Report on the

Southeast Data, Assessment, and Review (SEDAR) 32
Gulf of Mexico Menhaden and South Atlantic Blueline Tilefish

Prepared for:
The Center for Independent Experts

Dr Kevin Stokes
Stokes.net.nz Ltd
59 Jubilee Rd
Khandallah
Wellington 6035
New Zealand
Ph: +64 (04) 973 7305
E-mail: kevin@stokes.net.nz

EXECUTIVE SUMMARY

The CIE independent report shall be prefaced with an Executive Summary providing a concise summary of the findings and recommendations, and specify whether the science reviewed is the best scientific information available.

The Southeast Data, Assessment, and Review (SEDAR) 32 for Gulf of Mexico menhaden and South Atlantic blueline tilefish took place at the Crystal Coast Civic Center, Morehead City, NC from 27th to 31st August 2013. The meeting was well organized and administered and was open and transparent. The Review Workshop (RW) Panel was able to reach consensus on all issues and the Panel Report was provided according to the schedule. This report is an individual report that largely reflects the Panel Report although with some minor departures.

For blueline tilefish the RP reached agreement on what would constitute base case runs and sensitivity tests, and a basis for projections. For menhaden the RP reached agreement on what would constitute base case runs and sensitivity tests. No projections were undertaken for menhaden.

For blueline tilefish this was a first stock assessment. Standard Southeast regional assessment methods (Beaufort Assessment Model (BAM) and Monte Carlo Bootstrapping (MCB)) were applied. The data available are all fisheries-related and are limited in a variety of ways. That blueline tilefish is also a non-target species does not help matters. While I accept the assessment as the best available, I think there are two major areas of uncertainty. The first is fundamental – it is not clear that the stock can realistically be modeled using the traditional dynamic pool approach. Second, age data are sparse and poor quality and the scale of M is poorly defined. As stock status depends critically on M, this is potentially problematic. Notwithstanding, the Assessment Workshop (AW) conducted a careful and thoughtful assessment and has provided a strong basis for determining stock status. Most indications are that the stock is overfished and subject to overfishing.

For Gulf of Mexico menhaden, landings data are excellent but there is some concern about the limited fishery-independent information and bias in catch sampling. Difficulties with, and lack of clear protocols for, ageing also create potential biases. Nevertheless, the single species model has been well explored and appears to be reliable as a basis for informing decision making once goals and objectives have been agreed by the Gulf States Marine Fisheries Commission (GSFMC). Against traditional single species standards, the fishery appears neither to be overfished nor experiencing overfishing. However, as a key low trophic level species in the Gulf ecosystem, it is unclear what goals and objectives will be set and what this might mean for the standards set and consequent status of menhaden.

BACKGROUND

*The main body of the reviewer report shall consist of a **Background**, Description of the Individual Reviewer's Role in the Review Activities, Summary of Findings for each ToR in which the weaknesses and strengths are described, and Conclusions and Recommendations in accordance with the ToRs.*

Blueline Tilefish (SA BLT)

Blueline tilefish (*Caulolatilus microps*) is a demersal species, patchily distributed from as far north as Rhode Island (RI) but in greater abundance from around the North Carolina (NC) / Virgina (VA) border, south to the Campeche Banks of Mexico. It is generally found at depths between approximately 70m and 240m with a preference for sand, mud and shell-hash bottoms in which adults form burrows and appear to move little. The lifespan of blueline tilefish is possibly of the order of 40 to 45 years, reaching maturity at 3-4 years of age and with fecundity increasing with length/age. Maximum size appears to be reached by about age 15. Eggs are broadcast and pelagic.

The management region for blueline tilefish considered in this review covers the US coast from the NC/VA border southward to the SAFMC/GMFMC boundary although the stock assessment spans the entire US Southeast coast south from RI and down to Florida (FL) east coast and the FL Keys. Linkages with blueline tilefish in US Gulf of Mexico and Mexican waters are assumed to be negligible but are unknown.

Commercial catches of blueline tilefish were negligible prior to about 1972 but grew quickly from 1980 and reached a peak of about 450 mt in 1982. Catches then fluctuated in the range 45-90 mt until 2007 before increasing to around 180 mt in 2008-2010. Recreational catches have been primarily by headboat and charters but with some private boat contribution. The pattern by state has varied through time but the majority of estimated recreational catches have been from NC. Estimates of recreational discards have been high in recent years.

Blueline tilefish has not previously been assessed. As part of SEDAR 04 in 2004 data were assembled but no assessment was conducted. As reported to SEDAR 32, some studies have suggested that increases in total mortality (Z) since the 1970s and declines in mean length may be due to increased harvest in the snapper-grouper fishery (Ross and Huntsman, 1982; Harris et al., 2004; Rudershausen et al., 2008).

Blueline tilefish are managed under the Fishery Management Plan (FMP) for the Snapper-Grouper Fishery of the South Atlantic Region, first approved and implemented in 1983. Blueline tilefish have not been managed directly under the FMP but a wide variety of FMP and regulatory amendments have affected blueline tilefish fisheries and will impact upon data interpretation.

Menhaden (GoM M)

Gulf of Mexico menhaden (*Brevoortia patronus*) is a clupeid species, distributed from southwest FL to the Gulf of Campeche, Mexico, but centred and ubiquitous in the northern Gulf of Mexico from western FL to eastern Texas (TX). There is no evidence of substructure within this central area of concentration. Menhaden are filter feeders with juveniles favouring phytoplankton and adults zooplankton. Menhaden form dense schools near to the surface, particular in warmer months and are prey for many coastal predators. The lifespan of Gulf menhaden is possibly of the order of six or more years, with very few fish at age 6 observed in the fishery, reaching maturity at two years of age and with fecundity increasing with length/age.

Commercial fisheries for menhaden were developed after WWII when companies involved in Atlantic Menhaden fisheries moved into the Gulf of Mexico. Operations increased rapidly between 1948 and the late 1950s and by 1959 the annual commercial catch had increased to over 300,000 mt. The fishery continued to expand through the 1960s and 70s, reaching a peak in the 1980s with catches approaching 1,000,000 mt. Since the early 1990s catches have fluctuated in the range 400,000-600,000 mt with catches in the 2000s averaging near 500,000 mt. In 2011 catches exceeded 600,000 mt. During the 1990s the number of operating companies, processing plants and vessels declined. The operational context has been stable for the past decade.

The Gulf menhaden fishery has been managed under a regional Fishery Management Plan (FMP) since 1978. The fishery was last assessed in 2007 and was then estimated to be not overfished and not subject to overfishing. Currently, there are no agreed benchmarks for Gulf menhaden and there are ongoing discussions as to goals and objectives for the stock/fishery. Gulf menhaden is considered a key, ecologically important species within the Gulf ecosystem.

REVIEW PROCESS

The main body of the reviewer report shall consist of a Background, ***Description of the Individual Reviewer's Role in the Review Activities****, Summary of Findings for each ToR in which the weaknesses and strengths are described, and Conclusions and Recommendations in accordance with the ToRs.*

ToR 8 (SA BLT) and ToR 7 (GoM M)

Prepare a Peer Review Summary summarizing the Panel's evaluation of the stock assessment and addressing each Term of Reference. The CIE reviewers are contracted to conduct an independent peer review, therefore the contractual responsibilities of the CIE reviewers do not include the preparation of the Peer Review Summary.

- *Each CIE reviewer may assist the Chair of the panel review meeting with contributions to the Summary Report, based on the terms of reference of the review.*
- *Each CIE reviewer is not required to reach a consensus, and should provide a brief summary of the reviewer's views on the summary of findings and conclusions reached by the review panel in accordance with the ToRs.*

Southeast Data, Assessment, and Review (SEDAR) 32 for Gulf of Mexico menhaden and South Atlantic blueline tilefish took place at the Crystal Coast Civic Center, Morehead City, NC, from 27th to 31st August 2013.

Participants in the review are listed in Appendix 3. The SEDAR Panel comprised a SAFMC SSC appointed Chair (Cadrin), a further SSC member (Grimes), a Gulf States Marine Fisheries Council (GSMFC) appointed reviewer (Patterson) and three Center for Independent Experts (CIE) reviewers (Melvin, Smith and Stokes). The SEDAR Panel was tasked with providing separate reports for BLT and Gulf of Mexico menhaden (GM). The chair outlined the tasks for the two SEDAR Panel reports during the opening session. The chair assumed overall responsibility and asked the SSC member (Grimes) to coordinate the BLT report and the GSMFC member (Patterson) to coordinate the GM report. Contributions for text on all ToR for both assessments were split between the three CIE reviewers. Notification of the meeting and dissemination of papers followed closely the schedule laid out in the CIE Statement of Work (see Appendix 2). Materials were provided in advance *via* a dedicated ftp server (see Appendix 1). Overall, administration of the review was sound.

The Terms of Reference (ToR) for the stock reviews are given in Appendix 2, Annexes 2a and 2b. The ToR are extensive and it is debatable whether three days (as provided in the agenda) of full sessions is sufficient for a thorough or adequate review of two stock assessments, including data inputs and emanating decision support materials. SEDAR 32 was originally intended to cover three stocks. I would strongly encourage the CIE not to contemplate reviews that cover more than two stocks and even then to ensure that sufficient time is available. Four days of full session, plus writing time, would have been preferable in this case and in general for two stocks. For difficult, contentious or critical assessments, concentration on single stocks would be advantageous. In general, however, covering two stocks does have the benefit of allowing analysts to work effectively on requests without causing downtime.

The meeting followed the general outline of the draft agenda (Appendix 2, Annex 3) but with sufficient flexibility to allow necessary responses from the two STAT. In my opinion, the meeting was well run and Panelists, Analytical Team members, and the public were afforded proper opportunities for input and comment. I am not aware of any problems with notification of the meetings and interpret from the presence of stakeholder representatives and the public, and lack of complaint, that notification was appropriate. All participants were able to participate throughout the meeting and opportunity was explicitly and regularly given by the

chair for input. Many participants other than Panelists and Analytical Team members contributed usefully to discussion and I believe that all were provided appropriate opportunity for involvement both during the Panel meeting and during extra-mural discussions. Enough time was provided to look in reasonable detail at data inputs and modeling decisions and to contemplate assessment outputs. Although in general I consider the time tight for the tasks at hand, I am confident that the SEDAR 32 resulted in informed and reasonable conclusions.

