

Atlantic States Marine Fisheries Commission

Weakfish Technical Committee and Stock Assessment Subcommittee

January 22, 2009
Conference Call Report

Participants

Vic Crecco (CT), Christina Grahn (NY), Russ Allen (NJ, TC Chair), Jeff Brust (NJ, SAS Chair), Des Kahn (DE), Jim Uphoff (MD), Ellen Cosby (PRFC), Joe Cimino (VA), Lee Paramore (NC), Erin Levesque (SC), Joseph Munyandorero (FL), Pat Campfield and Nichola Meserve (ASMFC)

Data Poor Stocks Workshop Overview

Jeff provided an overview of the Data Poor Stocks Workshop (DPSW). Concerns about some aspects of the workshop process, such as the funding of only one SAS member to attend and the participation of observers in Panel discussions, prompted the SAS to draft and the TC to approve a memorandum to the Management Board. The memo (Appendix 1) was delivered by email to the Management Board on January 12, prior to TC and SAS receipt of the DPSW Report.

Data Poor Workshop Report

The DPSW Report (Appendix 2) was provided to the TC and SAS on January 20. Discussion began with general comments on the report. A common opinion was that criticisms in the report were insufficiently detailed and that too few recommendations were provided. Call participants then reviewed the report section-by-section discussing each finding and developing responses for the Management Board. Responses include reasons for agreement or disagreement, and if and how the ongoing assessment will be altered. Staff instructed TC and SAS members to send any other responses to Russ and Jeff by close of business on January 26. Subsequently, the response report (Appendix 3) was sent to the TC and SAS for final review and approval before presentation to the Management Board on February 5.

Discussion of Updates to the Stock Assessment

The status of tasks assigned at the Assessment Workshop was reviewed. Tasks remaining to finalize input data include: ageing the NJ index (Des, but if not done by January 30, Jeff will finish), reviewing the weights-at-age (reassigned to Joe with assistance from Jeff and Russ), and completing the standardized indices, including a methods description (Yan). Tasks for the next assessment meeting include: addressing selected findings from DPSW Report (personal assignments TBD), running models, selecting preferred model runs for each model, and drafting model reports (Jeff - ADAPT & ASAP, Des - Shelton ADAPT, Jim - biomass dynamic model, Vic - predation models, TBD if possible - SCA), catch curves (Pat and Jeff), and drafting the life history section (Lee). Jeff and Russ will provide assignments for addressing the DPSW Report.

Updated Stock Assessment Timeline

The stock assessment timeline (Appendix 4) was revised to accommodate the DPSW and delayed completion of the stock assessment report. The SAS and TC will next meet during the week of March 30 for two days to select preferred model runs and assign final tasks for completing the stock assessment report for a June SAW.

Adjourn

Appendix 1

Atlantic States Marine Fisheries Commission

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TO: ASMFC Weakfish Management Board
FROM: ASMFC Weakfish Technical Committee
DATE: January 12, 2009
RE: Data Poor Workshop Review of Weakfish

On behalf of the Weakfish Stock Assessment Subcommittee, the Weakfish Technical Committee would like to relay to you some concerns regarding the conduct of the review of the weakfish stock assessment during the recent NEFSC Data Poor Workshop.

The weakfish stock assessment was reviewed as a work in progress during about 3.5 hours on the afternoon and morning of December 11-12, 2008. One of the peer review panel members was not able to attend this portion of the workshop, so the panel reviewing weakfish consisted of two members plus the panel chair. Also in attendance were the SAW Coordinator, ASMFC/Council staff, and 4-5 staff from the NEFSC. Both panel members and audience members participated in the review and discussions. On many points, the review was commendable. The panel chair allowed extra time to review the assessment (we were originally scheduled for only 2.5 hours), the atmosphere of the meeting was professional, and although comments and questions were critical, they were generally constructive rather than confrontational or condescending.

Although it was understood prior to the workshop that the weakfish evaluation would be an “informal” review (*i.e.* no determination of “pass” or “fail”), the subcommittee’s impression was that the review would follow typical peer review procedures, with comments and questions posed by the designated peer review panel members, and limited audience (non-panel member) participation. An obvious example of this scenario would be the review of the weakfish stock assessment as a work in progress during the 40th SAW/SARC in 2004. However, as noted above, audience members were not restricted from participating during the Data Poor Workshop.

Of particular concern was the expression of opinions from NEFSC staff during the review that the assessment should not pass peer review in its current form. This comment is unwarranted since the assessment is not complete and was not intended to be reviewed relative to criteria of a rigorous “formal” assessment. Analyses are ongoing which may result in significant changes to the content and conclusions of the assessment. A similar comment suggested that, unless the subcommittee addresses the panel’s comments, weakfish might be removed from the June 2009 SAW schedule. This comment is also inappropriate given the timing of the Data Poor Workshop

Memo 09-007

Appendix 1

within the assessment development process. It was made clear that the subcommittee would address all of the panel's comments; however, the limited timeframe might preclude completion of all pertinent follow through work prior to the June 2009 SAW. Opinions of NEFSC staff did not constitute constructive advice and may have biased the reviewer's conclusions.

The Weakfish Stock Assessment Committee has worked diligently to develop a quality assessment useful for management. This has required significant investigative, often unprecedented, work to understand anomalous model results and the influences of a range of external factors on weakfish population dynamics. It is the subcommittee's opinion that evaluation of this assessment's future success or failure should have been limited to the review panel, particularly since much of what was presented was a work-in-progress.

