

Atlantic States Marine Fisheries Commission

American Eel Management Board

October 29, 2019

1:15 - 2:15 p.m.

New Castle, New Hampshire

Draft Agenda

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

- | | |
|--|-----------|
| 1. Welcome/Call to Order (<i>M. Gary</i>) | 1:15 p.m. |
| 2. Board Consent | 1:15 p.m. |
| • Approval of Agenda | |
| • Approval of Proceedings from August 2019 | |
| 3. Public Comment | 1:20 p.m. |
| 4. Consider Approval of Coastwide Cap Overages Policy Final Action
(<i>K. Rootes-Murdy</i>) | 1:30 p.m. |
| 5. Consider Approval of 2019 FMP Review and State Compliance
(<i>K. Rootes-Murdy</i>) Action | 2:00 p.m. |
| 6. Other Business/Adjourn | 2:15 p.m. |

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

Sustainable and Cooperative Management of Atlantic Coastal Fisheries

MEETING OVERVIEW

American Eel Management Board
October 29, 2019
1:15 – 2:15 p.m.
New Castle, New Hampshire

Chair: Marty Gary (PRFC) Assumed Chairmanship: 10/17	Technical Committee Chair: Jordan Zimmerman (DE)	Law Enforcement Committee Representative: Beal
Vice Chair: Lynn Fegley (MD)	Advisory Panel Chair: Mari-Beth DeLucia	Previous Board Meeting: August 2019
Voting Members: ME, NH, MA, RI, CT, NY, NJ, PA, DE, MD, VA, NC, SC, GA, FL, D.C., PRFC, USFWS, NMFS (19 votes)		

2. Board Consent:

- Approval of Agenda
- Approval of Proceedings from August 2019

3. Public Comment- At the beginning of the meeting, public comment will be taken on items not on the Agenda. Individuals that wish to speak at this time must sign-up 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 Board Chair will not allow additional public comment. 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.

<p>4. Consider Approval of Coastwide Cap Overages Policy (1:30 – 2:00 p.m.) Final Action</p>
<p>Background</p> <ul style="list-style-type: none"> • In 2018, the Board approved Addendum V to address management of the new coastwide cap and removal of state allocations for the yellow eel fishery. A Board working group was formed to develop a Coastwide Cap Overage Policy. • The Board working group met multiple times from December 2018-October 2019 to develop a draft Coastwide Cap Overage Policy (Briefing Materials)
<p>Presentation</p> <ul style="list-style-type: none"> • Coastwide Cap Overages Policy by K. Rootes-Murdy
<p>Board actions for consideration at this meeting</p> <ul style="list-style-type: none"> • Consider approval of the Coastwide Cap Overages Policy

5. Consider Approval of 2019 FMP Review and State Compliance (2:00 – 2:15 p.m.) Action

Background

- State compliance reports are due September 1.
- The Plan Review Team reviewed each state report and drafted the 2019 FMP Review. (**Supplemental Materials**)

Presentations

- Overview of 2019 Fishery Management Plan Review by K. Rootes-Murdy

Board actions for consideration at this meeting

- Accept the 2019 Fishery Management Plan Review and approve *de minimis* requests

6. Other Business/ Adjourn

American Eel

Activity level: Low

Committee Overlap Score: Medium (SAS overlaps with BERP, Atlantic herring, horseshoe crab)

Committee Task List

- TC –July 2019: review of Maine’s aquaculture proposal
- TC – September 1st: Annual compliance reports due

TC Members: Jordan Zimmerman (DE, TC Chair), Ellen Cosby (PRFC, Vice Chair), Ryan Harrell (GA), Kimberly Bonvechio (FL), Bradford Chase (MA), Chris Adriance (DC), Robert Atwood (NH), Sheila Eyler (USFWS), Alex Haro (USGS), Wendy Morrison (NOAA), Carol Hoffman (NY), Todd Mathes (NC), Patrick McGee (RI), Jennifer Pyle (NJ), Troy Tuckey (VIMS), Danielle Carty (SC), Keith Whiteford (MD), Gail Wippelhauser (ME), Tim Wildman (CT), Kirby Rootes-Murdy (ASMFC)

SAS Members: Greg Hinks (NJ), Bradford Chase (MA), Matt Cieri (ME), Sheila Eyler (USFWS), Laura Lee (NC), John Sweka (USFWS), Troy Tuckey (VIMS), Keith Whiteford (MD), Kristen Anstead (ASMFC), Kirby Rootes-Murdy (ASMFC)

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

**The Westin Crystal City
Arlington, Virginia
August 6, 2019**

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

Draft Proceedings of the American Eel Management Board Meeting
August 2019

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Adjournment..... 17

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INDEX OF MOTIONS

1. **Approval of Agenda** by Consent (Page 1).
2. **Approval of Proceedings of October 2018** by Consent (Page 1).
3. **Move to approve the 2020 aquaculture proposals (Maine 1 year, North Carolina 2 years) with the TC's recommendations and following the addendum to harvest up to 200 lbs per calendar year** (Page 7). Motion by Cheri Patterson; second by Pat Geer. Motion split (Page 8).
4. **Move to approve Maine's 2020 aquaculture proposal with the TC's recommendation. Eels harvested will be grown out to the yellow eel life stage (minimum 9")** (Page 8). Motion by Cheri Patterson; second by Pat Geer. Motion carried (Page 10).

Main Motion
5. **Move to approve NC's 2020-2021 aquaculture proposal with the TC's recommendations. In 2019, there will be no fishing in Nov-Dec. As per the addendum, the facility can harvest up to 200 lbs per calendar year. Eels harvested will be grown out to the yellow eel life stage (minimum 9") and the Board will be provided with an annual review** (Page 10). Motion by Cheri Patterson; second by Pat Geer. Motion to Amend.

Motion to Amend
6. **Move to amend to remove 2021** (Page 11). Motion by Sen. Craig Miner; second by Raymond Kane. Motion carried (Page 13).

Main Motion as Amended
Move to approve NC's aquaculture proposal with the TC's recommendations for 2020 only. In 2019, there will be no fishing in Nov-Dec. As per the addendum, the facility can harvest up to 200 lbs per calendar year. Eels harvested will be grown out to the yellow eel life stage (minimum 9") and the Board will be provided with an annual review to approve the second year.

Motion to Substitute
7. **Move to substitute to approve NC's aquaculture proposal for up to 200 lbs for 2019-2020 (Nov 1st 2019-March 31st 2020) consistent with the TC's recommendations. Eels harvested will be grown out to the yellow eel life stage (min 9")** (Page 16). Motion by Roy Miller; second by Pat Keliher. Motion carried (Page 17).

Main Motion as Substituted
Move to approve NC's aquaculture proposal for up to 200 lbs for 2019-2020 (Nov 1st 2019-March 31st 2020) consistent with the TC's recommendations. Eels harvested will be grown out to the yellow eel life stage (min 9"). Motion carried (Page 17).
8. **Move to adjourn** by consent (Page 17).

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ATTENDANCE

Board Members

Pat Keliher, ME (AA)	Andy Shiels, PA, proxy for T. Schaeffer (AA)
Sen. David Miramant, ME (LA)	Stewart Michels, DE, proxy for D. Saveikis (AA)
Cheri Patterson, NH, proxy for D. Grout (AA)	Craig Pugh, DE, proxy for Rep. Carson (LA)
Dennis Abbott, NH, proxy for Sen. Watters (LA)	Roy Miller, DE (GA)
G. Ritchie White, NH (GA)	Phil Langley, MD, proxy for Del. Stein (LA)
Sarah Ferrara, MA, proxy for Rep. Peake (LA)	Robert Brown, MD, proxy for R. Dize (GA)
Dan McKiernan, MA, proxy for D. Pierce (AA)	Lynn Fegley, MD, Administrative proxy
Raymond Kane, MA (GA)	Bryan Plumlee, VA (GA)
Phil Edwards, RI, proxy for J. McNamee (AA)	Pat Geer, VA, proxy for S. Bowman (AA)
Eric Reid, RI, proxy for Sen. Sosnowski (LA)	Mike Blanton, NC, proxy for Rep. Steinburg (LA)
David Borden, RI (GA)	Chris Batsavage, NC, proxy for S. Murphey (AA)
Justin Davis, CT (AA)	Ross Self, SC, proxy for R. Boyles (AA)
Sen. Craig Miner, CT (LA)	Malcolm Rhodes, SC (GA)
Bill Hyatt, CT (GA)	Spud Woodward, GA (GA)
Maureen Davidson, NY, proxy for J. Gilmore (AA)	Doug Haymans, GA (AA)
Emerson Hasbrouck, NY (GA)	Rep. Thad Altman, FL (LA)
John McMurray, NY, proxy for Sen. Kaminsky (LA)	Erika Burgess, FL, proxy for J. McCawley (AA)
Heather Corbett, NJ, proxy for J. Cimino (AA)	Marty Gary, PRFC
Russ Allen, NJ, proxy for T. Fote (GA)	Chris Wright, NMFS
Adam Nowalsky, NJ, proxy for Sen. Andrzejczak (LA)	Sherry White, USFWS
Loren Lustig, PA (GA)	

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

Ex-Officio Members

Staff

Bob Beal	Dustin Colson Leaning
Toni Kerns	Kristen Anstead
Kirby Rootes-Murdy	

Guests

Bill Anderson, MD DNR	Walker Golder, Natl Audubon Society
Mel Bell, SC DNR	Desmond Kahn, Newark, DE
Sam Chin, NOAA	Arnold Leo, E. Hampton, NY
Russell Dunn, NOAA	Jason McNamee, RI DEM
Syma Ebbin, UCONN	Tim Sartwell, NOAA
Jim Gilmore, NYS DEC	

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The American Eel Management Board of the Atlantic States Marine Fisheries Commission convened in the Jefferson Ballroom of the Westin Crystal City Hotel, Arlington, Virginia; Tuesday, August 6, 2018, and was called to order at 1:30 o'clock p.m. by Chairman Martin Gary.

CALL TO ORDER

CHAIRMAN MARTIN GARY: All right we're going to go ahead and get started. It sounds like a couple folks might still be lingering outside, but we're on a tight schedule. We have about an hour. I would like to welcome everybody to the American Eel Management Board. My name is Marty Gary from Potomac River Fisheries Commission; I'll be your Chairman.

Your Vice-Chairman is Lynn Fegley from Maryland. Seated at my right in a minute or two will be Kirby Rootes-Murdy, who is the Senior Fishery Management Plan Coordinator for this species, and Kristen Anstead, who is our Stock Assessment Scientist that works with American eels.

APPROVAL OF AGENDA

CHAIRMAN GARY: Our first item on the agenda is approval of the agenda.

Are there any changes, additions, modifications to the agenda? Seeing none, it is approved.

APPROVAL OF PROCEEDINGS

CHAIRMAN GARY: The second item on the agenda, Approval of Proceedings from the October 2018 meeting, is there any changes, any corrections with the proceedings from October 2018? Seeing none, we have approved those proceedings.

PUBLIC COMMENT

CHAIRMAN GARY: Next up is Public Comment. Kirby, do we have anybody that has signed up? We are on a tight schedule. We have one

person who has signed up. Desmond Kahn. If you could come up to the public microphone, and if you could limit, Desmond, to about two minutes or so, please, thank you.

MR. DESMOND M. KAHN: Thank you, Mr. Chairman. Real quickly, I just wanted to alert the Management Board to some new research on American Eels, which I published this spring in the Journal Fisheries. This concerns some new data on trends in abundance and fishing mortality of America eels. I was inspired to pursue this research by a comment made by Craig Pugh, one of the Delaware Commissioners.

What I did was use a source of data that the stock assessment did not use in the last assessment, and that is a source of data that is used for many assessments, and that is the Marine Recreational Information Program, or MRIP data on catches and trips. What I did was construct a mean catch per trip index of relative abundance for American eels, and I used the whole Atlantic coast.

This is a very broad coverage index, and one thing you learn when looking at this is that most eels that are caught by the recreational fishery are discarded by the fishermen. Primarily it seems to be a bycatch, and the majority is discarded. But for purposes of estimated abundance, we've always used the total catch, including discards. This data is used for the striped bass assessment, the weakfish assessment, the bluefish assessment, and probably some other species. What it shows is that while American eel for the period of 1981 to 2014, their peak abundance was in 1981. They did go into a steep decline until about '95, but ever since 2003 their trend in abundance has been increasing.

They've increased as of 2014 up to the point where they're back up to half the level they were in '81, which is the peak during that period. I just wanted to inform the Board, and

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there are various comments on the stock assessment, so I hope this could contribute to future assessments. Thank you very much.

CHAIRMAN GARY: Thank you, Desmond, I appreciate your comments.

**BOARD WORKING GROUP
RECOMMENDATIONS FOR ADDRESSING A
COASTWIDE CAP OVERAGE**

CHAIRMAN GARY: The next up on our agenda, we're going to have an update from Kirby on the Board Working Group recommendations for addressing a coastwide cap overage. As most of you know, we have passed a while back Addendum V to the fishery management plan.

There is a two-year trigger in place. Kirby is going to go through this. There is a Work Group that has been formed. They've met several times. I've listened in on all of those meetings, and there has been a lot of work, and we have a little bit to do. But Kirby, can you present that the Work Group.

MR. KIRBY ROOTES-MURDY: It's a very quick presentation, because it's just an update. For everyone's information we have a Work Group. The membership I have up on the screen now, it includes Marty Gary. For the state of Maine, Pat Keliher has designated Megan Ware to take part in this group. Cheri Patterson from New Hampshire, Lynn Fegley from Maryland, John Clark from Delaware, Pat Geer with Virginia, Chris Batsavage with North Carolina, and Ross Self from South Carolina.

As Marty laid out, Addendum V which was approved a year ago this month implements a new coastwide cap of 916,473 pounds. There is also a new management trigger as part of this Addendum, moving forward, a 10 percent overage which is greater than 1.008 million pounds for two consecutive years, triggers management action.

