Consultant Report on:

SEDAR 16 Stock Assessment Review
South Atlantic and Gulf of Mexico King Mackerel
August 3 - August 8, 2008

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Contents

Executive Summary

The Review Panel Report covers all comments on the SEDAR review of the assessment results and the consensus scientific advice. This report does not attempt to repeat the consensus report, where the findings of the review have been recorded.

A major concern is that the stock structure overlaps with the Mexican fishery. Although a temporary solution was found, it is important that co-operation with Mexico should be sought in future.

Abundance indices should be reviewed more rigorously with respect to their relationship to stock size. A multivariate analysis of sets of indices should aid in considering how they are to be used together in the stock assessment.

By default, it is recommended that observations of zero should be treated as no data in log-normal log-likelihood. Ideally, alternative log-likelihoods should be used.

In developing the new SS3 model, it needs to be ensured that the improvement in the assessment has a commensurate impact on management.

The SEDAR process needs to ensure management councils get feedback on their actions.

The workshop reporting should be standardised as much as possible to improve communication and efficiency.

Introduction

South East Data, Assessment, and Review (SEDAR) is a process for fisheries stock assessment development and review. SEDAR is organized around three workshops: data, assessment, and review. The review workshop provides an independent peer review of the products of the data and assessment workshops. The review panel is ultimately responsible for ensuring that the best possible assessment is provided through the SEDAR process.

This report concerns the review workshop, which took place at the Hyatt Regency Riverside Hotel in Jacksonville, FL, from 1:00 p.m. Monday, August 4, 2008 through 1:00 p.m. Friday, August 8, 2008. 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 a SEDAR Stock Assessment Report.

The SEDAR 16 review panel was composed of three Center for Independent Experts (CIE)-appointed reviewers, Kenneth Patterson, Paul Medley and Neil Klaer, one reviewer appointed by the Gulf of Mexico Council, Doug Gregory, and a chair appointed by the SEFSC Director, Guillermo Diaz. Council staff, Council members, and Council AP and SSC members also attended as observers and the review workshop was open to the public.

The review workshop terms of reference are described in Appendix III. They include evaluating the data and methods used, recommend the appropriate

estimates of management quantities, and ensure that results are accurately and clearly presented. The SEDAR was also evaluated and research recommendations from the data and assessment workshops were reviewed. The findings of the review panel are presented in the peer review consensus summary.

The Review Panel Report covers all comments on the SEDAR review of the assessment results and the consensus scientific advice. This report is not intended to repeat this consensus report, and information on the findings of the review will be found there. This CIE report provides further more detailed advice which is not based on consensus, but may only be a personal view. The objective of this report is to be constructive in terms of recommendations for the future direction and development of the stock assessment, and is therefore more concerned with the SS3 assessment, which only formed a small part of the review.

Catches

The data workshop proposed a sensitivity run, combining the data from Mexico with that for the entire U.S. Gulf of Mexico under the assumption that the king mackerel populations off Mexico are well-mixed with the populations in the U.S. Gulf of Mexico and effectively constitute a single stock. However, the data workshop also believed that the evidence for a single migratory unit occupying the entire range from West Florida through Mexico was not compelling. The available evidence appears to be inconclusive, and therefore the decision on the importance of Mexico appears to depend more upon an assumed null hypothesis than any direct evidence.

Clearly, the data obtained from Mexico are relatively poor and incomplete. In particular, size and age compositions are missing. Nevertheless, it seems likely that the western Gulf population is shared, and therefore that, at the very least, the fall-groundfish, fall-plankton and shrimp by-catch abundance indices may be strongly influenced by Mexican activities.

Where data are poor, they should not be automatically replaced by zero in assessments. There is a tendency to set catches to zero if they are uncertain, even when they are known to be greater than zero, as though this is the precautionary choice. It is not clear that this is always the appropriate response to inaccurate or unknown data, and therefore the best estimate, however poor, rather than zero should be used at least in a sensitivity run, as was done for the VPA with Mexican catch data at the review workshop.

On the other hand, adding inaccurate estimates of total catch rarely have much real impact on stock assessments. Usually, as in this case where the sensitivity run included reported Mexican ICCAT catches, the model raises the estimate of the biomass to account for the catch and little else changes. Unrecorded catches and catch trends may still be the underlying cause of the retrospective pattern, but more accurate data may be required to remove these.

The real critical issue is not so much whether the stocks are defined on a scientific basis, but that they can be managed as a unit. That is, increasing or

decreasing the amount of fishing in US waters predominantly controls the abundance of the fish population. The correct precautionary decision should be to conduct the assessment and apply its advice, even if Mexico cannot be involved directly. However, it is clear that further co-operation should be urgently sought with Mexico in defining stock structure and, if necessary, co-operative assessment and management.

Abundance Indices

The King Mackerel assessment was given a large number of abundance indices by the data workshop. These indices were briefly reviewed and proposed for the assessment unless a good reason to exclude them was apparent. All indices were used on a log-scale. There appeared to have been no in-depth review of these indices.

There is a lack of questioning of the relationship between the indices and the abundance of the stock. The assumption is that the log of the population size is proportional to the log of the index, and that the error is log-normal. While this is not unreasonable, it does not appear to be adequately tested.

