SEDAR

Southeast Data, Assessment, and Review

SEDAR 25

South Atlantic Tilefish

SECTION V: Review Workshop Report

October 2011

SEDAR
4055 Faber Place Drive, Suite 201
North Charleston, SC 29405

Section V: Review Workshop Report

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1 Introduction

1.1 Workshop Time and Place

The SEDAR 25 Review Workshop was held October 11-13, 2011, in North Charleston, SC.

1.2 Terms of Reference

1. Evaluate the adequacy, appropriateness, and application of data used in the assessment.

2. Evaluate the adequacy, appropriateness, and application of methods used to assess the stock.

3. Recommend appropriate estimates of stock abundance, biomass, and exploitation.

4. Evaluate the methods used to estimate population benchmarks and management parameters (*e.g., MSY, Fmsy, Bmsy, MSST, MFMT, or their proxies*); recommend appropriate management benchmarks, provide estimated values for management benchmarks, and provide declarations of stock status.

5. Evaluate the adequacy, appropriateness, and application of the methods used to project future population status; recommend appropriate estimates of future stock condition (e.g., exploitation, abundance, biomass).

6. Evaluate the adequacy, appropriateness, and application of methods used to characterize uncertainty in estimated parameters. Provide measures of uncertainty for estimated parameters. Comment on the degree to which methods used to evaluate uncertainty reflect and capture the significant sources of uncertainty. Ensure that the implications of uncertainty in technical conclusions are clearly stated.

7. Ensure that stock assessment results are clearly and accurately presented in the Stock Assessment Report and that reported results are consistent with Review Panel recommendations.*

8. Evaluate the SEDAR Process as applied to the reviewed assessment and identify any Terms of Reference which were inadequately addressed by the Data or Assessment Workshops.

9. Consider the research recommendations provided by the Data and Assessment workshops and make any additional recommendations or prioritizations warranted. Clearly denote research and monitoring needs that could improve the reliability of future assessments. Recommend an appropriate interval for the next assessment, and whether a benchmark or update assessment is warranted.

10. Prepare a Peer Review Summary summarizing the Panel's evaluation of the stock assessment and addressing each Term of Reference. Develop a list of tasks to be completed following the workshop. Complete and submit the Peer Review Summary Report no later than TBD.

* 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.

1.3 List of Participants

Appointee	Function	Affiliation
REVIEW PANEL		
Anne Lange	Review Panel Chair	SAFMC SSC
Michael Bell	Reviewer	CIE
Jim Berkson	Reviewer	SAFMC SSC
Steve Cadrin	Reviewer	SAFMC SSC
Paul Medley	Reviewer	CIE
Michael Smith	Reviewer	CIE
ASSESSMENT WORKSHOP REPRESENTATIVES		
Kyle Shertzer	Lead analyst, BSB	SEFSC Beaufort
Erik Williams	Lead analyst, GT	SEFSC Beaufort
Rob Cheshire	Data compiler, GT	SEFSC Beaufort
Eric Fitzpatrick	Data compiler, BSB	SEFSC Beaufort
Kate Andrews	Assessment team, GT	SEFSC Beaufort
Kevin Craig	Assessment team, BSB	SEFSC Beaufort
COUNCIL REPRESENTATIVES		
Tom Burgess	Council member	SAFMC
Ben Hartig	Council member	SAFMC
STAFF & AGENCY		
Kari Fenske	Coordinator	SEDAR
Rachael Silvas	Administrative assistant	SEDAR
Tyree Davis	IT support	SEFSC Miami
Myra Brouwer		SAFMC
John Carmichael		SAFMC
Brian Cheuvront		SAFMC
Mike Errigo		SAFMC
Julie Neer		SEDAR
Bonnie Ponwith		SEFSC Miami
Jessica Stephen		SERO
Gregg Waugh		SAFMC
OBSERVERS		
Joey Ballenger		
Peter Barile		
Rusty Hudson		
Marcel Reichert		
Helen Takade-Heumacher		
Renzo Tascheri		
Tracey Smart		

1.4 List of Review Workshop Working Papers & Documents

Documents Prepared for the Review Workshop		
SEDAR25-RW01	Comments and notes received during the data, assessment and review for SEDAR 25	Multiple authors
SEDAR25-RW02	Comments and notes received during the assessment and review for SEDAR 25	Multiple authors
SEDAR25-RW03	The Beaufort Assessment Model (BAM) with application to black sea bass: model description, implementation details, and computer code	Sustainable Fisheries Branch, NMFS 2011
SEDAR25-RW04	The Beaufort Assessment Model (BAM) with application to tilefish: model description, implementation details, and computer code	Sustainable Fisheries Branch, NMFS 2011
SEDAR25-RW05	Development and diagnostics of the Beaufort assessment model applied to black sea bass	Sustainable Fisheries Branch, NMFS 2011
SEDAR25-RW06	Development and diagnostics of the Beaufort assessment model applied to tilefish	Sustainable Fisheries Branch, NMFS 2011
SEDAR25-RW07	Use of MARMAP age compositions in SEDAR 25 – Methods of addressing sub-sampling concerns from SEDAR 2 and SEDAR 17	Ballenger, Reichert, and Stephen, 2011
SEDAR25-RW08	Fisheries management actions confound the ability of the Beaufort Assessment Model (BAM) to explain dynamics of the Golden Tilefish fishery off of east Florida	Hull and Barile, 2011
SEDAR25-RW09	A note on the use of flat-topped selectivity curves in SEDAR 25	Hull and Hester, 2011
SEDAR25-RW10	On steepness	Hull and Hester, 2011
SEDAR25-RW11	Some considerations of area interactions	Hull and Hester, 2011