I note that the ToR for CIE reviewers as part of the SEDAR ToR (ToR 8 for BLT and ToR 7 for GM) are somewhat difficult to interpret and could perhaps benefit from a rewrite. The ToR for BLT and GM explicitly state that "*…responsibilities of the CIE reviewers do not include the preparation of the Peer Review Summary*", but also that *"Each CIE reviewer may assist the Chair of the panel review meeting with contributions to the Summary Report, based on the terms of reference of the review."* A straightforward interpretation of the ToR is that the chair, and possibly other, non-CIE, Panelists would prepare the SEDAR 32 reports for BLT and GM, although with "*contributions*" as useful from CIE members to "*assist*" the Chair. For SEDAR 32 the three CIE reviewers were publicly assigned all of the primary reporting tasks for both stocks under review. When asked to clarify the ToR the Chair stated that the Summary Report is the most important and that CIE reports were often not looked at and his preference would be for CIE reviewers to focus on the Summary Report. The SEDAR Coordinator further clarified that SEDAR cannot require CIE members to contribute to the Summary Report but strongly encouraged it, and also noted that the language used for the ToR could usefully be modified. In my view, there is a need for clarification of roles of panelists in different regions, especially where there are multiple panelists. This is not a complaint about the assignation of tasks for SEDAR 32, but I think it would be helpful for each region to clarify panel appointments and specific roles of CIE and other members.

REVIEWER'S ROLE IN THE REVIEW ACTIVITIES

The role of the reviewer is set out in the CIE Statement of Work, Attachment A, attached here in Appendix 2, Attachment A. CIE reviewers are tasked with producing an independent report to the CIE. As part of the stock specific ToR, the reviewers are additionally tasked with contributing to Summary Reports for each of BLT and GM.

In addition to conduct(ing) necessary pre-review preparations, including the review of background material and reports provided by the NMFS Project Contact in advance of the peer review (SoW, ToR 1), I (Stokes) participated in all discussions (SoW ToR 2) and contributed sections on methods and uncertainty to the draft Summary Reports for BLT and GM, which were left with the Chair at close on 31st August. Due to illness, this (CIE) report (SoW ToR 3) has been provided later than the specified deadline, though with agreement of the CIE. I am grateful for that agreement. The Summary Reports were finalized and delivered by their due

date (20th September). Despite illness, I was able to provide input to the Summary Reports, including suggested edits and comments on the full drafts.

SUMMARY OF FINDINGS BY STOCK

The main body of the reviewer report shall consist of a Background, Description of the Individual Reviewer's Role in the Review Activities, ***Summary of Findings for each ToR*** *in which the weaknesses and strengths are described, and Conclusions and Recommendations in accordance with the ToRs.*

Blueline Tilefish

ToR 1 *Evaluate the data used in the assessment, addressing the following:*

a) Are data decisions made by the Data Workshop and Assessment Workshop sound and robust?
b) Are data uncertainties acknowledged, reported, and within normal or expected levels?
c) Are data applied properly within the assessment model?
d) Are input data series reliable and sufficient to support the assessment approach and findings?

There are no specific data from genetics or tagging studies to allow stock definition for blueline tilefish. Consistent with the approach taken for many South Atlantic stocks for which no such data exist, the stock assessment area is defined to include all landings from Rhode Island to Florida. It was noted during the Review Workshop (RW) that many species tend to exhibit a Gulf of Mexico/Atlantic split with respect to stock structure; this is consistent with the defined southern boundary of the stock assessment area. It was further noted that work on related species has indicated a stock split at Cape Hatteras, implying that the defined stock assessment northern boundary could be too far north. However, as there have been very few landings north of Cape Hatteras this probably is not of concern for stock assessment and status determination. Of more concern from an assessment and management perspective is that catches tend to be concentrated in particular areas and that the fish are known to be relatively sedentary as adults, displaying burrowing behaviour. While this might suggest that a more refined spatial model would be useful to define status, the concern is mitigated by pelagic spawning, a long larval duration and a strong north-south flow dissipating in the mid-Atlantic. Overall, despite the paucity of information, arguments made during the RW seemed reasonably to support the overall stock area definition for assessment. However, it remains unclear if the single dynamic pool assumption underpinning the assessment is valid.

The pattern of time invariant natural mortality at age was estimated using the method of Charnov et al. (2012), which defines M at age based on life history parameters and meta analysis. The pattern of natural mortality was then scaled to provide the same fraction of fish surviving to the maximum age as for a constant M estimate using the standard method due to Hoenig. The approach seems reasonable but is subject to error due to uncertain ageing (see

below) and consequent uncertainty in estimates of K and L_∞ from Von Bertalanffy growth curves. As there is considerable uncertainty in age determination of blueline tilefish (Harris, 2004), this is an area of potential concern. I am content that the general approach taken was reasonable, as too was the use of lower and higher scalars (cf 0.05 and 0.15 against the base case scalar of 0.10) for sensitivity testing in the assessment. I am concerned, however, that there are few reported age readings near to the maximum defined age of 43, especially as the stock is only apparently lightly exploited and the plus group is set at 15 due to few fish observed at older ages and because 98% of the growth is estimated to have taken place by age 15, that there are no age compositions from the earlier catch history, and that age sampling from the more recent series is very restricted. *A priori*, I do think that this suggests greater weight should be given to the higher M assessment scenarios than to the low M one when considering sensitivity tests (below). Of course, it is possible that few fish are observed over 15 due to their being unavailable or not vulnerable to the fishery, implying a high cryptic biomass, with implications for the assumed and estimated selectivity. This possibility cannot be discounted given the sedentary and burrowing nature of the fish and the concentrated and restricted fishery areas. The issue of M is considered at other ToR (below).

In my view, these are the major issues relating to data. Issues relating to maturity at age, ageing error estimation and application in the model, all considered in the Review Panel report, are relatively minor. Similarly, I have no major issues with the landings data and abundance indices used. The landings data have a number of weaknesses and the lack of overlap between the two available abundance indices is unfortunate. But they are what they are and cannot readily be improved. They are appropriately treated in the assessment model. The one exception to this perhaps is that it would be helpful if either the recreational headboat index could be extended forward in time or the commercial indices further back to create a period of overlap. Some work was done on this during the RW (using multi-year binning of the headboat data) and it appeared to hold promise.

Overall, considering ToR 1 (a-d), I am confident that the Data Workshop (DW) and AW made reasonable, sound and robust decisions about data, acknowledged uncertainties, and applied data correctly. The data used reasonably support the assessment and findings.

ToR 2 *Evaluate the methods used to assess the stock, taking into account the available data.*

a) Are methods scientifically sound and robust?

b) Are assessment models configured properly and used consistent with standard practices?

c) Are the methods appropriate for the available data?

It is not clear why the Beaufort Assessment Model (BAM) and Monte Carlo Bootstrapping (MCB) are used rather than an integrated Bayesian model, implemented for example using SS3. I do not see any benefits of using BAM and MCB in this way and there is a risk that status

estimates and the portrayal of uncertainty may be incompatible, or that status estimates and projections may be incompatible. I think it would be useful to see a clear rationale set out for the use of BAM and MCB rather than adopting a more integrated, Bayesian approach. Notwithstanding the above comment, considering ToR 2 (a-c), I am confident that the methods used are scientifically sound and robust, models are properly configured and used consistent with standard practice in the region, but taking account of wider and recent experience (e.g. Francis, 2012), and that the methods are appropriate given the available data.

The BAM was used as the principal assessment tool. The BAM, implemented in AD Model Builder software (Fournier et al, 2012), is structured to allow implementation of forward projecting, statistical catch-at-age assessment models. Use of the BAM permitted the inclusion of all available types of data, including total annual removals from commercial and recreational fleets (landings and discards), age and length compositions, and indices of biomass abundance, with appropriate error distributions and use of priors on parameters. Decisions on *a priori* data inclusion and exclusion are considered at ToR 1 and I am generally comfortable with the approaches taken by the Assessment Workshop (AW). The specified assessment model used standard approaches to predicting landings, modelling growth and recruitment, and the BAM allowed an exploration of catchability and selectivity options.

The base case model and rationale for modelling decisions are well described in the AW report (section 3) and were further explored during the Review Workshop. The base case run included commercial and recreational landings, age composition data and three indices of abundance (recreational head boats, commercial long line and hand line). As noted above, it is not ideal that the recreational and commercial abundance indices do not overlap, but this was explored during the RW and the general patterns do seem to be consistent. Length compositions were excluded by the AW due to concerns about inconsistent sampling and conflicts in fitting. The AW concluded that length composition data help to inform selectivity estimates but conflict with information in abundance indices, do not track year classes well, and add unnecessary noise. The RW panel was concerned at this exclusion and the issue was explored further during the RW by looking at shadow fits comparing the base case predicted (but not fit) length compositions with the data and by examining model fits to the length composition data. The RW concluded that the residual patterns in indices were not acceptable from the model that included length compositions, and the results could not be considered as a viable base case (or sensitivity run); the decision by the AW to exclude length composition data was therefore upheld. I agree with this conclusion. Natural mortality was assumed constant through time but age-specific and scaled consistent with maximum observed age (see ToR 1). Steepness was fixed at 0.84 based on meta-analyses (Myers et al., 2002; Shertzer and Conn, 2012). Selectivities and catchabilities were all estimated as constant for the full assessment period (1974-2011).