On a related note, the subcommittee wishes to express concern regarding subcommittee participation in the review. The weakfish assessment includes a range of models and analytical methods developed by the subcommittee as a whole. Unfortunately, funding was only available for the chair of the subcommittee (Jeff Brust, NJ DFW) to attend the review. Although Jeff has been involved with all aspects of the assessment and has working knowledge of the analytical methods, he was not the lead modeler on several of the key analyses, nor does he have substantial institutional memory of this subcommittee's actions (Jeff only joined the subcommittee in 2004). The subcommittee recognizes that participation was limited due to lack of Commission travel funds; however, additional participation would have been beneficial to respond to some of the panel's concerns. Insufficient participation could potentially result in a biased review due to inability to adequately respond to reviewer's comments during the workshop.

In closing, we note that a critical, thorough and constructive review of the weakfish, or any other, assessment is helpful to the assessment team and the management process in general. However, a fair and impartial peer review, with appropriate participation on both sides, is required in order to promote the free exchange of scientific ideas that is essential to the advancement of the management process.

Thank you for your attention in this matter. Should you like to discuss this issue further, please feel free to contact Jeff Brust, the chair of the subcommittee, at (609) 748-2020.

C: R. Beal
P. Campfield
N. Meserve

3. Weakfish

3.1 Background

The stock assessment for weakfish (*Cynoscion regalis*) that is being conducted by the Atlantic States Marine Fisheries Commission's technical committee (ASMFC - TC) was presented to the Panel by Mr. Jeff Brust, chair of the ASMFC weakfish TC on the afternoon of Thursday December 11th. The discussion on this first afternoon focused on the application of an age-structured virtual population analysis to the weakfish stock. The remainder of the presentation, which focused on biomass dynamic models of weakfish that include covariates, was given on Friday morning.

In preparation for the meeting, the review Panel was provided with access to a range of working papers (ASMFC Weakfish TC 2008a, b, c, Uphoff 2008) that outlined the approach taken in several key aspects of the assessment.

The Panel did not have time to provide a full and careful consideration of all elements of the assessment including the quality of all data inputs and the appropriateness of the inferences drawn. Thus, the comments that follow should not be considered as representing a detailed peer-review of the weakfish assessment. However, the Panel considered that it had adequate time to provide some general overview comments which we hope will be of help to the ASMFC in providing guidance to the weakfish TC as it seeks to complete its assessment. Discussions between Panel members and the TC chair were open and cordial.

3.2. Virtual Population Analysis

At their core stock assessments examine the consequences of observations under a suite of assumptions to explain the dynamics of the stock. Thus, it is critical that the assessment team be confident of the observations entering the assessment model. Errors and uncertainties in the observations on which the assessment is based can lead to spurious patterns in the inferred dynamics that may not be reflective of the true underlying dynamics.

The Panel expressed serious concerns over the reliability of input data used in the weakfish Virtual Population Analysis (VPA). The Panel concluded that until apparent inconsistencies in the input data are more fully explored, the TC's conclusion that the lack of fit of the VPA to the observations is due solely to an increasing natural mortality (M) rate is premature. The Panel recognizes that increasing M could be a possibility. This has been observed in other stocks at low population sizes (e.g. northwest Atlantic Cod) where predator – prey dynamics can maintain prey at low levels of abundance. However, before concluding that M is increasing, it is essential that the TC fully address the data input issues. The Panel does not consider that the VPA results are indicative of a pattern of increasing M to the exclusion of other plausible explanations.

The concerns noted by the Panel centred on the following issues:

- a) Reliability of catch information: While the Panel did not have sufficient time to examine the catch records in detail, there was some suggestion from the presentation that catches in some fisheries may have been underestimated substantially. For example, the TC chair and the Panel discussed uncertainties in the NC landings, particularly with regard to allocation to different gear types. It is important that not only the total catch is known, but that it is allocated accurately to the different sectors given the different biological catch characteristics in those sectors.
- b) Expansion of discard estimates based on catch per haul of targeted species on observed vessels to total discard for the fleet is likely biased: Related to the concerns expressed over the reliability of the catch data, similar concerns were expressed over the reliability of the discard data. The Panel suggested alternative approaches to the TC chair that might ameliorate these concerns.
- c) Reliability of catch at age information: The catch and discard tonnage are partitioned in the catch at age matrix. The key assumption of the VPA is that the catch at age is known with no or negligible error. For weakfish, catch at age is not fully described and estimates from one region and one sector have to be applied to other regions and sectors to provide a full catch at age matrix. The Panel concluded that the catch at matrix is of unknown precision.
- d) Spatial and temporal coverage of the indices: Although the VPA could have used more than 40 separate indices, many were found to be inappropriate by the TC for several valid reasons. However, the fishery-independent indices that were selected did not cover the entire population area, but rather were restricted to limited spatial areas within the overall weakfish stock area. Such indices may not be reflective of the entire population. If such indices are used, the implicit assumption is that each index represents a constant proportion of the overall population across the entire time series. When this assumption is not met, the overall results of the assessment are likely not reliable. While the TC spent considerable effort selecting those indices whose aggregate trends were comparable, the Panel remained concerned that these indices may have been coherent because they contained little information, rather than because they are reliable indices of population abundance.
- e) MRFSS CPUE index: The use of a MRFSS index is not inherently inappropriate and the assessment team appeared to be aware of potential issues in the use of such indices. However, the Panel noted particular concerns given that the MRFSS index was one of the few that exhibited any clear signal or contrast. When such indices dominate the input data set, these concerns become magnified. The Panel was appreciative of the efforts by the TC that have been made since the previous assessment to improve the index but still had concerns over the reliability of this index. For example, the index could have declined because anglers switched the rigging of tackle used to favour striped bass. The MRFSS weakfish CPUE would be expected to decline for this reason alone, particularly as all private and party boat trips were used as the index of effort. The Panel could not suggest a better estimator of effort for use in the calculations given the time available. The Panel remained concerned over the reliability of this fishery-dependent index, particularly given its pivotal role in the VPA.
- f) Coherence of fishery-independent indices: The Panel was troubled by the apparent coherence of the aggregate fishery independent indices used as input to the model

compared to the different trajectories estimated as output by the VPA when different groupings of these indices were used as inputs. The Panel considered that the differences between the coherence of the input time series and the model outputs may reflect differences in the age-specific catchabilities and thus abundances monitored by these surveys. The Panel felt that detailed exploration of this apparent discrepancy should be conducted.

