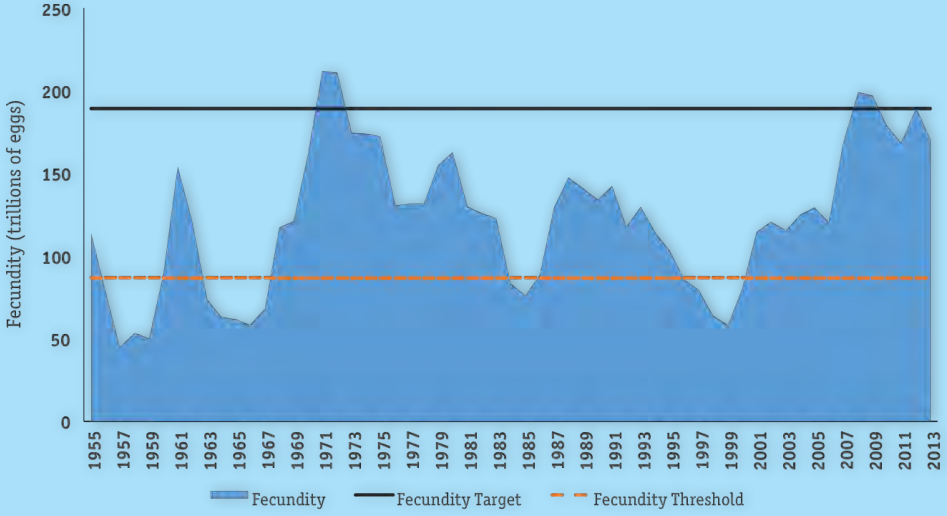
The fishery largely targets menhaden between the ages of 2 and 3: it harvested an average of **23** percent of age 2 menhaden and **15.9** percent of age 3 menhaden during the 2004-2013 period. The fishery does not target juvenile menhaden, which instead primarily serve as a food source for predator species. Similarly, the fishery rarely harvests older menhaden, which are the more fertile spawners. The harvest of both juvenile and older menhaden as a percentage of the total menhaden catch is negligible.[2]

Atlantic Menhaden Fishing Mortality (Ages 2-4)



The assessment also contained very positive measurements for several key indicators of a healthy stock. One such metric, fishing mortality, hit an all time low in 2013, with fishing effort in a sustainable range and well below levels that would trigger overfishing.[3] The Atlantic menhaden fishery today includes at least **12** active vessels and **one** processing plant located in Reedville, Virginia—a decrease from 150 vessels and **23** plants coastwide when fishing mortality peaked in 1956. from 150 vessels and 23 plants coastwide when fishing mortality peaked in 1956.

Atlantic Menhaden Fecundity



Another important measurement, fecundity, has reached a near-record high, and is well above the threshold level set by the ASMFC. Fecundity is one of the best measurements that fisheries managers have in determining whether or not a species is being managed sustainably. According to the assessment, the menhaden stock is producing more than enough eggs to successfully maintain the coastwide population.[4]

Additionally, the menhaden fishery takes several steps to avoid interfering with menhaden spawning, such as ending the fishing season before peak spawning migration begins to protect spawning-aged menhaden.

1 SEDAR. 2015. SEDAR 40 – Atlantic Menhaden Stock Assessment Report. SEDAR, North Charleston SC. 643 pp. available online at: http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=40. For more information on how these numbers were calculated, please see: http://menhadencoalition.org/wp-content/uploads/2016/03/Fate-of-an-Atlantic-Menhaden-Year-Class-Final.pdf

2 Ibid.

3 SEDAR. 2015. SEDAR 40 – Atlantic Menhaden Stock Assessment Report. SEDAR, North Charleston SC. 643 pp. available online at: http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=40.

4 Ibid.

Mike Waine

From: Sixto Portilla <openwater.sixto@gmail.com>
Sent: Wednesday, April 06, 2016 11:06 PM
To: JEFF KAELIN
Cc: Mike Waine; Robert H. Boyles JR; Jason E. Mcnamee; Chris Moore; Mary Clark
Subject: Re: Bunker fishkill research

Dear sirs:

I am emailing you to alert you that I believe there is a great likelihood of a massive bunker Fishkill throughout the Northeast. The areas which I believe will be hardest hit are those whose micro-plankton assemblage was dominated by diatoms early in the week.The Dead Fish should start washing up on shores within 2 weeks.