The model was fit to the data using appropriate methods, consistent with standard practice. Analysis included iterative reweighting using the method of Francis (2011) and exploration of a

variety of data configurations and parameterisations. The modelling processes and decision making resulting in a proposed base case run and sensitivity testing are well described in the AW Report and AW WDs and were further elaborated during the SEDAR 32 Review Workshop where additional diagnostics (Likelihood components, weights, likelihood profiles) were made available. The modelling procedures adopted appear to be robust. Landings and discards were fit closely, and age composition data and abundance indices were fit to the degree that they are compatible and as indicated using the reweighting procedures. Landings and indices were fit using lognormal likelihoods. Age composition data were fit using robust multinomial likelihoods. The treatment of the data and the relative importance given to the various components were well explored by the AW and at the RW and appear appropriate. The model structure is adequate to capture the main patterns in the data.

Overall, I think the AW has done a thorough and careful job and has made a good attempt at fitting less than ideal data. The AW Report does not include likelihood profiles on M, but these were provided to the RW meeting and are informative. Overall, the model prefers a higher M. This is driven, however, not by the data per se but more by model assumptions. In detail, the only data that can and do influence M estimation are the very limited age data. These data "want" M to be low but the likelihood range as M varies is not great. In contrast, the stock-recruit likelihood varies much more, "wants" M to be high, and dominates the total, penalized likelihood. I interpret this to mean i) there is not actually much information on M in the data and ii) there is an important sensitivity to M that does not get fully elaborated. Given that BRPs also depend on the stock-recruit assumptions and fit, the choice of M is critical in defining status.

In addition to the catch-at-age primary assessment, two biomass dynamics stock assessments were carried out using the ASPIC software, one fully age-aggregated and the other age structured. The biomass dynamics models were considered as confirmatory rather than alternative analyses, because the catch-at-age model makes fuller use of composition data and represents a more detailed investigation of population dynamics. The biomass dynamics models provide a useful comparison with the catch-at-age model results, which they broadly support, showing the similar status of the stock in relation to MSY benchmarks (ToR 3). The biomass dynamics models are well known and used methods and were appropriately configured and implemented.

MCB was used to portray uncertainty around model outputs, including status estimates. MCB combines parametric bootstrapping to landings and indices data and resampling from composition data. The Monte Carlo component entails drawing values of M and steepness from specified pdf's. Outputs provided are the quantiles of the distribution resulting from application of the MCB simulations. Each simulation applies a single BAM model using the weights developed for the base case run. No reweighting procedures are used for individual realisations.

The MCB generates a stochastic version of the BAM model by introducing process error to the model components of natural mortality and steepness. Means of management quantities (MSY, BMSY, FMSY) from the MCB runs do not equal estimates from the base run. As noted in the RW Report, the direction of the differences observed between the MCB based estimates and those of the base run are in the direction predicted by Bousquet et al (2008). FMSY from the MCB runs will be less than the deterministic estimates from the BAM base run, estimates of MSY will be slightly higher and those for BMSY slightly lower. The size of the differences will be a function of the amount of stochastic error in the model. These differences will not be apparent when looking only at ratio benchmarks.

ToR 3 *Evaluate the assessment findings with respect to the following:*

a) Are abundance, exploitation, and biomass estimates reliable, consistent with input data and population biological characteristics, and useful to support status inferences?
b) Is the stock overfished? What information helps you reach this conclusion?
c) Is the stock undergoing overfishing? What information helps you reach this conclusion?
d) Is there an informative stock recruitment relationship? Is the stock recruitment curve reliable and useful for evaluation of productivity and future stock conditions?
e) Are the quantitative estimates of the status determination criteria for this stock reliable? If not, are there other indicators that may be used to inform managers about stock trends and conditions?

a) All estimates are consistent with data inputs, given model structure and assumptions. Assuming a single dynamic pool and the base case M, the outputs are useful to support status determination. As noted above, it is not clear but M could be higher than assumed. During the RW it was accepted that the base case was appropriate but I consider this still to be moot. If this is so, then sensitivity tests reported by the AW (Fig. 3.41) suggest that the status determination could be overstated.

b) Based on the base case BAM and on sensitivity tests reported by the AW, the stock is likely overfished, with SSB in 2011 estimated as 91% of the MSST. Apart from 2005-2009, SSB is estimated to have been below MSST since the early 1980s, soon after substantial landings were reported and the estimated fast contraction of age structure. I think this raises a concern as to the appropriateness of the single dynamic pool assumption and the possibility that the (non-target) fishery has concentrated on limited pockets of a highly heterogenous distribution. I note that the majority of sensitivity tests confirm the base case status determination but that the only one of importance is the high M run which suggests the stock may not be overfished. However, I acknowledge that the production model results, both age-aggregated and disaggregated, support the status determination that the stock is overfished.

c) Based on the base case BAM and on sensitivity tests reported by the AW, the stock is likely being overfished. The pattern of estimated F suggests the stock has been subject to

F>>Fmsy since the beginning of the (non-target) fishery, but with large variation. As at ToR 3(b), I have concerns about the feasibility of the estimated SSB and F patterns and am concerned at the basic assumptions.

d) No, the estimated stock- recruitment assumption is not informative. The likelihood profiles on M presented during the RW show clearly that the S-R is dependent on the assumed M. Given the lack of information on M in the data, the status determination is driven substantially by assumptions about the stock-recruitment relationship and M. Better information on M is important to better definition of stock status.

e) As noted by the RW, the quantitative estimates for determination of stock status are reliable within the bounds of the uncertainties identified in the Assessment Document and the Review Panels report.

ToR 4 *Evaluate the stock projections, addressing the following:*

a) Are the methods consistent with accepted practices and available data?
b) Are the methods appropriate for the assessment model and outputs?
c) Are the results informative and robust, and useful to support inferences of probable future conditions?
d) Are key uncertainties acknowledged, discussed, and reflected in the projection results?

a) The MCB method used by the AW is an accepted practice in the region. As noted at ToR 2, I do not understand the use of BAM and MCB rather than an integrated approach and think there is a risk of inconsistency by use of the two (between status determination results and portrayed uncertainty, and as a basis for consistent projections). My main concern, however, is that the technical "art" of modeling is in the use of diagnostics to reweight and tune the base case and individual sensitivity runs. MCB is intended to provide an approximation of the uncertainty around a single run, allowing for the inclusion of error in the data (e.g. age data) and in parameters. For any MCB realization, however, bootstrapping data and drawing on parameters from input pdfs, the finely tuned weighting of the single run is retained even though it will in many realisations be inappropriate. This is acknowledged to an extent by the removal of unconverged and "unrealistic" runs (in this case CB realisations were sifted to leave 3043), but such filtering is not automated and is unclear, and all retained realisations are given equal weight in the MCB outputs and in calculating central tendencies. I would be more confident in the portrayal of uncertainty using MCB, and of using MCB for projections, if a comparison could be made against more common Bayesian approaches.

e) This is covered at ToR 2 (and in the RW Report). The bottom line is that if the MCB approach is being used for projections, the MCB estimates of the management quantities should be used for evaluating stock status to be consistent. My interpretation is that BAM might be used to investigate base cases and sensitivities, much like the use of MPD models, but full analyses should proceed using MCB to ensure consistency throughout.

Regarding this ToR, the methods are appropriate if used consistently but there is a potential inconsistency when used in combination with BAM.

f) Projection results are informative and reasonably robust. It is notable that for this fishery F is estimated to vary widely from year to year, and not always clearly related to management measures. It is not therefore clear if the use of three year averaged F is a good basis. Currently F is estimated as the mean of the three previous years. Given the observed rapid changes in F and the spatial restrictions imposed in 2011, care is needed to ensure projections are realistic. I agree with the RW conclusion that if possible it would be best to use preliminary landings estimates for 2012 and 2013 rather than model these using an assumed F.

g) Yes, key uncertainties are acknowledged, discussed, and reflected in the projection results (and see ToR 5).

ToR 5 *Consider how uncertainties in the assessment, and their potential consequences, are addressed.*

- *Comment on the degree to which methods used to evaluate uncertainty reflect and capture the significant sources of uncertainty in the population, data sources, and assessment methods. Ensure that the implications of uncertainty in technical conclusions are clearly stated*

Uncertainty was explored in the assessment modelling using extensive sensitivity runs and likelihood profiling, retrospective analyses and Monte Carlo Bootstrapping (MCB). All of the methods used are standard and much used in the region and/or more widely. The AW reported widely on the various analyses and more materials were provided and used in discussion at the RW, notably likelihood profiles on M. The application of methods appears to be comprehensive and well focused. Sensitivity runs as variants of the base case run are numerous and good information was provided on the impacts on fits (through detailed likelihood components and also weighting diagnostics, SDNRs, likelihood profiles, etc). Such runs can only look at what the model structure accommodates and cannot consider, for example, processes such as fishery or environmentally induced geographic changes in distribution of the stock or fishery induced local depletion. Nor can they consider variations on the fundamental dynamic pool assumption. There was much discussion at the RW on these issues and on data inclusion or exclusion in indices to represent stock abundance. Ultimately, the stock assessment assumes a single dynamic pool of fish and there are insufficient data at this time to support investigating alternative hypotheses. With the exception of this potentially major structural uncertainty, the other uncertainties in the assessment and its outputs have been appropriately and comprehensively considered. I do think that the reporting of uncertainty should more fully highlight the possibility that the dynamic pool assumption may be flawed.

Issues considered in sensitivity runs include variations in M and steepness, alternative maturity vector, adjustment of model weights and exclusion of each series of indices, allowing

catchability to vary, inclusion of ageing error, and allowing recreational selectivity to be dome shaped. Issues of uncertainty not covered explicitly in sensitivity tests include the quantum of landings assigned to recreational landings and especially discards in 2007-9 (CHECK) (see ToR 1). As noted at ToR 2 and 3, I think the issue of M is problematic and am not convinced that the interpretation of sensitivity results should not put more weight on the higher M option.