- g) **Weights at age:** The Panel noted substantial discrepancies in the weights at age in the catch at age (e.g., age-4 weakfish in one year were heavier than age-5 fish in the subsequent year). These discrepancies could be a consequence of estimation of the catch at age for one fleet using catch at age data from a different fleet.

Overall the review Panel believed that the conclusion that a time varying M was the principal explanation for the pattern of low biomass and high F 's observed in the MRFSS tuned VPA was unwarranted. The review Panel felt that other alternative explanations, even assuming inputs were correct, including missing catch, changing catchabilities and inappropriateness of information in the input surveys should be fully explored before the results of the VPA can be used as a spring board to suggest the need to explain an increasing pattern in M . The Panel noted that many of these concerns had been raised by the previous peer review team and have yet to be adequately addressed. Given the nature of the concerns regarding the catch at age, the assessment team should consider a statistical catch at age approach rather than VPA.

3.3. Biomass dynamic modelling

The Panel was very interested in the results of the biomass dynamic models that were presented during the meeting. The Panel felt that they were an interesting exploration of potential ecological mechanisms acting on weakfish. However, if such models are to form the foundation for management there needs to be compelling and direct empirical evidence for the mechanisms being hypothesized. In general, the Panel considered that such evidence was lacking. The Panel was further concerned that the implications of the results for management (e.g., if surplus production in weakfish is truly negative currently, then no viable weakfish fishery is possible) had not been fully considered by the TC.

The Panel again noted the central role of the MRFSS index in determining the results of the biomass dynamic modelling. When an index with a strong, almost exponentially declining pattern is used to drive a model, any variable that shows an opposite trend will appear as a strong covariate in model fits – particularly given the latitude in parameters implied by the assumption of the form of a type III functional response. However, such correlations obviously do not imply causation. Under such circumstances, the Panel noted that documentation of weakfish consumption by striped bass needs to be more fully documented to provide the causation strongly implied by the assumptions of the models presented to the Panel. The TC needs to consider the pattern of spatial and temporal overlap of the two species and the influence of this dynamic on the levels of consumption required. Such consideration appeared lacking from the material presented to the Panel.

The assumption of a type III functional response appears arbitrary. There are several valid alternatives that have been used in other predator-prey models – ranging from type I and II, to foraging arena concepts (Walters and Juanes 1993, Walters and Martell 2004). Each of the different functional responses would have extremely different consequences for the dynamics of weakfish inferred by such models. It was not apparent from the material presented that an adequate exploration of this aspect of the biomass dynamic models with covariates had been undertaken.

The Panel noted that when a resource is in a depleted condition, such as in the case of weakfish, a number of factors can be responsible for maintaining the stock in the depressed state. Examples in the literature of “predator pits” preventing recovery in predator - prey models have been reported (Bundy and Fanning 2005). There is a continuing debate in Atlantic Canada on the role of grey seals maintaining Atlantic cod at their low level of abundance (Chouinard et al. 2005, Trzcinski et al. 2006). However, the mechanisms maintaining the prey species at low levels of abundance and the mechanism that caused the reduced abundance in the first place are not necessarily the same thing. Thus, for weakfish, predation may be maintaining the population at low levels, without having contributed to the original decline of the stock.

The Panel felt that the attempts of the TC to develop a minimum realistic model (MRM) for weakfish trophic interactions, as recommended by Plagányi (2007), were laudable. However, the Panel also felt that the biomass dynamic models were not yet at the stage to provide a reliable basis for the determination of weakfish stock status.

The Panel did not have sufficient time to provide responses to a number of specific questions raised by the TC themselves (ASMFC Weakfish TC 2008a). However, the Panel noted that it has provided guidance on several questions. Most importantly, perhaps for the management of weakfish, the Panel feels that the VPA is not yet sufficiently developed or its results sufficiently explored to support the conclusion of an increasing pattern in M. While the Panel appreciated the spirit of the exploration of ecological mechanisms to explain a pattern of increasing M, these analyses are not of sufficient reliability, given concerns over the MRFSS index and the lack of empirical evidence for the hypothesized predator-prey interaction involving striped bass and weakfish, to be a current assessment tool of the weakfish resource.

**ASMFC Weakfish Technical Committee Report
Weakfish Management Board
February 5, 2009**

The Weakfish Stock Assessment was presented to the Data Poor Workshop (DPW) by Jeff Brust, chair of the ASMFC Weakfish Stock Assessment Subcommittee (SAS) in December. In preparation for the meeting, the Review Panel (Panel) was provided with access to a range of working papers (ASMFC Weakfish TC 2008a, b, c, Uphoff 2008) that outlined the approach taken in several key aspects of the assessment. The Panel, although aware of past assessment methodologies and information most likely did not have sufficient time to review those materials. Weakfish was allotted close to four hours of time for review.

The Weakfish Technical Committee (TC) and SAS held a conference call on January 22, 2009 to discuss the DPW report which was released on January 20th. Overall, the TC/SAS believes the DPW reviewers to be too general in their comments without specific recommendations regarding how to improve the current assessment. Many of their “concerns” have been thoroughly vetted through past assessments as well as during current analysis. Also, the time frame required to perform a proper review was lacking in this case, including both for SAS Chair and the Panel. This did not allow the SAS Chair to discuss previous assessments which could have answered many of the reviewers concerns and thus in the end may not have been concerns at all. The following comments, **in bold**, represent the consensus view of the TC/SAS on the DPW process.

