PROCEEDINGS OF THE

ATLANTIC STATES MARINE FISHERIES COMMISSION

ATLANTIC MENHADEN MANAGEMENT BOARD

The Westin Alexandria Hotel
Alexandria, Virginia
February 3, 2015

Approved May 5, 2015

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ATTENDANCE

Board Members

Steve Train, ME (GA)
Doug Grout, NH (AA)
G. Ritchie White, NH (GA)
Jocelyn Cary, MA, proxy for Rep. Peake (LA)
Dan McKiernan, MA, proxy for P. Diodati (AA)
Bill Adler, MA (GA)
Robert Ballou, RI (AA)
Dr. Lance Stewart, CT (GA)
James Gilmore, NY (AA)
Emerson Hasbrouck, NY (GA)
Kathy Heinlein, NY, proxy for Sen. Boyle (LA)
Tom Fote, NJ (GA)
Russ Allen, NJ, proxy for D. Chanda (AA)
Jeffrey Kaelin, NJ, proxy for Asm. Andrzejczak (LA)
John Clark, DE, proxy for D. Saveikis (AA)
Roy Miller, DE (GA)
Lynn Fegley, MD, proxy for T. O'Connell (AA)
Bill Goldsborough, MD (GA)
Rob O'Reilly, VA, proxy for J. Bull (AA)
Kyle Schick, VA, proxy for Sen. Stuart (LA)
Louis Daniel, NC (AA)
Robert Boyles, Jr., SC (AA)
Malcolm Rhodes, SC (GA)
Patrick Geer, GA, proxy for Rep. Burns (LA)
Spud Woodward, GA (AA)
Jim Estes, FL, proxy for J. McCawley (AA)
Martin Gary, PRFC
Steve Meyers, NMFS
Wilson Laney, USFWS

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

Ex-Officio Members

Amy Schueller, Stock Assessment Subcommittee Chair
Jason McNamee, Technical Committee Chair

Staff

Robert Beal
Toni Kerns
Melissa Yuen
Mike Waine

Guests

Kelly Denit, NMFS
Erin Schoettler, NOAA
Derek Orner, NOAA
Tara Scott, NOAA
Amy Schueller, NMFS
Jeff Deem, MAFMC
Michael Jones, Michigan State Univ.
Alexei Sharov, MD DNR
Matt Cieri, ME DMR
Greg Kenney, NYS DEC
David Sikorski, CCA
Jack Travelstead, CCA
Shaun Gehen, Omega Protein/Gehen Law
Ben Landry, Omega Protein
William Purcell, Omega Protein
Ronnie Bray, Omega Protein
Andy Hall, Omega Protein
Nick Sterrett, Omega Protein
Monty Deihl, Omega Protein
Harvey Hamm, Omega Protein
Ron Lukens, Omega Protein
Jared Gordon, PEW
Aaron Kornbluth, PEW
Jimmy Kellum, Kellum Maritime
Rob Gutknecht, Kellum Maritime
Taz Jones, Saving Seafood
Karl Blanketship, Bay Journal
Ken Hinman, Wild Oceans

Guests (continued)

Benson Chiles, Chiles Consulting
Chris Moore, CBF
Greg DiDomenico, GSSA
E. Silleck, KDW
Arnold Leo, E. Hampton, NY
Paul Spitzer, Trappe, MD
Patrick Paquette, MSBA
Raymond Kane, CHOIR
Beau Beasley, Warrenton, VA
Meghan Lapp, Seafreeze, Ltd
Robert Brown, MD Watermen Assn.
A.J. Erskine, Bevans Oyster
Emily Liljestrand, UMD
Drew Minkiewicz, KDW
Ken Hastings, Mason Springs Conservancy

The Atlantic Menhaden Management Board of the Atlantic States Marine Fisheries Commission convened in the Edison Ballroom of the Westin Hotel, Alexandria, Virginia, February 3, 2015, and was called to order at 3:00 o'clock p.m. by Chairman Robert H. Boyles, Jr.

CALL TO ORDER

CHAIRMAN ROBERT H. BOYLES, JR.: Good afternoon, everybody. My name is Robert Boyles. I am Chair of the Menhaden Management Board. We will call to order the meeting of the Menhaden Management Board.

APPROVAL OF AGENDA

CHAIRMAN BOYLES: The first item on the agenda is seeking board consent for the approval of the agenda, which was sent out in the briefing materials.

I know we've had a request to add an item by Ms. Fegley of Maryland on AP nominations. Are there any other items to add to the agenda? Seeing none; is there any objection to accepting that modified agenda with the addition of the AP nominations? Seeing none; the agenda stands approved as amended.

APPROVAL OF PROCEEDINGS

CHAIRMAN BOYLES: Next we will go way back to May of 2014 to look at our proceedings from our last meeting of the Menhaden Management Board. Again, those proceedings were sent out in the briefing materials. Any corrections, additions or deletions to those minutes? I see none. Any objection to accepting those minutes? I see none; those minutes are approved.

PUBLIC COMMENT

CHAIRMAN BOYLES: Next on the agenda is time for public comment from members of the public who wish to speak and who would like to address issues that are not on the agenda. We have had a request from Robert Brown from the Maryland Watermen's Association. Mr. Brown, if you could come up to the public mike and state your name for the record.

MR. ROBERT T. BROWN: I'm Robert T. Brown, President of the Maryland Watermen's Association. Our fishery in the state of Maryland is primarily on menhaden, a pound net fishery. They catch about 97 percent of the menhaden which are harvested in the state of Maryland. It is a stationary. We can't follow the fish. We have to wait for the fish to get us.

Our fishermen over the past two years have had to deal with these harsh quotas that we have had. It has been very hard on us. It has also increased the price of bait to all the crabbers that we have in our state and as far as it goes up north to the lobstermen and everybody else. With the new data received by the technical committee and in light of a new stock assessment, we're asking for a new consideration to reopen the menhaden fishery or at least relax what we have to now to give us more fish, so we can stay in business.

It is a very expensive business to be into, what it costs to paint the nets and everything else. I don't have to go into all those details. However, we do need relief on this. We would like to see it go back because what it was all based on before we found out was not the true figures of the amount of fish that was out there. If you could help us out with this, we'd appreciate it very much. Thank you and are there any questions?

CHAIRMAN BOYLES: Thank you, Mr. Brown. Any other public comments?

2015 ATLANTIC MENHADEN STOCK ASSESSMENT PRESENTATION OF STOCK ASSESSMENT REPORT

CHAIRMAN BOYLES: I see none and we will now move on into the agenda for presentations on the 2015 Atlantic Menhaden Stock Assessment Report. First up is Amy Schueller to talk about the presentation of the stock assessment report.

DR. AMY SCHUELLER: As you guys know, we've been working on the stock assessment for quite some time. You guys have received updates as we've been going through this process. Basically, I'm here to talk about the assessment itself and what changes have occurred since the last assessment and the outcomes of this assessment.

Here is my outline: the terms of reference that were tasked to the stock assessment subcommittee; the data that were used for the assessment; the assessment itself; and then major changes from that last assessment before I move into reference points; and then future directions. Just keep in mind this assessment was a back-to-the-drawing board and every consideration made.

There are differences and we will get to that. Terms of reference for this assessment included reviewing and vetting all available data sources available; characterize the precision and accuracy of the data; develop population assessment model or models compatible with the data and analyze the performance; characterize uncertainty; perform retrospective analyses; and then recommend stock status; and, if appropriate, recommend alternative reference points.

The last three terms of reference were to identify potential ERPs or ecological reference points, which Jay will be talking about next. That is with respect to Atlantic menhaden as well as the forage fish. Then provide research recommendations to move forward before the next assessment and then recommend timing of the next assessment.

I'm going to walk through these terms of reference in this presentation; so the first one is data used. This is just a summary of the data used for the stock assessment. I'm going to start with the life history data. The life history data included maturity based on historical data that were, lack of a better word, I guess discovered in the historical fishery-dependent data base.

These data were compared to current data that came from NEAMAP. Those data were very similar. In the past a paper had been used as a reference for maturity. It was recognized that paper had been misinterpreted in the past; and so we have a new maturity ogive here. For natural mortality, we moved towards age-varying, time-constant values.

Those values were scaled to estimates from the tagging data; so we moved away from the multispecies VPA, which you guys have typically seen, which had age and time-varying natural mortality from 1982 to the present, and moved toward a time-constant matrix. I'll talk about this more in this major changes section.

Growth was estimated similar to past assessments from fishery-dependent data. This figure is basically a figure of all the data pieces included over time. On the top it says year from '55 to 2013; that is on the top; and then on the side are data type, so removals or landings, composition, both age and length composition, and then indices.

The slide is color-coded so yellow is the reduction fishery; orange is the bait fishery;

the green is the recruitment or young-of-the-year index, and then the two different blue colors are the northern adult index and the southern adult index. That is at the top, if you want to reference that. For removals we have removal time series from 1955 to the present for both the reduction fishery and the bait fishery as indicated at the top in yellow and orange.

We have age composition data for the reduction fishery from 1955 to the present indicated in yellow by the age composition label. Then underneath that there is a shorter bar that is orange; that is the bait fishery age compositions. Those start in 1985 and run to the present. For indices there is the green bar; that represents the young-of-the-year recruitment index, which starts in 1959.

The other two indices are the northern adult index, which is a composite of seven trawl surveys, fishery-independent surveys. That is the darker blue; that runs from 1980 to the present. The lighter blue underneath that runs from 1990 to the present; and that is the southern adult index, which is a composite of two trawl surveys in the southern region. Then on the bottom are the length compositions with that.

I do have a note down here; selectivity blocks are denoted here for the reduction fishery removals at the top. You will see SEL Block 1, Block 2, Block 3. Those decisions were based on fishery changes over time. For example, in 2005 in the southern region, there is the Selectivity Block 3 that starts in 2005. That block was included because that is the year in which the Beaufort Reduction Plant closed down and therefore the fall fishery wasn't operating after that.

The selectivity blocks that were chosen are based on fishery changes and also migratory patterns of species. Moving to the next slide, these are the overall landings' data for the entire coast. The axis on your left is the reduction landings in thousands of metric tons. That is the solid black line. You can those landings were quite high in the late fifties, declined, were lower in the sixties, increased somewhat in the seventies and eighties and then have been declining since.

On the other axis are the bait landings. Notice the scales are much different. That is the dashed line. Bait landings were relatively stable and then started increasing in the eighties, were stable again, and then increasing in the latter part of the time series. Then in 2013 the TAC was implemented and so that is represented in here as well in the terminal year.

For fishery-independent indices that were created, approximately 40 fishery-independent data sets were brought to the table for consideration for this assessment from up and down the coast; from Rhode Island all the way through Florida. These data sets are not designed to sample menhaden, but they are useful for menhaden and potentially useful for other assessments.

In order to be considered beyond sort of our first cut, they needed to meet certain criteria. For example, one of those criteria was the data set needed to be at least ten years long. That is just one example. There is a series of criteria for them to make the cut and then moved to the next step. If they made it to the next step, data sets were used to create standardized indices. This was done to account for catchability differences due to things like time of the year, environment, stuff like that.

In the end we ended up with three composite coast-wide indices of relative abundance. The first was a young-of-the-year recruitment index that was composed of 16 data sets coastwide, ranging from

Georgia to Rhode Island. The second was the northern adult index, which was composed of seven fishery-independent trawl surveys ranging from the Bay Area north to Connecticut. Then the southern adult index, which was a composite of two surveys, specifically Georgia and SEAMAP. Those were the data that were used.

The second term of reference was to consider precision and accuracy of those data. I just have a quick slide on this. Basically, we did assess that. Uncertainty around those data was included. For example, there was uncertainty around annual landings' values to account for things like measuring reporting. There was also uncertainty around the index values.

As far as accuracy goes, comparisons among indices did support accuracy of the data. For example, the northern adult index and the southern adult index were correlated and showed the same general patterns over time in abundance. The stock assessment itself; data were split into northern and southern regions. This is a big change from the last stock assessment, and I will talk about it again in that major changes section.

The data were split due to migratory patterns of the species. Fish are moving farther north the larger and older they are; coming back off the North Carolina coast and aggregating to spawn in with wintertime; and then moving again the next year according to age and size, with those larger, older individuals again moving farther north up the coast.

In addition to that, that are fishery dynamics occurring with plants opening and closing throughout the duration of the time period from '55 to 2013. Currently there is one reduction plant, but there has been as many as twenty, ranging from Florida up to Maine. In this process we have analyzed some tagging data. They're the historical tagging data that were rekeyed. They have been analyzed and they also support these same splits.

You might hear me call this "fleets-as-areas model"; so if you hear that, that is what I'm talking about. It is the spatial split in the data due to these migratory dynamics and fishery dynamics. This better accounts for the population dynamics of the species and better accounts for fishery removals over time.

In this presentation I'm using the run recommended by the SEDAR Review Panel; so this run is the same as the base run in the report that came out, except that the length composition information is down-weighted. This allows the length information to inform selectivity of the indices but not influence the other model outputs as much.

This is a figure of recruitment. This recruitment in billions of fish over time as estimated by model. The 1958 year class sticks out, as it always does. We can track that class through the composition data and we can see it pass through the fishery. After that '58 year class, there is a decline in recruitment in the 1960's and increased with large recruitments occurring in the seventies and early eighties; declines then again into the nineties.

Then at the end of the time series we have some upticks; and so there are some above-average year classes for 2010 and also 2005 there. Biomass over time; this is biomass in thousands of metric tons. This has been variable over time. Again, this is very high in the late fifties; corresponding to that time when saw the big year class in '58. There has also been information about bigger year classes even before '58. It declined into the sixties. As we saw in the last slide, recruitment declined and also the biomass is declining during this time period.

An increase in biomass over the seventies and eighties; this is where we see those big recruitment classes; a major decline here in the 1990's with that recruitment decline but also some fishing pressure going on there. We will see that when we get to the reference point slides. Then as we move into the 2000's, there is an increase in biomass over time.

There was an increase in recruitment, especially with the large year classes of 2005 and 2010, but also reductions in the fishing mortality rate over time. This is abundance. This is numbers in billions of fish at age. The bottom color is red; that is age zero. As you would expect, that is the bulk of the fish out there are age zeros.

As you move up the bar, it becomes older and older age classes. These follow the same trends. You can see that 1958 year class there, quite large – you can track that through as ones, twos and beyond – an increase in the seventies and eighties and the numbers at age; and then an increase again in the 2000's.