2. Review Panel Report

The South Atlantic tilefish stock assessment presented by the SEDAR 25 Assessment Workshop (AW) provided the Review Panel (RP) with outputs and results from two statistical assessments models. The primary model was the Beaufort Assessment Model (BAM), while a secondary, surplus-production model (ASPIC) provided a comparison of model results. Based on the assessment provided, the RP concludes that the stock is not overfished and not subject to overfishing. The current level of spawning stock biomass (SSB_{2010}) is estimated to be well above MSST (SSB_{2010}/MSST = 2.43), and the current level of fishing is slightly higher than one-third of F_{MSY} ($F_{2008\text{-}2010}/F_{MSY}$ = 0.36). Both estimates appear robust across Monte Carlo/bootstrap (MCB) trials and sensitivity analyses, however it should be noted that the base run tended to result in high SSB_{2010}/MSST and low $F_{2008\text{-}2010}/F_{MSY}$ values relative to the central tendency of values from both the MCB runs (i.e. the base run does not equal the mode or the mean of the MCB values) and the sensitivity analyses. However, there were significant areas of uncertainty identified both in the data and in components of the model. The most significant sources of this uncertainty include the lack of a reliable fishery independent index of abundance, and the spawner-recruit relationship (e.g. steepness could not be estimated reliably). Results of the ASPIC model qualitatively agreed with those of the BAM model.

The terms of reference from the Data Workshop (DW) and AW were met.

2.1. Terms of Reference

2.1.1. Evaluate the adequacy, appropriateness, and application of data used in the assessment.

Stock definition for South Atlantic tilefish remains unchanged from SEDAR 4, extending from the North Carolina/Virginia border in the north to the Florida Keys in the south. The RP noted that the northern boundary is confirmed by a recent assessment for the Mid-Atlantic/Southern New England stock indicating slower growth and later sexual maturity to the north of this location. The RP supported the choice of updated values for several life-history parameters underlying the assessment. These included modeling natural mortality as an inverse function of length, scaled to a higher value than previously used based on downward revision of age determinations since SEDAR4. Growth appears to vary between males and females, but lack of data on sex composition of catches dictated the use of a combined sex growth curve for most purposes. Also for this reason, population sex ratios were treated as fixed at 50:50. Spawning biomass was measured in terms of female gonad weight. Paucity of data on immature fish precludes calculation of a parametric maturity ogive for female tilefish and the RP accepted the use of assumptions about maturity at age recommended from the DW, based on limited data.

Tilefish landings are dominated by the commercial longline fleet, with some handline landings and a small proportion contributed by recreational fishing. The RP supported separate treatment of these three fleets in the assessment. Data on length and age composition of landings were incorporated in the age-based BAM model. Data were selected for inclusion avoiding double

counting of fish that were both aged and measured but giving primacy to age compositions. Two abundance indices were developed for the assessment. Standardized CPUE from the commercial longline fleet provided the most information (1993 onwards). A fishery-independent index based on MARMAP longline data provided data back to the mid-1980s, but small sample sizes led to low confidence in estimates for individual years. The RP supported the use of 4-year blocks (2-year block for the most recent two years) for inclusion of the MARMAP indices in the assessment models. Some conflicts about trends in stock abundance were seen between the commercial longline and MARMAP indices. The RP noted that the bulk of the fishery occurs off north Florida, well represented in the commercial longline index, whereas MARMAP data pertain to the Carolinas, north of most of the fishery. This disparity possibly accounts partly for differences in trend between the indices. Little is otherwise known about the spatial distribution of the fishery and the stock. Fishery logbook data do not provide good spatial definition, being based on 10 minute blocks. Limited tagging data suggest little movement of adults, but there is generally a lack of information on movement and migration.

Overall, the RP concluded that, whilst there are limitations in what is known about tilefish life-history, and limited data from which to draw conclusions about stock trends, such data as are available have been used appropriately and the assessment makes best use of them.

2.1.2. Evaluate the adequacy, appropriateness, and application of methods used to assess the stock.

The BAM was used as the principal assessment method. It is an age-structured population assessment model implemented using ADMB. This permitted the use of all available types of data, including total annual landings and discards, age and length compositions, and indices of biomass abundance.

The model was fitted to the data using appropriate methods. The model uses lognormal likelihood to fit to abundance indices and catches, and the multinomial likelihood to fit to compositions. The fitting criterion was a penalized likelihood approach, with additional penalty functions to avoid unrealistic results and give higher weight to abundance indices. These penalties generally only applied during some of the Monte Carlo simulations and avoided numerical errors.