3.1 Background

The stock assessment for weakfish (*Cynoscion regalis*) that is being conducted by the Atlantic States Marine Fisheries Commission’s technical committee (ASMFC - TC) was presented to the Panel by Mr. Jeff Brust, chair of the ASMFC weakfish TC on the afternoon of Thursday December 11th. The discussion on this first afternoon focused on the application of an age structured virtual population analysis to the weakfish stock. The remainder of the presentation, which focused on biomass dynamic models of weakfish that include covariates, was given on Friday morning.

In preparation for the meeting, the review Panel was provided with access to a range of working papers (ASMFC Weakfish TC 2008a, b, c, Uphoff 2008) that outlined the approach taken in several key aspects of the assessment.

The Panel did not have time to provide a full and careful consideration of all elements of the assessment including the quality of all data inputs and the appropriateness of the inferences drawn. Thus, the comments that follow should not be considered as representing a detailed peer review of the weakfish assessment. However, the Panel considered that it had adequate time to provide some general overview comments which we hope will be of help to the ASMFC in providing guidance to the weakfish TC as it seeks to complete its assessment. Discussions between Panel members and the TC chair were open and cordial.

- **The SAS Chair did not have sufficient time to fully elaborate on the data sources and analytical methods of the stock assessment. Many of the Panel’s comments are based on insufficient information due to lack of time.**
- **There was no review of previous assessments and methodologies which could have assisted the Panel during their deliberations.**
- **The DPW review should have been conducted as a brief review of highly condensed data and methodologies and not a hyper critical review trashing all of the data.**

- **The TC/SAS did not ask for a general overview from the DPW. There were specific questions, in terms of assistance, which the Panel never answered.**
- **The whole DPW process cost the SAS a lot in lost time and didn't return much advice. The Board should be concerned about lost time of their state's employees.**
- **Due to time constraints, the Panel saw a lot of what the last peer review saw. It is not too surprising that the reviews are similar. It would have been useful to have had something reflecting more of the new work rather than the old.**

3.2. Virtual Population Analysis

At their core stock assessments examine the consequences of observations under a suite of assumptions to explain the dynamics of the stock. Thus, it is critical that the assessment team be confident of the observations entering the assessment model. Errors and uncertainties in the observations on which the assessment is based can lead to spurious patterns in the inferred dynamics that may not be reflective of the true underlying dynamics.

- **Not only should the TC/SAS be confident of the observations, it is also important that the TC/SAS is confident in the assumptions on which the model is constructed. One of the main concerns the TC has with VPA is the assumption of constant M. This is not a new concern with this committee, nor is it constrained to just weakfish. Members of the TC have been opposed to the use of this assumption for years, if not decades, for weakfish as well as striped bass, lobster, and others. As noted above, if the data your model is based upon are not valid, results of the model could be suspect. This extends to the assumptions the model is based upon as well. Therefore, errors and uncertainties in the assumptions on which the assessment is based can lead to spurious patterns in the inferred dynamics that may not be reflective of the true underlying dynamics. Unfortunately, the assumptions rarely receive the same level of scrutiny as the data.**

The Panel expressed serious concerns over the reliability of input data used in the weakfish Virtual Population Analysis (VPA). The Panel concluded that until apparent inconsistencies in the input data are more fully explored, the TC's conclusion that the lack of fit of the VPA to the observations is due solely to an increasing natural mortality (M) rate is premature. The Panel recognizes that increasing M could be a possibility. This has been observed in other stocks at low population sizes (e.g. northwest Atlantic Cod) where predator – prey dynamics can maintain prey at low levels of abundance. However, before concluding that M is increasing, it is essential that the TC fully address the data input issues. The Panel does not consider that the VPA results are indicative of a pattern of increasing M to the exclusion of other plausible explanations.

- **The data used for the current run of the VPA have changed little since the first peer reviewed weakfish assessment. In fact, data have gotten better – otolith based ages, expanded commercial sampling, fishery specific CAA. The VPA model passed one peer review (the 30th SARC) with no problems, yet now the data are no longer valid in this Panel's perspective. The results of past VPAs were used for management with the apparent positive result of a partial stock rebuilding. If the data are as bad as this review suggests, can we believe any of the trends and management results from previous assessments? (One would think not.) On the other hand, if the past assessments are valid, then why are they no longer valid when the data have actually improved?**
- **The TC/SAS has never said that the lack of fit of the VPA is due solely to an increasing natural mortality (M). It has been documented that a rise in M helps explain why the VPA shows a rise in total mortality.**

- **If the Panel disagrees with a dynamic M, why didn't the Panel recommend using only a constant M? Could it be that they realize the outputs would not show a clear picture of what is actually happening with the weakfish stock?**
- **The TC/SAS believes it has fully addressed all data input "issues" to the best of their ability. These are the same issues that affect all assessments and are not solely restricted to the weakfish assessment.**
- **If there were other plausible explanations that the Panel is aware of and the TC/SAS has not attempted to analyze, why do they not share them with us at this time?**
- **Would it be useful to the Board if the TC/SAS were to provide a table that lists or provides examples of other assessments that use the same types of data or data grinding processes as the weakfish TC/SAS? For instance, which assessments use NMFS landings (all), MRFSS estimates (all), bycatch from observer data (?), MRFSS index (At least three other ASMFC assessments feature MRFSS indices: Atlantic croaker, striped bass and bluefish), regional indices (all assessments are likely to).**

The concerns noted by the Panel centered on the following issues:

a) Reliability of catch information: While the Panel did not have sufficient time to examine the catch records in detail, there was some suggestion from the presentation that catches in some fisheries may have been underestimated substantially. For example, the TC chair and the Panel discussed uncertainties in the NC landings, particularly with regard to allocation to different gear types. It is important that not only the total catch is known, but that it is allocated accurately to the different sectors given the different biological catch characteristics in those sectors.