A narrative is required as to why the index is the form it is, and how it is related to stock size. A poor relationship might be due to hyper- or hypo-stability if the index does not cover the full range of the population, there is interference or competition between fishing units, or there are changes in fishermen or fish behaviour.

Evidence of a relationship to the local abundance might be obtained from fishermen, as was presented during the SEDAR 16 review workshop. When using commercial catch-per-unit-effort, it makes sense to consult fishermen as much as possible on its correct interpretation.

Given that the data workshop was able to develop a number of abundance indices to be used in the assessment, the coherence between these indices should have been explored. In general, the indices should be closely correlated if they are measuring the same variable (stock biomass). This is complicated by the fact that the indices do not relate to exactly the same variable due to differences age, time and location.

Coherence between indices might be measured using linear correlations between the logged indices (see Appendix I). Coherent indices would be expected to have zero or positive correlations. Positive correlations occur when they have the same trend, zero when neither has a trend (implying the stock size has not changed over the time period) or when the trends might be obscured due to the indices being related to different components of the stock (age groups or biomass as opposed to numbers). Negative correlations imply that the variables cannot be measuring the same thing and including all indices in the assessment is not helpful. If it cannot be determined which indices provide better indicators of the changes in stock size, a better approach would be to define sets of coherent indices and carry out separate assessments with each set as sensitivity analyses.

A more sophisticated approach using factor analysis (Zuur *et al.* 2003) would attempt to identify a single underlying variable (i.e. stock size) based on the joint variation of the indices. Apart from grouping indices with common factors, the factor analysis may also provide an appropriate basis for weighting the indices.

Reviewing indices should be undertaken as part of the index standardisation process. Although the indices could be addressed during the full assessment using model fit diagnostics, it would be complex and slow. Ideally, the assessment should have a set of fixed indices, which the assessment team can be confident are correlated with abundance. If this is not possible, alternative sets of coherent indices should be put forward as representing abundance trends. It would be up to the data workshop to give each of these sets a subjective probability, if this is deemed appropriate.

There is a big increase in the SEAMAP fall groundfish survey at the end of the series, which coincides with a decrease in Gulf shrimp trawler effort. This index covers the western Gulf, which may not be representative of the whole Gulf and particularly not of the mixing zone. It is noticeable that the three indices coinciding with the shrimp trawl area are similar (Appendix I). The lower shrimp trawl effort may cause the higher index through three possibilities: through an effect on fish behaviour, hence catchability, a local increase in abundance due to lower fishing mortality, or an overall abundance change. All three possibilities should be considered as part of the SS3 assessment.

Abundance indices are particularly susceptible to changes in management controls. It was good to see that this was recognised by the data workshop and addressed. However, it is important that management is made more aware of the implications of their decisions on monitoring the stock.

Likelihood and Model Form

As the population model will change with the upgrade to SS3, there was little point in too detailed review of the VPA structure. The perceived shortcomings are already being addressed. The focus of comments has therefore been on the data, as above, and on the strategy adopted for assessing the stock.

Where a log-normal likelihood is being used, it is advisable to treat all observations of zero as missing values. There can be a significant bias introduced by the choice of a single low value, with the degree of influence of the point increasing dramatically with decreasing value. Since the point falls somewhere arbitrarily below an unknown veil line, a fixed value is not really appropriate.

As this problem is an artefact of the incorrect choice of log-normal likelihood, an alternative likelihood would be preferable that has much lower weight on low values and allows zeros. The assumption that the residuals are overdispersed should be tested; that is the rate at which variance of the residuals increase with the expected values. As introducing a new untested likelihood may require some development, some quicker alternatives are:

- Using an alternative Box-Cox type transform to that of taking the log of the data, such as the square root (i.e. $y^{(\frac{1}{2})} = 2(y^{\frac{1}{2}} - 1)$). As long as the

expected value is subject to the same transform, the linear relationship should be preserved.

- Applying a veil line (estimated for example from the sampling data, such as the proportion of population area sampled by a trawl survey, or lowest value in the time series) and obtaining the log-likelihood as the log of the cumulative probability (integral) of the log-normal below this veil line.
- Treating zeroes as missing values – the simplest option.

It would also be worth reviewing the working papers and findings of the Northeast Fisheries Science Center Groundfish Assessment Review Meeting III[1]. The workshop presented reviews among other things on VPA vs catch-at-age models, retrospective bias and how to treat zeros in logged abundance indices. This addressed some of the issues encountered in the SEDAR 16 assessment, and while no universal conclusions were reached, the analysis and simulations presented at that meeting were useful in understanding these problems.

The model adjusted the natural mortality at age based on the length (Lorenzen 1996) scaled to the fixed mortality estimate from Hoenig (1983). As the Hoenig (1983) method is based on the fixed mortality model, the mortality at unit length would be more consistently estimated using the Hoenig (1983) approach, but with the Lorenzen (1996) model. This should only make small difference however.

Data collection is adequate for VPA stock assessment. However, it was noted that the SS3 spatial model requires movement information (most probably tagging or similar data), which are currently unavailable. It is very easy to make model data requirements exceed the type, quality and quantity data that in reality can be collected.