When it comes to that management action, previously there had been state-by-state allocations in which the states would be responsible for their quota, but currently under the new Addendum there is no allocation, so states that are harvesting 1 percent of that coastwide harvest are responsible for the reduction if that management trigger is tripped.

The Working Group has met over the last year a number of times to develop basically a policy on how that reduction strategy would be carried out. There are two main challenges that the Work Group has focused on during their meetings over the last year, the first being that if the coastwide cap is exceeded, you know there is this marginal difference between it being exceeded and hitting that management trigger.

You can go up to just shy of 10 percent of an overage annually, without there being any management action that is required. The second that we've talked about at this Board before is the lag time in which data becomes available for us to know if we have gone over the coastwide cap, or if a management trigger has been tripped. We often get data for the previous fishing year, usually between the late-spring through the summer. We are in the current fishing season in which we would be wanting to effectively take action to reduce harvest if need be, and so there is a one-year lag in terms of trying to get action to address an overage.

These are two of the main challenges the group has struggled with, and has talked through. The draft document is continuing to be worked on, and the group has thought through a number of overage scenarios and reduction strategies, and will be fleshing those out over the next few calls. The next step is for this Work Group to meet again later this month, and to continue work in developing this document, and for it to be presented to the Board at the Annual Meeting.

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The previous plan had been to present a draft document to you all today, but given some additional discussions by the group, it was determined that it would be best for the document to be fleshed out a little bit more with the decision tree, to really address some of these scenarios where the management trigger has not been tripped, but an overage has occurred of the coastwide cap, and how best to try to address that to prevent that management trigger from being tripped. With that I'll take any questions. Thank you very much.

CHAIRMAN GARY: There is no action or motions needed by the Board today. But if there are any questions about the Work Group's efforts, Kirby can take those now. Are there any questions for Kirby? I just wanted again to thank all the members of the Work Group. I think we have good, broad representation from both some of the lower harvesting states on both ends of the geographic spectrum.

Up and down the coast, as well as the Chesapeake region, where a lot of the higher landings of yellow eels occur, there has been a lot of effort that's been put into those meetings. We'll have information for you at the October Annual Meeting.

**REVIEW AND CONSIDER APPROVAL OF THE
2020 AQUACULTURE PROPOSALS**

CHAIRMAN GARY: Next up on the agenda will be the Review and Consideration of Approval for 2020 Aquaculture Proposals, and we have two, Kirby.

MR. ROOTES-MURDY: For my presentation today I'll go through the Maine proposal and the North Carolina proposal. The Technical Committee's review of those two proposals, Law Enforcement Committee's feedback, and I'll take any questions from you all. First the Technical Committee was presented Maine's

summary of the 2019 fishing year earlier this summer.

Effectively Maine harvested 130 pounds of their 200 pound allocation to grow out glass eels to the yellow eel life stage. American Unagi is the company that is working in Maine on this aquaculture allocation, and they contracted with several commercial eel fishermen, they all worked together to help make this program run smoothly this year.

Each fisherman had between 10 to 20 pound allocations to fish their fyke nets, and took their catch to buying stations with a swipe card system, as required by Maine Department of Marine Resources. It was a slow start to the season, due to the cold spring in the region, and most of the fishing took place from mid-April through May. American Unagi, as I said harvested only 130 pounds of their 200 allocation, and this was a decision made by the facility to try and not stress the capacity they have in the facility for growing out these animals. For the first year of this allocation they wanted to ensure that they were more successful, rather than trying to harvest all the way up to their allocation. Law Enforcement visited the facility and had no issues with the program. In terms of their proposal for the upcoming year, 2020, there are no changes in the facility or monitoring, and they plan to try to harvest the full 200 pounds.

For North Carolina, we received a summary of their 2019 fishing season. Todd Mathes presented an update on this year's fishing season, as well as their two-year proposal for the American Eel Farm that has submitted a proposal annually since about 2016. The American Eel Farm fishermen fished fyke nets, about 14 of 22 possible weeks, primarily from January 1 through March 30, ending about six weeks earlier than they had set their season.

Dip nets were only used on one occasion, and fishing primarily occurred in canals and

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tributaries of the Lake Mattamuskeet area. In total 13.82 pounds of glass eels, which are approximately 42,000 eels were harvested, and approximately 980 of them were released alive. Catch per unit data was collected, but some of the caveats included differences in net dimensions, changing harvest locations, gear modifications, inconsistent fishing effort, periods of no fishing, and recorded weights that included water.

In terms of the changes that they're proposing, they are putting forward another two-year proposal. The first change is that they are interested in moving the fishing year from starting on a calendar basis of January 1, to starting November 1, and going to March 31. It would cover two calendar years.

They are also going to change the time in which they needed to leave the nets open from noon to 3:00 o'clock p.m., this was primarily to address the need to get to some of these sites that are further away from the facility, so ease of transportation to get there to address the nets. Other changes are a move to record the actual number of eels harvested, or weight of glass eels harvested.

Basically, previously they had been trying to measure the weight, but they hadn't been able to do it to a precise level. The goal now is to record to the nearest 0.1 pounds of glass eels, and for any dip nets used. There will be changes to the weekly CPUE reporting. They will be increasing that, and they will also now be required to call in to North Carolina DMF prior to leaving the site of what their total harvest was for that trip.

The Technical Committee reviewed both of these proposals last month, and regarding Maine's proposal no concerns were raised. For North Carolina's proposal there was a minority opinion concerning moving the start date to November 1. Basically the concern stemmed

from whether this would present any law enforcement issues.

But overall the Technical Committee indicated that this would likely not be an issue, and if anything might provide more information about abundance in the fall. They were going off of, in terms of this interest in starting November 1. American Eel Farm had heard from some South Carolina fishermen that there might be higher abundance in the fall than previously known, and they also were interested in looking at some of the Beaufort Bridge, ichthyoplankton sampling program that seemed to indicate that there might be the presence of glass eels around that time as well. The Technical Committee, their primary recommendations were that for future proposals to include more information on the attributes of the harvest locations, the specific amount of the previous year's harvest. Much of these proposals when we've had the Technical Committee review them in a given year, have as a supplement offered up what their summary is.

But the group is looking to have that just rolled in with their proposal for the next year. Then also to require CPUE reporting for each of the harvest sites, so for example North Carolina is doing this on theirs, because they have only this one site where they're doing glass eel harvest, whereas for Maine currently, there is a CPUE that is calculated, but across all of the sites combined for the state.

The Technical Committee was interested in moving more towards a CPUE value for each of those sites that are harvested, as part of that glass eel aquaculture allocation. Overall the Technical Committee recommended approval of both proposals. The Law Enforcement Committee was also presented these proposals by e-mail, notified of the changes, and they did not indicate any concern or objections to these proposals as presented. With that that concludes my presentation. I'll take any questions. Thank you.

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CHAIRMAN GARY: Questions for Kirby on either of the two proposals. Dan.

MR. DANIEL McKIERNAN: Question about the call-in that the North Carolina fishermen do to the agency. Is it just dropping a message on somebody's voice mail, or is it something a little more sophisticated?

MR. ROOTES-MURDY: That's a good question, Dan. I might have to go to Chris Batsavage to give some more clarity on that.

MR. CHRIS BATSAVAGE: They call into our Communications staff, the phones are monitored 24 hours a day, and so they're actually talking to someone and not leaving a voice mail.

CHAIRMAN GARY: Cheri Patterson.

MS. CHERI PATTERSON: My question has to do with is there anything in the Addendum that allows for the straddling of a calendar year in the quota?

MR. ROOTES-MURDY: Thanks for the question. Currently the language in the Addendum references the allocation on an annual basis, but it doesn't have anything specific to calendar year versus fishing year.

CHAIRMAN GARY: Pat Geer.

MR. PATRICK GEER: Kirby, I don't know if this should go to the TC or to Chris in North Carolina, but looking at the North Carolina plan, they put a whole lot of effort. It says 73 days with over 15,000 hours of fishing, and they only caught roughly 10 pounds of glass eels, because they caught three pounds with dip nets. Did the TC discuss those numbers? I mean there is a lot of effort going in for the little amount that they're harvesting.

MR. ROOTES-MURDY: I think I failed to get into that detail about what they harvested in 2019,

looking back at my presentation. I had it up on the screen, but I didn't speak to it. They harvested 13.82 pounds, which is the highest amount that they've harvested in the three years or so that they have put forward proposals. But unfortunately they had a total mortality event on all of those eels that were harvested in June. I believe it was an issue with the feed. That is what was communicated to us on the call.

When the Technical Committee considered that change, in terms of them increasing and having some more success this year, there were some notes about how adjusting the season may allow for them to have more success if they are possibly seeing eels in the fall. But again that is anecdotal information from some fishermen in South Carolina. Right now we don't have great data to demonstrate for sure whether or not they will be successful being able to harvest glass eels at that time of year.

MR. GEER: Because as a business model it's going to be pretty hard, you know 13 pounds is just not going to be, they're not going to make a profit on that little amount even if they kept it alive.

MR. ROOTES-MURDY: I can't speak to the full business model that this aquaculture farm American Eel Farm in North Carolina is operating under, but I do believe they have other sales of eels at different life stages, so yellow eels I believe they are selling them for bait. But I don't know the full extent of what their business is.

CHAIRMAN GARY: Other questions for Kirby on either proposal. Eric Reid.

MR. ERIC REID: One of the things the TC is recommending is the CPUE. But if you look at the caveats, what is it really going to do unless you're calibrating every net and site and everything else, as far as a requirement goes? I

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don't know why that would even be in there, it seems a little confounding.

MR. ROOTES-MURDY: It's a fair observation. There are definitely caveats with how this data is collected. The Technical Committee didn't express any concerns about the CPUE data that was coming out of the North Carolina proposal currently. What they were looking to have more information on was regarding Maine's proposal, because currently, as I said that CPUE data is aggregated at the state level.

I mean the harvest is broken down on a county basis, but it doesn't have the CPUE at the site level, whereas the North Carolina one, we only have information on a small number of sites, and CPUE is calculated on those, and that's where the Technical Committee was hoping to get more information for any proposal coming forward that has it specific to the site.

CHAIRMAN GARY: Follow Eric?

MR. REID: Thank you for that I appreciate that. I have no problem with the North Carolina proposal. Mr. Chairman whenever you want a motion I'll give you a motion, but what are the chances of because two of their best weeks, not their best weeks, were right at the end of March. I mean they only caught a pound and a half, five pounds. So you had five pounds twice. But what is the likelihood if they don't catch any when they want to open up in November and December, and they catch a few halfway through March and say, hey we're catching a few, we would like to leave it open, because we have 186 pounds left to be caught. It just seems to me they want to close the fishery when they were catching a few.

MR. ROOTES-MURDY: I think something for this Board to consider in reviewing these proposals, and considering approval of them is if there are any specifications that you would prefer to have on that allocation. One thing for this Board to keep in mind is that these proposals have

operated under generally a calendar year basis, right.

They've outlined when their season starts and ends, usually in January through late in the spring. The proposal has outlined their start date and their end date. It does straddle two different calendar years. There is no language currently about them looking to extend their season beyond the end of their season in March, so if that is of concern then this Board can make those stipulations known.

CHAIRMAN GARY: Pat Keliher.

MR. PATRICK C. KELIHER: I'm having a little trouble. I'm trying to figure out why we would need to deal with CPUE when we're talking about a handful of harvesters in a few locations. How is that going to benefit management? There are so many factors that are going to impact CPUE outside of the control of the harvesters.

I mean, somebody could put a new in front of that fyke net. It could be weather driven. You know some rivers don't fish. It is good one year, as a river right beside it. It is unclear to me what benefit recording CPUE is going to be as it pertains to just the aquaculture harvest. If we're really looking for CPUE to benefit management, shouldn't we be talking about maybe a different approach as it pertains to the entire fishery, not just the aquaculture quota?

MR. ROOTES-MURDY: Again this was just an observation made during the call, and the group was in agreement on recommending that if possible to collect this information at the sites.

CHAIRMAN GARY: Adam Nowalsky.

MR. ADAM NOWALSKY: I would be interested in hearing some feedback on the state that reviewed the proposal, from the TC, from staff. Given the mortality event that occurred last year, we essentially just threw away 42,000

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eels. Done, gone, no benefit from it. What is going on at the facility? What reviews in place to make sure this isn't going to happen again that something similar isn't going to happen?

I think we've got a question. Do we have a wise use of this resource, if this is what happened to the eels last year? I've got a real concern about that, and I would like to hear some feedback from the state that reviewed the proposal or staff, about what's in place that this is going to have a better outcome in future years, and this is a reasonable use of this resource.

CHAIRMAN GARY: Chris, are you comfortable commenting on that?

MR. BATSAVAGE: Yes. I guess part of it is the timing of the mortality event, it occurred after the plan was submitted, not that that would necessarily change our minds, as far as bringing it forward. As Kirby mentioned, they actually had quite a bit more success in collecting glass eels this past year than they had in the last few. It was just unfortunate they didn't survive the tank rearing.

I mean in terms of inspection, our enforcement officers go in there to make sure that they're following what is laid out in the plan from a regulatory standpoint, not necessarily from – we don't evaluate them on whether or not they are going to be productive and profitable. You know we really don't do that for any of our permits.

But I think your point is well taken, as far as the concern the Board has, as far as just the lack of success seeing these things through to the adult stage. From our perspective, they're following the provisions of the plan, no enforcement issues, not a huge burden on staff to monitor this aquaculture plan. With that we don't really have any concerns with it, but your points are well taken.

CHAIRMAN GARY: Other questions on the proposals, or we can entertain a motion. Cheri Patterson.

MS. PATTERSON: Yes, I would like to move to approve the 2020 aquaculture proposals with the TCs recommendations, and also following the addendum to harvest up to 200 pounds per calendar year, not fishing year.

CHAIRMAN GARY: Get that on the board. Do we have a second to this motion? Pat Geer. I'm going to go ahead and read this in.