- **There seems to be no factual basis for concern of the catch information. Harvest weight is taken from NMFS and/or state weigh-out sources as with any other assessed species. The TC/SAS recognizes there is some uncertainty with all commercial and recreational landings estimates. Regardless, they are commonly used throughout ASMFC assessment work and should be of no concern to the Panel.**
- **The issue of uncertainties of the North Carolina landings seems unwarranted according to their sampling methodologies. The TC/SAS believes the sampling of North Carolina's commercial fisheries to be exceptional.**
- **Patrick Campfield from ASMFC has provided analysis in the past on potential bias in NMFS landings versus individual state weigh-outs.**
- **Trends in recreational and commercial landings follow similar patterns, even though they are determined using very different methods.**
- **What specific information was presented that suggested the catch was underestimated? The Panel does not provide sufficient information for us to fully evaluate this concern.**

b) Expansion of discard estimates based on catch per haul of targeted species on observed vessels to total discard for the fleet is likely biased: Related to the concerns expressed over the reliability of the catch data, similar concerns were expressed over the reliability of the discard data. The Panel suggested alternative approaches to the TC chair that might ameliorate these concerns.

- **As with the harvest information, it appears that the concern of bias in discard estimates is more speculative than factual. The DPW Panel does not seem to be aware of Janaka de Silva's 2004 paper where he investigated a variety of discard estimation methodologies, with the current method selected as the most reliable**

estimates of discards. He performed similar analysis during the last assessment of Atlantic croaker, an approved ASMFC assessment.

- It is possible for the SAS to:
 - Provide a table of the number of hauls or trips sampled by year/gear/target species to show low number of instances of weakfish discards at this fine of analysis.
 - Summarize findings of regression method, trip based method, etc. Conduct sensitivity runs of VPA.
 - Reference and summarize Jim Uphoff's report that estimates the amount of "unaccounted catch" necessary to fit trend. The estimates of discards would have to be enormous (15 to 20 times higher than the original estimate in recent years).
- Are there any other species with better, or even different, estimate of discards? Doubtful, the TC/SAS believes these estimates to be the best available.
- Reviewers could not agree on direction of bias in estimates, so where does that leave us?
- The Panel should have provided the alternative approaches mentioned in this section.

c) Reliability of catch at age information: The catch and discard tonnage are partitioned in the catch at age matrix. The key assumption of the VPA is that the catch at age is known with no or negligible error. For weakfish, catch at age is not fully described and estimates from one region and one sector have to be applied to other regions and sectors to provide a full catch at age matrix. The Panel concluded that the catch at matrix is of unknown precision.

- The TC/SAS recognizes that substitution affects precision and agrees that there may be errors in the CAA matrix. However, weakfish is not the only species where substitutions are made to develop catch estimates (e.g. bluefish). Substitutions were made in the past and passed the 30th SARC. Issues such as this require a great deal of review of past techniques. The SAS has already completed some work in this area including comparison of NJ CAA with substitutions of different data. Have other species' assessments utilized similar methodology of applying estimates from one sector to another when necessary? Did these estimates pass peer review?
- The SAS may also, time permitting, attempt to develop a 1993+ VPA to eliminate scale-otolith conversion concerns.
- The data concerns are minimal in recent years and continue to improve with the addition of commercial ages from NJ and NY.
- One option is to justify not using VPA (or any age structured assessment) until have sufficient number of years with better sampling from NJ north (started in 2004, so ignore VPA until 2014?).
- Try SCAM or other age based assessment modeling? Would have been completed but too much time wasted on the DPW.

d) Spatial and temporal coverage of the indices: Although the VPA could have used more than 40 separate indices, many were found to be inappropriate by the TC for several valid reasons. However, the fishery-independent indices that were selected did not cover the entire population area, but rather were restricted to limited spatial areas within the overall weakfish stock area. Such indices may not be reflective of the entire population. If such indices are used, the implicit assumption is that each index represents a constant proportion of the overall population across the entire time series. When this assumption is not met, the overall results of the assessment are likely not reliable. While the TC spent considerable effort selecting those indices whose aggregate trends were comparable, the Panel remained concerned that these indices may have been coherent

because they contained little information, rather than because they are reliable indices of population abundance.

- **There are 44 indices available, including five (5) fishery dependent (MRFSS 3-6+ and 2+) as well as 12 from NEFSC (1-6+) and SEAMAP (1-6+) that were omitted. The remainder, including nine (9) young-of-year, the NJ (6), DE (6), and NC (6) indices are all localized indices. The panel apparently recognized that the NEFSC survey (the only coastwide FI index) was inappropriate, so there is no “coastwide survey” besides the MRFSS CPUE index (see (e) below). The TC/SAS does believe that the indices used cover the core area as suggested from the SAW 40 review. Also, NC has the majority of commercial landings, NJ the majority of recreational landings, and DE is a major spawning area. These three States have the only aged FI surveys within core area and all show the same trend.**
- **The trends in FI indices are similar to trends in MRFSS and commercial CPUE.**
- **The Panel says these indices may be coherent because they contain little information. Once again there is no factual evidence that would warrant such a determination from the Panel. Only 2 aged indices (NEFSC and SEAMAP) showed a different trend, and their removal from the analysis was justified and approved by the Panel. Also, the trends observed in these indices are also observed in commercial and recreational harvest trends and commercial CPUE. Are all these data sources uninformative? Does the Panel suggest there is better data out there somewhere? If we cannot use these data, we have no data left to perform an assessment.**
- **The assessed trends of indices are too directional to be uninformative. There isn't that much inter-annual variation in recruited ages as we have them configured. The MRFSS index suggests that in the long-term they may be more of a one-way trip. Basically, they are a steady decline with a blip at recovery. However a recent paper by Magnusson and Hilborn (Magnusson, A. and R. Hilborn. 2007. What makes fisheries data informative? Fish and Fisheries. 8:337-358) found that one-way trip data was surprisingly informative.**
- **Dr. Yan Jiao's work of standardizing the indices may assist in proving the worth of the indices. Another way of measuring the indices is to compare them against the converged portion of the VPA.**
- **DE and NJ are at the center of the core area and both indices correlate with FD indices.**