The next term of reference is characterizing uncertainty. I think I have two slides here. The first slide talks about sensitivity runs. The sensitivity runs; there are several of them in the stock assessment document. Please note they're not considered equally plausible alternate states of nature. They're used to assess the impact of assumptions made in the model.

A couple examples that I just pulled here to discuss are, one, fishery selectivities. There is an example sensitivity run in there where we looked at if the selectivity of the fleet was flat-topped or asymptotic; did that result in a different stock status; and it did not. We also looked at inclusion of indices, which indices were having a big impact or not. Those are all in there.

What I wanted the take-home message to basically be with the sensitivity runs is that the stock status was robust to model assumptions; and the stock status was the same as the base run in all cases with these sensitivity runs. In order to assess uncertainty, we also did what we call Monte Carlos Bootstrapping; so MCB.

This accounts for uncertainty in the data itself; so every piece of data has an uncertainty associated with that; and so we're accounting for that in this analysis. We're also accounting for uncertainty in the model assumptions that have been made, such as natural mortality. As you recall, we've gone to an age-varying, time-constant natural mortality, but we are assessing the uncertainty within that particular life history parameter through these runs.

The take-home message for this as well is that the stock status was the same as the base run. Retrospective analyses; these were run back to 2009. There is no general statement about the fishing mortality rate pattern was dependent upon the age; F at age two, no general pattern to discern there. F at age three; if we looked at that, then we would say that we're under-predicting F by about 12 percent when compared to the base run with the terminal year of 2013.

As far as recruitment goes, we're under-predicting recruitment by about 30 percent as compared to the base run with the terminal year of 2013; and then for fecundity, over-predicting fecundity by about 12 percent when compared to the terminal year of 2013.

Okay, major changes from the last assessment; the last benchmark assessment was in 2010; the update was in 2012, and several changes have occurred to this

assessment. The first is that the maturity data are different in that basically the interpretation of the paper that was used for denoting maturity for the last assessments. Basically, there was a misinterpretation. Those fish in that paper were labelled as active versus inactive; and inactive could be – a spent fish could be considered inactive; and so we weren't getting an actual accurate picture of what the majority should look like.

What happened was we were looking at data that came from NEAMAP and then we found some data in the historical fishery-dependent data base; and we used those. They're very similar. The ultimate result is that maturation is occurring at a younger age than what we had in previous assessments.

In this version of the assessment, we're also accounting for changes in maturity over time; so maturity is linked to length and length is changing over time because we have this changing growth over time in this assessment. Another big change was the way natural mortality is handled. Natural mortality is time-constant but age-varying.

What does that mean? The natural mortality still includes mortality due to all causes, disease, predation, environment, senescence. It still includes that. It is just not time-varying. In addition, the estimates are similar to the estimates that were coming out of the MS-VPA. We did do a sensitivity run to look at if the stock status would change in any way if we used the time-varying natural mortality coming from the MS-VPA; and did not.

The next set of changes; these are both index-related changes. In the last assessment we had one fishery-dependent index based on the Potomac River Fishery Commission data set. In this assessment we had two new fishery-independent indices of relative abundance. We used those indices to give information on relative changes in abundance over time on a broader spatial scale.

These indices had data from Georgia up to Connecticut included in them and more fully used the state survey data available to us. The young-of-year or recruitment index; you may have seen it called JAI, juvenile abundance index, in the past. That was updated as well. It still starts in 1959 and runs the entire time series to the present. However, this time it includes more gears, more states and has a broader spatial coverage.

In this version of the assessment, the model was separated into northern and southern fleets. I alluded to this in the past. There are concerns that the fish are migrating outside the range of the fishery in present day because most of the fishing is off of Virginia; not all, but the bulk; and those fish are moving beyond typical fishing grounds.

We sort of looked at this and made the decision to separate into northern and southern fleets. That division was at the Virginia Eastern Shore, on the Virginia Eastern Shore there, so the Bay is included in the southern region. This decision was supported by data; so we looked at changes in length and age over time by plant.

We're looking at latitude and where do we see differences occurring; and that is how we chose the break that we used for depicting northern and southern fleets. For fishery selectivity, this is an additional major change. Fishery selectivity was dome-shaped for this assessment; and this was supported by data.

The fishery-independent surveys that were brought to the table for this assessment – recall I said approximately 40 of them – most of them had length data associated with them. Those lengths, when we looked

into them further, some of those surveys were capturing fish larger than we'd ever seen in a fishery-dependent data base, indicating that the fishery is not getting the full range of sizes of fish as you would expect.

There are data to support this decision. Therefore, the selectivities were allowed to be dome-shaped in this assessment. They were also time-varying based on the changes in plant operation over time, as I said on that data slide with the colors. Those breaks were based on when were plants operating, where were they operating, were there some major changes in the fishery. You can ask questions about that if you'd like.

Okay, reference points; we're currently using the board-selected reference points. Those reference points include a threshold, which is at 15 percent MSP, or maximum spawning potential; a target, which is set at 30 percent MSP. These were chosen based on the 2010 assessment when the stock status in the terminal year was denoted to be at F 8 percent of MSP.

These were intended as interim reference points; and the board expressed that they would like to move toward ecosystem-based reference points, which Jay will be talking about next. With those current reference points, here is your fishing mortality rate figure; so this is full F over time, from 1955 to 2013.

The blue line is F at 15 percent; and it is equal to 2.98. The F 30 percent, which is the target, is 1.03. The F in the terminal year of the assessment, which is F 2013, is equal to 0.27. In the past we were above the threshold in the late fifties, so the earliest years of this assessment, then rapidly declined; hovered around the target fishing mortality rate for most of the years; noting in the nineties there was a higher fishing mortality rate; and then since then declines.

Along with that, we've got the fecundity-based component of it. This shows the blue line, which is the threshold for fecundity at fecundity 15 percent, which is just under 50,000 – and this is billions of eggs. The orange line is the target and that is fecundity at 30 percent; MSP, that is around 100,000.

For most of the time period, we're bouncing kind of wildly around that target value; and then in 2013 the fecundity value is well above that target. The stock status is not overfished and overfishing not occurring based on the interim reference points established by the board. The interim reference points were based on the historical performance of the fishery.

There is some concern through the technical committee that the current reference points may not actually be sustainable given that we're no longer at F 8 percent MSP, as was indicated in the last assessment. The technical committee would like to recommend reference points based on the same method that was used the last time, this historical performance process of selection.

Specifically, the recommendations are this. The first recommendation is instead of using full F, to use F at age two. Specifically, this recommendation is centered around capturing the bulk of the fishery; so this represents the fishing mortality rate for the largest segment of the fishery, specifically the southern reduction fleet; but also represents the fully selected age given that we have dome-shaped selectivity occurring.

In addition, as far as the MSP percentages, we're suggesting adopting percentages based on past fishery performance for the years 1960 to 2012. 1960 was chosen; some uncertainty in those early years and likely those years were not sustainable.

There were huge landings coming out of the fishery. We cut it off in 2012 because 2013 is the year in which the TAC was implemented.

The suggestion is for the threshold to use the maximum fishing mortality rate; and whatever that percentage is, use that as the threshold. That happens to be F of 20 percent MSP. Then for the target, the suggestion is to use the median fishing mortality rate and whatever that equates to in MSP; and it happens to be 39 percent MSP.

I have those two figures here. The first is fishing mortality rate at age two. The blue line is the fishing mortality rate threshold that is being suggested. That equates to F 20 percent. You will see that is the maximum fishing mortality rate from 1960 to 2012; hence, one year hits that. Then the orange line is the recommended target; and that is an F of 39 percent MSP; and it equates to 0.71. That is the median fishing mortality rate for the time period of 1960 to 2012.

The current fishing mortality rate in 2013 is 0.24, which is below both the threshold and target. Moving on to the fecundity side of that; if we use the fecundity at 20 percent MSP, then that threshold is just over 67,000 billions of eggs. This is trillions of eggs. The orange then is the fecundity of at 39 percent, which is just over 130,000 on this figure. The fecundity in the terminal year 2013 is above both the target and the threshold here.

Stock status, using the technical committee recommendation, is not overfished and overfishing is not occurring. Projections were done, but they haven't been updated based on the recommended base run from the review workshop. Projections will likely show that maintaining current harvest will not jeopardize the stock status moving forward; and the technical committee is prepared to run additional projections as directed by the board.

The research recommendations that are coming out of this assessment; first, we will do some short-term recommendations for some data collection. First, continue current sampling levels from the bait fisheries. This will help inform the bait fishery catch at age in the future; and the sampling definitely could be improved over time.

Analyze the sampling adequacy of the reduction fishery and then sample areas outside of the reduction fishery; so specifically collect age structure and biological data outside the range of the fishery. We have a lot of fishery-dependent data and we need to focus on some fishery-independent data collection.

Conduct an aging validation study, particularly looking at scale/otolith comparisons. One other additional idea was to maybe look at some radioisotopes with archived scales. We actually have all the scales archived at the Beaufort Lab, still. The next one is conduct an aging workshop to assess the precision and error among readers for aging. This is planned for March 2015. There is actually a date selected for this. Then conduct a comprehensive fecundity study.

These are all the short-term data collection needs. Long term; develop a menhaden-specific coast-wide fishery-independent index of adult abundance at age. This one comes up every time. It is bolded; it is high priority. It is a critical need. Conduct studies on spatial and temporal dynamics of spawning, how often do they spawn, how many times a year do they spawn, are they batch spawners. More information about the spawning activities would help.

Conduct studies and productivity of estuarine environments related to recruitment dynamics; so which estuarine

environments are producing the most recruitment, where are we getting our recruitments from? Is it one place or is it across the board?

Assessment methodology recommendations: Conduct a management strategy evaluation; a management strategy evaluation would help with making decisions on which reference points to choose. Conduct a multi-objective decision analysis – you guys I think have seen this come up. We called it MODA – basically having managers put in objectives that they would be interested in seeing both on the menhaden side but also on any of the other multispecies side. For instance, you might have objectives for striped bass, weakfish, bluefish, et cetera.

Continue to develop an integrated length-and-age-based model; continue to improve methods for incorporation of natural mortality – this gets back to MS-VPA, whether we should proceed with that or move to something else. Then develop a seasonal spatially explicit model once sufficient age-specific data on movement rates of menhaden are available; and that is specifically related to continued use of the tagging data that were keyed and rekeyed.

The recommended timing of the next assessment; all of these research recommendations were made as either short- or long-term recommendations with the idea that short-term recommendations could be completed before the next benchmark assessment, which would occur in six years and assuming that there would be an update in three years.

Long-term recommendations were those that likely could not be completed before the next benchmark assessment; so the long-term recommendations were things that we were seeing that would probably take six or more years to complete. Future directions; the technical committee needs to review the formal review workshop report yet. That will be done in the future.

In addition to that, some work that will likely occur before the next assessment, the first of which is a management strategy evaluation, or that MSE, as I've said, can help guide with reference point selection in the future. Then also analysis of the tagging data; those data can help provide information on the spatial stock assessment model and how we would move forward with that. That's what I have term of reference by term of reference and I'll open up for questions.

BOARD DISCUSSION OF STOCK ASSESSMENT REPORT

CHAIRMAN BOYLES: Amy, thank you for that excellent and comprehensive report. I imagine there are some questions around the table, so we'll look for questions for Amy. Bill Adler.

MR. WILLIAM A. ADLER: Very complete report; thank you. A couple of questions. Going back to your charts on recommendations for thresholds and target under fishing mortality, that particular chart where the technical committee proposed that the target and threshold should be a certain number; where does that compare with where it is now? Are you raising that bar or both bars, actually, from where they are now?

DR. SCHUELLER: Okay, the fishing mortality rate, the recommendation is more conservative. The current interim reference point for fishing mortality rate, the threshold is 2.98. The technical committee recommendation is 1.80; so it is a decrease in the fishing mortality rate with the new recommendation for the threshold and the target.

MR. ADLER: Even though your report indicated that the stock status is sustainable and it seems to be going along okay; let's put it that way? You're still requesting to lower the bar?

DR. SCHUELLER: Yes. The reason why is that when you look at the interim reference points compared to the figures that we have, there has never been a time, except for in the fifties, when we've gone above that; and so there was concern amongst the panel that might not actually be a sustainable level.

We're trying to use this historical – I call it historical performance. Basically, the fishery seems to have been sustainable; it is still around; it is still harvesting fish. Therefore, we're using this time period where we think it is sustainable and we're using that to recommend some new reference points.

MR. ADLER: On another chart, I am assuming that the maturity rate being higher than you thought is a good thing, I would think; that they mature sooner than you thought. Okay, that's good. Are you doing the same with that chart where you're upping those bars on that particular chart, which I think came right after the chart I just talked about? Are you changing that, too?

DR. SCHUELLER: I think you're referring to the fecundity-based reference points. Those reference points would change corresponding to the recommendations for the fishing mortality rate. The fishing mortality rate recommendation is made; and then there is a corresponding fecundity reference point that goes with that percentage.

MR. ADLER: Okay, thank you. I'm glad to see that something is not overfished for a change and overfishing isn't occurring; how do we deal with success? Thank you.

MR. KYLE SCHICK: Thank you for your report. It is good to see the data coming in and being able to have a good technical committee report that everybody feels comfortable with in the technical committee. My question is, is using the new targets and whatnot, overfished not occurred and overfishing hadn't happened since 2000 – that is what the graphs kind of showed – so we could basically say that we've been doing a proper fishing level for the last 20 years; is that your conclusion?

DR. SCHUELLER: Well, we've been below the – well, with the current reference points, the formally adopted one, we've been below the target since the very late nineties, maybe 1999/2000. We have been below the threshold most of the time period, since the fifties. If we use the recommended technical committee reference points, the same thing holds there. We've been below the target since about 2000.

MS. LYNN FEGLEY: Dr. Schueller, I just want to thank you. You guys did a great job. I know it was a lot of work and it is just a really nice assessment and a nice piece of work. I had a question about natural mortality; and if you want to kick me over to Jay, that's fine. Now we have a natural mortality rate that is time-variant but age-specific; so my question is when you had explained all the things that natural mortality contained – so it contains senescence and predation and all those things – my question to you is on the predation piece of it, as we're thinking about this assessment in a single-species context, what is the predator state that is accounted for in that M? Is it an average level of predators over the time series of the assessment or is it – can you clarify a little bit what that – when you say predation is in there, what is that state?