The quality of advice needs to match the quality of the assessment. As the quality of the assessment improves, methodologies to communicate results accurately should also improve. Without this, the scientific endeavour can have little impact. Currently, most effort is put into presenting the science to other scientists (e.g. the reviewers) rather than managers.

The main reasons to improve an assessment are:

- Meet the minimum requirements of the management advice.
- Reduce uncertainty by making better use of the available data or reduce structural error.
- Improve the general science and understanding with a view to the long term.

The current assessment meets the minimum requirements for management advice. However, unless that advice addresses uncertainty explicitly, it is difficult to justify or understand the advantages of more data collection or accurate modelling.

The current assessment method had been questioned in the past however, and the SS3 mixing model has been developed largely in response to previous

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[1] http://www.nefsc.noaa.gov/GARM-Public/2.%20Models%20Meeting/

workshops. However, without evaluating the effectiveness and efficiency of the assessment in relation to improving management, this can become an unending and costly process of trying to continuously improve precision. One use of a management strategy evaluation (MSE) is to assess a reasonable approach that balances costs against the risks of different levels of information for stock assessment. MSE could be of use for this stock.

SEDAR Process

It is important to review past management actions and their effect on the stock. This forms part of the management cycle giving feedback on the effectiveness of the control and whether relevant management objectives are being met. Although a management review was included in the assessment workshop's terms of reference, it could not be completed through lack of time. However, the impact of management controls on some abundance indices were assessed by the data workshop. Given that a full review of management effectiveness could become complex, it would make sense for this to be scheduled as a separate task before the next assessment, so that the management councils could include this information in their deliberations.

It will be worth trying to standardise the SEDAR reporting as much as possible to improve communication and efficiency. The standardisation should not limit the workshops in the tasks they undertake, but provide a minimum template for the outputs they should produce. These could include, but not be limited to:

- Consistent reporting of indicators such as mean fishing mortality, which are easier to understand, particularly for less technical readers.

- Develop a template for communicating uncertainty. The decision table suggested by the assessment and review panel is an excellent choice, but it is likely that fishery managers will need to develop an understanding of these tools and how to use them. Standardisation on how they are produced and presented will help with this.

- Standardise the reporting as much as possible.

Output from the assessment workshops should be standardised as far as possible. The reports were already fairly well standardised in structure, but more thought could be given to reporting the various data sources, standard diagnostic output for the assessment model and minimising the work required to produce reports. Standardising output and updating stock assessment documents, rather than re-writing from scratch, should make documentation easier to write and understand. Maintained edited documents tend to improve in quality and accuracy over time and allow more time for analysis and checking results rather than writing. A checklist of standard diagnostics, including standardised residuals over time, standardised residuals vs. expected values, and Q-Q plots, should be produced for each assessment. Production of standard documentation can often be automated, which increases productivity and also avoids missing issues in reviews on the assumption that these diagnostics have been checked by the assessment team, where due to a shortage of time, they may not have been.

To assess the implications of management decisions, the social and economic costs should be considered. The separation between management and science becomes less clear when advice is uncertain. As all stock assessments include uncertainty, and for most it is the dominant feature, SEDAR should consider, in the longer term, incorporating information on social and economic costs in assessments.

On a more minor note, it may be best to avoid August for the review meetings if tight schedules are to be kept. It was difficult for this meeting to co-ordinate among participants where holidays were being taken at different times during the month.

References

Everitt, B. S., Landau, S. and Leese, M. (2001) *Clustering Analysis*, 4th edition Wiley, New York.

Hoenig, J.M. 1983. Empirical use of longevity data to estimate mortality rates. Fish. Bull. 82:898-903

Liao, T.W. (2005) Clustering of time series data—a survey. Pattern Recognition 38 (11) pp.1857-1874

Lorenzen, K. 1996. The relationship between body weight and natural mortality in juvenile and adult fish: a comparison of natural ecosystems and aquaculture. Journal of Fish Biology 49: 627-647.

Zuur, A.F., Tuck, I.D., and Bailey, N. (2003) Dynamic factor analysis to estimate common trends in fisheries time series. Can. J. Fish. Aquat. Sci. **60**: 542–552

Appendix I: Preliminary Analysis of Abundance Indices Clustering

There seems to be an interest in time series clustering as part of the effort in temporal data mining research (Liao 2005) which could afford new ideas on treatment of abundance indices. Abundance indices are likely to have a fixed lag associated with the age group they relate to, making a spectral approach unnecessary, and allowing simpler measures of dissimilarity based on correlation. However, there are still many issues with respect to the measures and method applied to clustering not considered below.

Because the main interest lies in the trends of series assuming no lag, a distance measure based on simple correlation seems appropriate. More complex approaches based on the assessment model could be considered in future, particularly where different age groups are taken into account. However, as an *a priori* selection of groups of indices, a simple correlation measure would seem to be reasonable.

Data were taken from S16_AW_08. Table 7. (Indices of abundance for the combined Atlantic and Gulf king model Stock Synthesis 3 2008). Correlations were calculated on a pairwise basis, minimising the effect of missing data. There are negative correlations between some of the indices suggesting that the set of indices are not coherent. Simple hierarchical clustering was used to group indices into ones with similar trends using Ward's minimum variance method (Everitt *et al.* 2001). The "R" commands are described under Table 1. Based on the correlation matrix, indices can be separated into 6 groups (Table 1; Figure 1). Some of these groupings correspond to the stock structure (Atlantic vs Gulf), others are more difficult to explain and may suggest problems in the indices. However, the structure does suggest there is real information in the indices overall which should provide a good foundation for the stock assessment.