Not all data series were complete for the assessment time period and some data were not used. Where data were absent, such as landings or discards data missing from some fleets early in the time series, reasonable decisions were made in filling these gaps to allow the model to fit. Where age and length composition data occurred in the same stratum, only the age data were used to avoid “double counting” the same sample.

The treatment of the data and the relative importance given to the various components were appropriate:

- The landings and discards are fitted very closely (effectively exactly), because they are measured with relatively high accuracy.
- Annual CVs for the landings and discard components were fixed small values, and for the annual values abundance indices were derived from the delta-lognormal GLM used to standardise the indices.
- The effective multinomial observation variance was based on sample size as number of trips rather than numbers of individual fish measured, because fish within the same trip are not independent.
- The weights between the likelihood components were fitted using an iterative scheme, but which actively maintained appropriate fits to the indices and did not allow the compositions to dominate the likelihood.

The model structure was adequate to capture the main patterns in the data:

- Selectivity was modelled as a logistic function of age. The RP discussed the possibility of dome-shape selectivity, but no mechanism for dome-shaped selectivity was identified (e.g. gear, selectivity, spatial availability or ontogenetic movement of exploited sizes).
- Model estimates of abundance indices were conditional on selectivity of the corresponding fleet or survey and were computed from abundance or biomass (as appropriate) at the midpoint of the year.
- For the base model, time invariant catchability was assumed within blocks, although some reasonable alternative sensitivity scenarios were considered where catchability was allowed to change.
- Uncertainty in model results was evaluated using sensitivity analyses and Monte Carlo bootstraps.

Some improvements in the model might be possible in future. For example, lengths might be fitted within the model conditional upon age in those cases where both age and length are present. However, it is not expected that such improvements would have significant impact of the model results.

While there might be other important processes in the stock dynamics, such as spatial changes (e.g. local depletion), there are not sufficient data to support including these in the stock assessment at this time.

The RP concluded that the BAM was appropriate for the data and adequate for providing management advice.

An alternative biomass dynamics stock assessment was carried out using the software ASPIC. Biomass dynamics models require fewer parameters and fit only to the total catch weight and abundance indices. This assessment also used a bootstrap to characterize uncertainty, but

considered fewer sources of uncertainty than the BAM model and thus provided narrower confidence intervals around estimates.

The biomass dynamics model was considered as a confirmatory analysis, because the BAM alternative made effective use of additional data and represented a more detailed investigation of population dynamics. However, the ASPIC model provided a useful comparison with the BAM results, which it broadly supports, showing the similar status of the stock in relation to MSY benchmarks.

2.1.3. Recommend appropriate estimates of stock abundance, biomass, and exploitation.

The RP accepted estimates from the base run of the BAM as final estimates of spawning stock biomass (SSB – measured in terms of gonad weight) and fishing mortality (F). The assessment indicated that SSB_{2010} was substantially higher than SSB_{MSY} (and therefore also substantially higher than MSST) and $F_{2008\text{-}2010}$ was substantially lower than F_{MSY}. It was noted, however, that expressed on a relative scale these estimates were optimistic compared with the central tendency of estimates from uncertainty (MCB) runs. The same applies in relation to the outcomes of sensitivity analyses, but it is worth noting that not all sensitivity runs should be considered as valid alternatives to the base run.

A biomass dynamic assessment (ASPIC) based on the same indices and landings data generated the same general pattern of relative outcomes as the BAM base model run, although the absolute estimates differ. Given the broad level of consistency also between the base run and sensitivity runs in terms of the relative positions of estimates and reference points (differences in central tendency notwithstanding), the RP concurred that SSB_{2010} was likely above SSB_{MSY} and MSST and $F_{2008\text{-}2010}$ was likely below F_{MSY}, but absolute values of biomass, fishing mortality and their reference points remain uncertain (see 2.1.4).

2.1.4. Evaluate the methods used to estimate population benchmarks and management parameters (*e.g., MSY,* F_{MSY}*,* B_{MSY}*, MSST, MFMT, or their proxies*); recommend appropriate management benchmarks, provide estimated values for management benchmarks, and provide declarations of stock status.

The RP supports the approach of estimating MSY reference points and derived management benchmarks using equilibrium expectations derived from the base model (BAM).

- MSY=638k lb whole weight
- F_{MSY}=0.185
- B_{MSY}=2918mt=6.4M lb whole weight
- SSB_{MSY}=25.3mt gonad weight
- MSST=22.6mt gonad weight

Several aspects of reference point estimation were discussed related to estimates of steepness and comparison to the biomass dynamics model.