The MCB is alluded to at ToR 2. A total of 3200 realisations were made using M and h values drawn from specified pdf's and with the landings, indices and age composition data bootstrapped. Each realisation of the BAM model was run using the iteratively reweighted weights from the base case (it would have been impossible to automate this process for each of the 3200 realisations). However, it should be noted that reweighting can have major implications for fitting and parameter estimation and that not all individual realisations may be feasible. The degree to which this may or may not matter is model and data specific. As all realisations are afforded equal weight in determining distributions of outputs there is in general need for care in interpreting MCB results. For blueline tilefish, the SDNRs for all sensitivity tests are surprisingly good when runs are made using the base case weights. This is encouraging. However, this is no guarantee that for specific M and h combinations drawn from the pdfs, which may be incompatible, the base case weights would in any way be appropriate. I note this is not a problem confined to MCB and is not one that will be quickly solved while model weighting/tuning remains an interactive process.

The RW was comfortable that the AW had fully explored uncertainty to the extent possible and that the characterisation of benchmark trajectories and hence stock status (ToR 3) and projections (ToR 4) are suitable for informing management decisions. I am in general agreement with this conclusion, noting the words "to the extent possible".

ToR 6 *Consider the research recommendations provided by the Data and Assessment workshops and make any additional recommendations or prioritizations warranted.*

- *Clearly denote research and monitoring that could improve the reliability of, and information provided by, future assessments.*
- *Provide recommendations on possible ways to improve the SEDAR process.*

The DW and AW made an impressive list of research recommendations. As noted at the RW, many of those recommendations are generally applicable to deepwater species and were not considered further. In my view, while there are a number of recommendations that might aid the blueline tilefish assessment through improved data acquisition, the most important relate to stock structure/life history and to ageing. I am always hesitant to say that specific recommendations should be prioritised as that depends on many factors beyond the specific stock assessment.

The DW and AW recommended genetic or other forms of stock identification across the Gulf of Mexico and the northwestern Atlantic. Of course such studies would be nice but they are also expensive. The issue in any case is not just whether or not there are genetic differences at different scales, but also how the stock(s) is(are) structured in space and time and throughout the life of the fish, and whether or not there are changes in relation to environmental or fishing pressures. The DW and AW also recommend habitat studies. I agree with the RW consensus that the starting place for any studies, perhaps considering a wider group of species, would be a full description and qualitative analysis of all information relating to the species – e.g., life history characteristics, known areas of occurrence, occurrences by age/size, known spawning areas (if any), habitat correlations, oceanographic considerations. The need is to get a better understanding of the potential alternative population structure characteristics to inform whether or not the single dynamic pool model is appropriate and also to aid in any possible fishery-independent survey design. Such work is also needed to understand the utility of the fishery-related abundance indices.

In addition, a key area for improvement is in ageing. The DW and AW made three recommendations related to ageing (validation, marginal increment analysis, and increased sampling from recreational fisheries). I would support all of these together with any attempts to find and read historical samples.

With regard to other DW and AW recommendations, I think all are lower priority, although it is undoubtedly the case that development of a fishery-independent abundance would be useful - in the long term. Given that blueline tilefish is part of a larger deepwater/grouper complex, it would seem sensible to consider index development in the wider context. I do not immediately see great value in the DW and AW recommendations related to statistical aspects of abundance index development. These are wider issues related to all such estimation and need to be viewed in that context.

Similarly, it appears that the various recommendations related to recreational fisheries are generic and need to be considered in a wider context.

The ToR asks for specific recommendations on how to improve the SEADR process. As stated above, I consider the process to be well organised and administered and open and transparent. As with many similar processes, I am concerned that too much is attempted in too short a time and was concerned at SEDAR 32 to hear that the original intention was to cover at least three stocks. From a reviewer perspective I think single stock reviews are the most valuable. I recognise, however, that considering two stocks allows for analysts to work on requests while review can continue. From a cost perspective that may be attractive but I am unconvinced it creates value and may in fact reduce it. I noted earlier that the terms of reference at least for CIE reviewers could usefully be clarified with respect to contributing to the Panel report and

individual reports. I understood this to be an intention of the SEDAR organisers and would encourage it.

ToR 7 *Provide guidance on key improvements in data or modeling approaches which should be considered when scheduling the next assessment.*

A key modelling assumption is that of the simple dynamic pool. As noted above, this needs to be explored as fully as possible; in my view this should be done before any further assessment is attempted. The lack of understanding affects not just the fundamental assessment assumption but also the interpretability and potential utility of abundance indices within the single pool model. As indicated above, a comprehensive analysis would be in order and the use of qualitative approaches, as well as quantitative where possible, would be in order.

As noted at ToR 1, exploring the potential for overlapping abundance indices, most likely by extending the recreational series, could be useful. I would recommend putting more energy into this than developing a new index, although that would have longer-term benefits.

At the RW it was noted that i) commercial abundance indices were based on data only as far north as Cape Hatteras, whereas ii) the assessment includes landings as far north as Rhode Island. This was regarded as not problematic because the landings north of Cape Hatteras had been small. However, with more recent catches expanding north of Cape Hatteras, this needs to be reconsidered.

GoM Menhaden

ToR 1 *Evaluate the data used in the assessment, addressing the following:*

a) Are data decisions made by the Data Workshop and Assessment Workshop sound and robust?
b) Are data uncertainties acknowledged, reported, and within normal or expected levels?
c) Are data applied properly within the assessment model?
d) Are input data series reliable and sufficient to support the assessment approach and findings?

The assumed stock structure seems appropriate and uncertainty was acknowledged with respect to possible differences in dynamics and trends between the eastern and western portions. There was good discussion on the issues and I see no cause for concern with the stock structure assumed for the assessment. Use of landings and index data are appropriate.

The methods used to estimate the pattern and scale of time invariant M are well described and seem reasonable. My only concern about M is that it may not be time invariant given the importance of menhaden with the multispecies fish complex of the Gulf. In discussion it was

noted that there is no indication of any trend in M but my concern in the multispecies context is more that there could be high inter-annual variability in M at age which would ideally be incorporated into uncertainty characterisation. Although it is not possible to import multispecies model results from another region, I wonder if it is at least possible to make any inferences about potential inter-annual variability in menhaden M at age from the MSVPA work in the mid-Atlantic.

Ageing of menhaden using scales is somewhat problematic, not helped by the use of multiple readers, but only one consistently for an extended period. While there seem to be plans for building a reference collection before that very experienced reader retires, it is of concern that there seems to be no clear reading protocol and that the current system seems to rely, as stated in the RW, on the fact that "we have Ethel". Given that informal analyses suggest relatively poor agreement between otolith and scale reading, between scales re-read in 2005 and 2012, and between historical readings and present readings, there is a clear need to sort out reading protocols and reader availability. With respect to the observed change in age proportions, there is considerable discussion in the AW report and the RW considered the issue in some detail. A wide set of drivers for real change were considered but re-reading a small sample of scales from the 1970s to compare with a contemporary sample suggested that age readings from the earlier period underestimated ages compared to re-read scales. Without this re-reading, if the assessment had used the full dataset, the model would have had to interpret the change in proportion at age through time. Because of the re-reading, the AW decided to remove the age data from the earlier period. This was appropriate although the (labour intensive) alternative of re-reading all scales and using the full dataset was not apparently considered.

I am unconvinced by the use of fecundity as a metric to be used in determining stock status. It is true that there will be greater fecundity as fish grow and age and this will increase faster than simple SSB. However, i) calculation of fecundity adds complexity and additional uncertainty in to any status determination, and ii) a standard (i.e. benchmark) can be set appropriately for any given metric (e.g., fecundity or SSB). I am aware that fecundity is used widely in the region but see no obvious advantage of using it for menhaden given uncertainty created by, for example, batch spawning. The GSFMC is currently deliberating on goals and objectives and has yet to agree standards, I would suggest concentrating on SSB unless it can be shown that there is a clear advantage of using fecundity (but see also ToR 4).

Removals data are good for Gulf menhaden due to lack of multiple fleets and sectors and long-term, high quality logbook system. The system was well reported and discussed at the RW and I see no areas of concern. It is good to see a fishery with such good fundamental data keeping to underpin assessment and management. The one area of concern is in the catch sampling for which it is clear the protocols lead to under-representation of older fish. This is potentially problematic and need to be improved but it is unclear how historic catch sample data can be

corrected. There is also some concern that the lack of older fish in the catch (as sampled) and the assumption of logistic selectivity may be incorrect if the stock distribution is age-related and the fishery does not target older fish (either because due to low spatial/temporal overlap or because schools of larger and older fish may be smaller and not targeted even if there is overlap). There was considerable discussion on this topic with useful input from industry, and it appears reasonable to assume the fishery does in fact operate in such a way that all ages of fish are available. Lack of older fish in the catches is therefore not likely related to fish availability, may be affected by the catch sampling protocols, or may (as inferred by the model) reflect very high fishing mortality rates. There is no way directly to investigate the effect of the biased catch sampling on the assessment and status determination but I am comfortable that the issues have been well explored and described by the DW and AW.

Despite the large number of potential abundance indices, only the Louisiana gillnet index was used in the assessment. All other surveys were excluded *a priori* for a variety of reasons. Of note is the exclusion of a previously used trawl survey for juveniles and the exclusion of gillnet survey data from the western and eastern peripheries of the defined stock (leaving just the Louisiana index). The trawl survey was excluded as being a poor sampling method for pelagic menhaden and because the spatial extent was not appropriate. The western (TX) and eastern (FL, AL) gillnet data were excluded due to difficulties distinguishing between species in those areas. It was suggested during the RW that exclusion of indices could have been made in the modelling process, using e.g. likelihood profiling. I am comfortable the approach taken by the DW and AW and think it is appropriate to judge the utility of indices on *a priori* considerations. I think the DW and AW did a good job in this respect. Considering all potential indices at the modelling stage would have been time consuming and likely unproductive.

Overall, considering ToR 1 (a-d), I am confident that the DW and AW made reasonable, sound and robust decisions about data, acknowledged uncertainties, and applied data correctly. The data used reasonably support the assessment and findings.