I understand I can be wrong, but at least in the Long Island regions all my testing of local water conditions demonstrate they are right for a massive bunker fish kill.

Kind regards,
Sixto

On Friday, January 29, 2016, Sixto Portilla <openwater.sixto@gmail.com> wrote:
> Thank you, Jeff, your efforts to identify a party interested in this research pursuit is much appreciated.
>
> Best regards,
> Sixto
>
> On Fri, Jan 29, 2016 at 9:54 AM, Jeff Kaelin <jkaelin@lundsfish.com> wrote:
>>
>> Thank you for your inquiry on bunker research funding, Ms. Portilla.
>>
>> I see that Toni and Mike, of the Commission staff, have responded to you relative to a Federal aquaculture research RFP, which may support your work .
>>
>>
>>
>> Since the MAFMC does not manage Atlantic menhaden, menhaden research priorities are not established by our Council and, therefore, were not included in our RFP.
>>
>> I will ask that your email be distributed to the members of our Collaborative Research Committee, however, for our meeting on February 9, as I believe members will appreciate and be interested in your hypothesis.
>>
>>
>>
>> With best regards,
>>
>> Jeff Kaelin, Lund's Fisheries, Inc.
>>
>> Chair, MAFMC Collaborative Research Committee
>>

>> Chair, Atlantic Menhaden Board Advisory Panel
>>
>>
>>
>> From: sixtoportilla@gmail.com [mailto:sixtoportilla@gmail.com] On Behalf Of Sixto Portilla
>> Sent: Thursday, January 28, 2016 1:00 PM
>> To: mwaine@asmfc.org; BOYLESR@DNR.SC.GOV; JASON.MCNAMEE@DEM.RI.GOV; JKAELIN@LUNDSFISH.COM
>> Subject: Bunker fishkill research
>>
>>
>>
>> Dear Sirs:
>>
>> Here in NY and in Connecticut this past spring we experienced a number of "bunker" fishkills. Specifically, they hit at the end of May and mid-June 2015. The recent work I have done on the bivalve Mercenaria mercenaria, also a filter feeding species, suggest the menhaden may have experienced hypothermic stunning. The timing of 2 abrupt drops in water temperature, as recorded at the USGS tide gauge in Riverhead, NY, coupled with an inadequate diet (in terms of fatty acid content) most likely caused these fishkills. The scientific narrative, however, stated that these bunker died of anoxic conditions caused by a plankton bloom which preceded the wash-up of dead bunker by about one day. The red flag in this proposed scenario is that New Haven, CT, which did not experience the same plankton bloom dynamic, also had a massive fishkill. They blamed it on "whirling disease".
>>
>> The work I have done thus far suggests a completely different narrative involving the nutritional value (in terms of fatty acids) of the plankton assemblage to which the menhaden were exposed coupled with the recorded rapid drop in water temperature experienced in northeast estuaries.
>>
>> I presented this data and the temperature/diet hypothesis of menhaden fishkills at the 36th Milford Aquaculture Seminar two weeks ago and it was well received. The work on M. mercenaria is detailed in two recently published papers .
>>
>> http://link.springer.com/article/10.1007/s10499-015-9889-4
>> http://www.sciencedirect.com/science/article/pii/S0044848615302519
>>
>> I would like to conduct research that would investigate whether menhaden have a similar sensitivity to the fatty acid profile of the plankton assemblage that M. mercenaria have. It would be a collaborative effort between a shellfish hatchery (thermal tanks and plankton culture) and a college (analytical instrumentation).
>>
>> Since this concept does NOT address one of the research priorities listed in the Mid-Atlantic Fisheries Research RFP (Deadline - February 12, 2016), I am reluctant to submit a proposal.
>>
>> Can you recommend an avenue for funding for a research effort of this nature? I think it may shed new light on bunker physiology, their sensitivity to environmental conditions and fishkills.
>>
>> Thank you for your consideration on this matter.
>>
>> Respectfully,
>> Sixto E. Portilla
>