DR. SCHUELLER: That's not an easy question. I guess to me, when I think about

it, I would think if the middle of the road, right – I mean, we're certainly not accounting for – if a certain species that has menhaden as a big forage component is very high or very low; but if we get in the middle of the road there, then we're still capturing those dynamics; that part of the entire fishery dynamics somewhat.

This board has indicated that they'd like to move towards ecosystem-based reference points; and obviously a component of this stock assessment, term of reference number seven, was addressing that and putting forwards some methods in which to address those wants from the board, which Jay will be talking about next.

MR. DOUGLAS E. GROUT: Thank you, Dr. Schueller, for an excellent report. I was wondering if Melissa could potentially put up a couple slides that sort of struck me; and they are the slides that have the total abundance and the one before it that says "biomass". The thing that struck me was that the biomass seemed to be at a very high level, even compared to levels back in the fifties.

Yet what I saw in the trend in the abundance graph, which was the follow-up one, there seemed to be a decline happening in the most recent five to six years. One, I'd like to find out why there is that kind of discrepancy; and, two, did the assessment committee and peer review have any concern with that declining trend in abundance that we were seeing there.

DR. SCHUELLER: Yes; I'll have you put it up on that abundance slide. Both of these figures show similar trends, right, so we sort of have this very high abundance in biomass in the late fifties, sharp declines in the sixties, up again in the seventies and eighties, down in the nineties and then an uptick again in the 2000's.

The biomass plot and the abundance plot do look different in that the biomass seems to have come up on par with some of the other historical biomass levels where abundance looks like it is not quite as high. My thoughts on this are that there are currently more bigger, older fish out there. Therefore, there may fewer fish; therefore fewer total abundance.

You're really talking about age zeros and age ones if you look at this figure. Those older, bigger fish are going to play into your biomass more because they weigh more. I think that's the tradeoff that we're seeing in those two figures is the composition of what is out in the population and what size fish they are.

MR. ROB O'REILLY: Thank you, Amy, and your colleagues. You set a high standard in a short amount of time I think to go through this process, so thank you. My question is really straightforward. You mentioned when the recruitment slide was up that 2005 and 2010 were above average. There is certainly some fluctuations there.

I was wondering if there was any sort of discussion by the technical committee or we'll hear something from the peer review about the level of recruitment. I know it is something that is always pointed to. Throughout the 2009 assessment, after that I think we kept hearing that the fishing mortality rate and recruitment are decoupled. There is no significant relationship there, no coefficient of determination, I assume, so how do you really look at the current recruitment? Are you looking at that in the whole time series from the fifties on; should the average be a moving average; what is involved there?

DR. SCHUELLER: When I said average, I meant basically over the time series. If you look at this figure, anything above 20 here, right, is a decent year class on this figure. We're talking about that '58 year class, the seventies, eighties, and then those two in the late 2000's; not to say that the

recruitment in the 2000's, it is still higher than what we're seeing in the 1990's. Those year classes, 2005 and 2010, also play out in the fishery-dependent data, so we can track them through the composition data. Does that answer your question?

MR. O'REILLY: I think it does mostly. I guess my real question is what type of concern should there be for after 2010 or is that an expectation given the inherent variability?

DR. SCHUELLER: You're right; the 2011, '12 and '13 recruitment classes, they are lower on par with what is in the sixties and the nineties. I was just looked at how the retrospective was treating recruitment just to see if that's part of the picture. It could be a concern.

It could be those cohorts are – we call them sort of incomplete in the model; so there are ages zero in 2013, so the only data point we have for that is that 2013 recruitment index; where if we move back in time we can actually use other data pieces to fill out that picture because we're seeing them grow older and move up into that population in the fishery. Potentially there could be some concern they are lower.

MR. O'REILLY: One other question – and I may not have seen it, Amy, but in the retrospective, how is the recruitment treated since it is also a model-based aspect?

DR. SCHUELLER: I'm not sure I understand what your question is. You are asking how the recruitment is treated in the retrospective component?

MR. O'REILLY: Yes, is there bias in either direction?

DR. SCHUELLER: Okay, if I'm understanding your question correctly, the model is underpredicting recruitment by about 30 percent. We haven't done any corrections or anything like that on it, if that is what you're asking.

MR. O'REILLY: I think that's fine, Mr. Chairman, and you had that in a word slide, I guess, as part of one of your slides, but I wondered if you had anything actually showing. The 30 percent is a good answer; thank you.

MR. ROBERT BALLOU: Thank you, Dr. Schueller, for an excellent job and through you to your colleagues on this assessment. When the board was working through the allocation issue, we struggled with uncertainty with regard to landings particularly in the bait fishery. I'm wondering how the assessment – you spoke to it. You noted there was uncertainty and it was addressed.

I'm curious as to whether you found decreasing uncertainty in the more recent data sets with regard to the bait fishery versus past years, prior years, and again how the assessment sort of incorporated what I would assume would be an increasing trend towards better landings' data particularly from the bait fishery. Thank you.

DR. SCHUELLER: Yes; that's a really good point. Throughout this assessment, all of these data pieces are improving in quality over time, meaning we're getting a better handle on actually what is being removed from the fishery; the indices, all the data component pieces.

The sample sizes on things have increased; so you are right, over time we have more information on exactly what is being removed from bait. We handled this in the model with a break, so the earliest data had more uncertainty with it; more recent data had less uncertainty with it. We didn't

necessarily specify 2000 had more uncertainty than 2005, though.

MR. EMERSON C. HASBROUCK, JR.: Thank you, Dr. Schueller, for your presentation. Mr. Chairman, I have two questions, two separate questions. Is it okay if I ask them both or do you want to come back to me later? My first question is what is the relationship, if any, between recruitment and FEC?

DR. SCHUELLER: Well, typically it would be the stock-recruitment relationship. In this instance the model is estimating a median recruitment and then yearly deviations using information from the recruitment index. We're not assuming any relationship between recruitment and fecundity.

MR. HASBROUCK: So high fecundity does not necessarily result in high recruitment nor does low fecundity result in low recruitment, if I'm understanding you?

DR. SCHUELLER: Correct.

MR. HASBROUCK: And my other question is for those very large fish that you found in the fishery-independent surveys; are they mostly or all in the northern fleet?

DR. SCHUELLER: They are in the northern fleet, in the northern data sets mostly. They're in the northern fishery-independent gears. There are several of them, but, yes, in the north.

MR. HASBROUCK: So larger and older fish are generally tending to go further north; there is still that –

DR. SCHUELLER: Yes; it is another piece of evidence to support that.

MR. G. RITCHIE WHITE: Going back to Doug's question to the abundance and the age structure of the population; would you characterize the existing population with the age structure that it has as a healthy population; it is something that we should be striving towards; or, does this age makeup give you concern?

DR. SCHUELLER: Well, I suppose it depends on what you consider a healthy population. I'm struggling with this question because I have my thoughts on it based on the assessment, but then there are also things that could be discussed around this table by the board as to what they think or classify as a healthy population; so it is not a straightforward –

MR. WHITE: I guess what typically would be seen as a healthy population across fisheries?

DR. SCHUELLER: You would hope for a filled-out age structure; and there doesn't seem to be any reason for concern here related to that.

MR. WILLIAM J. GOLDSBOROUGH: Thank you, Dr. Schueller, for your presentation. I, too, had a question about recruitment and those two recent peaks, the '05 and 2010 peaks. I wonder. to understand them a little better, if you could say something about the way the coast-wide recruitment index is put together.

I know that those peaks don't appear in Maryland's juvenile index. I don't know about Virginia's. I seem to recall a few years ago reports of an abundance of juveniles in more northern waters; so I'm wondering, if we can drill down a little bit, if there is any indication of what might be driving those peaks; and beyond that, if we see any indication that the epicenter of recruitment, if you will, might be shifting a little to the north.

DR. SCHUELLER: You're correct in saying that the Maryland-specific striped bass

seine survey didn't necessarily show those peaks. You're right, it is coming from the northern regions; and those fish are tracking through the composition data, et cetera. Those are signals that are seen in multiple data sources in the model.

Is the epicenter of recruitment moving north; I don't know that we've explored the data and we have enough to set at the table and give a good answer on that. At least I don't feel like I have. That is something that could be looked at in the future; and it was something that was a research recommendation in this.

MR. JEFF KAELIN: Thanks, Amy; this is a tremendous amount of work and we're very encouraged by the amount of data that went into it. I know that the industry – not only the reduction industry but the bait industry has been working to provide samples for aging over the recent years. It turned out I think that really helped make some of the decisions particularly about doming.

I can recall that there were actually midwater trawl catches of large menhaden. I think that was the first time I had ever heard anybody say something positive about midwater trawl bycatch, actually, but it is kind of a nice outcome because it demonstrated that those older fish do seem to be out there.

I think you mentioned that having a stock that is exhibiting a good mix of age classes does represent a healthy stock. I think there is nothing but good news here from our perspective in the fishery. I have a couple of temporal questions. There was a long list of things to be done, but no estimate of the amount of time that it might take to do all those things.

Specifically, I noted that the technical committee still needs to review the formal workshop report. That kind of surprises me since the technical committee has been sitting around putting this assessment together for months. I have a question about how long you would anticipate that to take. Also, one of the bullets was that management strategy evaluation process should be used to guide reference point selection.

At the same time, however, the technical committee is making some very specific recommendations about a reference point. Thirdly, my question is how long would it take the technical committee to develop projections of yield from this stock that would be based on the F 20 percent MSP threshold and the F 30 percent MSP target?

DR. SCHUELLER: Okay, Jeff, first, the technical committee reviewed the stock assessment report. That was done in November before it went to the review workshop. The review workshop was completed in the second week of December, the 9th through the 11th. The review workshop report came out in mid-January; I think the 16th.

I haven't seen the CIE reviews yet. The full set of review documents isn't even in yet; and that is what the technical committee hasn't reviewed are those review documents yet. We haven't sat down as a group and gone through those review documents. The next question I thought was the reference points.

MR. KAELIN: Well, in terms of that issue what is the time estimate for sitting down and reviewing that, getting the CIE review? Are you talking weeks, months? I think it is critical to trying to get more yield out of this assessment, which the bait fishery, for sure, is very interested. My question was about how long would that take, specifically?

MR. MICHAEL WAINE: Jeff, I'll jump in for Amy and just say that the plan from staff's perspective would be for the board to

direct the technical committee to review the peer review report during the March Technical Committee Meeting Week and come back in May after having done that.

Potentially with any projections that the board would like to see; they have projection methodology that was a part of this assessment and was part of the peer review. The timing; we wanted to make sure that the board was delivered the results of this assessment as soon as we could; and that didn't provide us the opportunity to go through all of that. Another example would be the advisory panel I'm sure would like to see the peer review report as well. I anticipate those tasks to come from the board for between and our May meeting.

MR. KAELIN: All right, that is encouraging. That means that if the board did request you to run the projections on the new reference points that you're recommending; that information could come back as early as May. Thank you very much.

DR. LOUIS B. DANIEL, III: How is fecundity used in the assessment?

DR. SCHUELLER: Fecundity is an estimated quantity, so it is based on number of fish and then the fecundity – I guess your question is how is it used in the model. It is something that is calculated in an output. It is not used to estimate anything. It is basically an output. The fecundity relationship comes from a paper that is cited in the assessment report.

DR. DANIEL: The thing that kind of jumped out to me – and I think everybody knows how I feel about ecosystem modeling; but just looking at the data needs and the research recommendations, there is still a lot about the single-species management that we don't know a lot about. The thing that really jumped out at me was not even knowing if they're batch spawners or not. That is not a criticism of the panel.

You all did an excellent job with this; but if we don't even know that they're batch spawners or not, I don't know how we determine fecundity; so I guess it is kind of a swag. It does surprise me with being a stock that we probably know as much or more about than any other stock that we manage that basic information like that is unavailable to us.

I just would ask that we keep that in mind as we move forward with the discussion on a potential amendment. I would also ask, though, for the technical committee whether these reference points are reasonable. There are some concerning trends to me in the population biomass and particularly the recruitment indexes, which would tend to indicate that maybe the 15 and 30 percent MSP is probably too low to provide the ecosystem function that we're trying to get out of menhaden.

I would like perhaps some discussion about that; and maybe it would be more appropriate during the ecosystem discussion; and maybe it will be more important in our deliberations later. I wanted to bring that point up on fecundity and I just wasn't real sure how that was used; and it did strike as interesting that batch spawning was the thing. Then the other thing that was extremely questioning to me was the senescence part of the natural mortality rate; and we can talk about that offline, but that is an interesting component that I'd like to know more about. Thank you.

MR. STEPHEN B. TRAIN: Mr. Chairman, Jeff Kaelin asked a question very similar to mine, and I think I got the answer.

MS. FEGLEY: I think this follows up on Louis' point. I'm also struck by fecundity as we're trying to get straight reference points

and think about what we're going to do with the reference points. When you look at the graphs of abundance and fecundity, they seem to be opposite of each other somewhat. They're both cyclical.

Abundance recently is lower, but fecundity recently is very high. As I understand that's because of this very interesting trait of menhaden that when there is fewer of them, they become more fecund; or there is a density-dependent impact on fecundity, so when there is fewer they grow faster and they're more fecund; is that true.

DR. SCHUELLER: I think you're seeing what was already pointed out in the biomass figure; and it is that with more older fish, those fish have a higher fecundity; therefore, that fecundity is going to be up.

MS. FEGLEY: Right; so my question is it almost seems like when you look at the graphs together; that you would tend to possibly have higher fecundity when your abundances are lower; is that true? If it is not, then I'll stop talking.

DR. SCHUELLER: I don't know that would be true. I mean, it would depend on is the abundance lower because there are less recruits or is abundance lower because there are less older fish. There are multiple components to consider there. I don't think it is as straightforward as that.

MS. FEGLEY: Okay; and I guess what I was getting at is there some breakpoint where this density-dependent effect on fecundity starts to become negative rather than positive on fecundity; but if it is not really that density-dependent effects, then it is sort of a moot question.

CHAIRMAN BOYLES: Any other questions from the board for Amy? Rob.