ToR 2 *Evaluate the methods used to assess the stock, taking into account the available data.*

a) *Are methods scientifically sound and robust?*
b) *Are assessment models configured properly and used consistent with standard practices?*
c) *Are the methods appropriate for the available data?*

As noted for Blueline Tilefish, it is not clear why the Beaufort Assessment Model (BAM) and Monte Carlo Bootstrapping (MCB) are used rather than an integrated Bayesian model, implemented for example using SS3. I do not see any benefits of using BAM and MCB in this way and there is a risk that status estimates and the portrayal of uncertainty may be incompatible, or that status estimates and projections may be incompatible. I think it would be useful to see a clear rationale set out for the use of BAM and MCB rather than adopting a more

integrated, Bayesian approach. Notwithstanding the above comment, considering ToR 2 (a-c), I am confident that the methods used are scientifically sound and robust, models are properly configured and used consistent with standard practice in the region, but taking account of wider and recent experience (e.g. Francis, 2012), and that the methods are appropriate given the available data.

It also needs to be noted that the assessment is for Gulf menhaden as a single stock. As management goals and objectives are still being developed, and given that menhaden is a key species in the Gulf ecosystem, it may be necessary in time to develop models that address this issue in order to provide decision support.

The Beaufort Assessment Model (BAM) was used as the principal assessment tool. The BAM, implemented in AD Model Builder software (Fournier et al, 2012), is structured to allow implementation of forward projecting, statistical catch-at-age assessment models. Use of the BAM permitted the inclusion of all available types of data, including total annual removals from the commercial fleets (and the very small recreational catches), age and length compositions, and indices of biomass abundance, with appropriate error distributions and use of priors on parameters. Decisions on *a priori* data inclusion and exclusion are considered at ToR 1 and I am generally comfortable with the approaches taken by the AW. The specified assessment model used standard approaches to predicting landings and modelling recruitment, and the BAM allowed an exploration of catchability and selectivity options.

The base case model and rationale for modelling decisions are well described in the AW report and were further explored during the RW. The base case run included commercial and recreational landings, age and length composition data and two indices of abundance, one each representing age 1 and age 2 fish. Natural mortality was assumed constant through time but age-specific based on the method of Lorenzen (1996) and scaled based on tagging studies. Steepness was fixed at 0.75. Selectivities and catchabilities were all estimated as constant for the full assessment period (1977-2011).

The model was fit to the data using appropriate methods, consistent with standard practice. Analysis included iterative reweighting using the method of Francis (2011) and exploration of a variety of data configurations and parameterisations. The modelling processes and decision making resulting in a proposed base case run and sensitivity testing are well described in the AW Report, which includes information on Likelihood components, weighting, SDNRs by data component and weight, likelihood profiles, etc. Further diagnostics were made available and elaborated during the SEDAR 32 RW. The modelling procedures adopted appear to be robust. Landings were fit closely, as were age composition data, and abundance indices were fit to the degree that they are compatible and as indicated using the reweighting procedures. Landings and indices were fit using lognormal likelihoods. Age composition data were fit using robust multinomial likelihoods.

The treatment of the data and the relative importance given to the various components were well explored by the AW and at the RW and appear appropriate. The model structure is adequate to capture the main patterns in the data.

In addition to the catch-at-age primary assessment, an age-aggregated biomass dynamics stock assessment was carried out using the ASPIC software. The biomass dynamics models was considered as a complementary rather than an alternative analysis, because the catch-at-age model makes fuller use of composition data and represents a more detailed investigation of population dynamics and is hence able to capture higher frequency changes in indices better (e.g., recent high indices and catches). The biomass dynamics model provides a useful comparison with the catch-at-age model, which it broadly supports without capturing recent population changes. A number of sensitivity tests were carried out on the biomass dynamics model which demonstrated the robustness of conclusions based upon it. The biomass dynamics model used, implemented with ASPIC, is well known and used. The methods were appropriately configured and implemented.

MCB was used to portray uncertainty around model outputs, including status estimates. MCB combines parametric bootstrapping to landings and indices data and resampling from composition data. The Monte Carlo component entails drawing values of M and steepness from specified pdf's. Outputs provided are the quantiles of the distribution resulting from application of the MCB simulations. Each simulation applies a single BAM model using the weights developed for the base case run. No reweighting procedures are used for individual realisations.

The MCB generates a stochastic version of the BAM model by introducing process error to the model components of natural mortality and steepness. Means of management quantities (MSY, BMSY, FMSY) from the MCB runs do not equal estimates from the base run. The direction of the differences observed between the MCB based estimates and those of the base run are in the direction predicted by Bousquet et al (2008). FMSY from the MCB runs will be less than the deterministic estimates from the BAM base run, estimates of MSY will be slightly higher and those for BMSY slightly lower. The size of the differences will be a function of the amount of stochastic error in the model. Of course, these differences will not be apparent when looking only at ratio benchmarks.

ToR 3 *Evaluate the assessment findings with respect to the following:*

a) *Are abundance, exploitation, and biomass estimates reliable, consistent with input data and population biological characteristics, and useful to support status inferences?*
b) *Is the stock overfished? What information helps you reach this conclusion?*
c) *Is the stock undergoing overfishing? What information helps you reach this conclusion?*

d) Is there an informative stock recruitment relationship? Is the stock recruitment curve reliable and useful for evaluation of productivity and future stock conditions?

e) Are the quantitative estimates of the status determination criteria for this stock reliable? If not, are there other indicators that may be used to inform managers about stock trends and conditions?

a) All estimates are consistent with data inputs, given model structure and assumptions. During the RW it was accepted that the base case was appropriate; I agree with this conclusion. As noted above, however, there are some issues with ageing, catch sampling and possibly cryptic biomass. These could all affect model fitting and status determination. Also, the assessment is single species only and does not account in any way for the role of menhaden within the Gulf of Mexico ecosystem. It was noted in the primary presentation at the RW that menhaden is a "key critter". There are no clear standards for setting BRPs for key species or Low Trophic Level (LTL) species but the Marine Stewardship Council (MSC) Certification Requirements (CR) offer insight in to developing international practice for default standards or use of more complex models to define appropriate BRPs. At this stage I would say that the current stock assessment might be used to assess stock status against standard BRPs (e.g. SSBcurrent/SSB40%) or even developing LTL standards (e.g. the MSC CR default of a target at SSB75%). More complex multispecies or ecosystem models would be required to support more refined management goals and objectives.

b) There are no standards set for Gulf menhaden (see ToR 3d). The AW provided estimates of a variety of standard single species status determinants, all of which suggested the stock was not overfished. I am hesitant to say that I consider the stock not to be overfished as the judgment depends on what goals and objectives the GSFMC decides and how these are translated in to specific standards.

c) Similar to ToR 3b, the AW presented status information that suggested overfishing is not taking place when judged against a plausible set of single species standards. As above, I am hesitant to say that the stock is not being overfished because it will depend on agreement as to goals and objectives and whether or not these take account of wider ecosystem considerations. I do agree that against all potential single species standards the fish stock is not being overfished.

d) No.

e) As noted above, goals and objectives are currently being developed for Gulf menhaden. The potential status determinants presented by the AW are all reasonably reliable on a single species basis without wider ecosystem considerations. There are no multispecies models available for the Gulf, as there are for the Atlantic, and it is not possible readily to transfer multispecies model results from one region to another, in the absence of a Gulf-specific model.

ToR 4 *Consider how uncertainties in the assessment, and their potential consequences, are addressed.*

- *Comment on the degree to which methods used to evaluate uncertainty reflect and capture the significant sources of uncertainty in the population, data sources, and assessment methods. Ensure that the implications of uncertainty in technical conclusions are clearly stated*

Uncertainty was explored in the assessment modelling using extensive sensitivity runs and likelihood profiling, retrospective analyses and MCB. All of the methods used are standard and much used. The AW reported widely on the various analyses and more materials were provided and used in discussion at the RW. The application of methods appears to be comprehensive and appropriately focused. Sensitivity runs as variants of the base case run are numerous and good information was provided on the impacts on fits (through detailed likelihood components and also weighting diagnostics, SDNRs, likelihood profiles, etc). Such runs can only look at what the model structure accommodates and cannot consider structural uncertainties such as alternative stock structures. No such structural uncertainties were identified for menhaden and the assessment and its outputs have been appropriately and comprehensively considered.

Issues considered in sensitivity runs include scaling and form of M, S-R steepness and form, adjustment of model weights and exclusion of each series of indices, alternative selectivity assumptions for the commercial reduction fishery, start year, inclusion/exclusion of indices, alternative weightings and alternative growth specification.

The MCB is alluded to at ToR 2. A total of 5,000 realisations were made using M and h values drawn from specified pdf's and with the landings, indices and composition data bootstrapped. A total of 4,068 realisations were used to compile the final MCB quantile plots with realisations discarded if they did not converge or showed other poor behaviour. The process for discarding realisations was not discussed in detail. Each realisation of the BAM model was run using the iteratively reweighted weights from the base case (it would have been impossible to automate this process for each of the 5,000 realisations). It should be noted that reweighting can have major implications for fitting and parameter estimation and that each realisation may not be feasible, possibly explaining why some realisations did not converge. The degree to which this may or may not matter is model and data specific. As all realisations are afforded equal weight in determining distributions of outputs, there is in general need for care in interpreting MCB results. For menhaden, the SDNRs for all sensitivity tests are surprisingly good (except for one case) when runs are made using the base case weights. This is encouraging. However, this is no guarantee that for specific M and h combinations drawn from the pdfs, which may be incompatible, the base case weights would in any way be appropriate.

The RW was comfortable that the AW had fully explored uncertainty to the extent possible and that the characterisation of benchmark trajectories and hence stock status (ToR 3) are suitable for informing management decisions. I agree with this conclusion.

ToR 5 *Consider the research recommendations provided by the Data and Assessment workshops and make any additional recommendations or prioritizations warranted.*

- *Clearly denote research and monitoring that could improve the reliability of, and information provided by, future assessments.*
- *Provide recommendations on possible ways to improve the SEDAR process.*

The DW and AW made a number of research recommendations, as did the RW. The following represents my opinion as to the most useful research avenues.