e) MRFSS CPUE index: The use of a MRFSS index is not inherently inappropriate and the assessment team appeared to be aware of potential issues in the use of such indices. However, the Panel noted particular concerns given that the MRFSS index was one of the few that exhibited any clear signal or contrast. When such indices dominate the input data set, these concerns become magnified. The Panel was appreciative of the efforts by the TC that have been made since the previous assessment to improve the index but still had concerns over the reliability of this index. For example, the index could have declined because anglers switched the rigging of tackle used to favor striped bass. The MRFSS weakfish CPUE would be expected to decline for this reason alone, particularly as all private and party boat trips were used as the index of effort. The Panel could not suggest a better estimator of effort for use in the calculations given the time available. The Panel remained concerned over the reliability of this fishery-dependent index, particularly given its pivotal role in the VPA.

- **The MRFSS index was one of four (4) indices that showed similar signals, along with other indicators as mentioned above. To be fair, commercial CPUE was not**

covered during DPW. Only two “aged” indices (NEFSC and SEAMAP) did not show this trend.

- **Once again there is no recommendation on how to make the MRFSS index better or why it is unreliable. During the workshop, one participant suggested a revised calculation methodology. Preliminary analysis suggests this modification did not change the overall pattern.**
- **The thought that anglers have “switched rigging” has caused the decrease in CPUE is not a very good example of why the index may be flawed. In many areas, the same methodologies are used for catching both species. It would be possible to evaluate this assumption by recalculating the trend with directed striped bass trips removed to see how the trend responds.**
- **The DPW Panel is mistaken in its assumption that party boat trips were used to develop the MRFSS index of effort.**
- **MRFSS VPA run preferred mainly because it gave the shortest retrospective pattern, not because it had the trend the TC/SAS was looking for. It also has a relatively large sample size and incorporates the entire core area (not localized like FI indices).**
- **It is the pattern of the index that is important!**

f) Coherence of fishery-independent indices: The Panel was troubled by the apparent coherence of the aggregate fishery independent indices used as input to the model compared to the different trajectories estimated as output by the VPA when different groupings of these indices were used as inputs. The Panel considered that the differences between the coherence of the input time series and the model outputs may reflect differences in the age-specific catchabilities and thus abundances monitored by these surveys. The Panel felt that detailed exploration of this apparent discrepancy should be conducted.

- **The TC/SAS agreed that this was the most useful of the DPW concerns and recommendations.**
- **All FI runs show a similar pattern although the Panel seemed to be concerned about the difference in FI vs. FD runs for indices that show same aggregate trend. Jeff Brust looked into these differences. The short retrospective of the FD run is driven by the MRFSS 3 to 6+ indices. Using just the MRFSS 2+ gives the same VPA result as using FI indices. Catchability does change when regulations change. This was described in the plot of the residuals from these indices in the 2006 assessment. The TC/SAS will continue exploration of this and provide results in assessment.**
- **Need to take all indices of a given age (all age 1, all age 2, etc) and compare them. Maybe something will jump out at us.**

g) Weights at age: The Panel noted substantial discrepancies in the weights at age in the catch at age (e.g., age-4 weakfish in one year were heavier than age-5 fish in the subsequent year). These discrepancies could be a consequence of estimation of the catch at age for one fleet using catch at age data from a different fleet.

- **How bad is this compared to other species? All assessments have this and it will affect estimates of biomass but not estimates of stock size (in numbers) or mortality rates. We are currently looking into historic data in attempt to find any problems with the WAA. It could also reflect real phenomena from heavy fishing or poor feeding. Plus there might be some effect of mixed ageing currencies (scales converted to otolith ages and actual otolith ages).**

- **Someone should look at length at age over time as well. Might provide insight into changing productivity over time.**

Overall the review Panel believed that the conclusion that a time varying M was the principal explanation for the pattern of low biomass and high F's observed in the MRFSS tuned VPA was unwarranted. The review Panel felt that other alternative explanations, even assuming inputs were correct, including missing catch, changing catchabilities and inappropriateness of information in the input surveys should be fully explored before the results of the VPA can be used as a spring board to suggest the need to explain an increasing pattern in M. The Panel noted that many of these concerns had been raised by the previous peer review team and has yet to be adequately addressed. Given the nature of the concerns regarding the catch at age, the assessment team should consider a statistical catch at age approach rather than VPA.

- **The results of the VPA provided in this assessment are not intended as spring board to explain an increasing pattern in M. The VPA estimates total mortality (Z) based on changes in age structure, then divides Z into F & M by subtracting the input M. Relative F analysis showed that the increase in Z was not due to F, so the SAS initiated analysis to determine an increase in M. The TC/SAS is aware of the limitations of the VPA such as the assumption of constant M, retrospective patterns and known error in CAA but it is still useful for total mortality estimates and stock size estimates.**
- **The 30th SARC reviewed data through 1998. Regardless of indices used, all runs of current model show same trends through 2001 or 2002. Therefore, the entire converged portion of the VPA output has passed peer review. Could changes to the inputs affect the converged portion of VPA? It is not apparent from the Panel's comments if they think trends prior to 2000 are inaccurate.**
- **With regard to missing catch, this could really be any unaccounted losses, such as harvest, mortality, bycatch, etc. The TC/SAS has developed estimates of the amount of unaccounted losses necessary to improve the model fit. In recent years, unaccounted losses would need to be 15-20 times our current discard estimates – an amount that would be difficult to overlook in our sampling.**
- **With regard to changing survey catchabilities, biomass and abundance estimates from the converged portion of the VPA – which is not dependent on survey data – clearly indicate a declining abundance. The decline can not therefore be entirely due to trends in catchability.**
- **With regard to inappropriate info in the indices, there is evidence that abundance is declining outside the influence of survey data (such as commercial CPUE from VA and NC), as explained in the above bullet as well as sensitivity runs made without any tuning indices during the 2006 assessment. The 2004 peer review recommended using a recreational CPUE index because of problems with the trawl surveys. We followed their recommendations.**
- **So they just trashed ALL of our VPA input data, yet suggest a model that uses the exact same inputs. The SCAM has more flexibility, but enough to compensate for what they consider to be such inappropriate data? A model can only do so much with the data you give it. The SAS initiated development of an ASAP model, but haven't been able to continue development because of the preparation for and dealing with the DPW review.**
- **There were no comments regarding Relative F modeling which is a good predictor of trends in fishing mortality without the reliance on actual measured abundance. It also is not dependent on an estimate of M which the SAS considers its strong point.**