F_{MSY} is largely determined by steepness of the stock-recruitment relationship. Steepness could not be freely estimated, largely because of the estimate of strong recruitment produced at low stock size (though the strong recruitment is not consistently supported in the age composition data). Therefore, steepness was assumed to be 0.84 based on a meta-analysis of fishes with similar life histories. The AW explored several alternatives in an attempt to estimate steepness, including increasingly greater weights on the prior distribution of steepness from the meta-analysis and increasing weights on the stock-recruitment penalty function to force the estimate of 2000 yearclass to be less of a positive deviation. Sensitivity analyses with increased penalties were rejected by the AW because those models did not fit the commercial longline index well. (see Section 2.2)

Relative stock status (F/F_{MSY} and B/B_{MSY}) is generally consistent between the age-based assessment and a biomass dynamics model (ASPIC). However, absolute reference points and population estimates were less consistent: ASPIC had greater MSY (965k lb), greater F_{MSY} (0.26) and lower B_{MSY} (3.7M lb) estimates (see Section 2.2). The Review Workshop agreed that the age-based analysis (BAM) provided more informative reference point estimates than the biomass dynamics model, but relative stock status may be more reliable than absolute estimates for both models.

2.1.5. Evaluate the adequacy, appropriateness, and application of the methods used to project future population status; recommend appropriate estimates of future stock condition (e.g., exploitation, abundance, biomass).

The MCB methodology for carrying out projections for tilefish involved generating a large number of replicate projections by sampling from the MCB assessment runs, in each case stochastically projecting forward the terminal populations at age and fishing mortality.

The MCB incorporated stochasticity on natural mortality, stock recruit parameters, selectivity curves and abundance at age (for ages >7). Variability was added to ages 2-7 of the initial population numbers because the assessment assumed no recruitment deviation for years 2004-2010. Recruitment variation was provided by randomly sampling multiplicative residuals from the SR fit for each MCB run and applying them to the SR fit expected values. Initial populations were the point estimates for 2010 abundance at age and fishing mortality was the geometric mean of the last 3 years of the assessment period (2008-2010). Management consisted of 5 fixed F scenarios (F_{MSY}, $F_{current}$, 65%F_{MSY}, 75%F_{MSY} and 85%F_{MSY}) applied from 2012 to 2030 and the intermediate year (2011) was projected forward using current F (0.067).

The RP agreed that the MCB approach as outlined in the report is rational and appropriate, constituting current best practice and providing a good basis for projection. However, the RP

also agreed with the assessment experts that the plausibility of the exceptionally strong 2000 year class was questionable and that this model estimate may reflect several stronger year classes and/or ageing errors rather than a single dominant year class.

The RP asked whether the sampling of recruitment residuals resulted in uncharacteristically large recruitments being carried forward into the projection. It was pointed out that highly skewed CIs for recruitment and other output variables suggested this was the case but that the nonparametric approach had nevertheless been considered more appropriate given the poor SR fit.

The RP agreed that despite some issues with the SR relationship the projections provided appropriate estimates of future stock condition.

2.1.6. Evaluate the adequacy, appropriateness, and application of methods used to characterize uncertainty in estimated parameters. Provide measures of uncertainty for estimated parameters. Comment on the degree to which methods used to evaluate uncertainty reflect and capture the significant sources of uncertainty. Ensure that the implications of uncertainty in technical conclusions are clearly stated.

MCB was carried out using the BAM base run. A penalty function was added to the likelihood to limit the number of runs tending to unreasonably high fishing mortality (F>1.0). Observed data for landings, discards and abundance indices were bootstrapped parametrically by applying multiplicative lognormal errors based on their CVs. Uncertainty in age and length compositions was provided by randomly sampling (with replacement) fish from the original data using the sample cell probabilities following a multinomial process. The number of fish drawn was the same as in the original data for each year and data source and the effective sample size (number of trips) was retained. Fixed input parameters (natural mortality, weightings on abundance indices and the SR steepness parameter) were drawn at random from distributions derived by Monte Carlo simulation and centered around the base run fixed input values. The distribution for natural mortality consisted of a truncated normal, weightings for indices were drawn from a uniform distribution and the SR steepness parameter was drawn from a beta distribution and the SR steepness parameter was drawn from a beta distribution. A more detailed specification is provided in the AW report.

Twenty four sensitivity runs were carried out to investigate alternative BAM model configurations including alternative values for M, steepness, model weightings, catchability increasing through time, removal of each abundance index, splitting selectivity in various years, time varying L50 for selectivity, a random walk in commercial longline catchability and removing longline age compositions in 2004-2006. Eight of the sensitivity runs were retrospective analyses sequentially removing data back to 2003.

Results from the sensitivity runs were all qualitatively similar to the base run, indicative of overfishing not occurring and the stock not being overfished. However, the base run was with one exception the most optimistic of the sensitivity runs. This concurs with results from the MCB analysis, the central tendency of which showed lower SSB_{2010} estimates relative to MSST and higher $F_{2008\text{-}2010}$ estimates relative to F_{MSY} compared with the base run. Retrospective analyses did not indicate strong bias associated with the most recent data points.

The RP agreed that the MCB approach as outlined in the report provided a rational and appropriate method for estimating and quantifying uncertainty in the assessment output metrics and projections. The report recognized that this will not acknowledge all sources of uncertainty and that possible covariances between input random variables may not be accounted for.