Rather than force any particular combination of indices or weighting in the assessment, the clustering can be used to define alternative "states-of-nature" based on groups of abundance indices.

Based on this simple analysis, it would suggest sensitivity analyses for the SS3 assessment would include:

- All indices included.
- Excluding indices MRFSS-ATL, LBOOK_ATLnoMix, and, possibly, SEAMAP_ATL.
- Separating the indices associated with the Western Gulf (ShrimpBycatch, FALL_Plankton_GOM, FALL_Groundfish_GOM) relating them to a different component of the stock, perhaps more associated with the Mexican fishery.

Table 1 Abundance indices used in the cluster analysis taken from those used to fit the SS3 model. The main six clusters are indicated and the structure can be seen in the dendrogram (Fig. 1).

Index	Dates	TS length	Population	Comments
MRFSS-ATL	Jul-Oct	26	ATL	The most inconsistent indices with all the others.
LBOOK_ATLnoMix	Jul-Oct	14		
SEAMAP_ATL	Apr-Jun	18	ATL	This index does not seem consistent with other ATL indices, perhaps because it is a recruitment index and requires a non-zero lag.
MRFSS-Gulf	Jul-Oct	26		Long time series and consistent eastern Gulf / mixed components. The mixed/GOM components may not be well separated in these cases.
MRFSS-Mixing	Jan-Mar	26	GOM/Mix	
HB-Mixing	Jan-Mar	28		
HB-Gulf	Jul-Oct	21		
LBOOK_GLFnoMix	Jul-Oct	14	GOM	Consistent GOM indices, but the time series is short.
FL_TT_GLFnoMix	Jul-Oct	21		
ShrimpBycatch	Jul-Oct	33		A coherent set of data of reasonable length, related to the Western Gulf. All the indices may be affected equally by the changes in the shrimp fishery.
FALL_Plankton_GOM	Jul-Oct	19	GOM	
FALL_Groundfish_GOM	Nov-Dec	35		
NC-PID8+	Jul-Oct	13	ATL/Mix	The time series for these indices are very short.
LBOOK_Mix	Nov-Dec	14		
HB-ATL	Jul-Oct	25	ATL/Mix	Atlantic and Florida mixed. Different time periods.
FL_TT_Mixing	Nov-Dec	21		

R commands:

```
correl <- cor(ABI, y = NULL, use = "pairwise.complete.obs", method = "pearson") #ABI is the data matrix
dissim <- as.dist(1 - correl)    #Create dissimilarity matrix
fit <- hclust(dissim, method="ward")  #Hierarchical clustering using Ward's method
plot(fit)  # Display dendogram
```

Cluster Dendrogram
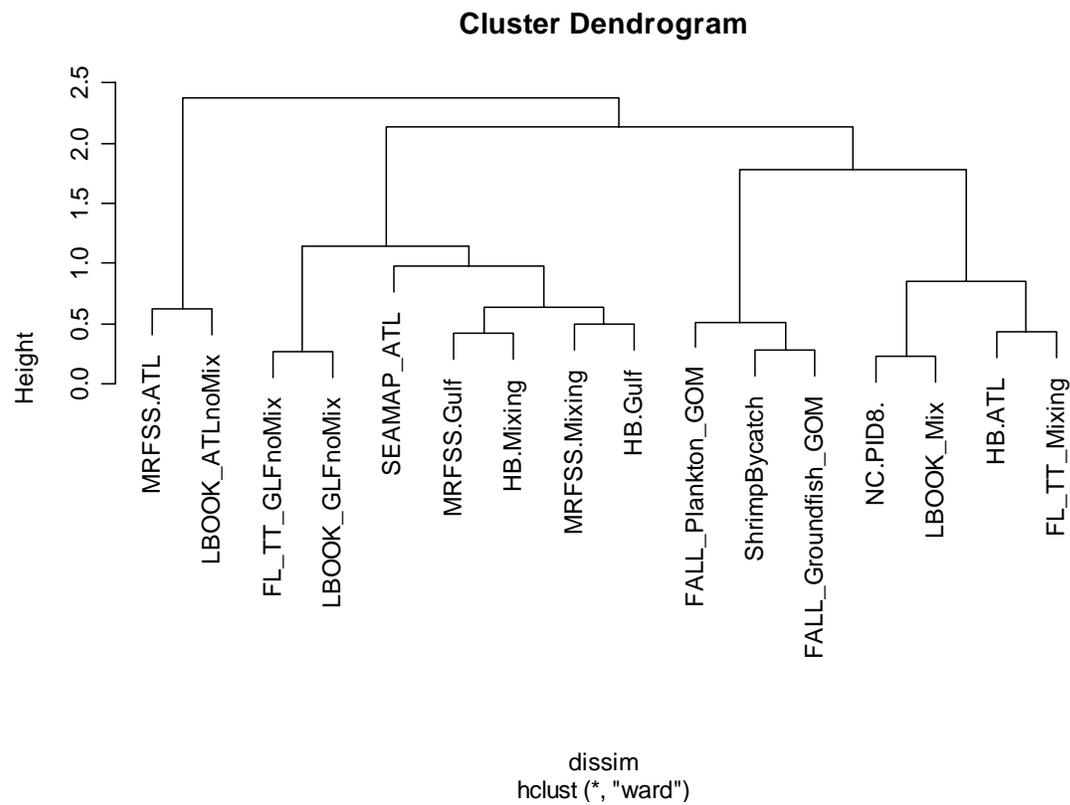
Figure 1 Results of the cluster analysis based upon correlation matrix between abundance indices, using Ward's method of hierarchical clustering. Ward's minimum variance method, which aims at finding compact, spherical clusters, seems a reasonably choice in this case.