MR. O'REILLY: I want to come back to the same question I had before; and it is about recruitment. I guess what I was thinking about, Amy, was there are a couple of figures in our reports that show the removals, both north of Virginia Eastern Shore and from Virginia Eastern Shore and south by the reduction fishery; and certainly in both cases they're somewhat at a low phase. Given that how should we look at recent recruitment; how should we really be looking at that in relation to removals; not just the snapshot from the last few years, but I think that is just an overall question through the time series?

DR. SCHUELLER: I think your question is that is recruitment being driven by fishing mortality rate; is that what your question is?

MR. O'REILLY: Not exactly. My question is when we – you know, there is a lot of concern I've heard over the years about recruitment; and it is expressed after each time there is an assessment. Current recruitment let's just say for the last three years, as you mentioned, is on the low side compared to 2010. However, when I look at the removals, I see that removals are also lower.

This is the reduction fishery; and I guess at the same time if we had a plot of what the natural mortality was as well on top of that, we would put all that together and we might be able to say something objectively about recruitment, whether or not there is a concern or not concern, which might go beyond there is a 30 percent bias that occurs that it is underestimated. I'm just wondering is that something – is that part of the conversation of the technical committee putting these pieces together.

DR. SCHUELLER: The natural mortality rate is constant in this assessment so kind of take that out of your frame of reference.

That would get more at the ecosystem part of it. With the fishing mortality rate decreasing, that is a good thing, right, for sustainability. It just depends on what the management goals and objectives are and sort of where the board would decide that they think the population should. The recruitment; I don't know that we agonized over the last three years being lower given all the other things that we agonized over; but it is something you could pitch back to the technical committee and ask them if they have thoughts on.

CHAIRMAN BOYLES: Any other questions from the board for Amy? Dr. Schueller, again, thank you for a very thorough and comprehensive report as well as the work of your team. We really appreciate your wisdom here.

PRESENTATION ON
ECOLOGICAL REFERENCE POINTS

CHAIRMAN BOYLES: We will move on now Jay McNamee's presentation on ecological reference points.

MR. JASON McNAMEE: My name is Jay McNamee. I work for the Rhode Island Division of Fish and Wildlife. I've got a presentation here that is going to walk through some of the ecological reference point work that we've done mostly through the Biological and Ecological Point Group, the so-called BERP. We thought the name was pretty clever.

We teased Term of Reference 7 already about a half dozen times, so I hope we can live up to the hype here. But just to restate it, Term of Reference 7 – and I think there was another set of term of references for the peer group; and it switched to number eight in that one; but the one that I grabbed was this one; and it was to identify potential ecological reference points that account for Atlantic menhaden's role as a forage fish; to provide proposed methodology; a model development plan; and example results using a preliminary model configuration, if time allows.

Time didn't allow for all of that; but what we did do was we brought forward suite of tools that we were looking at as a group. We brought that into the peer review process to get some expert opinion on some of those tools that we were looking at. Just an overview of this presentation; I'll try to go relatively quick. It is text heavy, no colorful pictures. I apologize for that.

What we're trying to do here is introduce to you the toolbox that we're looking at, the different models, the different approaches that we're looking at. The presentation is going to focus on those tools. There are four broad categories that capture the types of things that we're looking at. You will see the presentation is kind of broken up into these four categories.

Then after I finish with our comments on each of the categories, I'll also touch on what the Peer Review Panel said about those approaches as well; hopefully, not stealing Dr. Jones' thunder, but hopefully the repetition will help and kind of lock some of this stuff for you. The very first approach we looked at was ecosystem indicators.

As we step through these four categories, we're going to go from simplest to complex; so there is a progression there as well. We're starting off with some simple things. The development of ecological reference points – I will say ERPs from now to save time – is a complex and time-intensive process, but a number of methods exist that could provide more timely indicators of ecosystem health.

These indications, they're not quantitative, per se. However, these qualitative reference points can provide information

on the status of the whole ecosystem, the whole system as it stands right now. In addition, we can turn these sorts of things over pretty quick; so we can update these relatively quickly as opposed to some of the more complex procedures.

These sorts of ecosystem indicators could be used as interim or even complementary steps in the development of ERPs. Some of the things that we looked at were environmental indicators like chlorophyll-a indexes or sea surface temperature or big climate-driven cycles like the Atlantic Decadal Oscillation or the North Atlantic Oscillation.

We also looked at indices of forage abundance and we looked at prey-to-predator ratios. These are the different types of ecosystem indicators we looked at. Here are some comments from the Peer Review Panel on those approaches. The panel agreed that the monitoring of such indicators would likely be informative; that it would be helpful for us to be able to track these things.

The drawback, though, is there is not a strong connection between most of these indicators and then triggers for management action. These are the usual motivation for reference points. You hit some threshold and then there is some associated action that accompanies that. Two exceptions are the forage species abundance and the predator-to-prey ratios, which I'll talk about a little bit more in the next slide.

Tracking these indicators would likely have value – and we talked about them as an ecosystem-based fishery management dashboard, so something you could get a quick look at and develop some thoughts in that sort of context; but they're less important for the development of ERPs for the menhaden fishery specifically. Still some panel comments on the ecosystem indicators; the panel viewed the following indicators as more directly relevant to the development of ERPs; and that is the abundance of forage species, either a particular forage species or a group of forage species together; and predator/prey ratios.

These two types have the potential to be directly related to key management objectives. It would require empirical or some sort of theoretical argument that particular levels of forage abundance or some particular ratio is associated with some consequence that is germane to the ERP target or threshold.

There is still some work that needs to be developed to kind of turn these into useful indicators, but they still do have some value. It would be desirable to explicitly couple these biological indicators with models that aim to capture relevant predator/prey or food web dynamics to bring these indicators together with some of the other things we'll talk about might a good thing to do.

Okay, the next approach that we looked at were nutrition reference points. These are reference points describing desirable and undesirable nutrition or nutritional status of predatory fishes in general. We're talking about predatory fishes here. That would be useful for judging available forage. The concept could be developed into a systematic ERP.

You could use existing surveys for nutritional status. Some of these exist. I know one exists for the striped bass species in Chesapeake Bay, for instance. A coast-wide approach could be developed as well. Some of these nutritional reference points could be body fat indices, bio-electric impendence indices or consumption indices; so, namely, you would look at grams of prey you have per gram of predator that you have.

The peer review panel comments on these; the panel discussed these. They kind of talked about these in their comments amongst all the other ecological indicators, which I just talked about. The panel noted that these might be useful for ERP development if empirical relationships between this nutritional status and demographic or economic effects could be established.

You would have to make some sort of – you have to put another layer on there and make some linkages. Okay, we're going to start to get into some of the modeling approaches starting with our simpler modeling approaches. We looked at some production models. Biomass dynamic model, type of production model, with an additional predation function incorporated into it have been useful in exploring the role of predation for certain marine species.

There are some examples of using these types of production models out there. The virtues of these multispecies production models are they're trackable. They're kind of easy to follow. They're also easy to parameterize. Like we said, there are simple modeling approaches that are easy to interpret and easy to parameterize and therefore could probably be turned around in short order relative to some of the more complex approaches.

These modeling types can generate all sorts of estimates. They can develop estimates of undifferentiated prey biomass losses to key predators and estimates of prey biomass. You can develop predation mortality, fishing mortality; and some of these methods can also provide time-varying estimates of some of these parameters as well.

One of the ones we looked at has a time-varying component in it. These models can provide independent index-based assessments or you can use them in combination where you take output from other multispecies models to provide another view of the dynamics. You can use them kind of in parallel. The two types of production models that we looked at were the Steele-Henderson Model and the Surplus Production Model with time-varying R. These were two production model types that we looked at within the group.

The Peer Review Panel comments; the panel generally liked the suite of modeling approaches reviewed. They felt it was pretty comprehensive. They noted that it would be desirable to explore a range of modeling strategies from simple models like the surplus production models to more complex modeling structures.

Our primary goal should be to determine the extent to which the dynamics of menhaden and their predators are connected; so there should be a specific hypothesis when you're looking into these types of models. The model development should consider whether important effects are likely to be only from predators or whether menhaden abundance can also affect the abundance of its predators; so is there a feedback in this as well.

As prey populations decreased; does that have an impact on your predator population? Multispecies approaches; jointly modeling the dynamics of both menhaden and menhaden's predators will provide a more realistic representation of population dynamics and better opportunities to develop useful ERPs.

Okay, the next progression up the chain of complexity here is single-species models. Single-species statistical-catch-at-age models; the nice thing about them is they can encompass the whole coast-wide spatial extent of the population. Examples of some of the reference points that can be developed with single-species models are

reference points based on fishing mortality being some proportion of natural mortality or biomass being kept at a level at some proportion of the unfished biomass. There are different ways you can develop ERPs from a single-species assessment.

These sorts of ERPs have been advocated for and suggested by recent forage fish documents; but these are not directly developed on menhaden. They're based on expert opinion of related species, but not specifically on menhaden. The data requirements are standard stock assessment data needs, catch-at-age indices of abundance, so these are all things that we know how to get and know how to handle.

The things that we looked at include BAM. You may have heard of that one before. We also looked at a time-varying natural mortality model that had some interesting Bayesian statistical components in it. Some of the Peer Review Panel comments; they talked about all of the modeling approaches kind of together.

There wasn't anything explicit about the single-species models, per se, but one additional note that they did make was simple approaches may provide interim solutions; and these are things that you can do in the short term while you're developing some of these more complex approaches.

Okay, here is the last approach. These are the hyper-complex, multispecies models. One method of interest to managers – this board has expressed interest in them in the past as well – is to explicitly model a defined ecosystem. The nice thing about this approach is it allows for the connection of standard stock assessment models, so things we know how to handle and we connect them through trophic calculations or energy budgets.

These approaches allow for direct calculation of predation on target prey species by specific predators. In some cases you can also develop that feedback mechanism. These approaches can be or I'll say more boldly are labor and data-intensive and are highly complex. Some of the ones that we looked at in the BERP Committee are the multispecies virtual population analysis. This is the MS-VPA that you all have seen in the past.

There is also a multispecies statistical catch-at-age model in development. We also talked about Ecopath with Ecosim as well. Some of the Peer Review Panel comments; the panel was hesitant to encourage investment of a lot of effort into the development of models that include a ton of species, a ton of trophic levels.

What they said instead was the ideal approach is to do a model of minimum sufficient complexity, which I thought was a really cool way to couch that. It even went on to suggest perhaps a two-trophic level predator/prey model constructed within a statistical framework might be a good first step.

The panel was not enthusiastic about utilizing a whole food web model such as EwE or Atlantis. It is not that they don't like those models or anything like that. What they were getting at is don't invest all of your time and all of your energy into the most complex modeling if it means you can't invest in some of the simpler approaches. That is what they meant with that comment; and I think it is a good comment.

All right, a couple of summary slides here. It has been difficult to make a recommendation on which ERP would be best to adopt for Atlantic menhaden; and this has been the main task of the BERP Committee. We've talked about it for many years now. The reason it has been such a

struggle is there are two main questions that need to be addressed before significant progress can be made on this development.

The most important question is what the goals and objectives of the board? What we need is a statement of ecological or ecosystem goals and objectives for menhaden management. That should be provided by the board, the stakeholders, the constituents. The next thing we need to do is scientifically test the approaches that we're going to use.

We've already investigated them. We can manage most of the ones we talked about in this presentation; but the next thing to do is to dig in and really test these things, review them, use simulated data, all those sorts of things that we do. The performance of the proposed ERPs and the models used; they can be evaluated through multi-model comparisons, through simulation testing and completion of single and multispecies management strategy evaluation.

There is that comment again on management strategy evaluation for these as well as the single-species approach we talked about earlier. Although most of the options presented in the report are not ready for immediate management use, some of them could be used in a shorter time frame. The BAM-based reference points that account for forage services could be adopted at any time using the most recent peer-reviewed menhaden model.

These ad hoc forage service reference points may be more conservative than single-species reference points; so it is a note of caution. Another note of caution is density-dependent effects and unpredictable recruitment could negate any of the benefits that we're attempting to achieve by leaving more prey fish in the water. Just to restate; we need additional technical work and peer review of that work on these ERPs before they're ready for management use.

I'll end here with our favorite comment from the peer review report; and it is just a good parting thought. The Atlantic Menhaden Technical Committee has done a thorough job of investigating and summarizing the options. Now it is time for managers and stakeholders to guide the way forward. I will pause there for dramatic effect. This is just something I'll leave up.

I'm not going to go through the table. It is something you can stare at while you're thinking about your questions. We talked about objectives and goals; so if you look across the top of this table, we thought we would go and seed and discussion on what objectives or goals might look like. This is just based on a brainstorming session we had at the end of a very long meeting; but it is things that we have heard stakeholders say, we've heard board members say, and we just tried to itemize some of those.

Then down the left-hand column there what you see are the different modeling types that I've just gone through in this presentation, so those should look familiar to you. Then the objectives that we think each of those types of approaches could inform has a little "X" in that box. I will stop talking and leave some time for questions.

BOARD DISCUSSION OF ECOLOGICAL REFERENCE POINTS REPORT

CHAIRMAN BOYLES: Questions for Jay. Bill.

MR. GOLDSBOROUGH: Just a quick one, Mr. Chairman. Could we leave up Jay's first summary slide for a few minutes?

CHAIRMAN BOYLES: Bill, do you have a question? Jim Gilmore.

MR. JAMES J. GILMORE, JR.: Actually, Jay, I was going to look at your second summary

slide; because if you ever fail in fisheries, you probably could run for political office with that last statement. On the ERPs, after looking at them, I'm assuming you could use multiple ERPs. You could look multiple ones and not have one specific one.

Then I guess on one side that would be good; because since they're a little squirrely the way they connect back to the fishery, like that nutrition index, it sounds like you kind of get a leap of faith getting back to it. But if you have multiple ones, that would give you a greater assurance, I would think. However, then if they start disagreeing, then what do you have; so did the technical committee discuss that at all in terms of multiple ones and the pros and cons of doing that?

MR. McNAMEE: I think it is a good comment. What I kind of walked through here are not ERPs, per se. They're tools to get at ERPs. We could absolutely look at a number of different ecological reference points; and they would change depending on the type of approach that you're looking at here. You'd have to use different ones with some of these different methodologies. I think it would be imperative to at first have multiple ERPs that are review and tested so that you know which ones perform the best.

