Center for Independent Experts
Consultant Report on:

SEDAR 25 Stock Assessment Review
South Atlantic Black Sea Bass
South Atlantic Tilefish
October 11 - 13, 2011

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Executive Summary

SEDAR 25 covered South Atlantic black sea bass (*Centropristis striata*) and South Atlantic tilefish (*Lopholatilus chamaeleonticeps*) stock assessments. As well as this report, a SEDAR 25 Review Panel Report contains a summary review of the assessments and the scientific advice. This report covers the activities and views of the reviewer, Paul Medley. It does not conflict with any findings in the review panel report. The main findings, recommendations and conclusions are:

- The data and assessments reported by the review panel form a good basis for scientific advice for both species. Uncertainties associated with the assessment are dealt with appropriately and taken into account in the advice. The results represent the best scientific advice available for these stocks.
- The estimate of black sea bass SSB in 2010 is below SSB_{MSY}, indicating that the stock has not yet fully rebuilt, and the fishing mortality (F) estimate for 2009-2010 is slightly higher than F_{MSY}. The assessment indicates that the stock has been rebuilding more slowly than was anticipated at the last assessment (SEDAR 2).
- The tilefish assessment indicated that SSB in 2010 was higher than SSB_{MSY} and fishing mortality in 2008-2010 was lower than F_{MSY}.
- The assessments should switch from using the Beaufort Assessment Model software (BAM) to Stock Synthesis 3 (SS3) because it would be easier to explore different model structures and the models would be able to take advantage of various improvements that are available in SS3, but not in BAM. This would avoid the considerable work of developing these improvements in BAM.
- The determination of the status of protogynous hermaphrodite species, such as black sea bass, should explicitly take account of male biomass to avoid recruitment loss due to sperm limitation.
- Various recommendations have been made on the SEDAR process to improve the efficiency and productivity of the review. In particular, improvements should ensure uncertainty and risks are better represented in management advice, through for example using decision tables.

Background

SEDAR 25 consisted of assembling the relevant fisheries data sets for South Atlantic Black Sea Bass and Tilefish, conducting two benchmark stock assessments, and an assessment review. These stocks are within the jurisdiction of the South Atlantic Fisheries Management Council and the states of Florida, Georgia, South Carolina, and North Carolina.

This report concerns the final review workshop of the SEDAR process. Data Workshops (DW) followed by Assessment Workshops (AW) had already been conducted. The DW developed and approved the data and some model parameters for use in the stock assessment. The AW develops and approves the stock assessment model configuration as well as taking the final decisions on the data that will be used. Reports are produced by both these workshops for inclusion in the review.

The review workshop (RW) provides an independent peer review of SEDAR stock assessments and is responsible for ensuring that the best possible assessment is provided through the SEDAR process. The National Marine Fisheries Service's (NMFS) Office of Science and Technology coordinates and manages a contract providing external expertise for this review through the Center for Independent Experts (CIE: www.ciereviews.org). Three CIE reviewers were selected to conduct the independent peer review of NMFS science in compliance the Terms of Reference (see Appendix II). Each CIE reviewer was contracted to deliver an independent peer review report to be approved by the CIE Steering Committee.

Description of Review Activities

The independent peer review covers the data, assessment models, and results previously developed for and by the data and assessment workshops. The SEDAR documents include working papers prepared for each workshop, supporting reference documents, and the SEDAR Stock Assessment Reports.

Before the formal review took place, the background material and reports were provided by the NMFS Project Contact in advance. The information provided included the Data Workshop and Assessment Workshop reports (see Appendix I). The review panel, of which I was a member, met at the Crowne Plaza Hotel and Conference Centre in North Charleston, SC, from 9:00 a.m. Tuesday, October 11, 2011 through 1:00 p.m. Thursday, October 13, 2011.

The review evaluated assumptions, and looked for errors and possible improvements to the stock assessment that could be implemented within a reasonable time frame. The review panel has completed a summary report on their findings for each stock. This review report contained a summary of the stock assessment results, including suitability of the data and model, and the results and the uncertainty associated with those results.

The external CIE reviewers were Michael Smith (UK), Paul Medley (UK), and Michael Bell (UK). Jim Berkson (USA) and Steve Cadrin (USA) were also on the panel, as a local representative, and the panel was chaired by Anne Lange (USA).

The review meeting consisted of a series of presentations on the stock assessments that had been conducted. Erik Williams presented the methods and results of the Beaufort Assessment Model (BAM) and production model (ASPIC) for South Atlantic tilefish. Kyle Shertzer presented the same assessment models for South Atlantic black sea bass. After the presentations, the reviewers were given an opportunity to ask questions, request further results from the assessment, as well as additional stock assessment runs or sensitivity analyses. The review panel did not request more sensitivity analyses, but did request other output from the models to deal with various questions related to the assessment. No significant errors were identified, and there was broad agreement that the assessments gave valid scientific advice for the management of these stocks.

This report is not the summary review report, but an independent peer review report that addresses the same Terms of Reference. It does not disagree with any finding in the summary review report, but contains additional information and opinions, which are not necessarily a summary view.

The review covers the assessments of both the black sea bass and tilefish stocks, which often treated data in the same way and employed many of the same analytical methods. It should be assumed that any observation or finding applies to both assessments unless it is stated otherwise.

Summary of Findings

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

All the data used were appropriate, and suitable for use in the stock assessments. Data consisted of recorded commercial and recreational catches, fishery independent surveys, fishery dependent CPUE and sampling of the catch length and age from these. This basic data collection scheme should be suitable for all species caught by the fishery from these waters. The main weakness is the limited sampling, and therefore data, available for these stocks, particularly tilefish.

Excluding data should be avoided, if possible. In a number of cases, ages or lengths were excluded either because the amount of data was inadequate or length data, where age data in same stratum were adequate, were excluded to avoid double counting. Strictly speaking, likelihoods should cope with having low data as the probabilities should weight this information appropriately. However, age and length data are generally over-weighted in these models, and the multinomial likelihood does not model this source of information well. The DW and AW used trips for the degrees of freedom and excluded small samples altogether. Given that it is not clear on how to handle small samples where central limit theorem assumptions would not hold, this is not unreasonable, even if it is not desirable. However, there is a need to explore whether improvements are possible.