A series of sensitivity runs examining the impacts of different model configurations provided a comparative analysis of structural uncertainty in model outputs. Outputs presented included terminal status estimates (tabulated and SSB/MSST versus F/F_{MSY} phase plot) and the recruitment time series.

The use of two different models (ASPIC and BAM) provided a further comparison between different population dynamics models applied to very similar data.

The RP noted some inconsistencies and uncertainties including:

i) the exceptional 2000 year class, which both the RP and assessment experts felt was questionable and possibly related to several strong year classes and aging errors,

ii) the probability density distribution for the stock recruitment parameter, R0, indicated that R0 was substantially biased from the mode, whilst the steepness parameter needed to be fixed *a priori* for the base run,

iii) modes of probability density distributions for MSY benchmarks also tended to depart from the deterministic values, in particular F_{MSY} where the mode was substantially below the point estimate,

iv) the MCB phase plot (Fig 3.26) showed that although the majority of runs fell in the SSB>MSST and $F<F_{MSY}$ region, a significant proportion also fell in the over-fishing region and many of these also indicated that SSB was over-fished. The base run estimate was not central to the MCB distribution, being optimistic for both SSB and F.

v) the sensitivity runs also indicated that the base run was optimistic in relation to other BAM configurations, although deterministic outputs for all runs were in the SSB>MSST and F<FMSY region.

vi) ASPIC produced qualitatively similar results, but with narrow CIs on biomass and F relative to MSY reference points.

The RP commented on the difficulties with fitting the stock recruitment relationship and asked about the attempts made by the AW to fit the steepness parameter. They requested that the SR penalty be increased to evaluate the sensitivity to this. This output was produced (Table 1, Section 2.2) and showed that increasing the SR weighting resulted in a deterioration in the likelihoods for fitting the commercial longline abundance index and to a lesser extent the commercial longline age compositions.

The RP discussed the ability of the BAM to support a P* approach to setting ABC or OFL and concluded that the MCB provided a characterization of the uncertainty as a whole and was suitable.

The RP commented that the SR curve was rather flat and asked for a comparison of productivity between the BAM and ASPIC models. The lead assessor undertook additional analyses showing comparative production curves for the two models (see Section 2.2). Both these are to some extent predicated by assumptions regarding initial biomasses, set close to unfished levels in both cases, and functional forms of models, with ASPIC having a fixed functional form (logistic), while the BAM is driven by the Beverton and Holt SR function. Although they produce different absolute outputs they are similar in terms of status relative to MSY reference points.

2.1.7. Ensure that stock assessment results are clearly and accurately presented in the Stock Assessment Report and that reported results are consistent with RP recommendations.

The RP felt that the workshop reports were extremely well organized, clear and concise. The consistency of format among the two SEDAR 25 assessments and previous SEDAR assessments helped to make the review more efficient. Data and assessment methods and decisions were clearly documented, and the reports help to achieve a transparent process. In addition, the summary indicating whether each of the TOR were met or not, which appeared in the AW report was extremely helpful. The RP recommends the continuation of this section in future AW reports and the addition of this section to future DW reports.

2.1.8. Evaluate the SEDAR Process as applied to the reviewed assessment and identify any Terms of Reference which were inadequately addressed by the Data or Assessment Workshops.

The RP found the SEDAR process to be highly effective as structured for the tilefish and black sea bass assessments. The DW addressed all of its terms of reference with the exception of providing maps of fishery effort and harvest for commercial catch statistics and recreational catch statistics, due to insufficient time. The AW addressed all of its terms of reference.

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

> Clearly denote research and monitoring needs that could improve the reliability of future assessments. Recommend an appropriate interval for the next assessment, and whether a benchmark or update assessment is warranted.

The RP was in agreement with the research recommendations from the Data Workshop and Assessment Workshop reports. These identify the main shortcomings in the data and assessment which might be improved by research. However, the recommendations are extensive and some priority may be placed so that research having the greatest impact on the assessment might be given the greatest priority.

High Priority

Life history: There are a number of uncertainties over the life history of this species which are critical in setting up reliable age-structured stock assessment models. Some of this basic information is lacking, such as whether the species exhibits hermaphroditism. For example, in the Gulf of Mexico tilefish assessment (SEDAR 22), protogynous hermaphroditism was included in the model, whereas in this assessment it was not. Any studies that improve understanding of size or age specific spawning frequency, spawning seasonality, and functions modeling sex-change should be given high priority, particularly because they are critical in defining SSB and therefore stock status.

Movement: Several recommendations relate to fish movement. The RP recommends research on local population structure related to residence times and local migration, whether by tagging or alternative methods. Understanding fish movement should help understand how catches might cause local depletion and over what area. This could lead to improved data collection and use of spatial data in tractable way within the model.