MR. ROOTES-MURDY: Just a quick clarification. As you're aware, one of the proposals was for 2 years. The North Carolina proposal is a two-year program. Can you just specify with this motion whether this is an approval of that proposal for two years, or if it is for one?

MS. PATTERSON: Yes, for two years.

CHAIRMAN GARY: Just to be clear, this will be for both Maine and the North Carolina proposal for two years. Go ahead, Kirby.

MR. ROOTES-MURDY: We were just trying to clarify that one of the proposals is for two years, right. That is the North Carolina proposal. Maine's proposal is just for one year, so the motion is clarifying that it's just approval of these proposals, with one of them that will carry for two years.

MS. PATTERSON: You want that wording is what you're telling me, because the proposals are indicating that Maine is one year and North Carolina is two years.

CHAIRMAN GARY: One last clarification, Kirby, go ahead.

MR. ROOTES-MURDY: Cheri, I just want to be clear. For the 2020 aquaculture proposal, as indicated we already have a harvest that has occurred for North Carolina in 2019. Does this

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motion, can you clarify what it means for when North Carolina can begin their fishing season for this allocation?

MS. PATTERSON: Yes, North Carolina can proceed with their proposal for November 1, however they have already harvested slightly less than 14 pounds, so they can only harvest up to 200 each calendar year.

CHAIRMAN GARY: Senator Miner.

SENATOR CRAIG A. MINER: When I was listening to the discussion earlier, I didn't hear much about the state of Maine's proposal. I did hear about the review of their proposal, and it didn't seem like there were any issues. I wonder if splitting this motion wouldn't be the cleanest way to do it, so that any of the nuances of the proposal for North Carolina could be handled through a separate motion, rather than have it be done the way it's being done.

I have some concern about what occurred, and if there was a reoccurrence up to 200 pounds that would be an even more significant concern. I wonder why we would be approving a two-year proposal for North Carolina, not a one-year proposal. Anyway that was the reason for my request to consider a different motion.

CHAIRMAN GARY: Ritchie White.

MR. G. RITCHIE WHITE: Would we not have the ability to readdress these in a year if there was another episode, another mortality episode? In other words, we would have the ability to undo the second year if there was some reason. That's a question.

CHAIRMAN GARY: Kirby.

MR. ROOTES-MURDY: Yes again, I think this is for the Board to specify if you guys want to make it contingent on how the first year plays out, in terms of monitoring, performance of harvest, law enforcement review.

CHAIRMAN GARY: Ritchie, follow up?

MR. WHITE: Short of having that in the motion, we would not then have the ability at the end of the first year if there was an event for us to take action. I guess Toni might be able to answer.

CHAIRMAN GARY: Toni.

MS. TONI KERNS: Ritchie, I think we can ask for a review of how the fishing year went, just like we did I think a couple years ago. If there is something that alarms the Board you can revoke the proposal for the second year, or revoke yes the proposal, the allocation for the second year.

CHAIRMAN GARY: It's the Board's pleasure as to how we proceed with the existing motion. We'll pull it back. Ray Kane.

MR. RAYMOND W. KANE: Why don't we split this motion? I mean Maine is going to come back next year with a report, and why don't we leave the two states independent of one another? Why not split this motion?

CHAIRMAN GARY: Is the maker of the motion amendable to that Cheri? All right, so we're going to split the motion. Toni.

MS. KERNS: It would just be good to say is there any objection to splitting the motion, because it is property of the Board now, and so therefore.

CHAIRMAN GARY: Is there an objection to splitting the motion? Seeing none; we're going to proceed with a split of the motion, while we're putting this up, Cheri.

MS. PATTERSON: The first part of the motion, can you bring up the one used prior to this? Pat, feel free to jump in, you're the second.
Move to approve Maine's 2020 aquaculture proposal with the TC's recommendations.

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That would be the first one, Maine's 2020 aquaculture.

CHAIRMAN GARY: Does that capture your motion, Cheri and seconder, Pat?

MR. GEER: Then the North Carolina one will just be the same, move to approve North Carolina's 2020 aquaculture proposal with the TC's recommendation, because within the plan it says it's for two years. If you want to be more specific we could say two years if you want, if that is the pleasure of the Board.

MS. KERNS: Pat, because we split the motion we're going to hold off on that second half, and just talk about this first, and then get to North Carolina.

CHAIRMAN GARY: All right discussion, Justin Davis.

DR. JUSTIN DAVIS: Just a point of clarification. Were there any TC recommendations relative to Maine's 2020 proposal, as in recommendations for changes or additions to the proposal?

MR. ROOTES-MURDY: Well as mentioned there was an interest in trying to collect CPUE at the harvest site location, as well as whether including information on attributes of the harvest location. I had it up on the previous slide; it is Slide 6, the attributes of the harvest location, the previous year's harvest, as well as requiring CPUE reporting from each harvest site. Basically the Technical Committee is looking to try to get some more information about some of the information on each of these locations, and then as I said before, in the actual report the proposal they're sending in what the harvest was, because each year now we've received generally a summary after the fact in a memo, or in the actual presentation and not the written proposal.

CHAIRMAN GARY: Doug Haymans.

MR. DOUG HAYMANS: Not that I see it in here, but wasn't there also some discussion about a grow-out; grow out to the yellow eel life stage?

CHAIRMAN GARY: Kirby, can you address that?

MR. ROOTES-MURDY: Sure. Last year the Board specified that the 200 pound glass eel allocation was for glass eels to be grown out to the yellow eel life stage for Maine, because the language in Addendum IV specifies that the eels can be grown out to the state's legal eel size. For nearly all other states along the coast that is 9 inches at least.

CHAIRMAN GARY: Does that answer your question? Doug, you have a follow?

MR. HAYMANS: Well, since that is not part of that motion does it need to be? It wasn't in their proposal either, does it need to be?

MR. ROOTES-MURDY: Yes, it needs to be specified in the motion if it's going to be the requirement to grow out the glass eels to the yellow life stage.

MR. HAYMANS: Is that the desire is to require grow out to the yellow eel life stage?

MR. ROOTES-MURDY: As mentioned before, it was specified by the Board at the Board meeting last year, so it is the pleasure of this Board. To be clear that's just to make it absolutely transparent that the grow out operation will be growing out these glass eels harvested to the yellow eel life stage, which American Unagi has indicated that is their plan, but the motion specified that because of the state regulatory language.

CHAIRMAN GARY: Cheri, as maker of the motion would you like to add that in?

MS. PATTERSON: Yes, go ahead and add that in, thank you.

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CHAIRMAN GARY: I think that achieves what you were asking, Doug. Emerson Hasbrouck.

MR. EMERSON C. HASBROUCK: I'm a little unclear here. We needed to include that language for Maine. Why is it that we do not need to include that language for North Carolina?

MR. ROOTES-MURDY: As indicated, all other states, including North Carolina, their legal eel size is 9 inches, right? That has been determined by the Technical Committee to be the recommended yellow eel stage that these eels can be harvested at. Maine currently has language that allows for the harvest of less than 9 inch eels, so this is to specify that the grow-out of those eels in Maine would be at the yellow eel stage. North Carolina already has a minimum size on what those eels would be caught, and in turn sold at.

CHAIRMAN GARY: Follow, Emerson?

MR. HASBROUCK: Then it's implicit that for North Carolina they need to raise those eels to the state's minimum size, and then I've got a follow up on that.

MR. ROOTES-MURDY: Yes.

MR. HASBROUCK: What happens when they all die? They didn't raise them to the minimum size; does that put them in conflict with our program that allows this to occur?

MR. ROOTES-MURDY: I don't believe so, because they all died.

CHAIRMAN GARY: I don't think they went to market, Emerson, I think that's the point, but I understand what you're saying. Chris Batsavage.

MR. BATSAVAGE: Just to clarify the question Emerson had. Marine Patrol collected the dead

glass eels after it was reported that they died, so they are in our possession, thanks.

CHAIRMAN GARY: Other questions? All right so are we ready to go ahead and vote on this motion? Are we going to take these one at a time, Kirby? **This is the Maine proposal. All those in favor raise your hand, those opposed, any abstentions, any null votes? The motion passes 17, 0, 0, and now we'll move to the next proposal.** Go ahead, Pat.

MR. GEER: Move to approve North Carolina's 2020-2021 aquaculture proposals with the TC's recommendation, and eels harvested will be grown out to the yellow eel life stage, (minimum 9").

CHAIRMAN GARY: All right we have a motion by Pat Geer. Do we have a second to that motion? Cheri Patterson.

MS. PATTERSON: Thank you, we're trying to add in the calendar year provision.

MS. KERNS: Marty, you split the motion, so it is not a new motion. It's still Cheri and Pat's motion; it's okay as long as Cheri is okay with adding that additional language about eel being harvested to the yellow eel life stage. But in order to keep us in the rules of Roberts Order, we would keep it. Yes thank you for putting Cheri in there as the maker and the seconder would still be Pat.

CHAIRMAN GARY: The maker stays Cheri Patterson, second Pat Geer. Do we have the motion as you intended, Cheri?

MS. PATTERSON: Can we add in there to have an annual review?

CHAIRMAN GARY: Pat Geer.

MR. GEER: Since the other one had specifically said the size after yellow eel life stage, put in parentheses (minimum 9").

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CHAIRMAN GARY: Bob.

EXECUTIVE DIRECTOR ROBERT E. BEAL: Just a quick question. North Carolina is interested in starting their harvest November 1, so if they started harvesting eels November 1st of this calendar year, 2019. Are those eels counted against the 186 pounds they have remaining on their current proposal and approval, or are they sort of starting their 2020 200 pound allocation?

I think the answer is they are part of the 186 that they have left over. But I think we need to make that very clear that they can harvest the remainder of their quota in this calendar year, 2019. Then they start a new 200 pounds January 1, 2020. But that is my interpretation, but I think that everyone around the Board agrees to that.

CHAIRMAN GARY: I can see a lot of nodding heads. That's your intent, Cheri?

MS. PATTERSON: Yes that was my intent. Pat, is that your intent?

MR. GEER: I agree.

CHAIRMAN GARY: Pat Keliher.

MR. KELIHER: In a sense this is a three-year proposal, if we're going to expand on 2019, and then allow for a potential harvest in 2020 and 2021. It's now a three-year proposal, because you're allowing them to harvest, so it goes away from even their existing proposal we've expanded upon it as a Board.

If that is the way the Board goes, I'm not going to object. I think they've got challenges in North Carolina associated with this proposal that have been raised. I would like to see them succeed, but I am cautious. I would want to be cautious about wanting to expand this too much more.

CHAIRMAN GARY: Senator Miner.

SENATOR MINER: To the point about 2019 being I guess the current allocation that we're in. Is there any disagreement with Pat's statement that that allocation currently exists, and could still be fished on I think you were saying in November as part of this year's allocation. This would add two more years to that. **If that is true, I would propose an amendment to this that would make it for an additional year, 2020, as opposed to 2020 and 2021. Then have the review and see how it looks in 2020.**

CHAIRMAN GARY: Senator Miner, are you amending the motion?

SENATOR MINER: Yes, please to just make it 2020.

CHAIRMAN GARY: Twenty nineteen to 2020?

SENATOR MINER: Well, I think I may not be correct, but I don't think we're actually amending the current calendar year that we're in. I don't remember what the original motion was for the year that we're in. But assuming that the motion was that there would be fishing available in 2019 calendar year up to 200 pounds. How they administer that in North Carolina is up to North Carolina. I assume they keep track from the spring season to the fall season. It just occurs there differently than it does in New England, so the 2020 would be one more year.

CHAIRMAN GARY: Cheri.

MS. PATTERSON: Considering that this is a two-year proposal that is supposed to start in 2020. That's what it is. It's going to start in 2020, right? They can't fish this year in November or December. This is a 2020 proposal.

CHAIRMAN GARY: Kirby, you can clarify?

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MR. ROOTES-MURDY: Cheri, I'm sorry. I want to make sure we're getting this right for this motion. You're saying that they can't start November 1, they can start their fishery January 1, 2020, and they would be able to fish in 2020 after the season that they had laid out, so it would be January 1 through March 31, but they could start again in November of later that year. That's what you're specifying. Okay.

CHAIRMAN GARY: We had Senator Miramant; do you still want the microphone?

SENATOR DAVID MIRAMANT: No, thank you, that was answered.

CHAIRMAN GARY: Roy Miller.

MR. ROY W. MILLER: Mr. Chairman, the way I read this, and I have to assume that the attorney representing this company will read this motion carefully. As it reads to me, they can harvest 200 pounds per calendar year. That means they could harvest 400 pounds, as I read this. Was that our intent?

By spanning the sampling period from November, spanning over into the new calendar year it has confused things. When it says they can harvest up to 200 pounds per year, if you read that literally, that means they could take a total of 400 pounds, 200 pounds in 2020 and 200 pounds in 2021.

CHAIRMAN GARY: Chris, could you add some clarity?

MR. BATSAVAGE: I don't know, I'll try, because it is admittedly there is a disconnect with the calendar year under the Addendum, and the fishing year, which this plan proposes. When we looked at the plan we talked about how to account for the harvest under the fishing year, but keeping in compliance with the calendar year.

You had the statement, and the other part I want to go back to is the aquaculture plan that they had in 2019 ended in May, so there is not a current aquaculture plan in place in North Carolina. If this one is approved it presumably will start November 1st. When they start, hypothetically they start November 1; they can land up to 186 pounds of glass eels during the 2019 calendar year, because they already landed 14 pounds. However, if they did land, or so they land 186, and the following fishing year, this is a 200 pound allocation per fishing year. They've been limited to 14 pounds, and then they would have to wait until November, and start fishing again.

It's going to be a little extra math on our part, as far as making sure that they don't take more than 200 pounds of eels any given calendar year, which will be spanning two fishing years, and they don't take more than 200 pounds of eels during any given fishing year, which would be November through March. It's kind of hard to explain on the fly, but this is something that staff has talked about and has considered. Due to the call-in mechanism in place in the plan, we feel like we can keep track of that and making sure that they don't go out of compliance.