In terms of determining an effective sample size, it is possible to use the observations after the model has been fitted to estimate an effective sample size for the multinomial. This can be useful in determining whether assumed values are able to explain the observation errors in length and age compositions.

It is possible to include ages and lengths in the same stratum by using conditional likelihoods. This is already done in Stock Synthesis 3. This approach should be taken in this case to avoid excluding these data. However, I do not believe that this would significantly affect the outcome of these stock assessments.

As part of the submissions, there were a number of comments from fishermen. These concerns covered many uncertainties in the model structure and interpretation of the data. Some of these concerns were addressed during the review, either explicitly discussed or implicitly through assessment outputs (see also ToR 8).

The abundance indices were created from various surveys and commercial CPUE, standardised using generalized linear models (GLM). These were not reviewed in detail by the panel, but diagnostics presented suggested that there were no major problems. However, the delta lognormal, which is used routinely for many standardisations, may not be the most parsimonious or the best GLM to use for this purpose. For delta lognormal two separate GLMs are fitted. In some cases, a gamma likelihood was tested, but not surprisingly this gave little improvement over the log-normal.

Where two modes occur, at zero as well as elsewhere in the catch frequency, a delta lognormal may be the best approach. This form of two modes might also be reproduced in other ways, although these might not be easier to deal with in standard packages. For example, conditional likelihood, based on the sequence of hauls, would capture the two states of the gear (successful vs unsuccessful). Likelihoods allowing negative values could allow the cumulative probability of negative values to apply to zero values. The amount of work, together with the possibility that this would not improve on the delta-lognormal, would not make development of these approaches urgent, but once developed updating the indices would be straightforward.

Black Sea Bass

Recreational data is a significant component of the black sea bass assessment. A significant proportion of these data depend on intercepts of recreational vessels. By its nature, this sort of sampling is uncertain, but the data nevertheless appeared adequate in this case. The main gaps are historical and therefore it will not be possible to correct this through increased sampling. Although discards also form a significant component of the catch, and the historical discards are highly uncertain, the discard mortality is low which greatly reduces the impact of this uncertainty on the assessment.

Tilefish

Life history of tilefish is not well understood. As information improves, it is likely that the model will need to be changed to reflect improved understanding. The tilefish model used for the Gulf stock (SEDAR 22) included protogynous hermaphroditism, which was not used in the Atlantic assessment, primarily because the data could not support it. The sex change function was only poorly estimated in Gulf model. Introducing protogynous hermaphroditism into the Atlantic stock model could have a significant impact on the tilefish assessment.

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

As is usually the case in catch-at-age statistical models, there was conflict between the information supplied by the age and length compositions, and the abundance indices. In these stocks (and in most cases) I suspect changes in composition can come from what are effectively changes in selectivity. Introducing fixed selectivity models over fixed periods introduces structural error. There is no simple solution for this beyond trying alternative selectivity functions and changing the blocks of years when the selectivity remains the same. Given the limitations of the software, the treatment of this issue by the stock assessment groups was reasonable. However, it would have been useful to consider alternative models and configurations than those available in BAM, and in particular to compare age and length based selectivity.

Whether length-based selectivity would improve either of the models is unclear, and could only be tested by trial and error. Length and age are inextricably linked through growth. If selectivity as a process works through length (e.g. by mesh size), length-based selectivity should be used to avoid introducing growth errors to selectivity. For the tilefish and black sea bass fishery gears, length would not appear to be the dominant factor. However, in almost all cases in my experience selectivity depends on

both size and behaviour of fish, which may be better explained by age. Nevertheless, it would be instructive to compare age and length-based selectivity in these models.

Discards are modelled using their own selectivity rather than attempting to model discarding as a process after catching. I would prefer the assessment to attempt model discarding as a separate process after selectivity (as SS3 attempts to do). Although this might not necessarily lead to a better fit to the data, it should be more parsimonious and, perhaps more importantly, can be investigated and put on a firmer theoretical base. This might be particularly useful when predicting the impact of a change in regulation on minimum size.

The flat-topped logistic selectivity, as used in these assessments, is a good default choice of selectivity function. Domed shaped selectivity should not only fit the data better, but be justified in terms of the type of fishing gear, spatial and temporal distribution of the different components of the fish population or probabilities of capture and escape. This is necessary because domed shaped selectivity can have a significant impact on the determination of the stock, and yet its shape depends on the capture of relatively small numbers of large, old fish. There was no justification in these stocks for domed shaped selectivity.

The catch-at-age assessment models used were probably over-parameterised considering the limited data available. This was not a severe problem, but some estimation problems, notably extreme high estimates of fishing mortality for both assessments during the operation of the Monte Carlo bootstrap (MCB) and an unusually high peak in the recruitment of tilefish, suggest some underlying issues with estimation. These problems may decline as data accumulates, since some data collection programs have been short-lived. However, I would also recommend examining the parameter correlation matrix for the stock assessment models. This would indicate where two or more parameters might not be well estimated together and perhaps provide more focus on those areas of the model where improvements might be most required.

Although rarely preferred, biomass dynamics models can produce useful and valid stock assessments. Despite being based on a biological model, the model itself is crude and covers up a large number of biological processes such as growth, recruitment and mortality in two parameters. As such, it cannot hope to give any deep understanding of why a population responds as it does to different levels of fishing. However, it can provide an empirical description of how an abundance index has responded to different fishing intensities in the past, which is adequate for setting total catches. Extrapolation outside the observed past range of the indices is dangerous. As long as this type of assessment is not over-interpreted, it may provide a good alternative to age structure models. Its use in data-poor situations or where age and length data are poor is justified.

There are significant statistical advantages for models that have few parameters such as the biomass dynamics model. The model can and should be fitted using a fully Bayesian framework. Also, it may be possible to fit the model to raw data with the abundance index standardisation parameters being fit simultaneously with the population model. Models should be fit wherever possible to data rather than derived

indices. This is the philosophy behind statistical catch-at-age models in contrast to virtual population analysis, for example.