MR. KAELIN: Mr. Chairman, just a comment. I think both this board and the New England Council and the Mid-Atlantic Council are all wrestling with how do we move to ecosystem-based fisheries management or ecosystem approaches to fisheries management and so forth. We just had this discussion in Portsmouth last week that it is important for the management entities I think to kind of be on the same page as we develop an approach here.

I wanted to speak specifically to the slide that Jason had up about the single-species modeling options and the comment that simpler approaches may provide good interim solutions. One of the slides had some bullets that were some suggested harvest control rules around ecosystem values, F equals M or F 75 percent MSY and so forth.

Of course, we don't have an MSY projection for this stock because of the life history stages and so forth. My question is can the technical committee provide a real simple kind of graphic presentation of M versus fishing mortality as projected in this assessment? In other words, I think M is projected as constant M is 0.40, I think, and F is 0.27 at the terminal year, 2013.

What does that mean in terms of metric tons removed on an annual basis for comparison purposes? In other words, what is the ratio between the estimated M and the assessment and the mortality at the fishing effort rates that are being estimated in the terminal year? I mean, it ought to be a fairly simple thing to demonstrate that.

That is a tremendous of fish being left in the water, I think, relative to Atlantic menhaden. I think the last thing they want to do is allow a lot of fish to die and underfish the resource. Is there a way to graphically demonstrate M versus F estimates that come out of this assessment so that the public can understand that relationship, that ratio, and perhaps be comfortable that a significant amount of fish is being left in the water every year? Thank you.

MR. McNAMEE: It is a little more complex. The reason it is more complex is because what we used is not a static M across all ages but a vector of M that is different depending on the age. It was static through time. It would have to be like a matrix kind of setup. We can also, though, develop F at age as well. Conceivably we could do that

not right now but for a future meeting we could, I think, put that together.

DR. DANIEL: I guess I'll take a little different approach here. Having been dealing with these issues for now quite a long time; a lot of you were in Baltimore when we had our menhaden meeting and we had a pretty nice crowd. I know Mike and I remember it vividly; a lot of you do, too. In thinking about the difficulties this commission has on a regular basis trying to convince folks to take necessary management actions based on a good assessment; even then it is hard.

I would take a different approach to calling it underfishing menhaden. I don't think you can underfish menhaden. I think the more fish left in the water the better. I think we need to be taking more of a Lenfest Approach in terms of the target biomasses that we're trying to accomplish. I think we've seen a great result; nothing that we did, really, probably.

It just happens to be a change in the modeling design that resulted in a lot of good information. I just wonder if we take a more conservative approach on menhaden and we look at the current F and biomass levels and we set a target a little bit higher or a lot higher, depending on how this board wants to move forward, what is the difference between that and an ecosystem approach?

If you're being more conservative and you're leaving more fish in the water, they're going to provide that ecosystem approach. I don't see with the uncertainties associated with the ecosystem approach; I don't see us being able to sell that to the public as the reason for being more conservative or less conservative on a particular species.

I have deep concerns about the utility of the ecosystem modeling approaches; and I'm wondering just about how – I agree with exactly how you concluded your presentation when now it is time for the managers to decide; so let's decide and either decide to move forward with this or let's stop and stop spending so much time and effort from our staff on these issues and talk about the potential of maybe looking more at the Lenfest Report and maybe being a little more conservative on this fish. Those are my suggestions, Mr. Chairman, but we keep going around and around and around on this issue and we never have moved forward; and it has been years now.

CHAIRMAN BOYLES: Thank you, Mr. Chairman; that is a great segue for a conversation that I hope we'll have in about 20 minutes. Can you hold that thought, Louis? Rob.

MR. O'REILLY: This isn't related to the conversation. I see things a little bit differently in terms of getting the managers and stakeholders involved in shaping the ecosystem reference point arena. The reason I say that is – and I know Jay and others have talked about this – there is an increasing amount of data that are collected, whether it is predator/prey, whether it is stomach analysis, however you want to look at that.

We do have surveys. We have NEAMAP. In the Bay there is ChesMMAP. Delaware had a survey; New Jersey has a survey. Everywhere you look there is survey data. I really think that before managers or the stakeholders embark on a qualitative approach to helping determine what ecosystem reference points will be about – since there is going to be a modeling of all this and the right models – I think what is needed is to gather that information.

I'm sure that is what the plan is to start getting the information together and looking at what is available because things have probably changed since 1998 when I

went to my first Multispecies Management Workshop in the Bay. It would be very good to know, really, what are the dynamics out there, get the data, go through the model and then get the feedback on that.

I think it may be a problem to get involved at a manager and stakeholder level – maybe to help guide, but certainly we need to see what the models produce from the data that has been collected. We need to know what other data are necessary. I favor more in the interim – instead of jumping all the way from where we are with single species to ecosystem reference points – I favor some approach of an MSE that Amy mentioned for the biological reference points.

I think that would be really crucial for these ecological reference points. I also am a big fan of trend analysis. I know at the Mid-Atlantic Council part of what is being looked at for forage-based assessments is that the ones you can do, they might be able to be done, but others probably you're going to have to look at the trends in these forage species and use those trends to help still guide single-species management. I guess just some comments that maybe the group has thought about; and I am sure Jay has thought about all the data and others have as well as a key component here.

MR. McNAMEE: I think it gets at what you're talking about; but one idea that was pitched – I know it was definitely pitched to the Management and Science Committee – was I think exactly what you're talking about. We actually asked if we could pull together – I can't recall that something, but it was a report that does exactly what you're saying.

It grabs all of these pieces of information, puts them together – I'll use the word "dashboard", but them into this dashboard type report that can be published probably pretty frequently to this board. I just wanted to make sure that thought gets before this group as well. It may be kicking around some other committee and may eventually get to you, but I definitely heard this concept come up. I think it is a great idea and the committee does as well; so that is definitely something that we're thinking about.

CHAIRMAN BOYLES: Questions for Jay on the presentation? Stephen.

MR. TRAIN: My question, Jay – and I like the concept of ecosystem-based management, but can we actually do that instead of single-species management without prioritizing our species first? If I can expand a little bit, I'll take two of our biggest species here, menhaden and striped bass.

If we find out that we're not getting recruitment in menhaden because striped bass are eating them; then are we going to increase the harvest above the threshold on striped bass; or if we find out we need more menhaden because the striped bass level isn't high enough, then are we going to have to shut down the menhaden fishery to get it there to maintain our ecosystem-based. Either way we're going to fill this room to the point that we won't be able to have the meeting. Do we have to prioritize species first before we can even go forward with ecosystem-based management?

MR. McNAMEE: Yes; I wouldn't call it – what we have advocated here; we came forward a couple of years ago with the process called MODA, Multi-Objective Decision Analysis, so there is a way to get people's priorities – not necessarily my species is better than your species; but all sorts of different priorities, economic, and develop an objective modeling approach to incorporate that information and produce the sort of information we need to then take to that next step and model and simulation test and things like that. There is

work that needs to be done, for sure. I wouldn't couch it as starkly as picking or prioritizing one species over another. It is more complex than that; but there is an up-front workload that needs to be accomplished first.

DR. WILSON LANEY: Steve is headed where I was thinking sitting over here; and that is it is difficult. Even if you do single-species management, it seems to me that ERPs for menhaden are going to be dependent on how much biomass you want to have of all the other species out there that the commission manages which are consuming menhaden at least to a certain extent.

It seems to me I don't look at it in terms of species prioritization. I'd look at it in terms of how much biomass of each one of the commission species does the commission and its stakeholders want to have out there. We had this discussion a long time ago, I think, in terms of what constitutes a quality striped bass fishery.

One of the things that I think the board was decided fed into that definition of quality is a broader age structure. That was put into Amendment 6 as an objective. Looking at the board's recent management action on striped bass, it seems that another criterion may be a biomass higher than we have now, something that approached the peak SSB that we saw a few years back.

It seems to me that needs to be – if that is the desire of the commission and the Striped Bass Management Board, somehow, Jay, doesn't the desired biomass level of all these other species need to come into play as well if you're going to establish an ERP for menhaden. Maybe the same argument could, I presume, be made for Atlantic herring and certainly for shads and river herring. I've always said that I thought maybe – and I understand why striped bass was kind of picked as the poster child species for ASMFC; but in hindsight maybe we picked a predator species to manage to the high level of success first when we should have picked a prey species instead, going back and looking it. It seems to me you can't do it in isolation.

It seems to me, again, not necessarily setting priorities but maybe set biomass levels for all these other species. And then I don't know what you plug those into to try and see what level then of ecosystem reference points that would generate for menhaden; and I would suggest maybe you need to look at Atlantic herring and squid and other prey items as well. Am I way off base there or is that something we need to think about?

MR. McNAMEE: No; you are not off base at all. It could blow up into a massively complex thing. I think you could also manage it in a smaller complex system. I agree with everything that you said. I'll just offer, though, that to get at what that biomass level is, other characteristics, other priorities that people have can be used to figure out what that biomass level is so we want our party and charter fishery to have X amount of revenue. It is multilayered.

It is not a simple as just picking a biomass. I suppose it could be; but the way we were thinking about it is to encompass more stakeholder and constituent information in some sort of objective way to get at the outputs that you need to then run your models. Again, I think in this case we are talking about striped bass and menhaden and weakfish and bluefish. It could cascade up from that, but it doesn't necessarily have to.

CHAIRMAN BOYLES: Further questions for Jay? Keep in mind I think we're drifting in a little bit to Agenda Item 5. I want to manage time so further questions on Jay's presentation? Okay, Jay, again, thank you

for a great presentation and for leading us maybe a little prematurely into some great discussion, but we'll come back to it.

PRESENTATION OF
PEER REVIEW PANEL REPORT

CHAIRMAN BOYLES: Next we'll hear from Mike Jones on the Peer Review Panel Report.

MR. MICHAEL JONES: Good afternoon, almost evening now, ladies and gentlemen. It is my pleasure to give you hopefully a fairly concise report of the review panel that met on the 9th through 11th of December to take a look at the Atlantic Menhaden Stock Assessment that you've just heard about from Dr. Schueller and Jason.

The panel, for your information, consisted of myself as Chair of the panel. I'm an academic at the Quantitative Fisheries Center at Michigan State University and have worked a lot on stock assessments in Great Lakes Fisheries and somewhat in the Pacific Northwest. Then I was very fortunate to have as members of my panel three really sharp European stock assessment scientists, quantitative stock assessment scientists, John Simmonds from the UK, Carmen Fernandez from Spain and Anders Nielsen from Denmark, all of whom were appointed by the Center for Independent Experts.

I would be remiss in not mentioning just how incredibly helpful all three of them were for the review that we were able to conduct during this period. I'm going to start with a very quick overview of the main conclusions of our panel, and then I'll drill into the terms of reference that we were asked to conform our review under and discuss our findings with respect to those terms of reference.

First and foremost, I'm going to echo something that several of you said when addressed comments to Dr. Schueller after her presentation. We, too, were very, very impressed with the thoroughness, the comprehensiveness and the quality of the stock assessment that we learned about when reviewed the documents and attended the review panel meeting in December.

Overall, bottom line, the panel offered a strong endorsement for both the methods and the findings of the assessment as it was presented to us at that time. We did recommend, as you already know, a minor change to the assessment model, which resulted in the new base run that Dr. Schueller presented today; and I'll briefly about what that recommendation was.

We also did conclude that the rational for the proposed new single-species reference points was defensible and justified. Lastly – and I'll talk about this a little bit more at the end that connects to Jay's presentation – the panel strongly encouraged what I refer to here as a collaborative process to guide the development of ecological reference points. I will elaborate on that in few minutes.

Our terms of reference were a little bit different from the terms of reference that Dr. Schueller talked about earlier. What I'm going to do is I'm going to cover each of these except there was no minority report. All four panel members reached consensus on all of our recommendations. I'm going to aggregate Terms of Reference 6 and 7 into a single slide that summarizes some of the key recommendations that we made for research and improvements to the models.

In terms of the assessment data, we generally concluded that the fishery-dependent data were both substantial and used appropriately for the assessment. We had a lot of discussion of the fishery-independent data. As you know, the survey data and the way it is being used is a pretty large change from the previous assessment.

We were of the view that the development of these composite surveys, the two adult indices and the juvenile index, were substantial advances over the previous assessments. However, we did identify a concern as we were looking carefully at the model with how the length composition data from the surveys was being used. Again, I'll touch a little bit more on that in a moment.

With regards to our assessment of the methods that were used, the statistical catch at age or BAM modeling approach that was used for the assessment is very much kind of the accepted practice in fishery assessment these days; and there was nothing that we saw about it that was out of the ordinary. It seemed perfectly appropriate and properly used.

As I alluded to earlier, the one thing that we saw when we looked at all of the hundreds of figures of model results that were presented to us at the panel and in the documents, was that when we looked at what the model was estimating the length frequency of menhaden to be relative to what the observed length frequencies were; the fit was really quite poor.

We worked sort of interactively iteratively with the assessment team at the workshop to try alternative strategies for working with those data. To cut a long story short, we concluded that this approach that Dr. Schueller referred to a little while ago of down-weighting the index length-frequency data resulted in substantially better model fits.

Now, what down-weighting means here is that we don't leave the data out, but we allow it statistically to have less influence on how the assessment models are fit to the data, relatively speaking, than other data sources. We concluded that a more defensible-based assessment model would be one in which the index length-frequency data was down-weighted somewhat from what was proposed in the report that we looked at.

I would summarize this as a very minor change to a very big, complicated statistical catch-at-age model, but a change that did make the model fit the data better. We also were impressed by how comprehensive the sensitivity analyses were that the assessment team conducted. The uncertainty analyses – this is what they referred to as the Monte Carlos Bootstrap Method – and the retrospective analyses; we saw no issues with what they had done.

It was pretty darned extensive and certainly informative about the degree to which the conclusion that they reached in the assessment were or were vulnerable to some of the assumptions that they had to make. We concluded that generally the methods they used were both appropriate and thorough and led to increased support for the conclusions of the assessment with regards to the stock status relative to both the existing and the proposed reference points.

That was an important conclusion in our opinion. We did make the observation that the uncertainty analysis methods that they were using may in fact be overestimating the magnitude of their uncertainty. There was a little bit of a technical issue; but basically when you do these Monte Carlos methods, if you assume that all of the sources of uncertainty are varying independently of one another, you can exaggerate the magnitude of the uncertainty relative to what you would get if you acknowledged that some of those sources of uncertainty co-vary with one another.