CHAIRMAN GARY: Bob.

EXECUTIVE DIRECTOR BEAL: I think we've got ourselves in a little bit of a procedural spot. We've got a motion to amend without a second, and we've got the main motion that has been perfected by staff, I think to capture a lot of the conversation that's been going on, you know following the motion to amend.

What staff has done is made sure it's clear that no fishing can take place at the end of this calendar year, and that the intent is for 2020 and 2021, to allow fishing consistent with the new proposal from North Carolina in the months that they proposed. Hopefully that is all captured in the motion that's up on the board.

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One way out maybe if there is no second to the motion to amend, then that one goes away. Then we'll need to reread the main motion into the record, and we can move forward from there. But I don't want to cut off debate or lobby for either side, so just sort of highlighting the kind of spot we are in procedurally.

CHAIRMAN GARY: We are running a little bit short on time, and so maybe consistent with what Bob mentioned, let's give the amendment by Senator Miner an opportunity. We would need a second. If we don't get that second, as Bob mentioned, we pull this back. Is there a second to Senator Miner's motion? Ray Kane.

Is there discussion again? We'll call the question. **Move to amend to remove 2021, motion by Senator Miner, seconded by Ray Kane. All those in favor raise your hand please, those opposed, abstentions, 1, null votes. The motion passes 10, 6, 1.** We're going to get this adjusted on the board, just a moment. Okay so we're back to the motion, I'm going to read it into the record. Go ahead, Eric.

MR. REID: Sorry Mr. Chairman. What we're doing is we are not approving North Carolina's 2020 aquaculture proposal, because they're proposing to go fishing in November and December, and we're changing their fishing season in 2020 from January, February, March, and adding November and December. Is that correct? I would just as soon make a motion to accept the plan as it is and let it go. North Carolina says they can enforce it. We're going to be up to 15,000 hours of horsing around with this and have our CPUE pretty crappy here before this is over. I don't know why we're picking away at that. Let them do what they want, it's their money, and North Carolina can handle the enforcement.

CHAIRMAN GARY: Ritchie.

MR. WHITE: I would like to hear the intent of the maker of the motion to amend. Now was your intent that North Carolina will have the chance at a two-year proposal, and you just want to review it at the end of 2020, and then give them another year, or do you want this to just be a one-year proposal and they're back to the drawing board?

SENATOR MINER: My proposal is for it to be a one-year program, which they can administer. Understanding that they would begin fishing, I guess in the spring, and then have another opportunity to fish in the fall, until they reach 200 pounds in the calendar year of 2020. If I recall when I made the motion, the original motion had not been clarified to include that there would be no fishing in November and December of this year. I don't think the motion changes that at all, even though it's now added.

Next spring they would begin fishing, and they would have an opportunity, just like they do in Maine, to catch enough glass eels to begin that aquaculture program in 2020, even though it will be in two waves, or maybe they'll catch them all in the spring of next year. I have no idea what's going to happen.

Then we would still have the opportunity to review it, and they could make another request for a continuance under that proposal. I'm concerned about a review of a two-year plan that has a value on the street, never mind grown out, of something around \$400,000.00. When it starts to get to that number, I think people will argue about it. Rather than giving them an understanding that they would have a two-year proposal, I feel more comfortable with a one-year proposal.

CHAIRMAN GARY: We have Chris Wright and then Cheri. I would remind everybody we're already over, so we'll try to wrap this up quickly if we can.

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MR. CHRIS WRIGHT: If there is going to be a review, would that happen at the winter meeting?

MR. ROOTES-MURDY: Thanks, Chris, this is Kirby. What you're asking is that because they won't be harvesting any eels later this fall, and their fishing season is kind of bifurcated on the beginning of 2020 and the end of 2020 that they will report out on how the fishing year 2020 went would be in the winter meeting of 2021.

MR. WRIGHT: Right, so then they would have a chance to submit another proposal for the following 2021 year, correct?

MR. ROOTES-MURDY: I think that could be possible. I will point out that right that would be somewhat in the middle of their fishing season, so that is just something for the Board to keep in mind that if there is the interest in maintaining that for the 2021 fishing season, it would be the end of, well from February onward and then November through December, but it would be the Board's discretion on how to specify it then if need be.

MR. WRIGHT: Right, and that might cause a problem, because then it might foreclose their opportunity in 2021, and I think we should be clear that when we make this decision on this motion that they have an opportunity to actually submit a proposal in early 2021 and to get it approved. I mean it seems like you're foreclosing their opportunity for that second year.

CHAIRMAN GARY: Kirby. Senator Miner, can you clarify?

SENATOR MINER: Sure, we're in August. In August we found out what happened this spring, and it would seem to me that in the August meeting at the very latest next year, we could have an update. I would argue we could

have an update in May. I think North Carolina will know how the spring fishing went.

I don't think that would necessarily foreclose anything. I would certainly be willing to reconsider a motion next May or next August, just as we are today about another request for another year of fishing. I just think I would feel better having had that conversation by this time next year to provide that opportunity.

CHAIRMAN GARY: We have Cheri and then Chris, and hopefully we can wrap up.

MS. PATTERSON: The way that first sentence reads is we're approving the North Carolina's aquaculture proposal. Oh, I'm sorry it got changed to 2020 only. Sorry. The last sentence, if you go back to the original sentence, maybe then you can move the last sentence to say the Board will be provided with an annual review to approve the second year.

CHAIRMAN GARY: Cheri, because the motion is property of the Board, you would need to amend, we believe. Would you be willing to amend the existing motion? Toni, is that right, what I'm thinking?

MS. PATTERSON: Yes, we were trying to take a shortcut. I think we're getting too wrapped around the axle to have these guys be able to fish over a straddled year, a fishing year as opposed to two calendar years. It almost seems like we have to be nimble enough next year to be able to allow them to fish that second year, without having to go through a whole different proposal.

CHAIRMAN GARY: All right so we have a motion there, any last comments or suggestions? Chris.

MR. BASTSAVAGE: I understand and appreciate the Board's concerns, just with allowing these kinds of activities with glass eels, due to how valuable they are, and just keeping track of them. But I kind of feel like this motion rewrites

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the plan significantly. They wanted to do a fishing year to where they are fishing continuously from November through March.

I don't think they contemplated having a multi-month break between March and November in their fishing activity. I think for all practical purposes, this motion would give them three months to fish, as Chris Wright indicated. We come back and report to the Board the activities, in May or August, and then I guess that would maybe let them start fishing again in November, assuming that they could go November to March, or this plan to be approved for just a January through March fishing year, which is two months less than what they were doing in the previous plan. I can't support the motion. I think it's ventured too far away from what the American Eel Farm proposed, what we thought would be workable.

CHAIRMAN GARY: Maureen Davidson.

MS. MAUREEN DAVIDSON: In light of what Chris just said that we're sort of taking away some of their planned fishing. I would like to ask if it's possible, since the proposal from North Carolina expired May 30, would we be able to have your new proposal start November 1, so that you would be able to fish November and December in 2019.

Then the plan would include the fishing that would happen from January through March, and then we could decide what we would do with November 2020 through March of 2021. But at least for the first year we could try and prevent them from losing November through December, by just changing the date of when your proposal starts.

CHAIRMAN GARY: Chris, does that help you?

MR. BATSAVAGE: If I understand correctly, the proposal starts November right now for 2019, if the plan that we submitted was approved. It already was November through March, so it

was a two-year plan, November 2019 to March 2020, and then November 2020 to March 2021. This motion would not allow the November part of that. It would really just; it makes it for all practical purposes be January through March, unless I'm misunderstanding what you're asking.

CHAIRMAN GARY: We're really trying our best to provide the flexibility that they're requesting, but finding it's an incredible challenge. Unless somebody can solve this and bust this riddle, I've got Adam and then Lynn. Please, let's see if we can get through this and move forward in one way, shape or another form.

MR. NOWALSKY: When I think of the time that we've put into this now, and the potential that it was 600 pounds of glass eels over the last three years. We're contemplating another two years. That's 1,000 pounds of glass eels. There are probably people out there in the audience thinking, wow; the economic value I could have provided with this if you had given them to me instead.

Clearly we're struggling with concerns about these proposals, about the way this company has conducted business. I would ask North Carolina at this point, if we move to postpone this decision today, do they think they could go back, discuss these concerns with the company, and perhaps bring another proposal back to us that we could take up at the Annual Meeting for 2020 and beyond. That would be a way I would look to move forward at this point.

CHAIRMAN GARY: Chris.

MR. BATSAVAGE: I guess either the plan; yes if it was postponed then yes we would talk to staff, and then meet back up with the folks in the American Eel Farm and see what they want to do. I mean I guess that is an option, because I think the concerns expressed by the Board are pretty clear, at least what they proposed just doesn't sit well with many. If that is what the

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Board wants to do, we can go back to the American Eel Farm and see if they want to put in something that maybe eases some concerns in time for the annual meeting.

CHAIRMAN GARY: If that's the pleasure of the Board, we would need a motion to that extent. Kirby, could you please clarify?

MR. ROOTES-MURDY: Yes, just so the Board is aware. The language in Addendum IV says that aquaculture plans must be submitted by June 1 of the proceeding fishing year, and approval must be determined by the Board by September 1.

CHAIRMAN GARY: Roy Miller.

MR. MILLER: Mr. Chairman, with the Board's indulgence I would like to offer a substitute motion that I hope clears this matter up. Move to approve North Carolina's aquaculture proposal to harvest up to 200 pounds in the 2020 to 2021 fishing season, (Nov 1, 2020-March 31, 2021). Eels harvested will be grown out to the yellow eel life stage (minimum size 9").

CHAIRMAN GARY: Wait to get that up.

MR. ROOTES-MURDY: Roy, can you just clarify again what the dates are in the fishing year?

MR. MILLER: All right, my colleagues say they want to start this November, so the dates would change to 2019 to 2020, instead of 2020 to 2021, and it would start November 1, 2019 to March 31, 2020.

CHAIRMAN GARY: We have a second by Pat Keliher. Okay we have a motion on the table, is there a discussion, brief one? Cheri Patterson.

MS. PATTERSON: I'm just questioning whether that fits the Addendum that's my only concern is the Addendum indicates calendar year, I

believe, and now it's changing to fishing year? No?

MR. ROOTES-MURDY: No. As I mentioned earlier in my presentation, it doesn't specify calendar year. It speaks to annually.

CHAIRMAN GARY: Go with Ray Kane, then Emerson Hasbrouck and then Chris.

MR. KANE: We have the understanding that North Carolina will be able to come back to us a year from now at the August meeting with a report on the November 1, '19 to March 31, 2020, right?

CHAIRMAN GARY: Ray, I'm sorry. Could you say it just one more time? By what point in time were you saying the report come back?

MR. KANE: This time next year.

CHAIRMAN GARY: Okay, confirmed. We'll go to Emerson Hasbrouck.

MR. HASBROUCK: I have no problems with the substitute motion. But my concern goes back to an issue I raised, I don't know how long ago, half an hour ago. Maybe I'm the only one who's concerned here. We say here, we said it with Maine that they will be grown out to the yellow eel life stage.

What happens if there is a mortality event, total or partial, and they're not grown out to that life stage? That is the first part of my question. The second part is did anybody in North Carolina verify that there was a complete die-off in those 13.8 pounds or whatever it was, it did in fact die?

CHAIRMAN GARY: I thought Chris had mentioned law enforcement did verify that mortality event. Chris Wright.

MR. WRIGHT: My question was answered in the previous one.

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

Draft Proceedings of the American Eel Management Board Meeting
August 2019

CHAIRMAN GRAY: Roy Miller.

MR. MILLER: Mr. Chairman, I would like to just clean up the motion a little bit. In the second line I would insert the word for between proposal and up, so it reads proposal for up to 200 pounds for and strike the second there, for 2019 to 2020. I think that cleans it up, thank you.

CHAIRMAN GRAY: Acceptable to the seconder, Pat, any further discussion? Pat.

MR. KELIHER: Mr. Chairman, I just want the record to reflect that this Board does have the ability to revisit this after we report back next year and change our mind in regards to the second year if need be.

CHAIRMAN GARY: Kirby is confirming.

MR. ROOTES-MURDY: Just to clarify, Pat. The motion currently on the board is only for a one-year proposal.

CHAIRMAN GARY: Adam Nowalsky.

MR. NOWALSKY: Where does this motion leave the TC recommendations?

CHAIRMAN GARY: Kirby.

MR. ROOTES-MURDY: I guess the question is really to the makers of the motion. If you want to make it clear on the record that your motion is encompassing that then we can make sure that language is in this, but if you want to just speak to it and make sure that it's inclusive of Technical Committee recommendations, I think this Board has discussed this enough to clarify that that is of interest to this Board.

CHAIRMAN GARY: Roy, do you want to add that language?

MR. MILLER: Yes, we could add that language.

CHAIRMAN GARY: Consistent with the Technical Committee's recommendations.

MR. MILLER: Yes.

CHAIRMAN GARY: All right we're going to go ahead and call the question. **I'll go ahead and read the motion in. Move to substitute to approve North Carolina's aquaculture proposal for up to 200 pounds for 2019-2020 (Nov 1, 2019-March 31, 2020) consistent with the Technical Committee's recommendations. Eels harvested will be grown out to the yellow eel life stage (minimum 9"), motion by Mr. Miller, second by Mr. Keliher.**

All those in favor please raise your hand, opposed, abstentions, and null votes. The motion passes 16, 0, 1. Thank you all. We've run over, but is there any other business. We're all looking to make sure it gets done. All right is there any objection to the main motion? Seeing none, it passes by consent.

ADJOURNMENT

CHAIRMAN GARY: **Is there any other business to bring before the Board? Seeing none, this meeting is adjourned.**

MS. KERNS: Before everybody goes away really quick. I just want to introduce Dustin Colson Leaning; he is here at the front of the table. He's the Commission's newest staff member. He is working on summer flounder, scup, bluefish, winter flounder, and northern shrimp. If you get a chance just to come say hello this week and welcome him to the Commission family. He started in July but this is his first full week of Commission meeting week fun, and this was a great meeting to introduce him to motion taking. Thank you.