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

I agree with the point estimates and results reported by the assessment workshops and review panel. All estimates for both stocks came from the base runs of the Beaufort statistical catch at age model (BAM).

Black Sea Bass

Spawning stock biomass (SSB) was measured in terms of batch fecundity. The estimate of black sea bass SSB in 2010 is below SSB_{MSY}, indicating that the stock has not yet fully rebuilt. The fishing mortality (F) estimate for 2009-2010 is slightly higher than F_{MSY}. The estimates based on the Monte Carlo Bootstraps of the base assessment model suggest bias in the estimates is likely to be low.

Tilefish

The assessment indicated that SSB in 2010 was higher than SSB_{MSY} and fishing mortality in 2008-2010 was lower than F_{MSY}. However, the Monte Carlo Bootstraps suggest that these estimates may be biased optimistically, so SSB may be lower than indicated and fishing mortality higher. Despite this, it still appeared highly likely that SSB is above the SSB_{MSY} and F below F_{MSY}.

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.

Basing benchmarks on MSY using equilibrium expectations derived from the base model was appropriate for both stocks. The relative measures are used ($SSB(2010)/SSB_{MSY}$ and $F(2009\text{-}10)/F_{MSY}$) because they reduce the effect of correlations among some parameter estimates.

Tilefish

The MSY and associated benchmarks depend upon steepness estimates. The steepness was fixed for tilefish because it could not be estimated. The value (0.84) seemed reasonable for the species and the environment. I believe it likely, *a priori*, that the value would lie inside the range 0.75-0.90, although 0.93 was estimated for the Gulf tilefish stock (SEDAR 22).

Black Sea Bass

The relatively low steepness estimate in the black sea bass assessment was a contentious issue with stakeholders. The estimate is low, but has been shown to fit the available data better. The indications are that recruitment responds more quickly to decreases in stock size, and this is supported by the available information. It does not, of course, guarantee this estimate is correct, but other data or research are required to estimate alternative values. Any further research, including simulation work, to justify a benchmark would be valuable.

Reference points for black sea bass were based on female fecundity for which good information was available. The problem with using this with a protogynous hermaphrodite is male biomass could be heavily depleted before meeting benchmarks based on females only. This is mitigated in this case by the low steepness, so that there is a significant decline in recruitment continuous with declines in female biomass. Overall, it appeared that the male population was unlikely to have been reduced to the point where recruitment was limited by the number of males.

Although this might not be a factor in this case, at this time, I believe that it is still appropriate for this or other issues to be dealt with explicitly in the management system. In this case, explicit benchmarks for male biomass would be appropriate. There are two ways to do this. Firstly, a weighted average between male and female biomass could be calculated as the SSB. This could be based on how many males are required to fertilize a batch of eggs, for example. Although this is not unreasonable, it is not necessarily very clear and may not fully capture effects of changing the sex ratio in the population. The alternative is to have a benchmark for each sex and choose the worst to define status. Using two benchmarks derived on different principles is not unprecedented although I am not aware of them used for this purpose. For example, two reference points are routinely used for stocks within the jurisdiction of the Commission for the Conservation of Antarctic Marine Living Resources. For example, Antarctic krill has spawning stock biomass and a separate predator benchmark.

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).

Within the limitations imposed by the management structure, projections were adequate and appropriate, and methods were applied correctly. The projections from the Assessment Workshop report were approved by the review panel.

The projections and other output tended to use means rather than medians of the values of interest. Using medians is generally considered more robust because they remain unaffected by outliers.

Black Sea Bass

It was noted that the black sea bass recruitment residual variance is reducing and therefore may increase the risk of not achieving the rebuilding target because the cumulative mean recruitment would also be affected. Medians would be unaffected by changes in variance and using a median would likely result in lower estimates for the allowable catch (ACL).

The projection from the previous assessment of black sea bass (SEDAR 2) was shown. What has actually happened compared to what was projected was very different, and the projection now appears very optimistic in terms of the speed of rebuilding. The model and data have changed, but also catches have not been limited to the level previously included in the projection, all of which contribute to the differences. For any projection to be useful, it should represent reality as closely as possible, and should therefore cover likely management decisions as well as desirable ones. This issue could be partly addressed by using decision tables, which emphasise uncertainties (see ToR 8 below).

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.

There are broadly two ways to model uncertainty. The first is to treat the likelihood as a probability density function. By defining a probability for any set of parameter values, uncertainty in all measures of stock status and projections is defined mathematically. Modelling this uncertainty is difficult, and the only general technique available that works in high dimensions (with many parameters) is the Markov Chain Monte Carlo (MCMC) as for example implemented by SS3 (in ADMB). In Bayesian statistics, this method has a strong theoretical base, but relies on the correct specification for the likelihood and prior probabilities.

The alternative way to model uncertainty is to use bootstrapping, which relies on sampling theory. Parametric bootstraps, where data are simulated from parametric distributions should produce similar results to methods based on the first approach described above. It relies on the correct specification on the parametric data from which the bootstrap data will be drawn. Non-parametric bootstraps, where new data are resampled with replacement from the original sample, are more robust since the method only depends on the correct specification of the sampling model. With simple random sampling, the method is particularly straightforward. Interpretation of the uncertainty measures is not as straightforward as for Bayesian or likelihood based methods, but the robust nature of bootstrapping means that uncertainty estimates are valid.

One of the most important attributes of the bootstrap is that the method is relatively simple, can still be made to work with complex sampling schemes and can be carried out relatively rapidly. Unlike MCMC, issues such as convergence do not arise and therefore results can be guaranteed within a relatively short time frame, which, when fitting many models, is a very useful attribute.

Parametric bootstrapping is easy, but suffers from the assumption that the parametric probability being sampled from is correct or nearly correct. This method was used for the abundance indices.

Non-parametric methods are, in my opinion, better as it only depends on the underlying sampling scheme. Non-parametric sampling was used for the age and length compositions, although the sampling schemes for these data are not simple random sampling, and the sampling scheme itself is uncertain. Therefore, in this case it is unlikely that full uncertainty would be captured by simple re-sampling.