That is arguably good news in that it says that the degree of uncertainty that we might have about the results of the model is

actually a little bit less than the assessment report would suggest. In terms of the overall assessment findings, the panel agreed with the assessment team's conclusions that the stock was both not overfished and overfishing was not occurring; and that this conclusion was true even after making the adjustments to the assessment model recommended by the panel for the new base run and was true for both the current and the recommended reference points.

I'm largely reiterating with Dr. Schueller presented earlier and just indicating that the panel agreed with their conclusions in that regard. We made one suggestion with regards to the method that is being used to calculate reference points; and that was – or two suggestions, I should say. Those were to consider using an average F across ages two to four rather than simply using F at age two to reflect the fact that there are two different removal fisheries that have somewhat different selectivity patterns.

This is not going to make a big difference to the reference point calculation but it might be a better sort of acknowledgment of the different fisheries. And then to also for looking at target reference points, that one might want to consider looking at recent biological trends rather than looking at the entire period of record for defining target reference points.

The argument here being that in order to decide where you want to be relative to past performance, if there are long-term trends occurring in the productivity of these fish stocks, then the more recent biological data might be more indicative of what you're likely to see in the future than looking over the entire period. With regards to recommendations for research and modeling, we would like to suggest that the assessment team in the future to consider again to try to allow for assessment models that do allow natural mortality vary just by the simple notion that menhaden is a prey fish species and there is not much doubt that predation is a significant source of natural mortality for them and predation almost certainly varies over time.

There are obviously challenges associated with doing that technically, but it stands to reason that you ought to at least try to consider that. We also suggested that in the future the assessment team try to incorporate the methods they used to quantify growth and natural mortality into the assessment models as opposed to doing them external to the assessment models, which is what is currently done.

We suggest that they might consider using what is called an age-specific selectivity estimation method rather than a so-called dome-shaped selectivity; still allowing for selectivity to be lower for the older fish, but not forcing it to conform to a particular function. Then this is getting more into the ERP discussion; we encourage the assessment team to pursue the development of multispecies models to account for predator/prey dynamics.

Importantly, and we've talked about this a couple of times already, is as soon possible to try to conduct a management strategy evaluation analysis that could help you to determine future reference points in an arguably more objective and comprehensive way than by relying on historical fishery performance, which is being done right now.

I would emphasize that these recommendations are much more sort of suggestions for the future than criticisms of the current assessment process. My last slide is with regards to the ecological reference points.

We already started to have a discussion about this so some of what I said sort of

maybe should have been said before that discussion started; but in terms of our deliberations on what we heard about the ERP for menhaden, we are very much persuaded based on experience in other ecosystems that it is really important to continue the discussion and to wrestle with this question of ecosystem or ecological reference points; and that that process, as I say here, should or even must be guided by input from stakeholders and managers specifically with respect on what an appropriate set of objectives and performance measures that are used to judge whether those objectives are being met is defined by the resource users and the decision-makers.

We encouraged, as Jay indicated in his presentation, the group to focus on ERP analyses that look at indices of predator/prey relative abundances; so looking at how prey dynamics are affected by predator dynamics and vice versa, since this is sort of central to the whole issue of why you might want ecological reference points for menhaden.

Jay already introduced this term of "minimum sufficient complexity"; don't make the models any more complicated than you absolutely have to; because the more complicated you make them, the longer it will take before you have anything that makes sense to you. The last one I want to make is that to move forward with the development of ecological reference points; one of the things that we heard both in the report and in the discussions at the review was that the development of ERPs was somewhat held up or constrained by not knowing what the objectives were.

We wanted to emphasize that while it is really important to have some idea of what the objectives might be and what the performance measures might be; it is not necessary to have agreement on what those objectives are in order to proceed with the analysis that is germane to developing ecological reference points. The analysts need to know what type of performance measures you as decision-makers or stakeholders might use to judge whether a fishery was performing well or not; but they don't need to know which fish matters more than which other fish or things like that.

If you devise your ERP process to be constrained by having to determine that the outset, you're never going to get past first base or even home plate, really. The analysts do need to have some idea of how you would assess the performance of a fishery management strategy with respect to different objectives so that they can then use their models to help them to define what might be appropriate reference points given those objectives. That is my final point; so thank you for your attention and I'm happy to entertain any questions.

BOARD DISCUSSION OF PEER REVIEW PANEL REPORT

CHAIRMAN BOYLES: Professor Jones, thank you for that great, concise summary of the peer review panel. Thank you as well for your leadership of that peer review panel. By all accounts, you did a marvelous job so thank for your professionalism and your conscientiousness and bringing that to us today as well. Questions on the presentation on the Peer Review Panel Report for Professor Jones? Emerson.

MR. HASBROUCK: Thank you for the review committee presentation. I'm wondering if at a very basic level a variable M – it is one of the things that you had pointed out in one of your previous slides was to have M vary. Isn't that in a way taking into account the predator/prey relationships?

As abundance of striped bass and bluefish goes up, that is going to increase M on menhaden. I just pick on those two species; there are others as well. Conversely, if striped bass and bluefish abundance is reduced, that is going to reduce M on

menhaden or maybe not. Maybe it just opens up the opportunity for other species to increase their predation on menhaden. Do you have any comments or suggestions on that?

MR. JONES: I think you're absolutely right. That is the reason why M is likely to vary for this species perhaps more than it would for a predator species is because they're vulnerable to the ebb and flow of their predators. I think you're entirely correct that the time-varying M, if one were able to estimate it for this fishery, it would almost certainly or I would predict that it would reflect the phenomena that are occurring over time with regards to predator demand for menhaden.

Now, whether you're going to get a nice signal by just looking at one or two predator species is kind of a big question, I guess, ecological question, but that would be exactly why I think you would be interested in trying to – the process of trying to estimate a time-varying M is almost certainly going to be one in which you're trying to account for the role that predators are playing in influencing survival rates of menhaden.

CONSIDER ACCEPTANCE OF STOCK ASSESSMENT REPORT AND PEER REVIEW REPORT

CHAIRMAN BOYLES: Further questions for Dr. Jones? Seeing none; Dr. Jones, again, thank you. The next item on the agenda; I'm looking for a motion to accept the stock assessment report and the peer review report as suitable for management purposes. Dr. Daniel.

DR. DANIEL: So moved.

CHAIRMAN BOYLES: Motion by Dr. Daniel; second by Mr. Grout. Discussion on the motion. Dr. Daniel, would you read your motion?

DR. DANIEL: **Yes; move to accept the stock assessment report and peer review report for management use. You can put menhaden in there somewhere if you want to. It should be clear.**

CHAIRMAN BOYLES: All right, the motion is to accept the stock assessment report and the peer review report for Atlantic menhaden as suitable for management. Motion by Dr. Daniel; second by Mr. Grout. Ay discussion on that motion? Is there any objection to that motion? Seeing none; **that motion passes**. Louis, I think what I see; there were some questions.

Clearly, as we discussed earlier, the technical committee still has not formally reviewed the results of that peer review; and so I think we're going to get them together in March during meeting week for the technical committee to look at that; that the board understands that is where we're headed with this. Without objection, seeing heads nodding, very good.

BOARD DISCUSSION OF MANAGEMENT OBJECTIVES MOVING FORWARD

The next to the last item on the agenda – and, Louis, I may kick it back to you, but I'm going to start, if I may. Agenda Item 5, discuss management objectives moving forward based on the results of the benchmark assessment and ecological reference points terms of reference. I would like to thank everyone for a lot of work that has gone on around this board, a lot of work on the part of our technical advisors, a lot of effort on the part of our constituents.

This is clearly a big issue. The stock assessment process has worked. We've gotten a clear picture on the status of the stock based on the interim reference points that this board has adopted. We've gotten a clear picture on the basis of a lot of

technical input, some modifications to the models, a lot of cooperation with out stakeholders and a lot of back and forth with our stakeholders.

I see this as a success for collaborative science. We've arrived at a pivotal moment, I believe. When I first learned of the commission, I read a book by Peter Matthiessen called "Men's Lives"; and a lot of the discussions – I look over to my friend, Jim Gilmore – about the issues related to striped bass. It has been said that striped bass is where the commission really came of age.

I believe maybe menhaden – I believe menhaden is this generation's striped bass. I see our technical advisors begging us for guidance and direction on the future of this fishery, the future of this resource. A lot of people in the audience, our stakeholders, with a lot of questions that they've got about what we want to do and how we want to manage this resource.

So we're at the table and I think the question before now is where do we go and how do we want to move forward? Louis, I'm going to kick it back to you because you made a comment earlier, after a presentation, to kick off the discussion; and as commission chair, I think that is appropriate, so I'll throw you the ball.

DR. DANIEL: Or under the bus!

CHAIRMAN BOYLES: But I gave you a minute warning, though.

DR. DANIEL: I always hate following you any time I have to speak. I agree with everything you said and certainly would echo the comments to the peer review panel and to Amy and all the group in Beaufort and throughout the east coast and the industry expertise and the participation by the non-governmental groups was really great. The main concern that I have is we just had a pretty rough go of this just a couple of years ago.

Some things have changed and now we're all happy again. We don't have folks holding up signs in here today or walking around the room; and that's a good thing. But I don't want to walk out of this room and get hit by a train either. I would hate to see us move forward too quickly on these results. I think we do need to move forward deliberatively, carefully, take the advice of the technical committee and the peer review panel and provide that guidance that our technical folks need and what do we really think about these ERPs.

I think that's very important; and I think it is something that our technical folks, our advisory folks, the public needs to get. Dr. Jones, you said it – you know, I'm not asking you now, but I would ask you what type of benchmarks, what kind of parameters are you looking in an ERP; what are you trying to accomplish in an ERP?

I hear across the table folks are talking about striped bass and bluefish. I'm thinking bluefin tunas and king mackerel. It is different up and down the beach; and I think we need to get that perspective from everyone before we move forward. With that said, Mr. Chairman, I would turn it back to you with the sincere hope that we don't leave this meeting and haven't made any decisions, we don't make any motions to do anything except for moving forward potentially with Amendment 3 to begin developing the next generation's management approach for Atlantic menhaden.

MR. KAELIN: Mr. Chairman, I don't I'm seeing things the same way as the chairman. I think in the bait fishery we're looking at the situation relative to the assessment. I think a reasonable objective would be to provide a responsible Atlantic menhaden quota increase when supported

by the best available science to support the maintenance of healthy menhaden fishing communities, for example.

I'm not making a motion to that effect, but that articulates how we're seeing this situation. A couple of years ago I was at that meeting. I remember all the yellow shirts and so forth. We were all there. It didn't take long to seriously damage the bait fishery for Atlantic menhaden on the Atlantic Coast; and I think the graph show with the reduction of some 60 to 40 million – excuse me, 60 to 40,000 metric tons, somewhere around 30 percent reduction.

The market for bait is not unlimited, but there is significant demand for this fish. There are concerns about the herring assessment. That blew up and there may be a reduction in herring landings over the next couple of years where some proxy for OFL of, you know, some average catch proxy or something will be established.

I think it would be unfortunate for this board not to make a commitment to increase the quotas for the 2015 fishing year across the board. I think this commission would be bogged down for some undetermined period of time to answer all the questions that have been posed today both on the board and from members around the table. We feel very strongly that it is time to move ahead.

It is a positive assessment; and I see no reason why in May this board couldn't come together with the projections that have been talked about and at least provide an opportunity to make up what was taken away, as it turns out, without really any need to do so relative to what we now know about the stock status. Thank you for letting me have an opportunity to make that statement.

CHAIRMAN BOYLES: Kyle.

MR. SCHICK: I concur with that train of thought. I think we've seen here that overfishing has not occurred and we haven't overfished. We never did. We have moved from the dark ages of yellow shirts and a motion to the light of science; and it is time that we admit that; that the sky-is-falling mentality that we had in Baltimore and the couple meetings before that was wrong.

We have people out there that are in desperate need, not now – I mean, not tomorrow but now. I think this board needs to act. I don't think we need to go and be rash with this. We have the information; we have the knowledge. Let's take the emotion out. Let's put the science in now that we have full science, full agreement showing that this stock was not in danger.

Now, it could be in danger in the future. I'm not saying that this is something we just go ahead and put it on the back burner and don't look at it like maybe we did 20 or 30 years ago; but we certainly shouldn't be where we are today. I think we have to fix this now. We certainly overreacted two years ago or a year ago; and I think we need an appropriate reaction now to counterbalance that.

MR. GROUT: Mr. Chair, I have a couple of comments and possibly a suggestion to move forward here. The first comment comes with the ecological reference points. Back about four years ago I made the motion to task the technical committee to develop ecological reference points for us. In the meantime we were going to have an interim reference point; and that was developed.

When I made that motion, my vision for this was that it would be something like a biologically based reference point, which is something we're always striving for with

the single-species management we have. The technical committee came back and said, well, what do you want, what do your constituents want, what do our management and constituents want, what are our goals?

As someone who was here three years ago and is also the Chair of the New England Council's Herring Committee, what our constituents want are vastly different. We have very different opinions on what different constituents want and believe is best for the resource and the fishery. That is going to make us giving that kind of suggestion and recommendations, goals and objectives very difficult to come up with, because it is not as if there is a gray area.

There is left or right. I'm actually kind of disappointed. I still vision that there would be something that would – that from a scientific basis or an ecological basis that our technical committee could provide us with advice that is how many menhaden we need to leave in the ocean. Now, it could be anywhere from what a time-varying M is to something more conservative.

But the thing we have to take into consideration and I'm sure they'd have to is that menhaden isn't the only prey in the ocean. There are multiple preys and we have seen evidence – at least I've seen some evidence with herring; that when the herring stock went down, there were other prey that came up and took their place. Fish feed on multiple prey here.

I think it is going to be a very difficult and challenging thing if there is not a biological or best scientific estimate of what needs to be left in the ocean for this particular prey; and it is going to be a very difficult and long process for us to come up with what the board wants and what our constituents want. That being said, there was a recommendation in the near term from our technical committee and from the stock assessment committee that there was some revised reference points that we should consider.

My question is how can we put that into a management action? Can the board simply approve these revised reference points or do we have to go through an addendum process to implement them? If that's the case, then if we to do a management action, then that's the first thing we should be working on is revising the interim reference points to reflect what the most recent available science is. Then we move from there and tasking our technical committee to come up with projections of what a sustainable harvest would be under those reference points.