(Whereupon the meeting adjourned at 2:50 o'clock p.m. on August 6, 2019)

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

DRAFT POLICY TO ADDRESS COASTWIDE CAP OVERAGES FOR THE YELLOW EEL COMMERCIAL FISHERY

This document is intended to provide guidance to the American Eel Management Board (Board) in the event that the Coastwide Cap of 916,473 pounds of American eel is exceeded in a given year. Addendum V states the following regarding the management trigger and the response:

Issue 2 Management Trigger

Starting in 2019, the coastwide landings are annually evaluated against a two-year management trigger. If the coastwide cap is exceeded by 10% (10% of the coastwide cap= 91,647 pounds; coastwide cap + 10%= 1,008,120 pounds) for two consecutive years, the Board is required to alter the management program as specified below in Issue 3 to ensure the objectives of the management program are achieved.

Issue 3 Allocation

The yellow eel fishery is managed without state-specific quotas through adaptive management. If the management trigger is tripped (Issue 2), only states with landings greater than 1% of the coastwide landings, in the year(s) when the management trigger is tripped, will be responsible for reducing their landings to achieve the coastwide cap in the subsequent year. States with landings greater than 1% of the coastwide landings will work collectively to achieve an equitable reduction to the coastwide cap. For states with landings less than 1% of the coastwide landings, if in subsequent years a state's landings exceeds 1% of the coastwide landings after reductions have been applied, that state must reduce their individual state landings in the subsequent year to return to the less than 1% level¹.

A management objective under Addendum V is to manage landings to the Coastwide Cap (Cap). Annual landings are not finalized until the spring of the following fishing year. Therefore, if an overage occurs, a year lag will likely occur before full action is taken to reduce harvest to the Cap. For example, a Cap overage in 2019 would not be determined until 2020, and action would likely be delayed until 2021 since some states do not have authority to act within the same fishing year when the overage is determined.

One way to proactively manage the yellow eel fishery is to closely monitor landings and encourage states to take voluntary action when it is clear an overage has occurred in the previous year. By engaging with states before the management trigger is tripped, but after landings have exceeded the Coastwide Cap, a lengthy addendum process can be avoided and more immediate action can be taken to ensure the fishery is managed to the Cap. This proactive approach encourages vigilance and voluntary action in the first year of an overage, and provides opportunity for collaborative, rapid action to prevent an overage in the second consecutive year, thereby preventing the triggering of mandatory management action through an addendum.

Thus, to improve the expediency in reacting to an overage, it is recommended that preliminary commercial yellow eel landings from ACCSP Data Warehouse be made available for the Board's

¹ To clarify, reduction measures apply when the management trigger is tripped. States are not held to a landings level until coastwide landings have exceeded the Coastwide Cap.

consideration prior to the ASMFC Spring Meeting, annually. Based on the preliminary data review, if it's determined that the Cap has likely been exceeded in one year the Board will convene a work group (WG) consisting (at a minimum) of one representative from each jurisdictions that harvested more than 1% of the coastwide landings in the year of the overage. The charge of the workgroup is to consider the overage relative to the decision trees (Figure 1) and determine if, and how, the Board should recommend voluntary action by those states that harvested more than 1% of the coastwide landings (1% states).

Response Strategy When Cap is exceeded in One Year

Once convened by the Board, the WG will review the magnitude and the pattern of the overage relative to the decision trees (Figure 1) to determine the need for voluntary action. "Pattern" refers to whether landings of American eel increased in all states or in some states while harvest decreased in others. "Magnitude" refers to the extent of the overage and, for individual states, the amount of harvest increase relative to the previous year. It will be important for the WG to examine potential reasons for increasing harvest, such as increased effort, increased availability of eels, improved market conditions, etc. Once the Board recommends states decrease landings it will be up to the states to take action.

States may utilize (but are not restricted to) the following voluntary methods to reduce eel harvest as considered by the American Eel Management Board in Draft Addendum II (2007):

- Seasonal restrictions,
- Gear limits, and
- Size limits.

Note: Harvest reductions were not approved by the Board and were not included in Addendum II (2008).

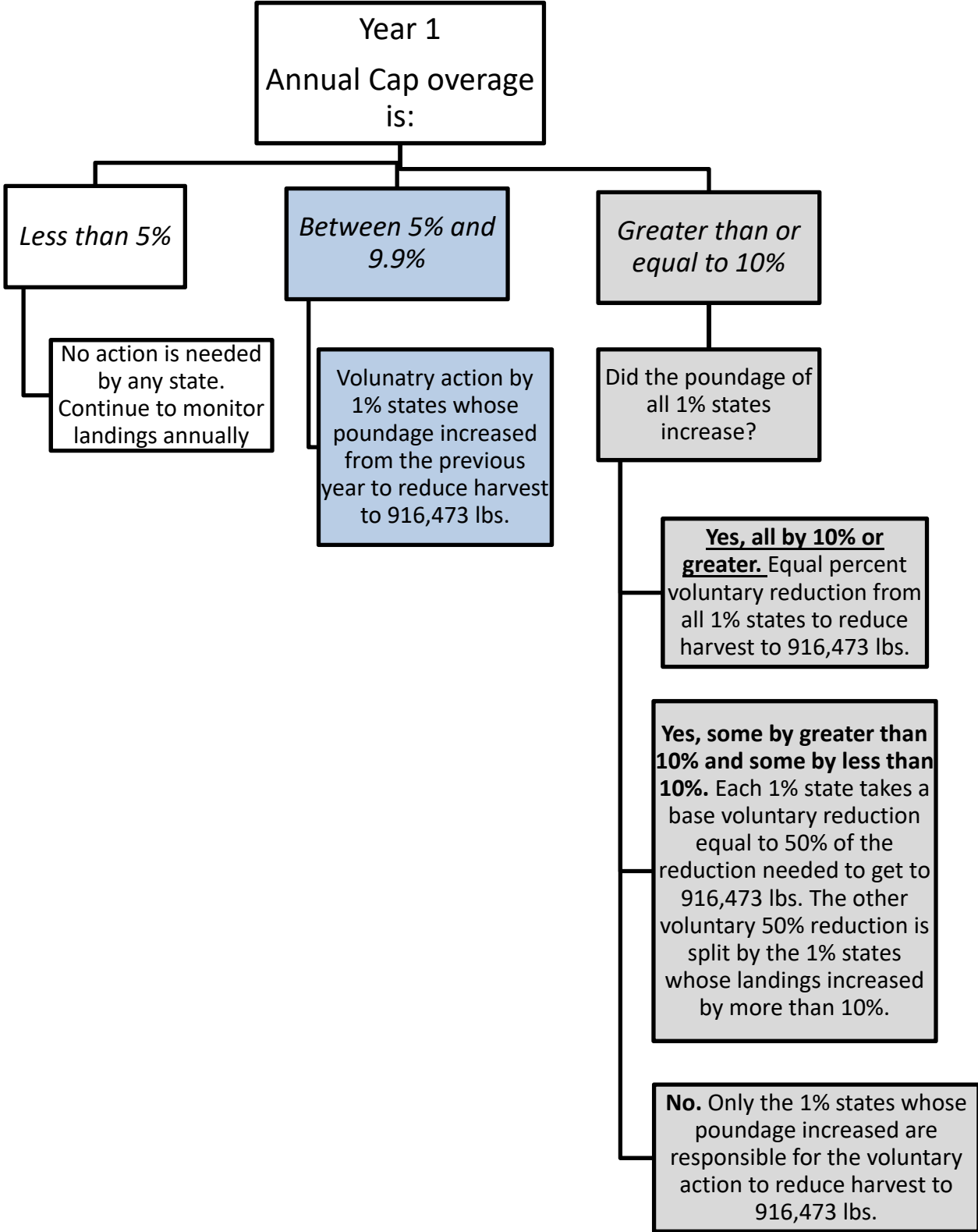
Seasonal restrictions are the simplest method of reducing harvest, but there was strong opposition to the seasonal restrictions from the Advisory Panel when proposed for Draft Addendum II. However, those seasonal closures were designed to increase escapement of silver eels and occurred in the fall during times of maximal fishing effort, so it is conceivable that a seasonal closure could be designed that would reduce harvest without imposing a severe hardship on the fishery. The Board considered a maximum size limit as a method to allow more escapement of silver eels and increase the eggs-per-recruit (EPR). A range of size limits were presented in the Draft Addendum ranging from a 19" maximum size limit, which was estimated to increase EPR by 138%, but at a reduction of 40% to the harvest, to a 23" maximum size, which only increased EPR by 3.8% and reduced harvest by less than 10%. A larger minimum size also will reduce harvest if harvest reduction is the sole goal. Size limits could either be enforced by gear modifications or by grading the eels on the water. Gear modifications can impose a large financial burden on harvesters, depending on the number of pots fished and length limit. If a minimum length is used, eel pots can be modified by installing an escape panel of a mesh size that would only retain eels above the minimum length, while if a maximum eel length is used, the funnel(s) on the eel pots can be modified by restricting the circumference. A grader can also be used to comply with length limits at a lower cost to the harvesters than gear modification. Grader bars can be set to pass all eels below a minimum length or to hold all eels above a maximum length. Although the Advisory Panel favored grading for complying with a maximum length limit during the Draft Addendum II deliberations, the Law Enforcement Committee thought on-water enforcement of the length limit by grading would be difficult.

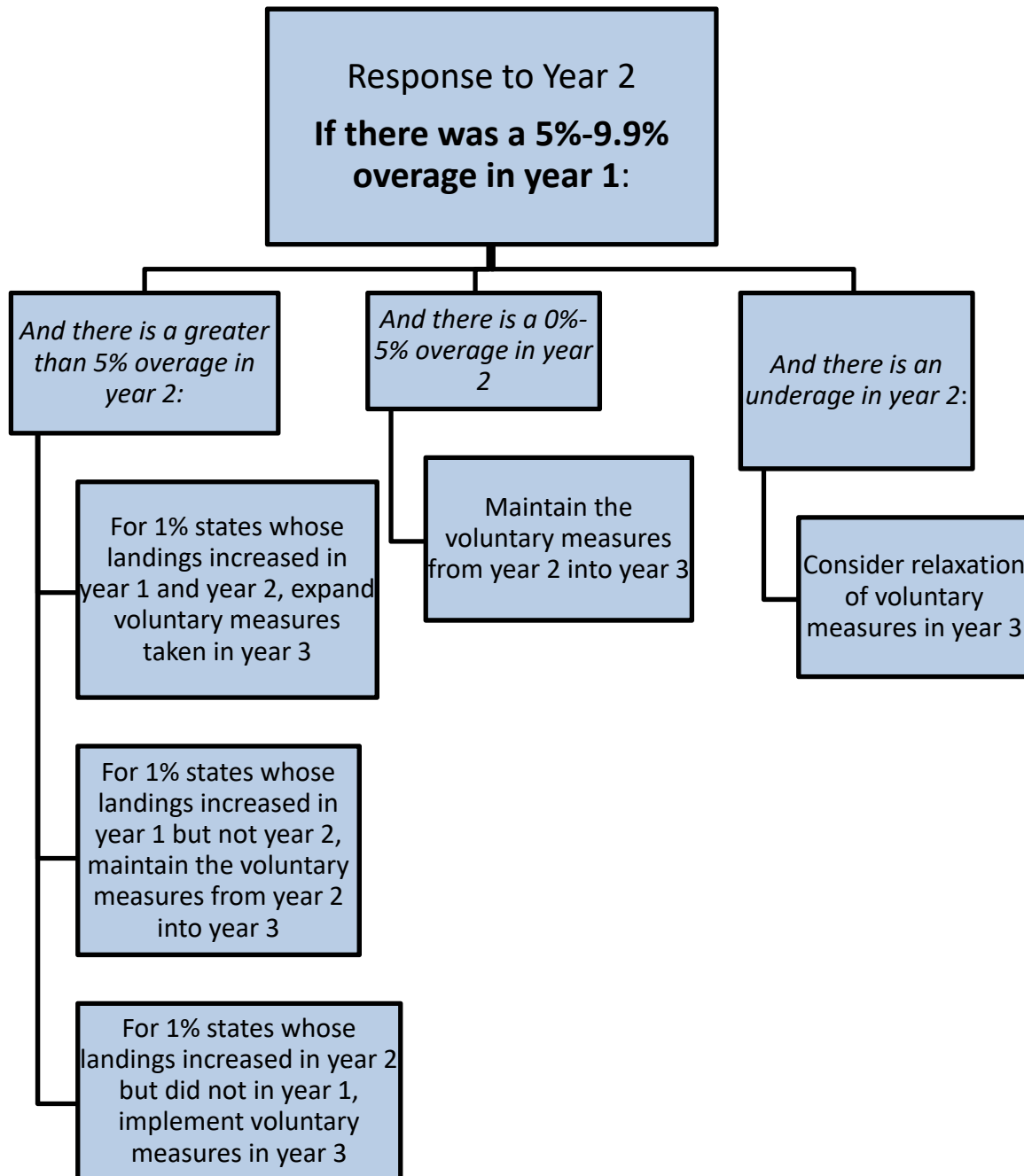
Response Strategy if the Two-Year Management Trigger is Tripped

If a review of landings at the Commission's spring meeting indicate the Two-Year Management Trigger has been met, the Board will initiate an addendum to reduce landings to or below the cap. A Plan Development Team (PDT) will be convened to draft an addendum (Table 1). The PDT will consider a variety of actions to reduce harvest back to the Cap including but not limited to: 1) an equal percent reduction taken only from the 1% states whose harvest increased in the overage year(s); 2) an equal percent reduction taken from all 1% states regardless of whether their harvest increased or decreased; 3) each 1% state takes a base reduction that is less than the total reduction needed, and the remainder of the reduction is taken only by those 1% states who had substantially increased harvest leading up to the overage year. The PDT should consider the impacts of calculating a reduction in harvest from a single overage year, the 2 years over which the trigger was reached or from a baseline within the last 5 years using a maximum of 3 years that ensures equitable reductions.