- **It is puzzling that the panel never recommends performing the analysis with a constant M.**
- **Tuning indices only affect estimates in the most recent years. The TC feels the panel was too focused on indices.**

3.3. Biomass dynamic modeling

The Panel was very interested in the results of the biomass dynamic models that were presented during the meeting. The Panel felt that they were an interesting exploration of potential ecological mechanisms acting on weakfish. However, if such models are to form the foundation for management there needs to be compelling and direct empirical evidence for the mechanisms being hypothesized. In general, the Panel considered that such evidence was lacking. The Panel was further concerned that the implications of the results for management (e.g., if surplus production in weakfish is truly negative currently, then no viable weakfish fishery is possible) had not been fully considered by the TC.

- **Biomass modeling shows fisheries are not responsible for the most recent decline in weakfish. Evidence of potential predation/competition assists this hypothesis. Jim Uphoff and Vic Crecco have developed biomass models that take into account the various potential causes including environmental, predation and competition factors.**
- **There is empirical evidence that is in synch with the modeling results. Members of the SAS performed a large-scale review of diet literature as well as spatial and temporal overlap. Statistical analysis of the literature was used to determine main candidates for modeling. This analysis was not available to the DPW but it was in the last assessment. It will also be presented at the final review in June.**
- **The TC/SAS has fully considered the implications of these findings, but really that's not the job of the TC/SAS as the implications are not a technical or analytical issue. The job of the TC/SAS is to determine the status of the weakfish population. It's up to the managers to discuss the implications of the findings and decide what needs to be done. The alternative is to pretend that fishing mortality is the only factor influencing stock dynamics, and fishermen need to bear the brunt of "fixing" the population.**
- **The SAS has presented a convincing case (hypothesis) that biotic factors in the form of enhanced predatory mortality, rather than overfishing, was the main reason for the recent unexpected and steady decline of weakfish abundance from 2000 to 2007. The recent trend in overall juvenile weakfish recruitment has been high since the late 1990's, but these dominant year-classes no longer translate through the age structure in subsequent years, suggesting the recent emergence of a demographic bottleneck in recruitment. Unless there has been a steady rise in weakfish juvenile discards since 1999, the emergence of a demographic bottleneck is consistent with enhanced predation on smaller weakfish. Has any other single species stock assessment conducted thus far examined the recruitment data to see whether such a phenomenon might exist?**

The Panel again noted the central role of the MRFSS index in determining the results of the biomass dynamic modeling. When an index with a strong, almost exponentially declining pattern is used to drive a model, any variable that shows an opposite trend will appear as a strong covariate in model fits – particularly given the latitude in parameters implied by the assumption of the form of a type III functional response. However, such correlations obviously do not imply causation. Under such circumstances, the Panel noted that documentation of weakfish consumption by striped bass needs to be more fully documented to provide the causation strongly

implied by the assumptions of the models presented to the Panel. The TC needs to consider the pattern of spatial and temporal overlap of the two species and the influence of this dynamic on the levels of consumption required. Such consideration appeared lacking from the material presented to the Panel.

- **MRFSS was only one of three equally weighted indices used in the two biomass models. The empirical evidence is not limited to predation. The TC/SAS will continue to look into forage data (e.g. menhaden and FHDBS), environmental data (oscillations, buoy data), changes in growth parameters (Vaughan data), changes in M (Lorenzen), and indices of forage (SVDBS engraulids and clupeids).**
- **The SAS has developed hypotheses, presented data, and evaluated plausibility. Regardless of cause, weakfish are at low abundance. The Panel even implies they agree with this statement in several of their responses. With regard to predation, there does not need to be a large number of weakfish eaten per predator, or even a trend in number eaten, because the trend in predators has increased, and there is an increased abundance of predators, even small consumption of weakfish might affect the stock.**
- **The temporal/spatial overlap of the two species is considerable, particularly during fall migration and overwintering areas.**
- **The SAS has produced an update on discards which gives a brief description of the relative level of consumption.**

The assumption of a type III functional response appears arbitrary. There are several valid alternatives that have been used in other predator-prey models – ranging from type I and II, to foraging arena concepts (Walters and Juanes 1993, Walters and Martell 2004). Each of the different functional responses would have extremely different consequences for the dynamics of weakfish inferred by such models. It was not apparent from the material presented that an adequate exploration of this aspect of the biomass dynamic models with covariates had been undertaken.