CHAIRMAN BOYLES: Doug, to your question, I think the short answer is, yes, that is an addendum process at a minimum, an addendum or an amendment, depending on how extensive a change that the board would be contemplating. I think the challenge – from my seat, the challenge seems to be these are largely policy questions and we want a technical solution to a policy question.

My sense of things from hearing the technical committee report, from hearing the BERP Report is that we seem to be bouncing around. We want a technical answer to a policy question. I think this is the appropriate group from where I sit to have those conversations. Once these decisions are made, you take options out via an amendment to the public and say this is what we're thinking in terms of future management and that we go through that management process. Toni, am I out on a limb, or is that largely – that's correct? Okay. Hold that thought, if we can.

MR. GOLDSBOROUGH: Mr. Chairman, I'd like to offer a comment on possible management objectives I think is what

you're looking for; but first a couple of comments on some things that have been said. First of all, I disagree with the statement that we overreacted with Amendment 2. If anything, I think we underreacted to the science we had at the time. As evidence of that, the reference points that are suggested now by this assessment are more conservative than the ones we adopted then.

We took timid steps, relatively speaking, at the time in part because of the great uncertainty we were confronted with in the 2012 update assessment. But with respect to the proposed motion to increase catches immediately, I think we have a very obvious problem in going down that road now; and that is that notwithstanding the fact that this assessment presents us with a much more positive situation than we had two years ago, it gives us room to work, if you will, it is still a single-species assessment as has been described and commented on several times already today by our presenters as well as members of the board.

So we have some more work to do to determine how much of a buffer, if you will, we need to leave; and that is one way of describing our need to develop and adopt ecological reference points. If anything, in the short term I don't think we have the ability to increase a coast-wide quota at this time. I can tell you just from a Maryland perspective, admitting that bias, that, if anything, the real short-term need as a manager is to address the allocation that we did two years ago.

I think with hindsight that we underestimated the historical catches in the bait fishery, especially in the small-scale bait fishery, by virtue of having poor catch data. So if anything, I think we need to revisit allocation; and that, of course, is not something you can do very quickly. But from a Maryland perspective that is important.

From the standpoint, though, of management objectives where you're hoping we will get, I'd like to take off from a comment that was made earlier or a statement that maybe what we need to do is come up with preferred levels of a priority species that the commission manages. That, of course, is what we did with the MS-VPA. We picked three of them and we tried to do that; we're still trying.

I would suggest that is not enough by a long shot; that not only do we have predators managed by this commission that depend on menhaden, but we have species managed by this commission that are alternative prey that are negatively affected by any trophic imbalance that might occur as a result of low menhaden abundance, which we do see now.

One good example that has been brought up in the past by our colleagues from the north is northern lobster and the concern voiced repeatedly a few years back that striped bass were preying heavily on them. They, of course, are a very valuable, perhaps our most valuable fishery on the coast. I'll let them speak to that.

But then also I want to point out there are also species that this commission does not manage that can be affected either as predators that depend on menhaden – and Dr. Daniel mentioned a couple of them – that we need to pay attention to, but also alternative prey that also might be negatively affected by trophic imbalance. From a Chesapeake perspective, I'll have to toss out blue crab is in that category.

We have had repeated observations and concern expressed by our commercial fishermen for many years now about blue crabs turning up in much higher abundance in striped bass stomachs from the Chesapeake perspective. Again, the very

low recruitment that I mentioned earlier that we're seeing in at least the Maryland part of bay for menhaden seems to be linked to that trophic shift.

Be that as it may, in addition, having mentioned all those types of species managed by the commission and not managed predators' alternative prey, there are also those that are not managed at all that are very important – and I just offer two groups, marine mammals and seabirds – that I think we have a responsibility to address as well.

I don't think that we can sit back and satisfy ourselves by just paying attention to commission-managed species. If we are going to adopt management objectives or ask for evaluation of management objectives or the ecological reference points that might address certain management objectives, I would suggest that the Cadillac, if you will, would be to maintain adequate forage for all components of the ecosystem. I don't think that's hard to do.

I don't think it has to take a lot of time; because as we've already discussed, there are some less quantitative, more qualitative options that have been thoroughly vetted in the last ten or twelve years or so for which we have multiple examples of their successful use in other fisheries around the world.

I think we have relatively short-term options for addressing that all-encompassing management objective that we ought to give serious consideration to. I do think we need to get input from stakeholders and managers, as has been suggested, but to me that is a very real option. Not to dismiss the possibility of a more quantitative approach, but the MS-VPA was we started working on the MS-VPA I want to say 13 or 14 years ago and we still only have three predator species.

We don't have any alternative prey species; we don't have any non-commission-managed species; we don't have any other components of the ecosystem included; so how long would it take to develop a fairly comprehensive quantitative approach? I agree with Dr. Daniel, with his concern about the tremendous staff resources that would go into taking that kind of an approach; but as I said, I wouldn't dismiss it out of hand. Perhaps we can continue some work on a parallel track, but in a shorter term consider some of these more comprehensive qualitative approaches.

MR. O'REILLY: It is amazing what good news brings out of this. On my case, I'd like to just read a little bit from our current Amendment 2; "The goal of Amendment 2 is to manage the Atlantic menhaden fishery in a manner that is biologically, economically, socially and ecologically sound while protecting the resource and those who benefit from it."

We didn't have the ability to look forward back in 2012. We couldn't magically know what the next assessment would say; but now we're faced with the situation where the social and economic consequences of that amendment have already happened. I think it is imperative that we, as part of an addendum, if the biological reference points go that way, figure out how we stay on a course to get our fisheries and the needs of our fisheries not just in Virginia but in other states as well back to where they were at a minimum.

I saw a lot of gaps with the current reference points or the other reference points and the way the abundance of the stocks looks, the way the proxy for the biomass looks. Those gaps tell me that, sure, despite what I said earlier, we can, as managers and stakeholders, have some idea of how much forage and how much fishery we might want in a qualitative sense.

The technical committee may even be able to tell us, well, here is what you can expect for forage based on current conditions compared to 2012 conditions or earlier. That could be important. That doesn't have to be an elaborate exercise to do that. I think there are many states. New York was very happy to find out that -- because New York had situations with harvesters that diligently New York tried to get hold of, mailed out to, got a very poor response rate, perhaps 4 percent – I forget what the number was – and was very concerned about the amount of menhaden that was going to be coming into New York that would be problematic.

Florida came to us and had a situation where they had a dip net fishery that again didn't really have a good quantification of just how many harvesters were there. It was unexpected. I think the board acted the way the board should. There were allowances made. The lobster fishery was very happy to have menhaden shipped. The crab fishery in North Carolina was supplemented.

We have to indicate today that Virginia is not going to be the only state this time that is standing alone as it did with its rejection of Amendment 2. There is lots to say here. I really mean it in a congenial fashion. I think our fisheries are important. I think the sport fisheries are important. I think forage is important. I think all can be accomplished. A full-blown amendment would not be the way to move forward here. I think we can do an addendum and we should. And recognizing the science, which is important to all of us, I think there is room for the industries and the fisheries to recoup what they have lost. Thank you very much.

MS. FEGLEY: This is a very fascinating situation for us; and it seems like in my mind we have three issues that we need to figure out how to deal with. That first one is, as people have said, remembering that the assessment that we have now is single species. There is the cautionary language by the peer review saying, you know, remember, your target may need to be lower if you have unrestricted predator growth.

I think it is important for us and it is time for us to decide how we're going to move this process and make our decision on how we want this fishery to look and how we're going to deal with forage. In listening to conversations about time-varying M, perhaps it is as simple as – it is probably not, but could be.

If M time varies and M is accounting for varying predator or pressure on this fish, then maybe we look back and look at when time-varying M was quite high and we try to keep abundance at that level under the assumption that was a time when predation pressure was heavy and we want to keep that level of fish in the water.
I don't know, but we need to figure out I think how to move this forward. In terms of liberalizing, based on the assessment results, I would hate to see us have regulatory whiplash. I think our fisheries deserve better than that. I would hate to say let's relax this TAC and then in a year we have some other ecological reference point and we're back in December 2012 all over again.

Nobody wants that; but at the same time, to Rob O'Reilly's point, we do have this issue where we need to take into account our fisheries and the economic aspects here. We did commit in Amendment 2 I believe to reviewing allocation in Year Three. I think that we have an overly complicated management for this fishery.

We have a New England set-aside for 1 percent of the fishery. We have small-scale bait fisheries that are catching 10 percent of

the total harvest and maybe not even that. I think there are some ways that we could rejigger things and make sure that we're not damaging our community fisheries, those fisheries that have not been well recorded over time, while we're working out these bigger issues.

In terms of the small-scale fisheries, I looked with interest at what the American Eel Board did. Why wouldn't we make a set-aside for small-capacity fisheries? We'd have to define small capacity; but if they fished at 10 percent, it would allow us to really understand what these little community fisheries are doing.

If we exceed 10 percent, that sets a trigger to do something more significant, go back to state by state. But the point is I think there are some creative ways we can get at this. We need to move this forward. We need to figure out that management objective. We need to be careful not to whiplash our fisheries in terms of bouncing from relax, tighten, relax, tighten. They deserve some stability; and I think we need to think really hard about the setup of the management overall.

MR. GILMORE: The last three speakers actually made most of my point, so I'll be a lot quicker now. I will just add to what they all said, and I agree with them. I think one of the problems maybe that wasn't mentioned was not only the magnitude of what we did but how fast we did it. I think that caused a great deal of problems.

We got into quota management and we did allocations based on really poor data. Then we started getting problems where we were – it got messy. We're transferring fish around where Jim Estes and I are going back to our fishermen saying a cast net is not a directed fishery, shhh, don't tell anybody, so it just got to be absurd after a while. I'm just to the point where I think we all need to reevaluate this and go slowly this time and essentially come up with an approach that is going to fix this long term; and I agree with you, Lynn, not whiplash this.

This roller coaster ride of going up and down doesn't serve anybody; so let's do this right this time. If we're going to get into allocations, let's get data and recent data so we can actually put together a plan that makes sense. Thanks.

MR. TRAIN: Mr. Chair, I've listened to a lot of the arguments. I was ready to speak earlier when I was going to talk about something; and I've had some more conversation that I heard since then. If I go back to what Doug Grout said, he says there is no gray area; and I believe there is. I mean, we've got harvest levels that are significantly under our current F.

I think that even if we would have a lower F, we still have room to move that up; and that is what I see as the gray area. We can still be precautionary and increased harvest levels here. We talk about whiplash from going and starting. The guys that got slammed the brakes on two years ago have already got whiplash. I think we have room to move this up and still be very conservative.

MR. ADLER: Mr. Chairman, we're bouncing around here a little going from increasing catches to biomass and stuff. I'm wondering back to the point where I think Doug made something about this; should the technical committee be able to see how much forage abundance there should be out there without getting into, well, I think the striped bass ought to have a quota of this and the herring have a quota – I mean, the weakfish have a quota.

Without getting into that; I thought there was some chart that did show the biomass level – in other words, how many fish,

which we all know how many fish there are in the ocean – that the fish are up there, the catch is down here, and there is more fishing sitting in the ocean or swimming in the ocean.

I think that would be helpful if the technical committee could at least start on that thing since we were getting into this ERP. I, for one, am in favor of raising the catch limits, especially since I'm overjoyed with we're not overfishing and we're not overfished. I think there is room, as Steve Train had said; that I think there is some room that we can still watch it, but at the same time that we can relax a little bit the catch allowances basically for the fishery without getting into trouble.

I do support at some – somehow we've got to look at that and see if we can relax the quotas a little bit on that particular thing. I think to get started on some statistics on that; I think it would be helpful to see just a number as to what the technical committee feels should be the abundance, the forage abundance out there without going into who gets what or what fish gets what. I think that would be a start, to get going on that. Thank you; I'll leave it at that.

MR. JOHN CLARK: Assuming we do go to an addendum, which sounds like we're heading in that direction, just to restate in a different way some of the comments that have been made; I would like to see us pursue the ecological reference points, particularly the simple ones that were recommended by the peer review, I believe it was, just looking at relative abundance of predator/prey.

When we change the reference points for striped bass, we'll now be managing for a very large striped bass biomass out there. We had a similar biomass of striped bass maybe in the mid-2000's. Based on the abundance we just saw from the menhaden, the menhaden abundance seemed to be good then; and we had no limits on the fishery then. I'd just be curious to see if we do anything, we could at least reassure people that whatever we decide to do with the harvest level of menhaden; that we are taking some sort of look at what the impact of forage base is out there on some of these other species we're managing.

MR. BALLOU: In listening to this discussion, it has been very compelling. I sense that we really are at a pivotal stage, as you indicated in your opening comments. We need to be very careful about proceeding in a direction without knowing where that is going to get us and what our aim is, it seems to me.

As such, it seems to me that this really is a discussion that speaks to an amendment process; an amendment process that takes a fresh look at what we want this – how we want to manage this fishery. To just give you sense of the way I sort of envision an amendment process; it would be going out to the public and getting feedback on the question of do we want to continue forward managing menhaden as a single species without regard to the environmental services they provide.

That would be Option 1; we have some biological reference points that have been offered up through this new assessment. That is a way forward and that could certainly be one path to be followed. A second would be single-species management with regard to the environmental services they provide; that sort of buffering approach that I think has been referred to, to recognize the role they have as a forage species.

Then sort of the third approach would be a true multispecies approach, which I think would be the most complicated, certainly the most progressive, almost certainly the most challenging. It seems to me that we need to have that discussion. We need

stakeholder input on that. We need to make sure that we're poised and ready to move forward knowing what it is we're trying to achieve.

Once we have determined the direction in which we want to proceed, it opens up a series of options in terms of how to get there. My thinking is that this is not an addendum; this is an amendment. This is about rethinking menhaden based on how we view this species and the role it plays. That is a long arc, but I think it is a very important and it is probably at the end of the day the best way for this board to proceed. Those are my thoughts.

MR. RUSS ALLEN: I concur with a lot of things that Bob had to say there. I think there is a need for an amendment process, but I also think there is a need for an interim process to get us to where we need to be as far as the resource and the social and economic issues that we have. I think the technical committee has made some recommendations on targets and thresholds for the species.

Maybe there is a time for us to go and move forward with that, take it back to the technical committee and have them see those reference points, what they would produce for a target and a threshold as far as a quota would be. Maybe we work on that in the interim, but we definitely need to move down the path of an amendment somewhere down the road that incorporates everything that has been going on around this board today.