Catch sampling appears to be highly biased. The assessment model only has a few ages of menhaden represented and the sampling bias could seriously influence outcomes, including status determination. Although it is not easy to fix existing biased data, more work on clarifying potential existing biases and on improving the sampling to reduce bias should be regarded as a high priority.

The RW noted that the Louisiana seine survey was used as a recruitment index for the menhaden in this assessment. Starting in late 2010, the state has reduced the sampling for this survey to a core set of stations on a quarterly basis due to budgetary reasons and to accommodate other priorities. Given the importance of this survey index to the assessment, the panel recommended that the survey return to the former sampling frequency and geographic coverage. I regard this as a high priority issue.

Difficulties with species identification in the TX, FL and AL gillnet surveys precluded their use in abundance indices. It is clear that if the difficulties could be overcome that adult and juvenile gillnet indices could be improved with respect to stock wide representation. Cost effective methods to improve species identification, including simple genetic approaches, could be usefully developed. I note that this needs to be additional to maintaining the Louisiana index (see above).

As noted at ToR 1 and by the RW, a number of issues were identified with ageing for menhaden including the lack of formal protocols for inter-reader comparisons and calibration/reference data sets. Given the short-lived nature of the fish, reader error of even one year can cause substantial bias in an age-based assessment. Given the pending retirement of the single ager, assessment of the accuracy of ageing and the establishment of formal protocols should be done as soon as possible.

The ToR asks for specific recommendations on how to improve the SEDAR process. As stated above, I consider the process to be well organised and administered and open and transparent. As with many similar processes, I am concerned that too much is attempted in too short a time

and was concerned at SEDAR 32 to hear that the original intention was to cover at least three stocks. From a reviewer perspective I think single stock reviews are the most valuable. I recognise, however, that considering two stocks allows for analysts to work on requests while review can continue. From a cost perspective that may be attractive, but I am unconvinced it creates value and may reduce it. I noted earlier that the terms of reference at least for CIE reviewers could usefully be clarified with respect to contributing to the Panel report and individual reports. I understood this to be an intention of the SEDAR organisers and would encourage it.

ToR 6 *Provide guidance on key improvements in data or modeling approaches which should be considered when scheduling the next assessment.*

The key issues for the single species Gulf menhaden assessment relate to signals about age compositions and selectivity. The detailed results of the Louisiana gillnet surveys (see AW Report Figure 5.44) suggest that there are larger and older fish in the fishery, at least as indicated by the catch sampling, which appears to be age-biased. The same figure also shows the wide range of net sizes used in the survey and the widely differing length distributions. It would be useful to account for the different mesh sizes in the development of a single stock index. Ideally, that index would also be developed to include data from the TX, FL and AL surveys following improved species identification. While a refined gillnet index would be useful, it is essential to improve the catch sampling to ensure that the assessment can compare unbiased population and fishery age compositions.

Perhaps more fundamentally, but depending on how the GSFMC sets goals and objectives, there may be a need to consider multispecies or ecosystem approaches to deal with the role of menhaden within the ecosystem.

GENERAL CONCLUSIONS AND RECOMMENDATIONS

Because of the wide scope (two stocks, consideration of both data collection and analysis, and stock assessment), it is highly likely that misinterpretation of some materials, presentations or discussions has been made. This is the fault of the reviewer, not of the many excellent STAT scientists who gave good presentations and made the review an enjoyable experience – to them, many thanks. Thanks also to the SEDAR organisers. The SEDAR system is well established, very well administered and transparent. I have seen it in action on a number of occasions and remain impressed.

Both assessments reviewed were carefully conducted and well reported. The Analytical Teams were clearly well on top of the many issues and provided excellent materials and presentations, as well as responding well to requests during the RW. It is clear that both teams (with much crossover) are well led, motivated and able.

The methods used are standard in the region but it is unclear why BAM and MCB are used in preference to other widely used and more integrated approaches. There is some risk in the BAM plus MCB approach, and it would be useful to see a clear explanation as to why it is used and what advantages or disadvantages may result. Putting this issue aside, the implementation of the BAM and MCB was robust and careful.

For Blueline tilefish I see two major issues. First, it is unclear if the standard dynamic pool model used is appropriate. The species is widely distributed but caught only patchily with spatial dominance of landings varying through time apparently in relation to effort distribution in other fisheries. Second, the only data available are fisheries related and are limited; it is hard conclusively to interpret these data. The generally limited data sets (restricted age data in time and across ages, uncertainty in age reading, non-overlapping and fishery dependent abundance indices) provide little information on M, which, in combination with stock-recruitment assumptions, is the key driver of stock status. Other issues are second order with regard to status determination and if any research or data priorities are made for the species, they should concentrate on these two major issues.

For Gulf of Mexico menhaden landings data are excellent but there is some concern about the limited fishery-independent information and bias in catch sampling. Difficulties with, and lack of clear protocols for, ageing also create potential biases. Nevertheless, the single species model has been well explored and appears to be reliable as a basis for informing decision-making once goals and objectives have been agreed. Against traditional single species standards, the fishery appears neither to be overfished nor experiencing overfishing. However, as a key low trophic level species in the Gulf ecosystem, it is unclear what goals and objectives will be set and what this might mean for the standards set and consequent status of menhaden.

APPENDIX 1

BIBLIOGRAPHY

Prior to the Workshop, extensive materials were provided *via* a dedicated, anonymous ftp server (ftp.safmc.net). The materials were extensive and relevant to all terms of reference in varying degrees.

During the workshop multiple presentations were given, and additional materials were provided on request, including further background documents and presentations as well as responses to Panel requests. All files were made available using the dedicated server, which was accessed using an open Wi-Fi connection throughout the meeting. Wi-Fi access was generally adequate.

REFERENCES

- Bousquet, N., T. Duchesne, and L. Rivest. 2008. Redefining the maximum sustainable yield for the Schaefer population model including multiplicative environmental noise. Journal of Theoretical Biology 254:65–75,
- Charnov, E.L., Gislason, H, and J.G. Pope. 2013. Evolutionary assembly rules for fish life histories. Fish and Fisheries 14:213-224
- Grimes, C. B., C. F. Idelberger, K. W. Able, and S. C. Turner. 1988. The reproductive biology of tilefish, Lopholatilus chamaeleonticeps Goode and Bean, from the United States Mid-Atlantic Bight, and the effects of fishing on the breeding system. Fish. Bull. 86:745–762.
- Fournier, D. and C.P. Archibald. 1982. A General Theory for Analyzing Catch at Age Data. Canadian Journal of Fisheries and Aquatic Sciences 39(8):1195-1207.
- Fournier, D., H. J. Skaug, J. Ancheta, J. Ianelli, A. Magnusson, M. N. Maunder, A. Nielsen, and J. Sibert. 2012. AD Model Builder: Using automatic differentiation for statistical inference of highly parameterized complex nonlinear models. Optimization Methods and Software 27(2):233-249.
- Francis, R.I.C.C. 2011. Data weighting in statistical fisheries stock assessment models. Canadian Journal of Fisheries and Aquatic Sciences 68:1124-1138.
- Harris, P.J., D.M. Wyanski, and P.T.P. Mikell. 2004. Age, growth, and reproductive biology of blueline tilefish along the southeastern coast of the United States, 1982-1999. Transactions of the American Fisheries Society 133:1190-1204.
- Lorenzen, K. 1996. The relationship between body weight and natural mortality in juvenile and adult fish: A comparison of natural ecosystems and aquaculture. Journal of Fish Biology 49:627-647.
- McBride, R.S., T.E. Vidal and S.X. Cadrin. 2013. Changes in size and age at maturity of the

northern stock of Tilefish (Lopholatilus chamaeleonticeps) after a period of overfishing. Fish. Bull. 111:161–174.

- Myers, RA, NJ Barrowman, R Hilborn, DG Kehler. 2002. Inferring Bayesian priors with limited direct data: application to risk analysis. North American Journal of Fisheries Management 22:351−364.
- Ross, J.L. and G.R. Huntsman. 1982. Age, growth and mortality of blueline tilefish from North Carolina and South Carolina. Transactions of the American Fisheries Society 111:585-592.
- Rudershausen, P.J., E.H. Williams, J.A. Buckel, J.C. Potts, and C.S. Manooch III. 2008. Comparison of reef fish catch-per-unit-effort and total mortality between the 1970s and 2005-2006 in Onslow Bay, North Carolina. Transactions of the American Fisheries Society 137:1389-1405.
- SEDAR, 2004. SEDAR 4: Stock Assessment of the Deepwater Snapper-Grouper Complex in the South Atlantic.
- Shertzer, K.W. and Conn, P.B. 2012. Spawner-Recruit Relationships of Demersal Marine Fishes: Prior Distribution of Steepness. Bulletin Marine Science 88:39-50

APPENDIX 2

Attachment A: Statement of Work for Dr. Kevin Stokes

External Independent Peer Review by the Center for Independent Experts

SEDAR 32 South Atlantic blueline tilefish and Gulf of Mexico menhaden assessment review

BACKGROUND

Scope of Work and CIE Process: The National Marine Fisheries Service's (NMFS) Office of Science and Technology coordinates and manages a contract providing external expertise through the Center for Independent Experts (CIE) to conduct independent peer reviews of NMFS scientific projects. The Statement of Work (SoW) described herein was established by the NMFS Project Contact and Contracting Officer's Representative (COR), and reviewed by CIE for compliance with their policy for providing independent expertise that can provide impartial and independent peer review without conflicts of interest. CIE reviewers are selected by the CIE Steering Committee and CIE Coordination Team to conduct the independent peer review of NMFS science in compliance the predetermined Terms of Reference (ToRs) of the peer review. Each CIE reviewer is contracted to deliver an independent peer review report to be approved by the CIE Steering Committee and the report is to be formatted with content requirements as specified in **Annex 1**. This SoW describes the work tasks and deliverables of the CIE reviewer for conducting an independent peer review of the following NMFS project. Further information on the CIE process can be obtained from www.ciereviews.org.