Parametric bootstraps are usually used when the sample is small (Manly 1997) as is the case for the abundance indices. Another option, which is semi-parametric, would be to use standardise residuals to estimate a density using kernel smoothing from which bootstraps could be drawn (Silverman 1986). Residuals drawn at random in this way would be used as described for the parametric residuals. This is more robust in the sense that the residuals are used to define their own probability density rather than assuming one. However, I am not aware that this technique is very widely used, so

simulation work might be required to test its performance relative to a mis-specification of the parametric distribution.

In these assessments, a number of sensitivities were used to profile important parameters such as steepness or natural mortality. Where appropriate, parameter values should be integrated into the uncertainty rather than fixed at discrete sensitivity values. Sensitivity runs should ideally be reserved for structural assumptions (such as alternative selectivity functions). While in theory these also could be integrated into the numerical uncertainty by assigning probabilities to different structural assumptions, interpretation of the output becomes difficult.

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.

This term of reference has been met by the Review Panel. The final reports are currently being produced.

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

The SEDAR process is an excellent, if expensive, approach to ensuring that the scientific advice is the best available. The SEDAR process had been applied correctly in the assessment of these stocks.

The involvement of stakeholders and fishermen was very valuable. There were many written submissions to the review panel outlining their main concerns and these were considered by the review panel using outputs from the stock assessments.

In some cases the stock assessment directly answered the questions raised. The black sea bass assessment was shown to be robust to concerns expressed about the headboat index and historical discarding. The likelihood profile excluding the base run prior justified the relatively low value estimated in the black sea bass stock assessment. Other issues concerning local depletion and movement in both stocks were valid, but the data are insufficient to support fitting assessments as requested by some stakeholders (although such assessments could be trialled in SS3 if desired).

Most valid concerns of stakeholders are likely to be addressed through further data collection and experimentation, and specific sensitivity analyses. The SEDAR should encourage stakeholders and particularly fishermen to be involved in developing and carrying out such research. Also stakeholders should be allowed to request specific sensitivity runs. This will require that they understand a little about how stock assessment work and how to interpret outputs and some diagnostics.

The review ToRs should focus on requiring the best possible stock assessment, taking into account limitations on data, methods and resources available, which in turn should depend on the size and level of exploitation of the fishery.

The review panel should only rarely find significant problems with the stock assessment and scientific outputs. The stock assessment methods applied by NMFS scientists are generally of the highest calibre, and there is sufficient internal review to ensure the assessments are of high quality. While external reviewers may be useful to confirm

this, they will only rarely find errors of significance or be able to identify solutions to problems given the short time available. Given this, I would suggest combining the review panel's terms of reference (ToR) on methods and results into two. Therefore, ToR 2, 3, 4, 5, 6 and 7 would be converted to two ToRs covering the methods and results respectively. This might allow some additional ToRs so that the review panel can develop exclusive outputs useful to the SEDAR process, while still applying its quality assurance role. Some possible additional ToRs are outlined below.

The review panel should attempt to identify sensitivities that bracket the uncertainty, such that the key indicators of interest for stock status and the exploitation rate are almost certainly within the range. This uses the review process to reduce a very complex multidimensional problem to a single dimension which is easier to understand.

Decision tables could be used to impart the implications of decisions that might be made at the Council level. Although uncertainty is reported, it is difficult to see how the Councils are able to assimilate this information without considering the implication of this uncertainty directly on their decision-making. For this to be done, the range of possible decisions that might be made needs to be defined by the Council. The decisions might be defined based on a principle (e.g. levels of acceptable risk or relative change from current ACL), rather than in absolute terms. It would be up to the review panel to define a range for the "states of nature" and report the decision results from the projection.

The other purpose of the review panel is to make decisions that might not be made in any other way. This might resolve conflicts that cannot be dealt with otherwise. Where such decisions are required, they should as far as possible be made explicit in the terms of reference. That is, the DW or AW should be able to ask the review panel arbitrate over a scientific decision where there is intractable disagreement. Note that this request must be reasonable and within the area of the expertise of the invited panel.

Re-using the same terms of reference for the CIE reports implies that where the CIE reviewer agrees with the Review Panel report, the text should be repeated. While the general structure for the CIE report could be the same, an overarching ToR for the CIE report should perhaps be to provide further information only where the reviewer believes it is necessary, and otherwise confirm agreement with the review panel.

The Data and Assessment Workshops addressed all of their terms of reference with the exception that the black sea bass DW was unable to provide maps of fishery effort and harvest for commercial and recreational catch statistics due to insufficient time.

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 research recommendations from the Data Workshop and Assessment Workshop reports covered the main research areas that would reduce uncertainty in the stock

assessment. The Review Panel provided further guidance on the priority which should be given among these recommendations.

The two most important areas of research in terms of impact on the stock assessment and management decisions are related to life history and historical catches. Life history information that affects the way SSB is calculated is very important for both species. Specific research might be required in developing separate or a weighted benchmark for male and female black sea bass and it needs to be determined whether tilefish is a protogynous hermaphrodite.

Extending catches further back, as long as this can be based on real historical information, could significantly affect the determination of the stock status as it may change both the stock size and benchmarks. This is always a worthwhile exercise even if the historical data are only considered for a sensitivity run because they are too unreliable. Historical data, particularly from periods beyond current stakeholder memory, can alter perceptions over how productive the stock might be.

Any improvements in recreational statistics are likely to improve the accuracy of the stock assessment in the long term. The impact of these programs could be large, but will only build up over time. Nevertheless, improving recreational fishery data is of high priority, particularly for black sea bass.

While sampling age composition from catches is always important for age structured modelling, increases in sampling effort for these species is unlikely to reduce model error, because much of the error from fitting to age and length compositions is structural rather than observation error. Therefore, age and length samples from fishing experiments (where local populations are depleted rapidly ideally with tagging) might provide more useful estimates for a selectivity function rather than increasing routine sampling across all fisheries.

Similarly, although discarding is an important issue, with such a high survival rate, discard estimates are unlikely to have a very significant impact on the assessment. Further work on the discard mortality is recommended, but unless it is shown that it is significantly underestimated, the low impact of discarding is likely to continue.