Appendix II: Review Document List

The following are the main documents that were used in the review.

Document	Title	Author
SEDAR 16-SAR	South Atlantic and Gulf of Mexico King Mackerel SECTION II: Data Workshop Report	
SEDAR16-AW-06	Virtual Population Analyses of Gulf of Mexico and Atlantic King Mackerel Migratory Groups: Continuity Case and Sensitivity Runs (Version 1)	Cass-Calay, S. and M. Ortiz
SEDAR16-AW-07	Updated Estimates of Gulf king mackerel bycatch from the U.S. Gulf of Mexico Shrimp trawl fishery	Ortiz, M. and K. Andrews
SEDAR16-AW-09	Notes on the weighting of the indices for the king mackerel VPA analyses	Restrepo, V.R., S. Cass-Calay, and M. Ortiz
SEDAR16-AW-10	Virtual Population Analyses of Gulf of Mexico and Atlantic King Mackerel Migratory Groups: Continuity Case and Sensitivity Runs (Version 2)	Cass-Calay, S., M. Ortiz and V.R. Restrepo
SEDAR16-AW-11	Virtual Population Analyses of Gulf of Mexico and Atlantic King Mackerel Migratory Groups: Continuity Case and Sensitivity Runs (Version 3)	Cass-Calay, S., M. Ortiz and V.R. Restrepo
SEDAR16-AW-12	Virtual Population Analyses of Gulf of Mexico and Atlantic King Mackerel Migratory Groups: Continuity Case and Sensitivity Runs (Version 4)	Cass-Calay, S., M. Ortiz and V.R. Restrepo
SEDAR16-RW-01	Virtual Population Analyses of Gulf of Mexico and Atlantic King Mackerel Migratory Groups: Continuity Case and Updated Runs Through July 2008	Cass-Calay, S., M. Ortiz and V.R. Restrepo

All documents produced by the data and assessment Workshops, as well as other reference documents, were available for use during the review and are listed elsewhere.

Appendix III: Statement of Work for Dr. Paul Medley

External Peer Review by the Center for Independent Experts

SEDAR 16 Stock Assessment Review
Gulf of Mexico and South Atlantic King Mackerel
August 4-8, 2008
Jacksonville, Florida

SEDAR Overview:

South East Data, Assessment, and Review (SEDAR) is a process for fisheries stock assessment development and review conducted by the South Atlantic, Gulf of Mexico, and Caribbean Fishery Management Councils; NOAA Fisheries Southeast Fisheries Science Center (SEFSC) and Southeast Regional Office (SERO); and the Atlantic and Gulf States Marine Fisheries Commissions. SEDAR is organized around three workshops: data, assessment, and review. Input data are compiled during the data workshop, population models are developed during the assessment workshop, and an independent peer review of the data, assessment models, and results is provided by the review workshop. SEDAR documents include working papers prepared for each workshop, supporting reference documents, and a SEDAR stock assessment report. The SEDAR stock assessment report consists of a data report produced by the data workshop, a stock assessment report produced by the assessment workshop, and a peer review consensus report prepared by the review workshop.

SEDAR is a public process conducted by the Fishery Management Councils in the Southeast US. All workshops, including the review, are open to the public and noticed in the Federal Register. All documents prepared for SEDAR are freely distributed to the public upon request and posted to the publicly accessible SEDAR website. Verbal public comment during SEDAR workshops is taken on an 'as needed' basis; the workshop chair is allowed discretion to recognize the public and solicit comment as appropriate during panel deliberations. Written comments are accepted in accordance with existing Council operating procedures. The names of all participants, including those on the review panel, are revealed.

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 review panel task is specified in terms of reference.

The SEDAR 16 review panel will be composed of three Center for Independent Experts (CIE)-appointed reviewers, one reviewer appointed by the South Atlantic Council, one reviewer appointed by the Gulf of Mexico Council and a chair appointed by the SEFSC Director. Council staff, Council members, and Council AP and SSC members will attend as observers. SEDAR review workshops are open to the public.

Overview of CIE Peer Review Process:

The Office of Science and Technology implements measures to strengthen the National Marine Fisheries Service's (NMFS) Science Quality Assurance Program (SQAP) to ensure the best available science for fisheries management. For this reason, the NMFS Office of Science and Technology oversees a contract for obtaining external expertise through the Center for Independent Experts (CIE) to conduct independent peer reviews of stock assessments and various scientific research projects. The primary objective of the CIE peer review is to provide an impartial review, evaluation, and recommendations in accordance to the Statement of Work (SoW), including the Terms of Reference (ToR) herein.