SCOPE

Project Description SEDAR 32 will be a compilation of data, an assessment of the stock, and an assessment review conducted for South Atlantic blueline tilefish and Gulf of Mexico menhaden. The CIE peer review is ultimately responsible for ensuring that the best possible assessment has been provided through the SEDAR process. The South Atlantic blueline tilefish stock is within the jurisdiction of the South Atlantic Fisheries Management Council and the state waters of North Carolina, South Carolina, Georgia, and Florida. The Gulf of Mexico menhaden stock is within the jurisdiction of the Gulf States Marine Fisheries Commission and the state waters of Texas, Louisiana, Mississippi, Alabama, and Florida. . The Terms of Reference (ToRs) of the peer review are attached in **Annex 2a and 2b**.

OBJECTIVES

Requirements for CIE Reviewers: Three CIE reviewers shall have the necessary qualifications to complete an impartial and independent peer review in accordance with the tasks and ToRs described in the SoW herein. The CIE reviewers shall have expertise in stock assessment, statistics, fisheries science, and marine biology sufficient to complete the tasks of the scientific peer-review described herein. Each CIE reviewer's duties shall not exceed a maximum of 14 days to complete all work tasks of the peer review described herein.

Location of Peer Review: Each CIE reviewer shall participate during a panel review meeting to conduct the independent peer review in Morehead City, North Carolina, from 27-30 August 2013.

Statement of Tasks: Each CIE reviewer shall complete the following tasks in accordance with the SoW and Schedule of Milestones and Deliverables herein.

Tasks prior to the meeting: The contractor shall independently select qualified reviewers that do not have conflicts of interest to conduct an independent scientific peer review in accordance with the tasks and ToRs within the SoW. Upon completion of the independent reviewer selection by the contractor's technical team, the contractor shall provide the reviewer information (full name, title, affiliation, country, address, email, and FAX number) to the contractor officer's representative (COR), who will forward this information to the NMFS Project Contact no later than the date specified in the Schedule of Milestones and Deliverables. The contractor shall be responsible for providing the SoW and stock assessment ToRs to each reviewer. The NMFS Project Contact will be responsible for providing the reviewers with the background documents, reports, foreign national security clearance, and other information concerning pertinent meeting arrangements. The NMFS Project Contact will also be responsible for providing the Chair a copy of the SoW in advance of the panel review meeting. Any changes to the SoW or ToRs must be made through the COR prior to the commencement of the peer review.

Foreign National Security Clearance: Foreign National Security Clearance will not be necessary for this review because the panel review meeting will be conducted at a non-governmental facility.

Pre-review Background Documents: Approximately two weeks before the peer review, the NMFS Project Contact will send (by electronic mail or make available at an FTP site) to the COR the necessary background information and reports (i.e., working papers) for the reviewers to conduct the peer review, and the COR will forward these to the contractor. In the case where the documents need to be mailed, the NMFS Project Contact will consult with the COR on where to send documents. The reviewers are responsible only for the pre-review documents that are delivered to the contractor in accordance to the SoW scheduled deadlines specified herein. The reviewers shall read all documents deemed as necessary in preparation for the peer review.

Tasks during the panel review meeting: Each reviewer shall conduct the independent peer review in accordance with the SoW and stock assessment ToRs, and shall not serve in any other role unless specified herein. **Modifications to the SoW and ToRs shall not be made during the peer review, and any SoW or ToRs modifications prior to the peer review shall be approved by the COR and contractor.** Each reviewer shall actively participate in a professional and respectful manner as a member of the meeting review panel, and their peer review tasks shall be focused on the stock assessment ToRs as specified herein. The NMFS Project Contact will be responsible for any facility arrangements (e.g., conference room for panel review meetings or teleconference arrangements). The NMFS Project Contact will also be responsible for ensuring that the Chair understands the contractual role of the reviewers as specified herein. The contractor can contact the COR and NMFS Project Contact to confirm any peer review arrangements, including the meeting facility arrangements.

Tasks after the panel review meeting: Each reviewer shall prepare an independent peer review report, and the report shall be formatted as described in **Annex 1**. This report should explain whether each stock assessment ToR was or was not completed successfully during the SEDAR meeting. If any existing BRP or their proxies are considered inappropriate, each independent report shall include recommendations and

justification for suitable alternatives. If such alternatives cannot be identified, then the report shall indicate that the existing BRPs are the best available at this time. Additional questions and pertinent information related to the assessment review addressed during the meetings that were not in the ToRs may be included in a separate section at the end of an independent peer review report.

Specific Tasks for CIE Reviewers: The following chronological list of tasks shall be completed by each CIE reviewer in a timely manner as specified in the **Schedule of Milestones and Deliverables**.

1) Conduct necessary pre-review preparations, including the review of background material and reports provided by the NMFS Project Contact in advance of the peer review.
2) Participate during the panel review meeting in Morehead City, North Carolina, from 27-30 August 2013.
3) Conduct an independent peer review in accordance with the ToRs (**Annex 2a and 2b**).
4) No later than September 13, 2013, each CIE reviewer shall submit an independent peer review report addressed to the "Center for Independent Experts," and sent to Mr. Manoj Shivlani, CIE Lead Coordinator, via email to shivlanim@bellsouth.net, and Dr. David Sampson, CIE Regional Coordinator, via email to david.sampson@oregonstate.edu. Each CIE report shall be written using the format and content requirements specified in Annex 1, and address each ToR in **Annex 2**.

Schedule of Milestones and Deliverables: CIE shall complete the tasks and deliverables described in this SoW in accordance with the following schedule.

22 July 2013	CIE sends reviewer contact information to the COR, who then sends this to the NMFS Project Contact
12 August 2013	NMFS Project Contact sends the stock assessment report and background documents to the CIE reviewers.
27-30 August 2013	Each reviewer participates during panel review meeting and conducts an independent peer review
13 September 2013	CIE reviewers submit draft CIE independent peer review reports to the CIE Lead Coordinator and CIE Regional Coordinator
27 September 2013	CIE submits CIE independent peer review reports to the COR
4 October 2013	The COR distributes the final CIE reports to the NMFS Project Contact and regional Center Director

Modifications to the Statement of Work: This 'Time and Materials' task order may require an update or modification due to possible changes to the terms of reference or schedule of milestones resulting from the fishery management decision process of the NOAA Leadership, Fishery Management Council, and Council's SSC advisory committee. A request to modify this SoW must be approved by the Contracting Officer at least 15 working days prior to making any permanent changes. The Contracting Officer will notify the COR within 10 working days after receipt of all required information of the decision on

changes. The COR can approve changes to the milestone dates, list of pre-review documents, and ToRs within the SoW as long as the role and ability of the CIE reviewers to complete the deliverable in accordance with the SoW is not adversely impacted. The SoW and ToRs shall not be changed once the peer review has begun.

Acceptance of Deliverables: Upon review and acceptance of the CIE independent peer review reports by the CIE Lead Coordinator, Regional Coordinator, and Steering Committee, these reports shall be sent to the COR for final approval as contract deliverables based on compliance with the SoW and ToRs. As specified in the Schedule of Milestones and Deliverables, the CIE shall send via e-mail the contract deliverables (CIE independent peer review reports) to the COR (William Michaels, via William.Michaels@noaa.gov).

Applicable Performance Standards: The contract is successfully completed when the COR provides final approval of the contract deliverables. The acceptance of the contract deliverables shall be based on three performance standards:
(1) The CIE report shall completed with the format and content in accordance with **Annex 1**,
(2) The CIE report shall address each ToR as specified in **Annex 2**,
(3) The CIE reports shall be delivered in a timely manner as specified in the schedule of milestones and deliverables.

Distribution of Approved Deliverables: Upon acceptance by the COR, the CIE Lead Coordinator shall send via e-mail the final CIE reports in *.PDF format to the COR. The COR will distribute the CIE reports to the NMFS Project Contact and Center Director.

Support Personnel:

William Michaels, Program Manager, COR
NMFS Office of Science and Technology
1315 East West Hwy, SSMC3, F/ST4, Silver Spring, MD 20910
William.Michaels@noaa.gov Phone: 301-427-8155

Manoj Shivlani, CIE Lead Coordinator
Northern Taiga Ventures, Inc.
10600 SW 131st Court, Miami, FL 33186
shivlanim@bellsouth.net Phone: 305-383-4229

Roger W. Peretti, Executive Vice President
Northern Taiga Ventures, Inc. (NTVI)
22375 Broderick Drive, Suite 215, Sterling, VA 20166
RPerretti@ntvifederal.com Phone: 571-223-7717

Key Personnel:
NMFS Project Contact:

Julia Byrd, SEDAR Coordinator
4055 Faber Place Drive, Suite 201
North Charleston, SC 29405
julia.byrd@safmc.net Phone: 843-571-4366

Annex 1: Format and Contents of CIE Independent Peer Review Report

1. The CIE independent report shall be prefaced with an Executive Summary providing a concise summary of the findings and recommendations, and specify whether the science reviewed is the best scientific information available.

2. The main body of the reviewer report shall consist of a Background, Description of the Individual Reviewer's Role in the Review Activities, Summary of Findings for each ToR in which the weaknesses and strengths are described, and Conclusions and Recommendations in accordance with the ToRs. The CIE independent report shall be a stand-alone document for others to understand the weaknesses and strengths of the science reviewed. The CIE independent report shall be an independent peer review of each ToRs.