I would recommend switching to Stock Synthesis 3 as the main assessment model software. On balance, I believe that advantages in moving to Stock Synthesis 3 in the next benchmark assessments for both species out-weigh the disadvantages.

1. Both age and length data in the same stratum can be used.
2. Length-based selectivity could be trialled. Even if this did not fit the data as well, the diagnostics might suggest other ways in which the model might be improved.
3. The discard rate model used in SS3 may be more parsimonious than the discard selectivity model used in BAM.
4. SS3 allows limited spatial modelling. While the data may not support this yet, if some spatial aspects are included in the future at the request of some fishermen, SS3 would allow this to be done.
5. It would be possible to share information more directly between the Gulf (SEDAR 22) and Atlantic tilefish assessments. Neither assessment had complete information on tilefish life history.

6. SS3 does not offer a bootstrap method, but uses MCMC to sample from the posterior (penalised likelihood) probability. While theoretically sound, this may not be as robust as the MCB used by BAM, and numerical problems may make MCMC difficult to complete within a reasonable time frame.

If the stock is close to being overfished or is rebuilding, frequent update assessments should take place (every one or two years). If new data becomes available, management changes (harvest control rule, the targets or limits) or new methods are developed (e.g. switch from BAM to SS3), a full benchmark assessment should be undertaken. For black sea bass, I would recommend annual or biennial updates to monitor and encourage rebuilding and for both stocks a benchmark assessment within 5 years. This does not preclude more urgent action should other information suggest that it is required.

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.

The Peer Review Summary reports have been completed and were with the Chairperson (Anne Lange) for final edits when this report was submitted.

Conclusions and Recommendations

The data and assessments reported by the review panel form a good basis for scientific advice. Uncertainties associated with the assessment are dealt with appropriately and taken into account. The results represent the best scientific advice available for these stocks. All data were appropriate, and suitable for use in stock assessment. The main assessment software, BAM, is appropriate for the type of data available and should enable the scientists to set up assessments and obtain credible and consistent results.

I would recommend moving to Stock Synthesis 3 (SS3) for these stocks at the next benchmark assessment, however. BAM is set up so that it is relatively static, making it difficult to consider alternative model configurations. Using Stock Synthesis would make the investigation of alternative model structures easier as well as introduce a number of other improvements. Stock Synthesis is not perfect, but overall the benefits of this switch outweigh the costs.

One option that is unavailable in SS3 is a Monte Carlo Bootstrap simulation, which is a valuable tool, as demonstrated in these analyses. Since there is no guarantee MCMC simulations will converge, alternative methods allowing a different approach are useful. As long as there is a maximum likelihood for each bootstrapped data set, MCB will provide a random draw of estimates.

The large number of sensitivity runs to scope the uncertainty in the assessment presents a problem for combining this uncertainty into a single form for advice. I suggest reducing sensitivity runs as much as possible, though developing priors for key parameters, such as natural mortality, rather than a series of fixed values over a range.

Generally, several improvements could be made in incorporating uncertainty and risk into management advice. Decision tables provide a good way to understand the implications of uncertainty rather than the uncertainty itself. For decision tables to work,

the managers must provide information to allow the range of possible decisions to be defined.

I recommend using median estimates rather than means when requiring point estimates for decision-making. Medians are generally more robust, and consistent in handling decisions relative to levels of acceptable risk. Hence, the assessment would use the median estimates from the uncertainty analysis (in these cases MCB) rather than the maximum likelihood estimate from the base run.

The management system should consider the specific risk for protogynous hermaphrodite species by including males in the benchmarks. This would set explicit limits below which sperm limitation would put recruitment at risk.

References

Manly, B. F. J. (1997) Randomization, Bootstrap and Monte Carlo Methods in Biology, 2nd edition. Chapman and Hall, London.

Silverman, B.W. (1986) Density Estimation for Statistics and Data Analysis. Chapman and Hall / CRC, London.

Appendix I: *SEDAR 25* Workshop Document List

Document #	Title	Authors
Documents Prepared for the Data Workshop		
SEDAR25-DW01	Black sea bass length frequencies and condition of released fish from at-sea headboat observer surveys, 2004-2010	Sauls, Wilson, and Brennan 2011
SEDAR25-DW02	Standardized CPUE of black sea bass (*Centripristis striata*) caught in blackfish and Florida snapper traps deployed by MARMAP	Bacheler, Shertzer, Reichert, Stephen, and Pate 2011
SEDAR25-DW03	Standardized CPUE of black sea bass (*Centropristis striata*) from chevron trapping by MARMAP	Bacheler, Shertzer, Reichert, Stephen, and Pate 2011
SEDAR25-DW04	Catch-per-unit-effort of golden tilefish from MARMAP bottom longlining	Bacheler, Reichert, Stephen, and Pate 2011
SEDAR25-DW05	Klibansky and Scharf batch fecundity methods	Klibansky and Scharf 2011
SEDAR25-DW06	The Regulations that have already affected the Black Sea Bass rebuilding	Fex 2011
SEDAR25-DW07	Commercial Longline Vessel Standardized Catch Rates of Tilefish in the US South Atlantic, 1993-2010	McCarthy 2011
SEDAR25-DW08	The potential for using the sea bass pot fishery to assess changes in abundance of black sea bass (Centropristis striata) in the South Atlantic region	Hull and Hester 2011
SEDAR25-DW09	Fisheries-dependent landings data for the east Florida golden tilefish (L*opholatilus chamaeleonticeps*) fishery	Hull and Barile 2011
SEDAR25-DW10	Black sea bass and tilefish discard mortality working paper	Collier, Fex, Rudershausen, and Sauls 2011
SEDAR25-DW11	Bottom longline fishery bycatch of golden tilefish from observer data	Hale 2011
SEDAR25-DW12	Abundance indices of black sea bass collected during SEAMAP shallow water trawl surveys in the South Atlantic Bight (1990-2010)	Ingram 2011
SEDAR25-DW13	Standardized discard rates of US black sea bass (*Centropristis striata*) from headboat at-sea observer data	Sustainable Fisheries Branch, NMFS 2011
SEDAR25-DW14	Preliminary standardized catch rates of Southeast US Atlantic black sea bass (*Centropristis striata*) from headboat data	Sustainable Fisheries Branch, NMFS 2011
SEDAR25-DW15	South Carolina Department of Natural Resources State Finfish survey (SFS)	Hiltz and Byrd 2011
SEDAR25-DW16	SCDNR Charterboat Logbook Program Data,	Errigo et al. 2011