Indices: Abundance indices are usually the main information drivers in the stock assessments in these fisheries. The RP recommends developing a fishery independent index, which eventually would greatly improve the determination of stock status. Also, local absolute stock size estimates might be obtained from underwater video surveys (e.g. counting fish burrows), tagging, depletion fishing experiments within a small area, or some combination of these three. Estimating absolute biomass should be done in a way which is informative on catchability and selectivity in the model (could be included as a prior, for example). This last method may be particularly suitable for tilefish, which is probably a relatively sedentary species.

Medium Priority

Stock structure: A number of research recommendations by the DW and AW indicate possible ways to improve definitions of stock structure (e.g. genetic analyses). The RP found no very significant problem with this issue in this assessment. However, it may be that tilefish could be

included in a wider program looking at stock structure of a variety of species which perhaps could also include Gulf of Mexico as well as the southern North Atlantic.

Recreational Statistics: The RP believed that research recommendations with the objective of improving recreational statistics would most likely have limited impact on the tilefish stock assessment, and hence these only have medium priority. However, any program to improve recreational fishery data is likely to cover a wide number of other stocks where such data may be more critical. Therefore, any such program as a whole may be given high priority.

Low Priority

The Commercial Statistics working group suggested examining the impact of the historical foreign fleet. However, the RP believed that the impact of any activities on tilefish would be low, obtaining data would be difficult and could be unsuccessful.

Ultimately the interval between the current and next assessment is a policy decision, requiring scientific input. The Peer RP wants to highlight scientific factors that should be taken into consideration when making this decision. The current tilefish assessment indicates the stock is not overfished and not undergoing overfishing, and has experienced high levels of recruitment in one or more recent years. This indicates the stock is likely not in need of a new benchmark assessment in the short term, in the absence of changes to management actions. No new data sources are expected to be available, at least in the short term, limiting the utility of conducting a new benchmark assessment in the short term.

If management actions change, conducting a new assessment after their implementation has the potential to identify the impacts of the new management actions on the stock, as well as better identify the stock's dynamics. A new assessment could provide improved information on benchmarks such as MSY or status indicators such as B/B_{MSY}.

The RP recommends that assessment updates be conducted to regularly, at the interval of a low-risk stock, or more often in response to changes in management regulations. If an update assessment indicates the stock's status is declining or new data become available, the RP recommends moving forward with a full benchmark assessment.

2.1.10. Prepare a Peer Review Summary summarizing the Panel's evaluation of the stock assessment and addressing each Term of Reference. Develop a list of tasks to be completed following the workshop. Complete and submit the Peer Review Summary Report no later than October 28, 2011.

This report constitutes the RP's summary evaluation of the tilefish stock assessment and discussion of the Terms of Reference. The RP will complete edits to its report and submit to SEDAR by 10/28/11.

2.2. Summary Results of Analytical Requests *(Sensitivities, corrections, additional analyses etc)*

The SEDAR 25 RP requested additional information from the tilefish stock assessment. Specifically, they requested, (1) a comparison of the BAM and ASPIC model estimates and (2) an analysis of the effects of increasing weight on the stock-recruit deviation likelihood component on the model fit for the BAM model.

Item (1) was addressed by providing the RP with graphic model results as shown in Figures 1-3 (see below). These figures indicate that although the absolute values of biomass and F differ (Figures 1 and 2) in magnitude, both the trend and relative measures with respect to the benchmarks were similar (Figure 3).

Figure 1. Comparison of BAM and ASPIC annual estimates of biomass (1000 mt) and fishing mortality (yr^{-1}).