3. The reviewer report shall include the following appendices:

   Appendix 1: Bibliography of materials provided for review
   Appendix 2: A copy of the CIE Statement of Work

Annex 2a: Terms of Reference for the Peer Review

SEDAR 32 South Atlantic blueline tilefish assessment review

1. Evaluate the data used in the assessment, addressing the following:
   e) Are data decisions made by the Data Workshop and Assessment Workshop sound and robust?
   f) Are data uncertainties acknowledged, reported, and within normal or expected levels?
   g) Are data applied properly within the assessment model?
   h) Are input data series reliable and sufficient to support the assessment approach and findings?
2. Evaluate the methods used to assess the stock, taking into account the available data.
   d) Are methods scientifically sound and robust?
   e) Are assessment models configured properly and used consistent with standard practices?
   f) Are the methods appropriate for the available data?
3. Evaluate the assessment findings with respect to the following:
   f) Are abundance, exploitation, and biomass estimates reliable, consistent with input data and population biological characteristics, and useful to support status inferences?
   g) Is the stock overfished? What information helps you reach this conclusion?
   h) Is the stock undergoing overfishing? What information helps you reach this conclusion?
   i) Is there an informative stock recruitment relationship? Is the stock recruitment curve reliable and useful for evaluation of productivity and future stock conditions?
   j) Are the quantitative estimates of the status determination criteria for this stock reliable? If not, are there other indicators that may be used to inform managers about stock trends and conditions?
4. Evaluate the stock projections, addressing the following:
   h) Are the methods consistent with accepted practices and available data?
   i) Are the methods appropriate for the assessment model and outputs?
   j) Are the results informative and robust, and useful to support inferences of probable future conditions?
   k) Are key uncertainties acknowledged, discussed, and reflected in the projection results?
5. Consider how uncertainties in the assessment, and their potential consequences, are addressed.
   - Comment on the degree to which methods used to evaluate uncertainty reflect and capture the significant sources of uncertainty in the population, data sources, and assessment methods
   - Ensure that the implications of uncertainty in technical conclusions are clearly stated.
6. Consider the research recommendations provided by the Data and Assessment workshops and make any additional recommendations or prioritizations warranted.

- Clearly denote research and monitoring that could improve the reliability of, and information provided by, future assessments.
- Provide recommendations on possible ways to improve the SEDAR process.

7. Provide guidance on key improvements in data or modeling approaches which should be considered when scheduling the next assessment.
8. Prepare a Peer Review Summary summarizing the Panel's evaluation of the stock assessment and addressing each Term of Reference. The CIE reviewers are contracted to conduct an independent peer review, therefore the contractual responsibilities of the CIE reviewers do not include the preparation of the Peer Review Summary.
   - Each CIE reviewer may assist the Chair of the panel review meeting with contributions to the Summary Report, based on the terms of reference of the review.
   - Each CIE reviewer is not required to reach a consensus, and should provide a brief summary of the reviewer's views on the summary of findings and conclusions reached by the review panel in accordance with the ToRs.

The panel shall ensure that corrected estimates are provided by addenda to the assessment report in the event corrections are made in the assessment, alternative model configurations are recommended, or additional analyses are prepared as a result of review panel findings regarding the TORs above.

Annex 2b: Terms of Reference for the Peer Review

SEDAR 32A Gulf of Mexico menhaden assessment review

1. Evaluate the data used in the assessment, addressing the following:
   a) Are data decisions made by the Assessment Workshop sound and robust?
   b) Are data uncertainties acknowledged, reported, and within normal or expected levels?
   c) Are data applied properly within the assessment model?
   d) Are input data series reliable and sufficient to support the assessment approach and findings?
2. Evaluate the methods used to assess the stock, taking into account the available data.
   a) Are methods scientifically sound and robust?
   b) Are assessment models configured properly and used consistent with standard practices?
   c) Are the methods appropriate for the available data?
3. Evaluate the assessment findings with respect to the following:
   a) Are abundance, exploitation, and biomass estimates reliable, consistent with input data and population biological characteristics, and useful to support status inferences?
   b) Is the stock overfished? What information helps you reach this conclusion?
   c) Is the stock undergoing overfishing? What information helps you reach this conclusion?
   d) Is there an informative stock recruitment relationship? Is the stock recruitment curve reliable and useful for evaluation of productivity and future stock conditions?
   e) Are the quantitative estimates of the status determination criteria for this stock reliable? If not, are there other indicators that may be used to inform managers about stock trends and conditions?
4. Consider how uncertainties in the assessment, and their potential consequences, are addressed.
   - Comment on the degree to which methods used to evaluate uncertainty reflect and capture the significant sources of uncertainty in the population, data sources, and assessment methods
   - Ensure that the implications of uncertainty in technical conclusions are clearly stated.
5. Consider the research recommendations provided by the Assessment workshop and make any additional recommendations or prioritizations warranted.
   - Clearly denote research and monitoring that could improve the reliability of, and information provided by, future assessments.
   - Provide recommendations on possible ways to improve the SEDAR process.
6. Provide guidance on key improvements in data or modeling approaches which should be considered when scheduling the next assessment.
7. Prepare a Peer Review Summary summarizing the Panel's evaluation of the stock assessment and addressing each Term of Reference. The CIE reviewers are contracted to conduct an independent

peer review, therefore the contractual responsibilities of the CIE reviewers do not include the preparation of the Peer Review Summary.

- Each CIE reviewer may assist the Chair of the panel review meeting with contributions to the Summary Report, based on the terms of reference of the review.
- Each CIE reviewer is not required to reach a consensus, and should provide a brief summary of the reviewer's views on the summary of findings and conclusions reached by the review panel in accordance with the ToRs.

The panel shall ensure that corrected estimates are provided by addenda to the assessment report in the event corrections are made in the assessment, alternative model configurations are recommended, or additional analyses are prepared as a result of review panel findings regarding the TORs above.

Annex 3: Tentative Agenda

SEDAR 32/32A South Atlantic Blueline Tilefish and Gulf of Mexico Menhaden Review Workshop

Morehead City, NC August 27-30, 2013

Tuesday

9:00 a.m. Convene

9:00a.m. – 9:30a.m. Introductions and Opening Remarks **Coordinator**

- Agenda Review, TOR, Task Assignments

9:30a.m. – 12:00p.m. Assessment Presentation and Discussion (BLT*) TBD

12:00p.m. – 1:30p.m. Lunch Break

1:30 p.m. - 3:30 p.m. Panel Discussion **Chair**

- *Assessment Data & Methods*

- Identify additional analyses, sensitivities, corrections

3:30p.m. – 3:45 p.m. Break

3:30 p.m. - 5:00 p.m. Panel Discussion **Chair**

-Continue deliberations

5:00p.m. – 6:00p.m. Panel Work Session **Chair**

***Tuesday Goals*:** Initial BLT* presentation completed, sensitivities and modifications identified.

Wednesday

8:30 a.m. – 12:00 p.m. Assessment Presentation and Discussion (GM) TBD**

12:00 a.m. – 1:30 p.m. Lunch Break

1:30 p.m. - 3:30 p.m. Panel Discussion **Chair**

- *Assessment Data & Methods*

- Identify additional analyses, sensitivities, corrections

3:30p.m. – 3:45 p.m. Break

3:30 p.m. - 5:00 p.m. Panel Discussion **Chair**

-Continue deliberations

5:00p.m. – 6:00p.m. Panel Work Session **Chair**

***Wednesday Goals*:** Initial GM** presentation completed, sensitivities and modifications identified.

Thursday

8:30 a.m. – 12:00 p.m. Panel Discussion **Chair**

- Review additional analyses, sensitivities

12:00 a.m. – 1:30 p.m. Lunch Break

1:30 p.m. – 3:30 p.m. Panel Discussion **Chair**

-Continue deliberations

3:30 p.m. – 3:45 p.m. Break

3:45 p.m. – 5:00 p.m. Panel Discussion **Chair**

-Consensus recommendations and comments

5:00 p.m. - 6:00 p.m. Panel Work Session **Chair**

Thursday Goals: Final sensitivities identified, preferred models selected, projection approaches approved, Summary report drafts begun.

Friday

8:00 a.m. – 10:30 a.m. Panel Discussion **Chair**

- Review additional analyses, final sensitivities

- Projections reviewed.

10:30 a.m. – 10:45 p.m. Break

10:45 a.m. – 1:00 p.m. Panel Discussion or Work Session **Chair**

- Review Consensus Reports

1:00 p.m. ADJOURN

Friday Goals: Complete assessment work and discussions. Final results available. Draft Summary Report reviewed.

* BLT = South Atlantic blueline tilefish **GM = Gulf of Mexico menhaden

APPENDIX 3
PERTINENT INFORMATION FROM THE REVIEW

1) Participants List

Review Workshop Panelists

Steve Cadrin	Review Panel Chair	SAFMC SSC
Churchill Grimes	Reviewer	SAFMC SSC
Will Patterson	Reviewer	GSMFC Appointee
Gary Melvin	Reviewer	CIE
Stephen Smith	Reviewer	CIE
Kevin Stokes	Reviewer	CIE

Analytical Team

Kevin Craig	Lead analyst, SA BLT	NMFS Beaufort
Amy Scheuller	Lead analyst, GoM menhaden	NMFS Beaufort
Kyle Shertzer	Assessment Team	NMFS Beaufort
Erik Williams	Assessment Team	NMFS Beaufort
Katie Andrew	Assessment Team	NMFS Beaufort
Rob Cheshire	Assessment Team	NMFS Beaufort
Robert Leaf	Assessment Team	USM

Observers

Dewey Hemilright	Fishing Industry	Commercial, NC
Robert Johnson	Fishing Industry	Charter/Headboat, FL

Council Representative

Michelle Duval	Council Member	SAFMC

Council and Agency Staff

Julia Byrd	SEDAR Coordinator	SEDAR
Julie O'Dell	Administration	SEDAR/SAFMC
Michael Errigo	Fishery Biologist	SAFMC Staff
Steve VanderKooy	IJF Program Coordinator	GSMFC
Jessica Stephen	Fishery Biologist	SERO
Brian Langseth	Observer	SEFSC Beaufort
Joe Smith	Observer	NOAA

GSMFC Menhaden Advisory Committee

John Mareska, ADCNR-MRD
Behzad Mahmoud, FL FWC

Jerry Mambretti, TPWD
Borden Wallace, Daybrook Fisheries
Ron Lukens, Omega Protein, Inc.
Matt Hill, MDMR
Harry Blanchet, LDWF