- **This comment is largely due to the time limitations of the workshop. The first day (2+ hours) was spent discussing data inputs, VPA, and relative F. The second day, due to time limitations, the Panel considered both biomass models in less than an hour, so they may not have picked up on the differences between the predator hypothesis and the forage hypothesis.**
- **Regardless, the forage hypothesis investigated 4 functional responses, including Type I, II, III and depensatory. Type III actually performed poorly, so the SAS has already addressed this. It will be thoroughly discussed in the final assessment.**
- **Residual errors were clarified through adding a predation factor. Through analysis, the SAS has not been able to falsify the striped bass/dogfish predation factor.**

The Panel noted that when a resource is in a depleted condition, such as in the case of weakfish, a number of factors can be responsible for maintaining the stock in the depressed state. Examples in the literature of “predator pits” preventing recovery in predator - prey models have been reported (Bundy and Fanning 2005). There is a continuing debate in Atlantic Canada on the role of grey seals maintaining Atlantic cod at their low level of abundance (Chouinard et al. 2005, Trzcinski et al. 2006). However, the mechanisms maintaining the prey species at low levels of abundance and the mechanism that caused the reduced abundance in the first place are not necessarily the same thing. Thus, for weakfish, predation may be maintaining the population at low levels, without having contributed to the original decline of the stock.

- **The TC/SAS agrees that the weakfish stock is at a low level and that the influence(s) that is keeping it there could be different than what put it there in the first place. The question is what put it there in the first place, especially since we were starting to rebuild (and have lots of different data sources that indicate this). To change from rebuilding to declining stock, total mortality would have had to increase and/or recruitment decrease. Relative F indicates that fishing mortality was probably not the leading cause.**
- **The SAS looked at other factors such as recruitment (environmental?) or mortality (other anthropogenic or natural).**
- **The DPW Panel appears to concede that the stock is at low levels. If it is due to predation, we probably can't have a viable fishery until that predation pressure is removed. These are the same implications they accused us of not fully considering?**
- **If the Panel agrees the stock is at low levels, they are implicitly "accepting" the index and harvest data, thereby contradicting many of their concerns.**

The Panel felt that the attempts of the TC to develop a minimum realistic model (MRM) for weakfish trophic interactions, as recommended by Plagányi (2007), were laudable. However, the Panel also felt that the biomass dynamic models were not yet at the stage to provide a reliable basis for the determination of weakfish stock status.

- **The DPW Panel believes that the input data and the results of the VPA are inappropriate, the biomass models are unreliable, and SCAM uses same data as VPA. So what is left? Weakfish has become the ultimate example of "data poor" after the last 2 reviews. The data has been shot down as unacceptable and ASMFC is worse off now than prior to the last assessment. Back to the drawing board?**

The Panel did not have sufficient time to provide responses to a number of specific questions raised by the TC themselves (ASMFC Weakfish TC 2008a). However, the Panel noted that it has provided guidance on several questions. Most importantly, perhaps for the management of weakfish, the Panel feels that the VPA is not yet sufficiently developed or its results sufficiently explored to support the conclusion of an increasing pattern in M. While the Panel appreciated the spirit of the exploration of ecological mechanisms to explain a pattern of increasing M, these analyses are not of sufficient reliability, given concerns over the MRFSS index and the lack of empirical evidence for the hypothesized predator-prey interaction involving striped bass and weakfish, to be a current assessment tool of the weakfish resource.

- **It appears on several levels that the Assessment presentation needs adjustment. The SAS may need to make some concessions on the cause of stock decline by generalizing, but it can do this without saying it is all due to F. Also, the focus should be on the findings of all the models – i.e. that the stock appears to be at low levels currently. The Panel appears to agree that the stock is depressed, which is a positive step since the last peer review didn't even agree that we were in a depressed state. The Board needs to know that the stock is in a depressed state, so we need to figure out how to get the Panel to make a statement about status regardless of how that status came about.**
- **It will not take much to address the concerns of this Panel. In a few places the SAS will need to do some additional exploratory work with models and such. Much of the work will come from just expanding the text of the assessment to acknowledge the Panel's concerns and to reference and summarize other reports where that work was done.**

WEAKFISH STOCK ASSESSMENT TIMELINE

DATE	OBJECTIVE
April 16-18, 2007	TC Meeting to initiate assessment planning
May 8, 2007	Board approves assessment timeline
June - Dec, 2007	SAS working to address deficiencies identified in past assessments
January 7-8, 2008	SAS Pre-Data Workshop Meeting
February 5, 2008	Board approves Terms of Reference
March – June, 2008	SAS preparing for Data Workshop
July 14-17, 2008	Data Workshop
August 1, 2008	Post-DW assignments due
August 19, 2008	Board receives Progress Report
Aug - Sept, 2008	SAS preparing for Assessment Workshop
October 28-30, 2008	Assessment Workshop
Dec. 11-12, 2008	Data Poor Workgroup reviews weakfish assessment methodologies
January 22, 2009	TC/SAS Conference Call to review and address DPW recommendations
February 5, 2009	Board receives TC report on DPW recommendations and a timeline update
Feb - March, 2009	TC/SAS addressing DPW recommendations and finishing model runs
March 2009	TC/SAS Meeting to select preferred model runs
April 2009	TC/SAS working to finalize Stock Assessment Report
May 1, 2009	Stock Assessment Report for Peer Review completed
June 2009	Review Workshop
August 2009	Board accepts Stock Assessment Report and Peer Review Report

Sequence of Changes to Original Timeline

April 2007: Original timeline approved by the Weakfish Technical Committee.

May 2007: August 2008 progress report added due to Board request.

August 2007: SAS meeting moved from September 2007 to January 2008.

December 2007: Peer Review moved from December 2008 to June 2009 to reflect new SAW schedule.

January 2008: SAS reviews agenda; no changes.

June 2008: December 2008 Data Poor Stocks Workshop planned by SAW Coordinator and added.

July 2008: Assessment Workshop moved from September to October 2008; subsequent events adjusted.

October 2008: Additional TC meeting set in January 2009 to finalize AW tasks, respond to DPW report; report to Board in February added.

December 2008: January 2009 TC meeting changed to a call to review DPW report, TC/SAS given February to March to revise and complete model runs, selection of preferred model runs postponed until an additional TC/SAS meeting set for March 2009, completion of stock assessment report delayed from January to May 2009, review workshop date does not change.