MR. O'REILLY: Thank you for a second change, Mr. Chairman. I agree with what Russ has indicated. I was thinking that there is nothing wrong with an amendment since there are some complicated questions. But, when it comes to looking at the total allowable landings; that is really not something that is very complicated. I would think a management objective should for the technical committee to be able to tell us in May what it would be like to reinstitute those 20 percent reductions. That is just a start.

There are going to be others who want to talk about shifting of things, and that is more for an amendment. I think that could be done by May. I also think that along the striped bass story that you started; there is nothing wrong with increments or stepwise. When the ASMFC worked towards Amendment 5 and it came down to 1994 to get ready; at that time the AMFC had done two different schemes of quotas. They did a 1995 quota and they did a 1996 quota.

As it turned out, the 1996 quota has never materialized because the ASMFC found out that where they had set the 1995 quotas; that was really where things should be. Similar to that, we certainly can get a step forward with restitution of these total allowable landings and use the amendment process to look further into there as well as looking at the ecological reference points.

My understanding from Amy's conversation earlier in answering questions; she also put up that it would be three years before the next assessment update is what I think I saw. If that is the case, then that gives us time to explore some of the more complicate questions. The word "complex" was all about Jay's talk today.

I know he must have told us at least a dozen times about the complexity dealing with ecological reference points. I would think there are two roads we can take, one short term with an addenda for the total allowable landings and anything else anyone thinks of; but for the more complex situations, that should be an amendment.

MR. WHITE: I guess what has stuck with me was the technical committee's recommendation that the existing reference points are unsustainable; so that

is a red flag to me. I think quickly going to an addendum and increasing harvest and mortality I think is the wrong way to go. I agree with the amendment process, slow it down, work towards the ecological reference points, and get the stakeholder input. I would not favor going the quick addendum route.

MR. SCHICK: If I recall it really, they were talking about changing the reference points as far as your threshold and your targets. If it was changed to the technical committee, we still could fish pre-Amendment 2 levels and not be overfishing and overfished not occurred. I think tasking the technical committee with coming up with some levels of fishing that we can do with an array of changing those thresholds and reference points would be a good thing so we could we look at March. That's the short-term thing.

I don't think it is something that is a mystery. I think it can be quantified very easily. We're still talking about doing it cautiously and not just going back to 2000 levels and have a free for all. We're talking about changing some things and bringing back some fish to the industry that maybe need to restrict.

MR. KAELIN: Mr. Chairman, I appreciate you giving me a second chance. I really agree with what Kyle just said and how he summed it up. I've seen some projections based on the new reference points that were developed outside of this process. They yield extremely robust opportunities. I agree we don't need maybe a hundred percent of what the potential is, but there is an opportunity here to restore to these fishing communities what was lost a couple of years ago.

I think it would be a mistake – and, certainly, maybe we'll get some green or yellow shirts or something like that; but to delay this until all the other issues that are important are resolved would be extremely disappointing to the fishing community who has waited for this assessment, engaged in the process, provided data and so forth. I appreciate your comments, Mr. Schick.

MS. FEGLEY: Thank you, also, for a second change. I do think it is worth our time to task the technical committee and to come up with some tradeoffs for increases in the TAC and see where we wind up. Given their current knowledge of the status of predators and how predators are trending, what are some consequences of bumping up the TAC incrementally?

With that said, I also, at the risk of being redundant, want to say that a relatively substantial increase in TAC for the coast provides very little back to many of the states with these small-scale fisheries. It really is almost – you have to increase a lot on the coastal level to really provide any sort of measurable change to any of these artisanal bait states, including Maryland.

I would say that I would really like to see the technical committee do something for us, perhaps break out non-purse seine bait landings. We have the bait sector combined. We have purse seine bait and we have very small bait fisheries. What do those small bait fisheries look like relative to the purse seine bait fisheries? Is it appropriate to be putting a small-scale fishery on the same scale as the purse seine are? As we explore this increase, I really would like us to think about how we simplify this management that we have and maybe think about a simpler way to accommodate these smaller-scale fisheries.

MR. ROY MILLER: Mr. Chairman, I just wanted to summarize a little bit. I think what I have heard is an approach, a deliberative process that includes us examining potential management options such as status quo with the present fishing regime; rollbacks to the catch controls that

were in effect prior to Amendment 2 as a second option; and then a third option that includes the things that we've been talking about at length, that we still have some discomfort with; namely, what are desirable predator/prey ratios, what is the desired relative abundance of key prey species.

We'd have to look to our technical committee for guidance on those particular topics. I see us heading in this direction. Whether it is via the addendum process or the amendment process, I don't have an opinion on that. I see us heading in this direction at the next meeting; and I think those are our choices. Thank you.

CHAIRMAN BOYLES: From my seat, what I've heard is we want more fish. I've heard others say not yet. I think I've heard almost unanimous agreement about continuing to investigate within reason these questions of ecological functions, these predator/prey relationships; continuing the decision that the board made with Amendment 2 to manage for ecosystem functions.

I've heard relief now and I've also heard comments about regulatory whiplash. I've heard move quickly and I've heard move slowly. I've also heard a request for the technical committee to do some projections on the basis of the recommendations from the peer review. Mike referenced earlier the AP has not seen or heard these things yet, either.

I'm not sure where we go, but may I suggest the following. We've got a lot to think about. I think we are at a place, we are at this pivotal place through a lot of hard work, through a lot of sacrifice by a lot of folks; and we've got some significant decisions to make. I'm sensitive to those communities that are screaming for relief; I recognize that. At the same time, I find myself concerned as well about regulatory whiplash as we seek to get a better handle on this marvelous resource that belongs to all of us and that we are responsible for managing on behalf of the citizens of this country.

I think we can task the technical committee. They need to convene to review the comments from the peer review. I think we ask the technical committee for projections for using these interim reference points and new reference points. I think we as the board have some questions that we need to ponder between now and May.

If you will indulge me, I have three R's for you to consider. The first is removals; how do we manage removals from this fishery. I think central among that are questions of allocation, which is going to be a tough one. The second R is the remainder; how do we manage the remainder of the fish that are not removed from the system; what are we trying to optimize as board?

These are big questions. For what purposes are we leaving these fish unharvested? Do we have a good handle on that technically? Lastly and equally important is a word I call reciprocity; how do we expect our system that we're trying to manage to respond, including these communities, these communities that have borne a lot and a lot particularly in the last several years.

How do we want this system to respond – we're at a pivotal moment – and how do we manage dare I say success or the beginnings of success? Can we think about those things between now and May and be prepared to come back and start to really roll up our sleeves and ask ourselves between now and May to really contemplate these questions? Bob, I think we need a lot of help and staff support. Doug.

MR. GROUT: Mr. Chairman, clearly, by some of the discussion here, there are some issues concerning menhaden

management both from the point of ecologically based reference points and some of the – there are a lot of things that need to be done in an amendment; and that is going to take a long time and I believe longer than a year.

My original concern was we have reference points currently in place that are being unsustainable by our technical committee. However, even if we have those high reference points, we don't have to increase the quota all the way up to what those reference points would be. That is still within the purview of the board.

I understand your thoughts about let's take a breather here; let's come back in May and decide whether we want to take the addendum or full amendment route and also task our technical committee with coming up with some catch advice that would include, at a minimum, what the catch advice would be under their proposed revised reference points.

As I understand it, in my consultation with staff, this board can change the quotas by a board vote; and we don't have to go through an addendum process or a management process. This way we can decide whether we want to go addendum or amendment and still have the flexibility, based on the catch advice we get from the technical committee, of deciding whether we're going to move forward with having relaxation of some of the quotas. I support your let's take a breath here and task the technical committee recommendation.

MR. WAINE: Mr. Chairman, I'll just follow up on what Doug was saying to confirm that the board does have the flexibility through board action to adjust the TAC. Specifically in the amendment it specifies that they can use all the technical information to do that. I don't think that – although formally we don't have whatever the new technical committee recommendation is, as part of our management program, because we haven't gone through that addendum process, I still don't think that precludes the board's ability to use that technical information when specifying what the TAC may be.

MR. ADLER: Mr. Chairman, I'm glad to hear what Doug said. First of all, whatever you're thinking of putting into an amendment, fine; thinking about more things that need to be done on that stuff. I'm concerned about the fact that we probably should take a look at relaxing – I'll put it that way – relaxing at least a little bit what we had come up with for quotas or TACs, whatever they are, and what Mike had just said; that it would be – it is encouraging to see that we don't have to go through an addendum necessarily to do this; that we could in fact – if we get the information, we could make a decision on that particular part while we're think about all the stuff for an amendment.

That would be good if we could do that. Now, what do we need to look at if we were going to change the catch limits – I'll use that word – what do we need? Do we need something from the technical committee to look at? Maybe that's what we have to have in May and then we'll have some information that we could use if we decide to help out with the catch limits. I sort of agree with Doug and I'm glad to hear about you don't have to do an addendum necessarily.

MR. O'REILLY: I support Doug's comments. The one thing, Mr. Chairman, I'm certainly not going to disagree about this; but I wanted to make comment. The regulatory whiplash is something that – since there was a 20 percent reduction, depending on how the incrementally approach is here, I can't see a whiplash.

For example, in 2004, Amendment 6 for striped bass added some more benefits. The whiplash occurred in 2014. It is something that really I don't see as a problem, especially given what we saw today and what we saw from the stock assessment. Thank you, Doug, for your comments.

DR. DANIEL: I hate to mess this up and I agree with what you said, Mr. Chairman and Doug. One thing I would want us to keep in mind – and I don't want us to get too close to May and have these projections by the technical committee on some kind of an increase in harvest that may be available.

With the current allocation, I don't know if that is going to help the bait fishery very much; and that is going to raise a red flag. I don't want people going home thinking, well, there may be an increase. I have no problem with an increase; and I recognize the issue with the bait industry, especially in states like New York where they didn't have good counts on their menhaden harvest, and the impacts it has had in North Carolina have been significant.

But with the current allocation, an increase in quota may not have as substantial an impact on the bait side as we might hope it would. That is going to require an amendment, as you said, and so I don't know that we will have an exact – and Mike looks like he wants to correct me; but I just want to make sure that is on the record and that folks are thinking that way between now and May.

MR. WAINE: Thanks for the prompt, Louis. There has been this discussion about allocation; and I just want to clarify that through the projections – and I could try to work with the technical committee on this; but we wouldn't be looking at that allocation discussion. It would just be what is this total allowable catch for menhaden?

It wouldn't be whether it gets broken down by the bay or the reduction or the recreational catch. It would just be what is the total; and that is what we would come back with for projections to show the board.

DR. DANIEL: Right; and that is exactly what I mean. If you look at the allocation right now, the way it is set up is there would be a certain percentage that would go to the reduction fishery and a certain percentage that would go to the bait fishery. I don't think we have the flexibility to change that through just our quota-setting opportunities. That was my concern; and I'm wrong there, you need to correct me.

MR. WAINE: Yes; that is the other part that I should have said. I ended a little early there. Yes; that state-by-state allocation is how we ended up allocating the TAC through Amendment 2. In order to change that, it requires an addendum or an amendment to the FMP. That isn't part of the specifications' process.

MS. FEGLEY: Maybe it be helpful to get the discussion going a little bit. If we did these projections about a coastal TAC increase and if staff could provide under a TAC increase and under the current allocation what that gives to each jurisdiction so we can actually see state by state the impacts of each subsequent TAC increase or an interval of TAC increases. Maybe that will help us kind of start to think more about that future discussion.

MR. KAELIN: I think from the perspective of New Jersey an allocation along the lines or a quota increase along the lines of what Mike was suggesting is what we're suggesting, I think, and not getting involved in reallocations. If we were to get back to where we were in 2011; that is about a $4 million benefit to the state of New Jersey

and to the lobster industry and the crab industry and all the people that we serve as bait producers. It is not just Lund's Fisheries.

We're only a percentage of that activity, but it would be an immediate impact economically. It would create jobs; it would extend the season beyond when we shut – I think we had to shut down in July last year. The bait demand was tremendous. It is in the middle of the lobster industry. For all those reasons, I appreciate the direction I think the board is heading in here for discussions in May very much.

As soon as this meeting is over, I turn back into a civilian and I guess I'm the AP Chair again at that point. I do hope we can have a face-to-face AP meeting perhaps after the March Technical Committee Week or something like that, Mr. Chairman. You mentioned it earlier and I appreciate your asking that questions or indicating that we could get the AP together; and it is obviously very important. Thank you, Mr. Chairman.

MR. SCHICK: I do like what Lynn had said. I think seeing it state by state – although I'm kind of confused. If we increase or reverse 15 percent of the 20 percent cut or 10 percent, I don't know what would come out of what the technical committee recommendations of the new target and threshold levels are; but if that is 15 percent, I think that would be a huge boost to the bait industries and the small industries. It would be good to see that and maybe a chart that would be able to do that would be a good thing.

CHAIRMAN BOYLES: Further discussion? Let me encourage us, as we move towards May, to recognize there is a lot of work to do, a lot of very, very hard policy questions; certainly some very complicated technical questions as well. I just encourage us all when we go back home and talk to folks at home; that we think about these big, big picture questions of this national resource and how we manage it for the future.

ADVISORY PANEL NOMINATIONS

CHAIRMAN BOYLES: The last item on the agenda; we have recommendations for AP nominations. Mike, are you handling that?

MR. WAINE: We received two AP nominations from the state of Maryland. The first is for John Dean. He is a commercial pound netter with over 40 years of fishing experience. The second nomination is David Sikorski. He has 20-plus years' recreational representative from CCA. He also serves on our Striped Bass Advisory Panel. We have two nominations on the board for the Menhaden AP.

CHAIRMAN BOYLES: Two nominations for the AP; is there a motion? Mr. Adler.

MR. ADLER: **I'll make a motion to accept the two nominees to the advisory panel.**

CHAIRMAN BOYLES: Second by Stephen Train. Further discussion? To the Menhaden AP; thank you, Toni. Any objection to that motion? **Seeing none; that motion carries.**

ADJOURNMENT

Any other business to come before the Menhaden Board? Thank you for a vibrant discussion and thank you for your time. I look forward to further consideration in May. We are adjourned.

(Whereupon, the meeting was adjourned at 6:25 o'clock p.m., February 3, 2015.)