The NMFS Office of Science and Technology serves as the liaison with the NMFS Project Contact to establish the SoW which includes the expertise requirements, ToR, statement of tasks for the CIE reviewers, and description of deliverable milestones with dates. The CIE, comprised of a Coordination Team and Steering Committee, reviews the SoW to ensure it meets the CIE standards and selects the most qualified CIE reviewers according to the expertise requirements in the SoW. The CIE selection process also requires that CIE reviewers can conduct an impartial and unbiased peer review without the influence from government managers, the fishing industry, or any other interest group resulting in conflict of interest concerns. Each CIE reviewer is required by the CIE selection process to complete a Lack of Conflict of Interest Statement ensuring no advocacy or funding concerns exist that may adversely affect the perception of impartiality of the CIE peer review. The CIE reviewers conduct the peer review, often participating as a member in a panel review, in accordance with the ToR producing a CIE independent peer review report as a deliverable. The ToR may require a CIE reviewer to contribute to a summary report. The Office of Science and Technology oversees the CIE contract to ensure the deliverables (e.g., CIE reports) are in compliance with the SoW and ToR. Further details on the CIE process are provided at
http://www.rsmas.miami.edu/groups/cie/

Requirements for CIE Reviewers:
The CIE shall provide three CIE reviewers to conduct independent peer reviews in accordance with the ToR and Schedule herein, and each CIE reviewer's duties shall not exceed a maximum of 14 days for pre-review preparations, conducting the peer review at the SEDAR 16 panel review meeting, and completion of the CIE independent peer review reports. The CIE reviewers shall participate as technical reviewers on the SEDAR 16 review panel that will consider assessments of king mackerel in the Gulf of Mexico and South Atlantic regions. The CIE reviewers shall have expertise in stock assessment, statistics, fisheries science, and marine biology to complete their primary task of conducting an impartial and independent CIE peer review report in accordance with the ToR to determine if the best available science is utilized for fisheries management decisions. The CIE reviewers shall not provide comments on fisheries management decisions.

Statement of Tasks for CIE Reviewers:

The CIE reviewers shall conduct necessary preparations prior to the peer review, conduct the peer review, and complete the deliverables in accordance with the ToR and milestone dates as specified in the Schedule section.

Prior to the Peer Review: The CIE shall provide the CIE reviewers contact information (name, affiliation, address, email, and phone), including information needed for foreign travel clearance when required, to the Office of Science and Technology COTR no later than the date as specified in the SoW. The Project Contact is responsible for the completion and submission of the Foreign National Clearance forms (typically 30 days before the peer review), and must send the pre-review documents to the CIE reviewers as indicated in the SoW.

Foreign National Clearance: If the SoW specifies that the CIE reviewers shall participate in a panel review meeting requiring foreign travel, then the CIE shall provide the necessary information (e.g., name, birth date, passport, travel dates, country of origin) for each CIE reviewer to the COTR who will forward this information to the Project Contact. The Project Contact is responsible for the completion and submission of required Foreign National Clearance forms with sufficient lead-time (30 days) in accordance with the NOAA Deemed Export Technology Control Program NAO 207-12 regulations at the Deemed Exports NAO link http://deemedexports.noaa.gov/sponsor.html

Pre-review Documents: Approximately two weeks before the peer review, the Project Contact will send the CIE reviewers the necessary documents for the peer review, including supplementary documents for background information. The CIE reviewers shall read the pre-review documents in preparation for the peer review.

This list of pre-review documents may be updated up to two weeks before the peer review. Any delays in submission of pre-review documents for the CIE peer review will result in delays with the CIE peer review process. Furthermore, the CIE reviewers are responsible for only the pre-review documents that are delivered to them in accordance to the SoW including the scheduled deadlines specified herein.

Panel Peer Review Meeting: The CIE reviewers shall participate and conduct the peer review participate during a panel review meeting as specified in the dates and location of the attached Agenda and Schedule of Deliverable. The Project Contact is responsible for any facility arrangements (e.g., conference room for panel review meetings or teleconference arrangements). The CIE Program Manager can contact the Project Contact to confirm the facility arrangements.

The primary role of the CIE reviewer is to conduct an impartial peer review in accordance to the Terms of Reference (ToR) herein, to ensure the best available science is utilized for the National Marine Fisheries Service (NMFS) management decisions (refer to the ToR in Annex 1).

The stocks assessed through SEDAR 16 are within the jurisdiction of the Gulf of Mexico and South Atlantic Fishery Management Councils and the states of Texas, Louisiana, Mississippi, Alabama, Florida, Georgia, South Carolina, and North Carolina.

The review workshop will take place at the Hyatt Regency Riverfront, Jacksonville, Florida from 1:00 p.m. Monday, August 4, 2008 through 1:00 p.m. Friday, August 8, 2008.

Meeting materials will be forwarded electronically to review panel participants and made available through the internet (http://www.sefsc.noaa.gov/sedar/); printed copies of any documents are available by request. The names of reviewers will be included in workshop briefing materials.