Once action is taken to reduce harvest to the Cap (either voluntary after the first year of an overage or required after the management trigger is tripped), actions will remain in place until the coastwide harvest returns to a level that is at or below the Cap. At this point, states may propose adjustments to the Board recognizing the process will begin again if another year's overage occurs or a management action is enacted.

Figure 1. Decision Tree for Management Response to Coastwide Cap Coverage





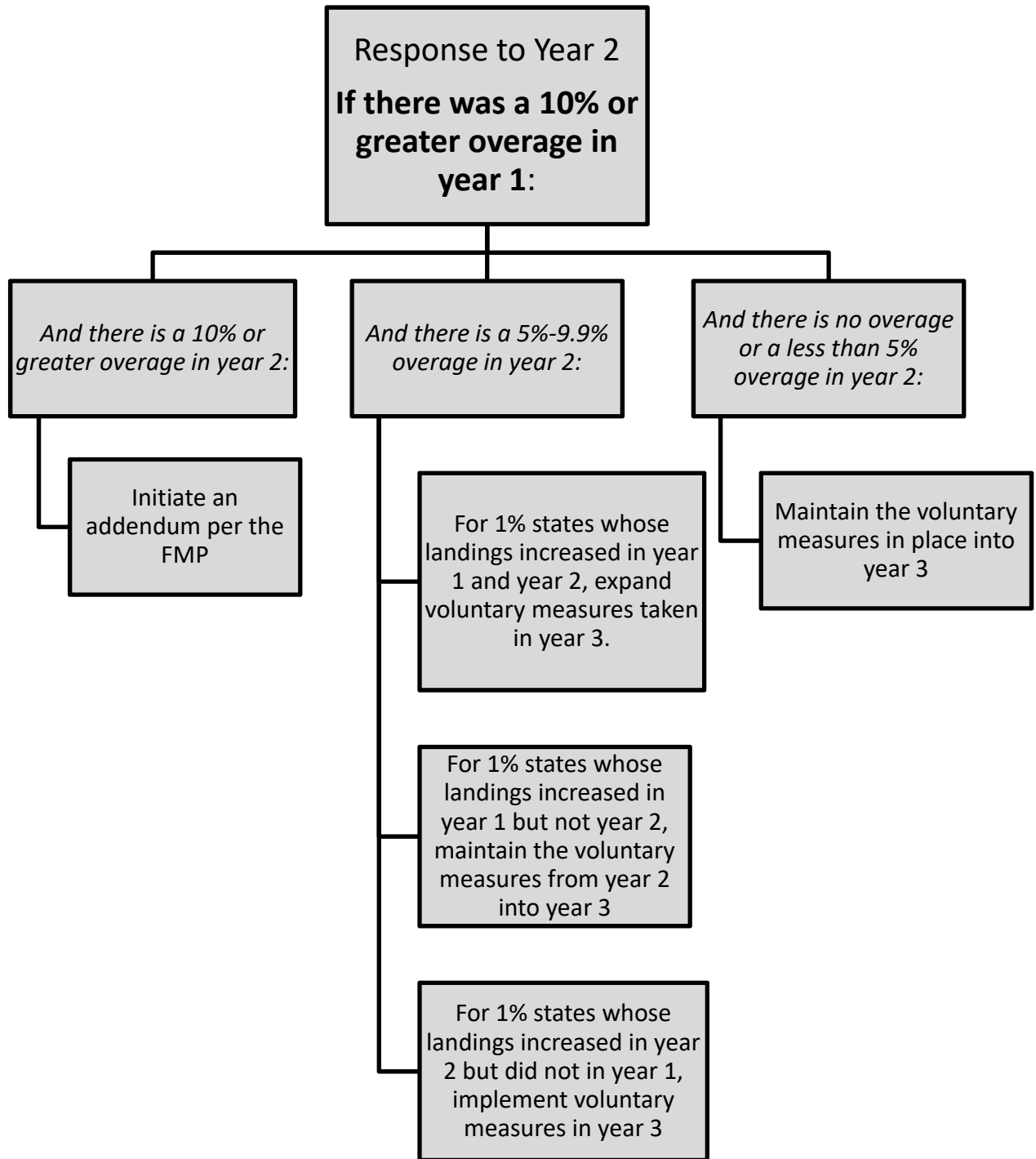


Table 1. Example Timeline if Two Year Management Trigger is tripped based on Decision Trees

Date	Action
Spring 2020	Board review 2019 landings. It is determined an overage => 10% of the Cap occurred. Board convenes workgroup.
Summer 2020	Workgroup reviews the overage relative to decision trees and develops report with recommended action for Board consideration.
August 2020	Board considers Workgroup report and recommends states take voluntary action as soon as possible. Voluntary measures are implemented as soon as possible for 2020 fishing year.
Spring 2021	Board reviews 2020 landings. It is determined an overage =>10% of the Cap occurred. Management trigger tripped. Board initiates Addendum.
Summer 2021	Staff and PDT develop Draft Addendum.
August 2021	Board approves Draft Addendum for Public Comment.
Fall 2021	Public comment period for Draft Addendum.
October 2021	Board finalizes and approves Draft Addendum.
January 2022	Addendum implemented.

COLUMN
PERSPECTIVE

Trends in Abundance and Fishing Mortality of American Eels

Desmond M. Kahn | Fishery Investigations, 916 Rahway Drive, Newark, DE 19711. E-mail: dkahn2013@gmail.com



American Eel. Photo credit: EricksonSmith/Flickr

A range of findings on the status of American Eels *Anguilla rostrata* has been published. The most extreme report occurred in 2014, when the International Union for the Conservation of Nature placed the species on its Red List, meaning that the Union considered it endangered. The trend in abundance of American Eels is consequently of concern for conservation biology and fishery management. Here, I present a new index of American Eel relative abundance in the estuarine waters along the U.S. Atlantic coast from 1981 through 2014, consisting of the total American Eel catch per trip by recreational anglers. Abundance was highest in 1981 and then declined through 1995 to about one-sixth of the 1981 value. By 2003, abundance began an irregular increase; by 2014, it was approximately one-half of the 1981 value. Combining commercial landings with the index of relative abundance produces the trend in fishing mortality, which has been relatively low during both the period of declining abundance and the period of increasing abundance, although it increased temporarily during the period of lower abundance from 1995 through 2002. I include a discussion of the Atlantic States Marine Fisheries Commission's 2012 stock assessment and explore some general issues in stock assessment of American Eels.

The American Eel *Anguilla rostrata* begins life in the Sargasso Sea, where spawning occurs from February to April (Shepard 2015). Eggs hatch into the larval stage, the leaf-shaped leptocephali. Many of these larvae drift northward with the Gulf Stream, although some drift into the Caribbean and Gulf of Mexico and some reach the northern shore of South America. According to some authors, the northward-drifting larvae leave the Gulf Stream and swim across the continental shelf toward coastal estuaries, although other writers contend that directed swimming does not occur until metamorphosis into the glass eel stage, which occurs from October through March (Shepard 2015). Glass eels arrive at the mouths of streams in estuaries during winter through spring, at roughly 1 year of age, and transform into pigmented elvers within a few days of arrival in brackish water or freshwater (Shepard 2015). Many elvers migrate up rivers and streams beyond tidewater, whereas others remain in estuaries. As elvers grow, they are referred to as yellow eels, although a clear demarcation between the two stages seems lacking. After growing for 3–30 years, yellow eels metamorphose into sexually mature silver eels, which migrate downstream and out into the Atlantic to the Sargasso Sea to spawn and die. American Eels are targeted by a commercial fishery in most of the states along the U.S. Atlantic coast as well as in Atlantic Canada.

In 2014, the International Union for the Conservation of Nature (IUCN) placed the American Eel on its Red List of endangered species (Jacoby et al. 2014; <https://www.iucnredlist.org/details/full/191108/0>). The report by the IUCN is one of

a series of reports in Canada and the USA since 2006 with various findings on the status of the American Eel. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2006) stated that American Eels were of “special concern.” The following year, the U.S. Fish and Wildlife Service (USFWS 2007) reported that American Eels were neither “...threatened nor endangered...” in the USA.

In 2012, the Atlantic States Marine Fisheries Commission (ASMFC), which manages the fishery for American Eels on the U.S. Atlantic coast, conducted a stock assessment, which reported that the status of eels was “depleted,” although the ASMFC failed to define that term in any way (ASMFC 2012). Model results in the ASMFC (2012) assessment, however, which showed relatively low biomass by the terminal year (2010) indicated that lower abundance had occurred three times previously in the 20th century. Additionally, in 2010, a second COSEWIC report found the species to be “threatened” (COSEWIC 2012). Cairns et al. (2014) reported a decline in abundance over two generations (32 years) in Canada but also found that “Trends over one generation (16 years) show an improvement relative to trends over two generations.” Despite this, Cairns et al. (2014) reported that over this last generation (16 years), “...standing stock indices have declined for three of the four geographic areas.” Cairns et al. (2014) did not attempt to develop a composite index for Canadian waters. In the next year, the USFWS issued a second finding that the American Eel was neither threatened nor endangered in the USA (Shepard 2015).

Aside from technical reports, several peer-reviewed papers have commented on the status of American Eels since the end of the 20th century. In an earlier paper, Haro et al. (2000) presented evidence for a decline in American Eel abundance in North America previous to that year. Secor (2015) wrote that the “American Eel... has been in freefall for the last two decades, with continental phase juveniles declining threefold or more...,” citing the ASMFC (2012) assessment. Jessop and Lee (2016) reviewed some of the above literature and other information, including population genetics research. They did not state a general status of American Eels, although they noted that, “The threat status designations proposed or applied throughout its range suggest general concern for the species.”

In the assessment information for the IUCN's classification of the American Eel as endangered, Jacoby et al. (2014) did not present new data or analysis. Instead, they discussed available data and assessments, especially the ASMFC (2012) stock assessment and the COSEWIC (2006, 2012) reports. The latter two reports gave great weight to the well-documented and severe decline of the American Eel stock in Lake Ontario and the upper St. Lawrence River area. The IUCN report (Jacoby

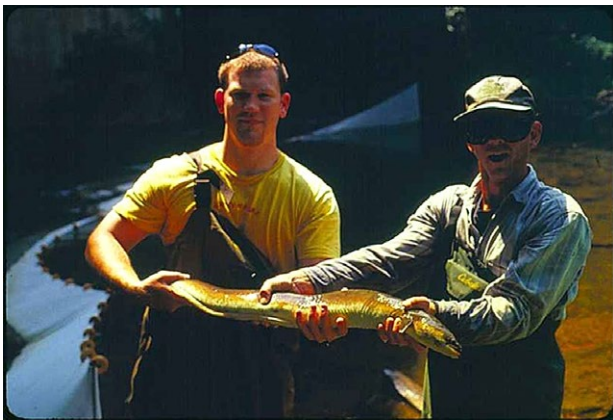


Photo of a large American Eel collected from Manatawny Creek, Pennsylvania, and held by Kevin O'Donnell (left) and Paul Overbeck (right) during a survey of eel populations in streams of the Delaware River watershed, July 2001 (see Horwitz et al. 2010). Photo courtesy of Rich Horwitz, Academy of Natural Sciences of Philadelphia.

et al. 2014), however, stated that abundance is now increasing in Lake Ontario. Jacoby et al. (2014) did state, "...it was not felt that the species was at an immediate risk of extinction" but that it was "outside safe biological limits"; despite this qualification, the IUCN chose to list the species as endangered.

To evaluate the claim of the IUCN that American Eels are endangered with extinction, we can consider that if a species is endangered, its abundance must be extremely low or, at a minimum, its abundance must be trending downward to a very significant extent. For a species subjected to a commercial fishery to be in danger of extinction, it would first have to become so uncommon as to be commercially extinct—that is, a directed fishery would become financially unfeasible. Commercial landings of American Eels are from a highly directed pot fishery in estuaries. If this species was endangered, its abundance would decline to the point that the income from landings could not cover the expenses of boat, gear, fuel, and bait. If commercial extinction was at play, American Eel landings would decline steeply and eventually would disappear.

The IUCN's claim that American Eels are endangered can be seen as a hypothesis to be evaluated in light of current data. The objective of this paper is to conduct such an evaluation. To do so, I introduce a previously unutilized source of data on trends in American Eel abundance in estuarine waters of the U.S. Atlantic coast: the estimates of catch in numbers produced by the Marine Recreational Information Program (MRIP), a large-scale, ongoing coastwide survey of recreational catch and fishing effort, conducted from 1981 to the present by the National Marine Fisheries Service (NMFS). I develop an index of relative abundance using the annual mean total catch of eels per trip, including eels released by anglers (discards), for the period 1981–2014. I then combine commercial landings from that period with the index of relative abundance to estimate the trend in commercial fishing mortality in the form of relative fishing mortality (relative *F*). I also discuss some of the results produced in the ASMFC (2012) stock assessment, which was cited as a major source of data for the IUCN's decision to list American Eels as endangered with extinction. My conclusion is that the available data do not support the claim that American Eels are endangered.

METHODS

To estimate the trend in American Eel abundance through 2014, I developed a catch per unit effort index of relative abundance (Quinn and Deriso 1999:15) from estimates of recreational catch and effort for the entire U.S. Atlantic coast, which were provided by the NMFS MRIP. The data were downloaded in June 2015 from the MRIP website (NMFS, Fisheries Statistics Division; <https://www.st.nmfs.noaa.gov/SASStoredProcess/do?>). Similar indices developed from this data set are employed as primary tuning indices in the ASMFC's stock assessments of species with recreational catch, such as Striped Bass *Morone saxatilis*, Bluefish *Pomatomus saltatrix*, and Weakfish *Cynoscion regalis*.