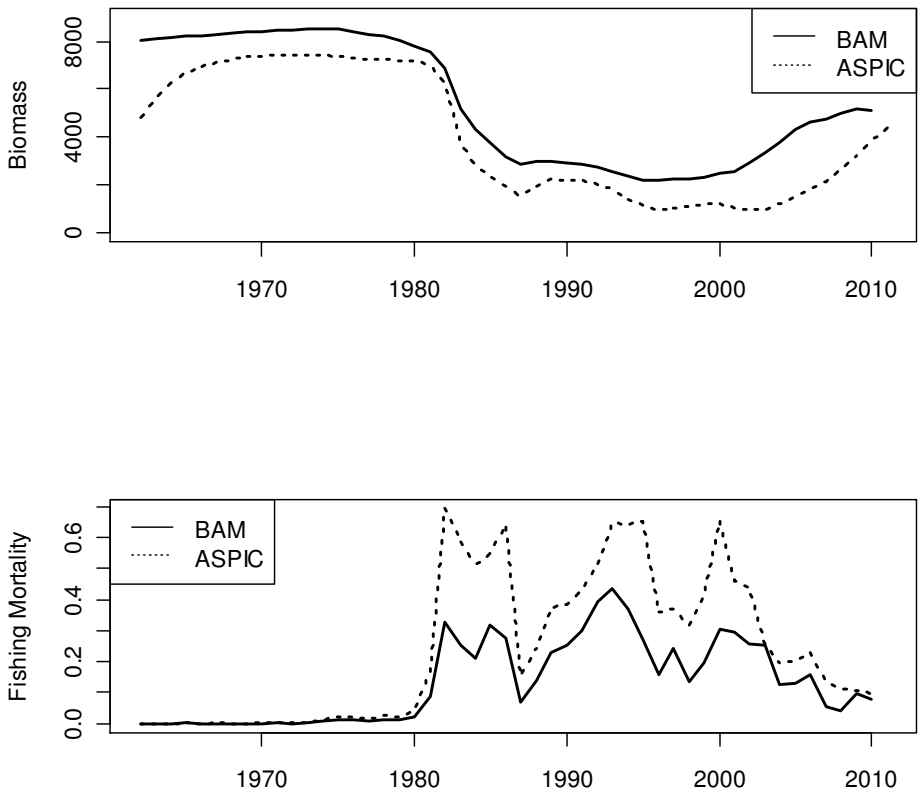


Figure 2. Comparison of BAM and ASPIC annual estimates of F/F_{MSY}.

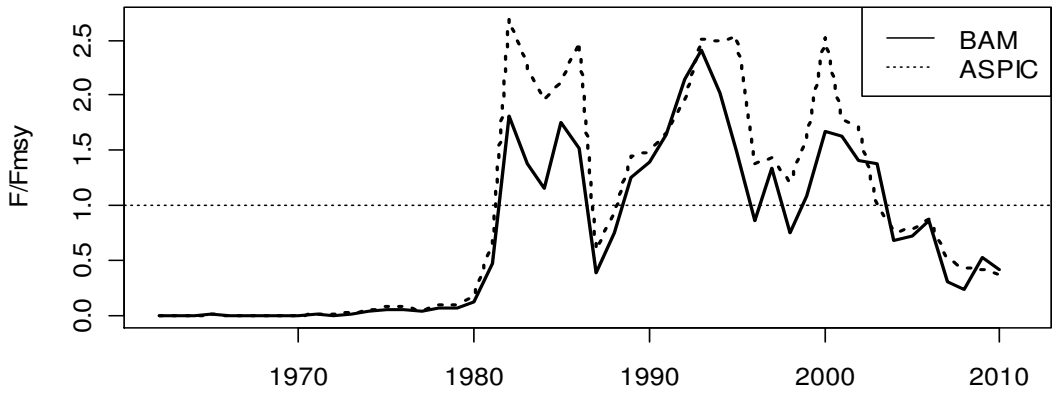
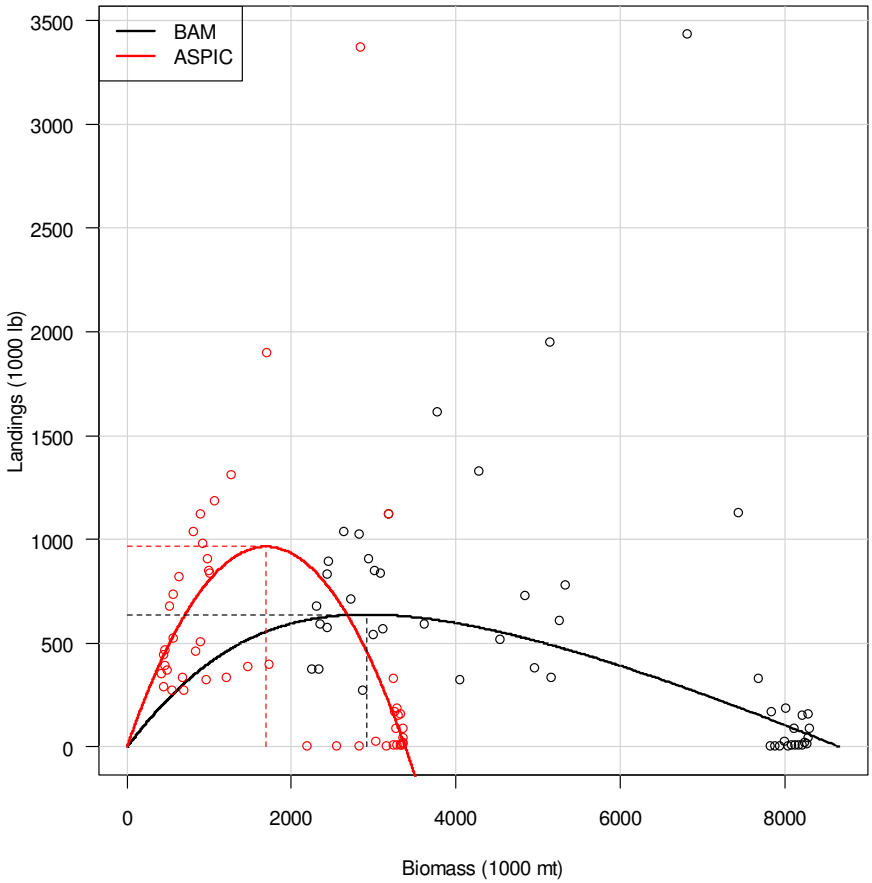


Figure 3. Comparison of BAM and ASPIC estimates of production curves with associated annual estimates of landings (lbs) and biomass (1000 mt). Horizontal and vertical dashed lines represent the estimates of MSY and B_{MSY}, respectively.