Please contact Julie A. Neer (SEDAR Coordinator; (843) 571-4366, Julie.Neer@safmc.net)or John Carmichael, (Science and Statistics Program Manager; (843) 571-4366, John.Carmichael@safmc.net) for additional details.

Hotel arrangements:

Hyatt Regency Riverfront
225 Coast Line Drive East
Jacksonville, FL 32202
904-588-1234 or 800-233-1234
Phone: (919) 828-0811 or (800) 331-7919

Group "SEDAR" $84 /night plus 1.13% city tax = $84.95; rate is guaranteed through 3 July 2008.

SEDAR Review Workshop Panel Tasks:

The SEDAR 16 review workshop panel will evaluate an assessment of Gulf of Mexico and South Atlantic king mackerel. During the evaluation the panel will consider data, assessment methods, and model results. The evaluation will be guided by terms of reference that are specified in advance. The review workshop panel will document its findings regarding each assessment in a peer review consensus summary (Annex I). (Note that the consensus summary is a SEDAR product, not a CIE product.) Separate CIE reviewer reports will be produced as described in Annex II to provide distinct, independent analyses of the technical issues and of the SEDAR process.

Terms of Reference for SEDAR 16 Review Workshop:
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 and provide estimated values for management benchmarks, a range of ABC, and 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[*]. 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, including the Summary Report, and that reported results are consistent with Review Panel recommendations[**].

8. Evaluate the SEDAR Process. Identify any Terms of Reference which were inadequately addressed by the Data or Assessment Workshops; identify any additional information or assistance which will improve Review Workshops; suggest improvements or identify aspects requiring clarification.

9. Review the research recommendations provided by the Data and Assessment workshops and make any additional recommendations warranted. Clearly indicate the research and monitoring needs that may appreciably improve the reliability of future assessments. Recommend an appropriate interval for the next assessment.

10. Prepare a Peer Review Consensus Summary summarizing the Panel's evaluation of the stock assessment and addressing each Term of Reference. Complete and submit this report within 3 weeks of workshop conclusion.

[*] The review panel may request additional sensitivity analyses, evaluation of alternative assumptions, and correction of errors identified in the assessments provided by the assessment workshop panel; the review panel may not request a new assessment. Additional details regarding the latitude given the review panel to deviate from assessments provided by the assessment workshop panel are provided in the *SEDAR Guidelines* and the *SEDAR Review Panel Overview and Instructions*.

[**] 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.

These Terms of Reference may be modified prior to the Review Workshop. If so, final terms of reference will be provided to the reviewers with the workshop briefing materials.

SEDAR Review Workshop Panel Supplementary Instructions

The review panel Chair is responsible for reviewing documents prior to the workshop, conducting the meeting during the workshop in an orderly fashion, compiling and editing the peer review consensus summary for each species assessed and submitting

it to the SEDAR Coordinator by a deadline specified by the SEDAR Steering Committee. The review panel chair will work with SEDAR staff to complete the SEDAR assessment summary report. The review panel chair may participate in panel deliberations and contribute to report preparation.

Reviewers are responsible for reviewing documents prior to the workshop, participating in workshop discussions addressing the terms of reference, preparing consensus reports during the workshop, and finalizing SEDAR documents within two weeks of the conclusion of the workshop. Each reviewer appointed by the CIE is responsible for preparing an additional CIE reviewer report as described in Annex II.

The Chair and SEDAR Coordinator will work with the appointed reviewers to assign tasks during the workshop. For example, the Chair may appoint a panelist to serve as assessment leader for each assessment covered by the review, with the leader responsible for providing initial draft consensus report text for consideration by the panel. Alternatively, reviewers may be assigned particular terms of reference to initially address. Regardless of how initial drafting is accomplished, all panelists are expected to participate in discussion of all terms of reference and contribute to all aspects of the review.

The review panel's primary responsibility is to ensure that assessment results are based on sound science, appropriate methods, and appropriate data, and to determine whether or not the assessment is adequately robust to support management decisions. During the course of the review, the panel is allowed limited flexibility to deviate from the assessment provided by the assessment workshop. This flexibility may include modifying the assessment configuration and assumptions, requesting a reasonable number of sensitivity runs, requesting additional details and results of the existing assessments, or requesting correction of any errors identified. However, the allowance for flexibility is limited, and the review panel is not authorized to conduct an alternative assessment or to request an alternative assessment from the technical staff present. The review panel is responsible for applying its collective judgment in determining whether proposed changes and corrections to the presented assessment are sufficient to constitute an alternative assessment. The review panel chair will coordinate with the SEDAR Coordinator and technical staff present to determine which requests can be accomplished and prioritize desired analyses.

Any changes in assessment results stemming from modifications or corrections solicited by the review panel will be documented in an addendum to the assessment report. If updated estimates are not available for review by the conclusion of the workshop, the review panel shall agree to a process for reviewing the final results within the time allotted for completion of the project.

The review panel shall not provide specific management recommendations. Such recommendations will be generated through existing Council bodies, such as the Science and Statistical Committee and Advisory Panels, following completion of the assessment. However, the review panel is free to point out items of concern regarding past or present management actions that relate to population conditions or data collection and monitoring efforts.