	1993-2010	
SEDAR25-DW17	A note on the occurrence of bank sea bass (*Centropristis ocyurus*) in the Florida hook and line and black sea bass pot fisheries	Nelson 2011
SEDAR25-DW18	Commercial vertical line vessel standardized catch rates of black sea bass in the US South Atlantic, 1993-2010	McCarthy 2011
SEDAR25-DW19	Calculated discards of black sea bass and tilefish from commercial fishing vessels in the US South Atlantic	McCarthy
SEDAR25-DW20	Summary of black sea bass (*Centropristis striata*) length composition sampling from the Gulf and South Atlantic Fisheries Foundation observer program, 2007-2009	Gloeckner 2011
SEDAR25-DW21	Summary of black sea bass (*Centropristis striata*) length composition sampling from the Trip Interview Program (TIP) 1981-2010	Gloeckner 2011
SEDAR25-DW22	Summary of golden tilefish (*Lopholatilus chamaeleonticeps*) length composition sampling from the Trip Interview Program (TIP) 1981-2010	Gloeckner 2011
SEDAR25-DW23	Revised working paper: SCDNR Charterboat logbook program data, 1993-2010 (replaces SEDAR25-DW16)	Errigo et al 2011
SEDAR25-DW24	Standardized catch rates of black sea bass from commercial fish traps in the US South Atlantic, 1993-2010	McCarthy 2011
Documents Prepared for the Assessment Workshop		
SEDAR25-AW01	Is pooling MARMAP chevron trap data justifiable for Black Sea Bass (*Centropristis striata*) in the South Atlantic Region?	Hull and Hester 2011
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
Final Assessment Reports		
SEDAR25-SAR1	Assessment of Black Sea Bass in the US South Atlantic	To be prepared by SEDAR 25
SEDAR25- SAR2	Assessment of Golden Tilefish in the US South Atlantic	To be prepared by SEDAR 25
Reference Documents		
SEDAR25-RD01	Tilefish off South Carolina and Georgia	Low et al. 1983
SEDAR25-RD02	Temporal and spatial variation in habitat characteristics of tilefish (*Lopholatilus chamaeleonticeps*) off the east coast of Florida	Able et al. 1993
SEDAR25-RD03	The fishery for tilefish, *Lopholatilus chamaeleonticeps*, off South Carolina and Georgia	Low et al. 1982
SEDAR25-RD04	The complex life history of tilefish *Lopholatilus chamaeleonticeps* and vulnerability to exploitation	Grimes and Turner 1999
SEDAR25-RD05	South Carolina Sea Grant Project: To investigate and document legal and undersized fish (Black Sea Bass) and injuries to released fish.	D. Lombardi 2008
SEDAR25-RD06	The 1882 tilefish kill – a cold event in shelf waters off north-eastern United States?	March et al. 1999
SEDAR25-RD07	Contributions to the life history of black sea bass, *Centropristis striata*, off the Southeastern United States	Wenner et al. 1986
SEDAR25-RD08	Population characteristics of the black sea bass *Centropristis striata* from the Southeastern US	Vaughan et al. 1995
SEDAR25-RD09	The summer flounder, scup, and black sea bass fishery of the Middle Atlantic Bight and southern New England waters	Shepherd and Terceiro 1994
SEDAR25-RD10	Estimating discard mortality of black sea bass (*Centropristis striata*) and other reef fish in North Carolina using a tag-return approach	Rudershausen et al. 2010

SEDAR25-RD11	List of working papers for SEDAR 4 (Atlantic and Caribbean deepwater snapper and grouper) – all documents are available on the SEDAR website	SEDAR 4
SEDAR25-RD12	List of reference documents for SEDAR 4 (Atlantic and Caribbean deepwater snapper and grouper) – all documents are available on the SEDAR website	SEDAR 4
SEDAR25-RD13	Evaluation of multiple survey indices in assessment of black sea bass from the US South Atlantic Coast	Vaughan et al. 1997
SEDAR25-RD14	Seasonal distribution and movement of black sea bass (*Centropristis striata*) in the northwest Atlantic as determined from a mark-recapture experiment	Moser and Shepherd 2009
SEDAR25-RD15	Species profiles: Life histories and environmental requirements of coastal fishes and invertebrates (South Atlantic) – Black sea bass	Mercer et al. 1989
SEDAR25-RD16	Black sea bass	Shepherd 2006
SEDAR25-RD17	Seafood Watch – Black Sea Bass (*Centropristis striata*), northeast region	Kerkering 2004
SEDAR25-RD18	Dispersal of black sea bass (*Centropristis striata*) larvae on the southeast US continental shelf: results of a coupled vertical larval behavior – 3D circulation model	Edwards et al. 2008
SEDAR25-RD19	List of working paper for SEDAR 2 (SA Black sea bass) – all documents are available on the SEDAR website	SEDAR 2
SEDAR25-RD20	Catch rates and selectivity among three trap types in the US South Atlantic black sea bass commercial trap fishery	Rudershausen et al. 2008
SEDAR25-RD21	Lead-radium dating of golden tilefish (*Lopholatilus chamaeleonticeps*)	Andrews 2009
SEDAR25-RD22	Black sea bass, *Centropristis striata*, life history and habitat characteristics (second edition)	Drohan et al. 2007
SEDAR25-RD23	Spawning locations for Atlantic reef fishes off the Southeastern US	Sedberry et al. 2006
SEDAR25-RD24	Growth of black sea bass (*Centropristis striata*) in recirculating aquaculture systems	Perry et al. 2007
SEDAR25-RD25	American food and game fishes. A popular account of all the species found in America north of the equator, with keys for ready identification, life histories and methods of capture – *Tilefish excerpt*	Jordan and Evermann 1908
SEDAR25-RD26	American fishes: A popular treatise upon the game and food fishes of North America with	Goode and Gill 1903