The MRIP has two components. One component is a survey of anglers to estimate fishing effort in terms of recreational fishing trips. This survey has operated via a telephone survey employing random-digit dialing in the coastal counties, with add-ins to account for anglers from non-coastal counties. The second component, known as the Access Point Angler Intercept Survey (APAIS), is a survey of catch by anglers who are interviewed in person either while fishing at shore access

points or as they return from shore or boat fishing trips. The average catch over all anglers interviewed is the mean catch per trip, or catch rate. To estimate the total catch of a species, MRIP multiplies the estimated catch per trip by the estimated total number of trips. However, the explicit results of the APAIS are not available to users of the MRIP website. These catch rates can be calculated, however, by dividing the estimated total catch by the estimated total number of trips (R. Andrews, NMFS, personal communication). That is what I have done here.

In 2015, MRIP initiated changes to the APAIS, including adding some interviews conducted after dark. Since American Eels are nocturnal, this change could possibly have increased the likelihood of anglers catching eels; whether this increase in catchability occurred will require further analysis, so no index values after 2014 were included in this article.

The steps to obtain the data from the MRIP website include (1) selection of a catch query at the website; (2) selection of the years needed; (3) selection of the time period, which was "Annual" for the present case; and (4) selection of the geographic area, which was the "Atlantic coast" in this analysis. Note that selection of smaller areas, like individual states, will reduce the precision of estimates, although whole coastal regions, such as the Mid-Atlantic, can often produce acceptable precision. The next steps are (5) selection of the species (for American Eel, the "Other Species" button must be used); and (6) selection of the "Type of Fishing" (for this situation, "all modes combined" is required).

For the next step (step 7), "Fishing Area" must be selected. American Eels are known to live primarily in estuarine or freshwater areas as juveniles or yellow eels. The MRIP divides data among three fishing areas: Inland; State Territorial Sea (which does not include inland areas) from 0.00 to 4.83 km (0 to 3 mi) from shore; and the Federal Exclusive Economic Zone from 4.83 to 321.87 km (3 to 200 mi) from shore. The MRIP defines the "Inland" area as "inshore saltwater and brackish water bodies such as bays, estuaries, sounds, etc. It does not include inland freshwater areas." Investigation of the MRIP catch data showed that although the distribution of reported American Eel catch among these fishing areas has been somewhat variable, for the last 10 years, 96% of the catch on average was reported from Inland waters, so catch-effort data employed here were restricted to Inland waters.

The next selection (step 8) is the "Type of Catch." This is a critical selection with regard to American Eels, because the choices include harvested (landed) catch that was available for inspection by the interviewer (type A); landed catch that was not available for inspection by the interviewer (type B1); catch that was released alive (type B2); or total catch (including types A, B1, and B2). Examination of the catch data showed that the proportion of American Eels that had been released alive increased over time from about 40% in 1981 to 90% by 2014. To monitor trends in abundance, I used the total catch, including discards, designated by MRIP as type A + type B1 + type B2. Use of the total catch per trip is the best practice for estimation of trends in abundance. Doing so avoids the distorting effects on landed catch of changes in minimum size limits and creel limits as well as cultural changes in landings versus releases.

The last choice (step 9) in the query form is Information, meaning either numbers of fish, weight in pounds, or weight in kilograms. This is another critical choice, because of the high proportion of American Eels released alive. No weight

data can be collected for fish released alive, and for abundance (as opposed to stock biomass), numbers are required. The high discard rates result in very low recreational landings by weight, as was reported in the ASMFC (2012) assessment (see Discussion). The output chosen for this data was in numbers of fish. Estimated catch in numbers, when output by MRIP, includes the proportional SE (PSE) of the estimate, providing a measure of precision.

The next set of estimates required is the number of angler fishing trips, which are selected by the same criteria as the Catch estimates where possible. For this output, the user returns to the Query index and selects an Effort Query. Here, the years covered must be selected, followed by the Wave (the portion of the year covered), which is annual for this purpose. The next selection is the Geographical Area; here, it is the Atlantic coast. The next selection is Type of Fishing—in the present case, all modes combined. The final selection is Fishing Area (Inland in this analysis). As with the estimated catch, the estimated trips have estimated PSEs included.

The index of relative abundance presented here is the annual mean catch per trip, which is actually the average of the APAIS results for American Eels as outlined above. To recreate the catch rate estimate produced by the APAIS, I divided the estimated total catch per year by the estimate of the total number of trips for that year to obtain the catch per trip, or catch rate. I developed a 95% confidence interval around the ratio of catch per trip ($\hat{R} = Y/X$, where Y is the total catch per year and X is the total number of trips per year), by first employing the delta method (Casella and Berger 2002) to estimate the variance of $1/X$. This estimate of variance was then used to calculate the variance of the product of two random variables following Goodman (1960; M. Christman, University of Florida, personal communication; see Appendix A for the derivation).

Using commercial landings data and the index of relative abundance, I estimated the trend in commercial fishing mortality of American Eels on the U.S. Atlantic coast in Inland waters. This method is analogous to Ricker's (1975: equation 1.17) presentation of Baranov's catch equation, solved for F :

$$C = F \times \bar{N},$$

where C is the catch (landings or total amount of fish killed by a fishery), F is instantaneous fishing mortality, and \bar{N} is the average population size over the period of time under consideration (1 year in this case). The equation can be rewritten to define fishing mortality (rate of fishing) as:

$$F = C / \bar{N}.$$

The relative analogue of absolute fishing mortality, relative F , is defined as:

$$\text{Relative } F = \frac{\text{(annual landings)}}{\text{(mean annual index of relative abundance)}}.$$

The units of absolute fishing mortality can be interpreted as landings (catch) per unit of mean abundance per year, or the proportion of the stock landed per year. This makes intuitive sense. Similarly, the units of relative F are landings (catch) per unit of relative abundance, which is the ratio of catch per unit of relative abundance. In the present case, these units are kilograms (pounds) of American Eels landed per mean catch

per trip; however, the value of relative F , similar to that of relative abundance, is in its trend.

RESULTS

The estimated annual total catch in numbers of American Eels reported by MRIP in inland waters of the Atlantic coast during the early 1980s ranged roughly between 175,000 and 200,000 and then declined irregularly until 1993, when the estimates were below 50,000 (Figure 1). Catch remained relatively low through 2002. The 2003 estimate then climbed above 100,000. The estimate then increased with fluctuations through 2014 to roughly 150,000. Precision of the catch estimates was acceptable, with PSEs averaging 26%, but in 2010 and 2014, the PSEs were slightly over 50%.

The MRIP estimated the total number of recreational fishing trips in inland waters of the Atlantic coast at about 15 million in 1981. Annual estimates then increased steadily until they had doubled to 30 million by 2008, when the Great Recession began (Figure 2). Estimated trips then declined to 23 million by 2014. The average PSE was only 2.6%.

The catch per trip (Figure 3) serves as an index of relative abundance for 1981–2014, showing that abundance during this period peaked in 1981–1982 at a value of 0.0120, meaning that about 12 eels were caught, primarily as bycatch, for every 1,000 angler trips. Abundance then declined irregularly until the mid-1990s, when it reached its nadir of an average of 0.0017 during 1995–2002. During this period, 17 eels were caught for every 10,000 trips, about one-seventh as many as in 1981–1982. After about 7 years at this lower abundance, the index began an irregular climb in 2003 until reaching an average of 0.0060 for 2010–2014, meaning that about six eels were caught for every 1,000 angler trips. This was a return to one-half of the catch per trip from 1981–1982. The precision of this index improves at lower values; it averages 26% as a proportional SE.

The U.S. commercial landings of American Eels have been relatively stable since the mid-1990s (Figure 4) and have been dominated by landings in the mid-Atlantic region, consisting of states from New York through Virginia. In 2013, for example, 85% of American Eel landings on the Atlantic coast occurred in this region. Given the stable commercial landings, there has been no visible movement toward commercial extinction.

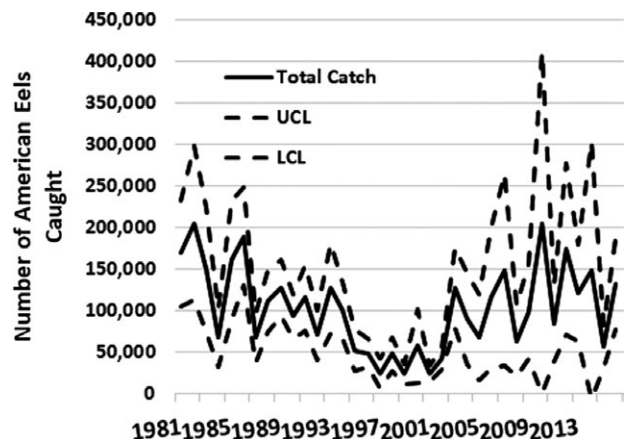


Figure 1. Estimated total recreational catch of American Eels (UCL and LCL = upper and lower 95% confidence limits), including discards, during 1981–2014 in estuarine waters of the U.S. Atlantic coast (source: Marine Recreational Information Program, National Marine Fisheries Service).

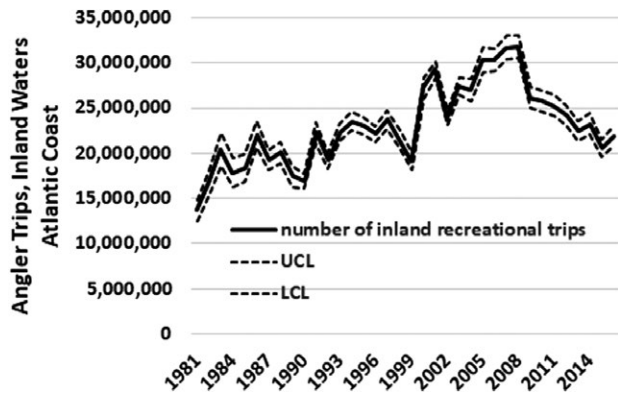


Figure 2. Estimated recreational fishing effort (number of recreational fishing trips; UCL and LCL = upper and lower 95% confidence limits) in estuarine waters of the U.S. Atlantic coast during 1981–2014 (source: Marine Recreational Information Program, National Marine Fisheries Service).

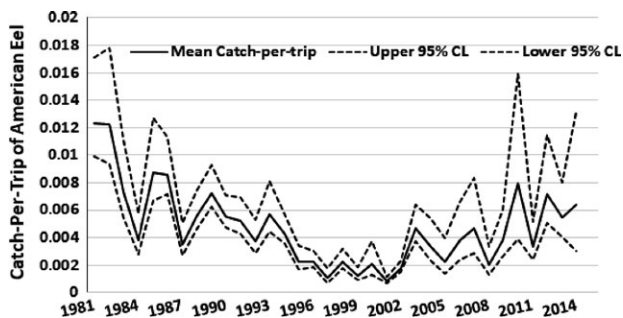


Figure 3. Estimated total catch of American Eels per trip (CL = 95% confidence limit), including discards, in the recreational fishery during 1981–2014 in estuarine waters of the U.S. Atlantic coast (source: Marine Recreational Information Program, National Marine Fisheries Service).

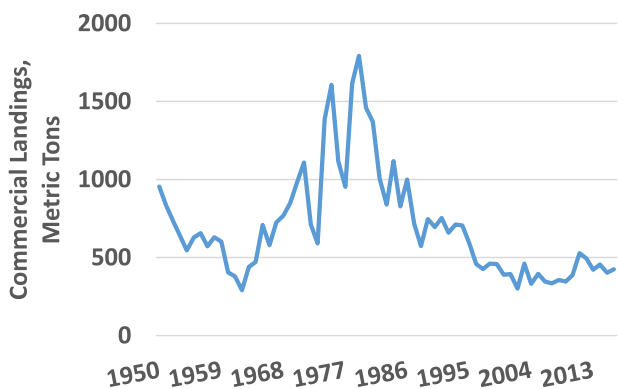


Figure 4. Total commercial landings of American Eels (lbs) along the U.S. Atlantic coast, 1950–2016 (source: National Marine Fisheries Service).

Commercial fishing mortality was at a relatively low level beginning in 1981 (Figure 5) and remained so until the nadir of abundance began in 1995. At that point, fishing mortality increased to a higher level, roughly double that of the earlier period. After 2002, when abundance began to rise, fishing mortality returned to the original, lower level.

If fishing mortality was the cause of the decline in abundance from 1981 through 1994, then relative F would probably

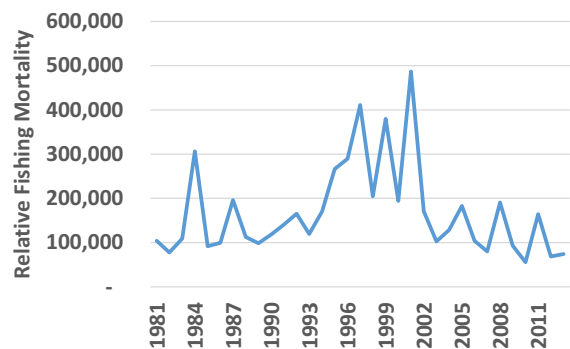


Figure 5. Relative commercial fishing mortality of American Eels (lbs landed per mean catch per trip) on the U.S. Atlantic coast during 1981–2014.

have been higher during that period of decline than it was during the later period of increasing abundance from 2003 through 2014. I tested this hypothesis of unequal fishing mortality between the period of decline and the period of increase with a t -test, and the hypothesis was rejected ($t = 1.26$, $df = 24$, not significant). Consequently, there is no evidence that estimates of relative F were higher during the period of declining abundance from 1981 to 1994 than they were during the later period of increasing abundance from 2003 to 2014. This result does not support a hypothesis that increased fishing mortality was responsible for the initial decline during the 1980s and early 1990s.