Item (2) was addressed by referencing a table of BAM model runs that were conducted during the assessment workshop. During the assessment workshop profiles were run for various parameters and likelihood component weights, including a profile on the weight applied to the stock-recruit likelihood component. A table of individual likelihood component estimates for a range of stock-recruit component weights (SR weight) were presented to the RP (Table 1). The base model run applied a weight of 1.0 to the stock-recruit likelihood component. In Table 1, a smaller likelihood value indicates a relatively better fit.

An increase in the SR weight translates into more restriction in the annual recruitment deviations from the underlying stock-recruit curve. The results of this profile of likelihood component responses to change in the SR weight indicate that there is a trade-off in restricting the recruitment deviations (SRwgt) and the fit to the commercial longline CPUE index (lk.U.cl). There is also some erosion of the commercial longline age composition (lk.agec.cl) fit when the SR weight is increased. The conclusion that can be drawn from this is that the freedom in the annual recruitment deviation estimates, made possible by lower SR weights, allows a better fit to the commercial longline CPUE index and a slightly better fit to the commercial longline age composition data.

Table 1. Likelihood values for various weights applied to the stock-recruit likelihood component (SRwgt). lk indicates negative log-likelihood, U indicates indices, lenc indicates length compositions, and agec indicates age compositions (cl=commercial longline, ch=commercial handline, ra=recreational, and mm=MARMAP longline).

SRwgt	lk.total	lk.unwgt.data	lk.U.cl	lk.U.mm	lk.L.cl	lk.L.ch	lk.L.ra	lk.lenc.cl	lk.lenc.ch	lk.agec.cl	lk.agec.ch	lk.agec.mm	lk.priors	lk.SRfit
0.5	92.4	89.5	17.1	18.0	0.1	0.0	0.0	3.3	21.2	6.4	18.4	5.0	-2.9	11.7
1	92.8	106.4	24.4	25.1	0.2	0.0	0.0	5.3	21.6	6.1	19.3	4.4	-3.7	-10.0
1.5	86.4	113.5	26.1	28.0	0.3	0.0	0.0	6.2	21.7	6.3	19.5	5.3	-3.8	-15.5
2	74.8	125.8	24.9	30.3	0.8	0.0	0.1	8.6	21.9	10.4	21.2	7.6	-3.0	-24.0
2.5	52.4	158.6	45.3	28.7	3.1	0.1	0.5	11.2	22.0	18.6	24.0	5.2	-1.9	-41.7
3	31.0	164.0	48.9	28.5	3.8	0.1	0.6	11.5	21.9	19.7	24.0	5.0	-1.9	-43.7
3.5	8.7	169.0	52.2	28.3	4.5	0.1	0.7	11.8	21.9	20.8	24.0	4.7	-1.9	-45.3
4	-14.3	173.5	55.4	28.1	5.0	0.1	0.9	12.0	21.8	21.7	24.0	4.5	-1.9	-46.5
4.5	-37.8	177.8	58.5	28.0	5.5	0.1	1.0	12.2	21.8	22.4	23.9	4.4	-1.8	-47.6
5	-61.8	181.8	61.5	27.8	6.0	0.1	1.1	12.3	21.8	23.1	23.9	4.2	-1.8	-48.4
5.5	-86.2	185.6	64.4	27.6	6.4	0.1	1.3	12.5	21.7	23.8	23.8	4.1	-1.8	-49.2
6	-111.0	189.1	66.7	27.3	6.9	0.1	1.3	12.6	21.7	24.5	23.9	3.9	-1.8	-49.9
6.5	-136.1	192.3	68.9	27.2	7.3	0.1	1.4	12.7	21.7	25.2	23.9	3.8	-1.8	-50.6
7	-161.5	195.0	70.8	27.2	7.7	0.2	1.5	12.7	21.6	25.3	24.1	3.8	-1.8	-51.0
7.5	-187.1	197.7	72.8	27.1	8.1	0.2	1.6	12.8	21.6	25.7	24.0	3.8	-1.8	-51.4
8	-212.5	199.7	73.6	27.4	8.7	0.2	1.8	12.8	21.7	25.6	24.1	3.9	-1.8	-51.6
8.5	-238.8	202.7	76.4	27.0	8.8	0.2	1.8	12.9	21.6	26.1	24.1	3.8	-1.8	-52.0
9	-264.9	204.9	78.1	27.0	9.1	0.2	1.9	12.9	21.6	26.3	24.1	3.7	-1.8	-52.3
9.5	-291.1	207.1	79.6	26.9	9.5	0.2	2.0	12.9	21.6	26.4	24.2	3.7	-1.8	-52.5
10	-317.4	209.2	81.1	26.9	9.8	0.2	2.1	13.0	21.6	26.5	24.2	3.7	-1.8	-52.8

2.3. Additional Comments
None provided

3. Submitted Comment
(Any written comment or opinion statements submitted by appointed observers)
None provided

VI. Addenda

Revisions or corrections to preceding sections.
None provided

Additional documentation of final review model configuration if required.
None provided