	especial reference to habits and methods of capture – *Sea basses excerpt*	
SEDAR25-RD27	American food and game fishes. A popular account of all the species found in America north of the equator, with keys for ready identification, life histories and methods of capture – *Centropristes excerpt*	Jordan and Evermann 1908
SEDAR25-RD28	Returns from the 1965 Schlitz tagging program including a cumulative analysis of previous results	Beaumariage 1969
SEDAR25-RD29	Source Document for the Snapper-Grouper Fishery of the South Atlantic region	SAFMC 1983
SEDAR25-RD30	FMP, Regulatory Impact Review, and final Environmental Impact Statement for the SG fishery of the South Atlantic region	SAFMC 1983
SEDAR25-RD31	Biological-statistical census of the species entering fisheries in the Cape Canaveral area	Anderson and Gehringer 1965
SEDAR25-RD32	Survey of offshore fishing in Florida	Moe 1963
SEDAR25-RD33	Southeastern US Deepwater reef fish assemblages, habitat characteristics, catches, and life history summaries	Parker and Mays 1998
SEDAR25-RD34	Sea bass pots: bigger mesh may yield larger fish	Lee 2007
SEDAR25-RD35	Migration and standing stock of fishes associated with artificial and natural reefs on Georgia's outer continental shelf	Ansley and Harris 1981
SEDAR25-RD36	The South Carolina fishery for black sea bass (*Centropristis striata*), 1977-1981	Low 1982
SEDAR25-RD37	Age sampling of the commercial snapper grouper fishery and age description of the black sea bass fishery in North Carolina	Collier and Stewart, 2010
SEDAR25-RD38	Black sea bass 2009 stock assessment update (Northeast Fisheries Science Center Reference Document 09-16)	Shepherd 2009
SEDAR25-RD39	The recreational fishery in South Carolina: The Little River story	Burrell
SEDAR25-RD40	Otolith and histology interpretation workshop for golden tilefish and snowy grouper	Joint agency report 2009
SEDAR25-RD41	Age workshop for black sea bass (*Centropristis striata*)	Joint agency report 2009
SEDAR25-RD42	Population genetic structure of black seabass (*Centropristis striata*) on the eastern US coast, with an analysis of mixing between stocks north and south of Cape Hatteras, North Carolina	McCartney and Burton 2011
SEDAR25-RD43	Delineation of tilefish, *Lopholatilus chamaeleonticpes*, stocks along the United States east coast and in the Gulf of Mexico	Katz et al 1982

SEDAR25-RD44	Foreign fishing off the southeastern United States under the currently accepted contiguous sea limitation	Fuss
SEDAR25-RD45	Black sea bass, managing a fishery. A case study. *website document*	Camblos et al. 2005
SEDAR25-RD46	SAFMC Science and Statistics Committee, Bio-Assessment sub-committee	SA SSC 2003

Appendix II: Statement of Work for Dr. Paul Medley

External Independent Peer Review by the Center for Independent Experts

SEDAR 25 South Atlantic Black Sea Bass and Golden Tilefish Review

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 Technical Representative (COTR), 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.

Project Description: SEDAR 25 will be a compilation of data, a benchmark assessment of the stock, and an assessment review conducted for South Atlantic Black Sea Bass and Golden Tilefish. The review workshop provides an independent peer review of SEDAR stock assessments. The term review is applied broadly, as the review panel may request additional analyses, error corrections and sensitivity runs of the assessment models provided by the assessment workshop panel. The review panel is ultimately responsible for ensuring that the best possible assessment is provided through the SEDAR process. The stocks assessed through SEDAR 25 are within the jurisdiction of the South Atlantic Fisheries Management Council and the states of Florida, Georgia, South Carolina, and North Carolina. The Terms of Reference (ToRs) of the peer review are attached in **Annex 2**. The tentative agenda of the panel review meeting is attached in **Annex 3**.

Requirements for CIE Reviewers: Three CIE reviewers shall conduct an impartial and independent peer review in accordance with the SoW and ToRs herein. CIE reviewers shall have working knowledge and recent experience in the application stock assessment, statistics, fisheries science, and marine biology sufficient to complete the primary task of reviewing the technical details of the methods used for the assessment. Expertise with data poor assessment methods would be preferable. 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 conduct an independent peer review during the panel review meeting scheduled in Charleston, South Carolina during October 11-13, 2011.

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

Prior to the Peer Review: Upon completion of the CIE reviewer selection by the CIE Steering Committee, the CIE shall provide the CIE reviewer information (full name, title, affiliation, country, address, email) to the COTR, who forwards this information to the NMFS Project Contact no later the date specified in the Schedule of Milestones and Deliverables. The CIE is responsible for providing the SoW and ToRs to the CIE reviewers. The NMFS Project Contact is responsible for providing the CIE reviewers with the background documents, reports, foreign national security clearance, and other information concerning pertinent meeting arrangements. The NMFS Project Contact is also 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 COTR prior to the commencement of the peer review.

Foreign National Security Clearance: When CIE reviewers participate during a panel review meeting at a government facility, the NMFS Project Contact is responsible for obtaining the Foreign National Security Clearance approval for CIE reviewers who are non-US citizens. For this reason, the CIE reviewers shall provide requested information (e.g., first and last name, contact information, gender, birth date, passport number, country of passport, travel dates, country of citizenship, country of current residence, and home country) to the NMFS Project Contact for the purpose of their security clearance, and this information shall be submitted at least 30 days before the peer review in accordance with the NOAA Deemed Export Technology Control Program NAO 207-12 regulations available at the Deemed Exports NAO website: http://deemedexports.noaa.gov/sponsor.html).

Pre-review Background Documents: Two weeks before the peer review, the NMFS Project Contact will send (by electronic mail or make available at an FTP site) to the CIE reviewers the necessary background information and reports for the peer review. In the case where the documents need to be mailed, the NMFS Project Contact will consult with the CIE Lead Coordinator on where to send documents. CIE reviewers are responsible only for the pre-review documents that are delivered to the reviewer in accordance to the SoW scheduled deadlines specified herein. The CIE reviewers shall read all documents in preparation for the peer review.