Note that this analysis cannot determine the absolute value of fishing mortality; it could have increased from 0.1 to 0.2, from 0.2 to 0.4, or any of a host of possibilities. The fact that the increase in the index of abundance occurred immediately after the higher level of fishing mortality, however, indicates that fishing was not so intense, even at the higher level, that it eliminated the ability of the stock to rebuild. The other major factor suggesting that the absolute level of fishing mortality was low is the fact that the entire freshwater component of the stock was out of reach of the fishery.

DISCUSSION

At a fishery meeting in Delaware in 2015, Craig Pugh, a waterman who is the mayor of Leipsic, Delaware, and the proxy for Delaware’s Legislative Representative to the ASMFC, which manages the American Eel fishery on the Atlantic coast, said that if biologists “...tell us eels are going extinct, we say you’re crazy, because we have them falling out of our crab pots.” American Eels enter pots fished for blue crabs *Callinectes sapidus* and consume the bait, usually Atlantic Menhaden *Brevoortia tyrannus*. Some biologists might dismiss such a comment as anecdotal evidence; however, I tend to give substantial weight to the observations of watermen who spend many days on the water and have scores to hundreds of interactions with fish and crustaceans each year. This incident piqued my interest in the status of American Eels.

If the American Eel were endangered, as the IUCN claimed in 2014 (Jacoby et al. 2014), its abundance would have declined recently or would have been very low for the recent period. In fact, the index of relative abundance presented here for the U.S. Atlantic coast, based on recreational fishing data, indicates that abundance has increased over the period 2002–2014. The index declined dramatically from 1981 through 1995 to about one-seventh of its original level but

then increased beginning in 2003, and by 2014, it was roughly half the level observed in 1981. Second, to obtain some handle on the absolute abundance of American Eels, we can see that roughly 453,592 kg (1 million lbs) have been landed annually for the last 15 years in a very stable fishery. The examination of relative F presented here does not support the idea that this level of fishing is detrimental to the status of eels, since abundance has increased since 2002 with this level of yield.

A valuable aspect of the index of relative abundance based on recreational data presented here is that it is integrated over the entire U.S. Atlantic coast through the statistical survey methodology implemented by MRIP. The catch and effort data are obtained with consistent methodology over the entire U.S. coast. The resulting coastwide index is appropriate for a stock that is distributed over an even greater expanse than the U.S. Atlantic coast—from Greenland into northern South America. Since American Eels are not usually targeted by recreational fishermen, as shown by the high release rate, and since they are largely nocturnal, their catchability by the survey is relatively low.

The claim that a species subject to a fishery is endangered, such as the claim made by the IUCN about American Eels (Jacoby et al. 2014), if incorrect, can have negative impacts on fisheries. Potential consumers of American Eels may avoid them, which would reduce the market for the fishery, and managers may be pressured into excessively conservative and precautionary policies, resulting in underfishing of the eel resource and reductions in income and employment opportunities for coastal communities. Responsible utilization of this resource is the best management goal for human society, as opposed to extreme conservation and underfishing.

The IUCN report (Jacoby et al. 2014) cited the stock assessment (ASMFC 2012) as a major source of information on the status of the American Eel. The primary model employed in the ASMFC assessment, a depletion-based stock reduction analysis, was judged by the peer reviewers to be unacceptable for judging stock status in that "...the overfishing and overfished status in relation to the biomass and fishing mortality points cannot be stated with confidence" (ASMFC 2012); therefore, post-review, the assessment was enjoined from drawing conclusions on those parameters.

Although the estimated status of the American Eel stock from the ASMFC (2012) model in terms of the level of fishing was judged to be unreliable, the model also estimated trends in stock biomass going back to the 19th century, and the review panel accepted those results. The results indicated that compared to the estimated abundance level in 2010, American Eels had been at lower stock biomass levels three times in the 20th century and had recently rebounded to a relatively small extent. However, despite that finding of some rebound, the peer review report stated that "The Panel review concluded the American Eel population is *depleted* in U.S. waters. The stock is at or near historically low levels."

This model output, like the output of all mathematical models, is produced by making various assumptions and choices. Consequently, this model result should be (1) viewed with caution, (2) considered to be a hypothesis, and (3) tested against actual data. When compared to the data considered here, the model result of a relatively low level of recovery for American Eels by 2010 does match up well to the index of relative abundance for 2010 (Figure 3), which had increased to that of some years in the late 1980s and early 1990s. In the

ensuing years since 2010, however (i.e., 2011–2014), the index increased noticeably.

Besides the population model, the ASMFC (2012) assessment included a large amount of data that were geographically dispersed, including numerous indices developed from surveys in the waters of individual states, which were challenging to integrate. The assessment combined these individual indices into three integrated indices by using generalized linear models. The assessment, however, presented none of the fit statistics for any of the various models carried out, making it difficult for reviewers or readers to evaluate the fit of the trend analyses presented. One integrated index included data sources going back 40 years, a second included data sources going back 30 years, and the last included data sources going back 20 years. The 40-year index showed no trend; the 30-year index showed a declining trend during the 1980s and then was flat; and the 20-year index showed a gradual increase. Consequently, these various indices contradicted each other, showing no consistent trend in relative abundance. The trend in the recreational index presented here contrasts with each of the three integrated indices presented in the ASMFC (2012) assessment. The present index declined steeply for 14 years beginning in 1981, remained at a nadir for about 7 years, and then gradually increased to an intermediate level beginning in 2003. The initial decline is consistent with the report of a decline by Haro et al. (2000) previous to that year.

The recreational catch data in the MRIP survey are reported in both weight and numbers. The ASMFC (2012) assessment did not present any data on the recreational catch in numbers, but reported (in Section 4.3, Recreational Fisheries) that the recreational catch of American Eels in weight had declined greatly in both the South Atlantic and North Atlantic regions from the 1980s to the 2000s based on MRIP data. The MRIP estimate of catch in weight is based on American Eels actually landed by recreational anglers, as estimated by the APAIS. To obtain an estimate of catch in weight, personnel conducting the APAIS must have access to landed eels to either weigh directly or to measure so that the length measurements can be converted to weight. Such data have been difficult to obtain in recent years, since only a small proportion of eels caught have been landed (only 10% by 2014). This seems to be due to a cultural shift among recreational anglers against retaining, and, presumably, eating eels.

The paucity of data also seriously reduces precision. Although this lack of precision was not reported in the ASMFC (2012) assessment, since 2003 most of the PSEs of the weight estimates have exceeded 50%, meaning that the 95% confidence intervals cannot be distinguished from zero. In sum, the MRIP estimates of American Eel weight landed by the recreational fishery appear to be increasingly unreliable through the time series.

The increase since 2002 in total numbers of American Eels caught (Figure 1) is opposite the declining trend in landed weight reported in the ASMFC (2012) assessment. Since the assessment reported recreational landings in weight only and did not include total catch in numbers, the assessment may have proceeded under the influence of the wrong signal from the recreational fishery—one of stock decline as opposed to a signal of increasing catch in recent years.

The ASMFC (2012) stock assessment makes a questionable claim in its Introduction, stating that "The seeds of the current depletion lay in part in a fishing up/fishing down episode that occurred on American Eels in the 1970s into the

1980s as export demand rose” (ASMFC 2012:4). The statement assumes, without providing a basis, that eel abundance trends are controlled by fishing. Long-term trends in fish abundance are partly or largely the result of recruitment trends. Research discussed below reports that oceanic phenomena influence patterns in European Eel *A. anguilla* recruitment. The above statement by the ASMFC implies that fishing “into the 1980s,” in part, caused the stock to be “depleted” all the way into 2010. How would this occur? Since new recruits continually appear on the Atlantic coast, and since they would have replaced almost all eels landed during the 1980s, the statement seems to imply that fishing reduced the spawning stock, which then reduced the recruitment (i.e., that recruitment overfishing occurred). However, there is no evidence that this happened. On the basis of genetic evidence, Cote et al. (2013) proposed that the annual spawning stock of American Eels could comprise 50–100 million fish. If this estimate is correct, the relatively low level of landings—even at the fishery peak decades ago—would have an effect on the spawning stock that would be difficult to detect.

The cause of the extended decline in abundance during the 1980s and 1990s and of the increasing trend since 2002 indicated by the index presented here is unknown. Cote et al. (2013) reported that genetically based surrogates for abundance were shown to be “...positively influenced by variation during high (positive) NAO [North Atlantic Oscillation] phase.” Research on trends in European Eel abundance has produced evidence that oceanographic phenomena in the Sargasso Sea are correlated with trends in a large-scale index of recruitment (Knights 2002; Friedland et al. 2007). No wide-scale index of recruitment has been presented for American Eels, but such a mechanism could be at work with this species as well.

Most sampling studies have found the large majority of American Eels in both freshwater and saline sites to be female, although the sex ratio is highly variable among sites, according to Cairns et al. (2014), who estimated the average proportion of males at 19%. However, Shepard (2015) stated that in “...productive habitats, particularly estuaries with high densities of eels, most mature as males while those in headwaters and northern latitudes grow more slowly and mature as large, fecund females.” He also stated that “Eels that move upstream tend to be female... Yellow eels in upstream reaches of rivers and inland lakes tend to be larger, older females—males are extremely rare in these habitats,” citing Helfman et al. (1987) and Oliveira (1999). Consequently, a significant but unknown proportion of female spawning stock biomass resides in freshwater.

This spawning biomass maturing from freshwater seems to have been missed by the assessment (ASMFC 2012), which was restricted to data from tidal waters. The U.S. commercial fishery is conducted in tidal water, except for some weirs fished in the fall of the year for down-running silver eels in New York and Maine. Even in tidal water, commercial fisheries for American Eels may be prosecuted in only a small proportion of eel habitat.

The freshwater component of the stock, described as mostly female, is almost completely protected from the commercial fishery. When migrating downstream toward the Sargasso Sea to spawn, silver eels tend to reduce and eventually stop feeding and are less susceptible to commercial eel pots once they enter tidal water. These females—many of them large—that are migrating out of freshwater are consequently underrepresented

in fishery samples and thus in the ASMFC (2012) stock assessment to the extent that it is based on samples of fishery landings.

Research findings on American Eel abundance in non-tidal freshwater indicate that eel biomass can be high. Horwitz et al. (2010), sampling streams in the Delaware River watershed, found noticeable variability among dams in the amount of blockage they provided to eel passage. In stream reaches with little blockage, however, median eel biomass comprised 33% of total fish biomass (R. Horwitz, Academy of Natural Sciences of Philadelphia, personal communication). Machut et al. (2007), surveying tributaries of the Hudson River, reported that “eels were the most numerous fish within the Hudson River tributaries,” ranging up to 155 eels/100 m². Machut et al. (2007) found that dams reduced upstream density, however, by “at least a factor of 10.” Hitt et al. (2012) reported that after removal of a large dam on the Rappahannock River, Virginia, density of American Eels in headwater tributaries up to 150 km distant increased annually for the next 6 years. These reports suggest that removal of dams or installation of effective fishways would be positive management measures to benefit American Eels by increasing the carrying capacity of their environment.

Sinclair (1998) introduced relative F using the mean catch per tow from a research survey cruise conducted over a few weeks as an index of relative abundance, rather than using an average over a year as was done here. Strictly speaking, since such a survey does not provide an index of the mean relative abundance for a year but only for one point in time during a year, Sinclair (1998) actually estimated relative exploitation, the relative equivalent of the proportion of a stock present at the beginning of a year that is caught in the ensuing year (see Ricker 1975: equation 1.11 for the relationship between exploitation [u] and F).

A major advantage of relative F as used here is that accurate estimation of the trend in fishing mortality does not require estimation of natural mortality, which can rarely be accurately estimated. In contrast, accurate estimation of absolute fishing mortality from catch-at-age modeling is usually dependent on accurate estimation of natural mortality, and these estimates of absolute F are biased to the same degree that estimates of natural mortality are biased whenever absolute F is estimated as:

$$F = Z - M,$$



Photo of an American Eel. Photo courtesy of Jim Uphoff, Maryland Department of Natural Resources.

where Z is total instantaneous mortality; and M is total instantaneous natural mortality. This method is often used in catch-at-age modeling.

Estimation of natural mortality seems particularly problematic for anguillid eels due to their semelparous life history. For this life history, successful spawning produces death, and the age of spawning varies by latitude and between freshwater and brackish-water habitat (Shepard 2015). Since estimation of M often relies on estimation of average maximum life span, T_{MAX} (Hewitt and Hoenig 2005; Then et al. 2015), the fact that successful semelparous spawners die as a result of their success presents a difficulty. The idea behind use of the life span to estimate the average mortality is that to attain a given life span, a certain mortality rate is required, on average (i.e., a lower mortality rate is required, on average, to attain a longer life span). For a semelparous species, however, life expectancy is governed by the spawning mortality rather than the accumulated mortality over the life span of the animals (J. Hoenig, Virginia Institute of Marine Science, personal communication). In the case of eels, if they adhered to iteroparous spawning, they could potentially live to older ages. If so, their natural mortality rate would be estimated to be relatively low by the T_{MAX} method.

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APPENDIX A

Derivation of the Model-Based Estimator of the Variance of the Ratio \hat{R}

The following derivation is from M. Christman, University of Florida (personal communication).

Step 1. Use the delta method (Casella and Berger 2002) to obtain an estimate of the variance of $1/\bar{X}$. The result is:

$$\widehat{\text{var}}\left(\frac{1}{\bar{X}}\right) = \frac{1}{(\bar{X}^2)^2} \widehat{\text{var}}(\bar{X}).$$

Step 2. Use the result from Goodman (1960) for the variance of a product of two random variables.

If the two quantities used in the ratio are independent, then the estimate of the ratio's variance is given in equation (5) of Goodman and can be written for this case as:

$$\widehat{\text{var}}(\hat{R}) = \frac{Y^2}{(\bar{X}^2)^2} \widehat{\text{var}}(X) + \frac{1}{\bar{X}^2} \widehat{\text{var}}(Y) - \frac{1}{(\bar{X}^2)^2} \widehat{\text{var}}(X) \widehat{\text{var}}(Y). \quad \text{AFS}$$