Panel Review Meeting: Each CIE reviewer shall conduct the independent peer review in accordance with the SoW and ToRs, and shall not serve in any other role unless specified herein. **Modifications to the SoW and ToRs can not be made during the peer review, and any SoW or ToRs modifications prior to the peer review shall be approved by the COTR and CIE Lead Coordinator.** Each CIE 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 ToRs as specified herein. The NMFS Project Contact is responsible for any facility arrangements (e.g., conference room for panel review meetings or teleconference arrangements). The NMFS Project Contact is responsible for ensuring that the Chair understands the contractual role of the CIE reviewers as specified herein. The CIE Lead Coordinator can contact the Project Contact to confirm any peer review arrangements, including the meeting facility arrangements.

Contract Deliverables - Independent CIE Peer Review Reports: Each CIE reviewer shall complete an independent peer review report in accordance with the SoW. Each CIE reviewer shall complete the independent peer review according to required format and content as described in Annex 1. Each CIE reviewer shall complete the independent peer review addressing each ToR as described in Annex 2.

Other Tasks – Contribution to Summary Report: 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.

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 in the panel review meeting in Charleston, South Carolina during October 11-13, 2011.
3) In Charleston, South Carolina during October 11-13, 2011 as specified herein, conduct an independent peer review in accordance with the ToRs (**Annex 2**).
4) No later than October 27, 2011, each CIE reviewer shall submit an independent peer review report addressed to the "Center for Independent Experts," and sent to Manoj Shivlani, CIE Lead Coordinator, via email to shivlanim@bellsouth.net, and CIE Regional Coordinator, via email to David Sampson 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.

September 6, 2011	CIE sends reviewer contact information to the COTR, who then sends this to the NMFS Project Contact
September 27, 2011	NMFS Project Contact sends the CIE Reviewers the pre-review documents
October 11-13, 2011	Each reviewer participates and conducts an independent peer review during the panel review meeting
October 27, 2011	CIE reviewers submit draft CIE independent peer review reports to the CIE Lead Coordinator and CIE Regional Coordinator
November 10, 2011	CIE submits CIE independent peer review reports to the COTR
November 17, 2011	The COTR distributes the final CIE reports to the NMFS Project Contact and regional Center Director

Modifications to the Statement of Work: Requests to modify this SoW must be approved by the Contracting Officer at least 15 working days prior to making any permanent substitutions. The Contracting Officer will notify the COTR within 10 working days after receipt of all required information of the decision on substitutions. The COTR 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 COTR 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 COTR (William Michaels, via William.Michaels@noaa.gov).

Applicable Performance Standards: The contract is successfully completed when the COTR provides final approval of the contract deliverables. The acceptance of the contract deliverables shall be based on three performance standards:
(1) each CIE report shall completed with the format and content in accordance with **Annex 1**,
(2) each 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 COTR, the CIE Lead Coordinator shall send via e-mail the final CIE reports in *.PDF format to the COTR. The COTR will distribute the CIE reports to the NMFS Project Contact and Center Director.

Support Personnel:

William Michaels, Program Manager, COTR
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Roger W. Peretti, Executive Vice President
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Key Personnel:

Kari Fenske, SEDAR Coordinator
4055 Faber Place Drive, Suite 201
North Charleston, SC 29405
kari.fenske@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.

   a. Reviewers should describe in their own words the review activities completed during the panel review meeting, including providing a brief summary of findings, of the science, conclusions, and recommendations.

   b. Reviewers should discuss their independent views on each ToR even if these were consistent with those of other panelists, and especially where there were divergent views.

   c. Reviewers should elaborate on any points raised in the Summary Report that they feel might require further clarification.

   d. Reviewers shall provide a critique of the NMFS review process, including suggestions for improvements of both process and products.

   e. The CIE independent report shall be a stand-alone document for others to understand the weaknesses and strengths of the science reviewed, regardless of whether or not they read the summary report. The CIE independent report shall be an independent peer review of each ToRs, and shall not simply repeat the contents of the summary report.

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
   Appendix 3: Panel Membership or other pertinent information from the panel review meeting.

Annex 2: Tentative Terms of Reference for the Peer Review

SEDAR 25 Black Sea Bass Review Workshop 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 October 28, 2011.

* 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.

SEDAR 25 Golden Tilefish Review Workshop 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 October 28, 2011.

* 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

Tentative Agenda

SEDAR 25 South Atlantic Black Sea Bass and Golden Tilefish Review Workshop

Charleston, SC
11-13 October, 2011

Tuesday

9:00 a.m.	**Convene**	
9:00 – 9:30 a.m.	**Introductions and Opening Remarks** *- Agenda Review, TOR, Task Assignments*	**Coordinator**
9:30 – 12:00 p.m.	**Assessment Presentations and discussion**	
12:00 – 1:15 p.m.	**Lunch Break**	
1:15 – 6:00 p.m.	**Assessment presentations and discussion**	**Chair**

***Tuesday Goals*:** Initial presentations completed, sensitivity and base model discussion begun

Wednesday

8:00 a.m. – 11:30 a.m.	**Panel Discussion** **-** *Assessment Data & Methods* *- Identify additional analyses, sensitivities, corrections*	**Chair**
11:30 a.m. – 1:00 p.m.	**Lunch Break**	
1:30 p.m. – 6:00 p.m.	**Panel Discussion/Panel Work Session** *- Continue deliberations* *- Review additional analyses* *- Recommendations and comments*	**Chair**

***Wednesday Goals*:** sensitivities and modifications identified, preferred models selected, projection approaches approved, Report drafts begun

Thursday

8:00 a.m. – 1:00 p.m.	**Panel Discussion** *- Final sensitivities reviewed.* *- Projections reviewed.* *- Review Reports*	**Chair**
1:00 p.m.	**ADJOURN**	

Thursday Goals: Complete assessment work and discussions, final results available. Draft Reports reviewed.