If the review panel finds an assessment deficient to the extent that technical staff present cannot correct the deficiencies during the course of the workshop, or the panel deems that desired modifications would result in a new assessment, then the review panel shall provide required remedial measures in writing. These instructions shall include an appropriate approach for both correcting and subsequently reviewing the assessment.

Statement of Tasks for CIE Reviewers:

Roles and responsibilities:

1. Approximately 3 weeks prior to the meeting, reviewers shall be provided with stock assessment reports, associated supporting documents, and review workshop instructions including terms of reference. Reviewers shall read these documents to gain an in-depth understanding of the stock assessment, the resources and information considered in the assessment, and responsibilities as reviewers.

2. During the review panel meeting, reviewers shall participate in panel discussions on assessment methods, data, validity, results, uncertainties, recommendations, and conclusions as guided by the terms of reference. Reviewers shall participate in development of a peer review consensus summary report for each assessment reviewed, as described in Annex I. Reviewers may be asked to serve as an assessment leader during the review to facilitate preparing first drafts of review reports.

3. Following the review panel meeting, reviewers shall work with the chair to complete and review the peer review consensus summary reports. Reports shall be completed, reviewed by all panelists, and comments submitted to the Chair by August 22, 2008.

4. Following the review panel meeting, each reviewer appointed by the CIE shall prepare an individual CIE reviewer report. These reports shall be submitted to the CIE no later than August 29, 2008, sent to Dr. David Sampson, via email to David.Sampson@oregonstate.edu, and to Mr. Manoj Shivlani, via email to mshivlani@rsmas.miami.edu. See Annex II for complete details on the report outline.

   The duties of each review panelist shall occupy a maximum of 12 workdays; several days prior to the meeting for document review; five days at the SEDAR meeting; and several days following the meeting to ensure final review comments and document edits are provided to the Chair and to complete a CIE review report.

Workshop Final Reports:

The SEDAR Coordinator will send copies of the final review panel consensus report and the complete SEDAR stock assessment report for each stock assessed to Mr. Manoj Shivlani at the CIE.

Submission and Acceptance of CIE Reports:

The CIE shall provide via e-mail the individual CIE Reviewer Reports to the COTR, Dr. Stephen Brown (stephen.k.brown@noaa.gov) for review and approval, based on compliance with this Statement of Work, by September 12, 2008. The COTR shall notify the CIE via e-mail regarding acceptance of the reports within two working days of receipt. Within two working days of the COTR's approval, the CIE shall provide the final individual CIE reviewer reports to the COTR in pdf format.
The COTR shall provide the final CIE reviewer reports to:

SEFSC Acting Director: Bonnie Ponwith, NMFS Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, FL 33149 (email, bonnie.ponwith@NOAA.gov)

SEDAR Coordinator: Julie A. Neer, SAFMC, 4055 Faber Place Drive, Suite 201, North Charleston, SC 29405 (email, Julie.Neer@safmc.net). (SEDAR shall provide the final CIE Reviewer Reports to the SEDAR Steering Committee and Executive Directors of those Councils having jurisdiction over the included stocks)

Schedule of Deliverables:

2 July 2008	CIE shall provide the COTR with the CIE reviewer contact information, which will then be sent to the Project Contact
14 July	The Project Contact will send the CIE Reviewers the pre-review documents
4-8 August	Each reviewer shall participate and conduct an independent peer review during the panel review meeting
20 August	CIE shall submit draft CIE independent peer review reports to the COTRs
29 August	CIE will submit final CIE independent peer review reports to the COTRs
5 September	The COTRs will distribute the final CIE reports to the Project Contact

Acceptance of Deliverables:

Each CIE reviewer shall complete and submit an independent CIE peer review report in accordance with the ToR, which shall be formatted as specified in Annex 2. Upon review and acceptance of the CIE reports by the CIE Coordination and Steering Committees, CIE shall send via e-mail the CIE reports to the COTRs (William Michaels William.Michaels@noaa.gov and Stephen K. Brown Stephen.K.Brown@noaa.gov) at the NMFS Office of Science and Technology by the date in the Schedule of Milestones and Deliverables. The COTRs will review the CIE reports to ensure compliance with the SoW and ToR herein, and have the responsibility of approval and acceptance of the

deliverables. Upon notification of acceptance, CIE shall send via e-mail the final CIE report in *.PDF format to the COTRs. The COTRs at the Office of Science and Technology have the responsibility for the distribution of the final CIE reports to the Project Contacts.

Key Personnel:

Contracting Officer's Technical Representative (COTR):
William Michaels
NMFS Office of Science and Technology
1315 East West Hwy, SSMC3, F/ST4, Silver Spring, MD 20910
William.Michaels@noaa.gov   Phone: 301-713-2363 ext 136

Contractor Contacts:
Manoj Shivlani, CIE Primary Coordinator
10600 SW 131st Court, Miami, FL 33186
mshivlani@ntvifederal.com   Phone: 305-383-4229

SEDAR contact:

Julie A. Neer, 4055 Faber Place Drive, Suite 201, North Charleston, SC 29405.

Phone: 843-571-4366. Email: Julie.Neer@safmc.net.

Request for Changes:
Requests for changes shall be submitted to the Contracting Officer at least 15 working days prior to making any permanent substitutions. The Contracting Officer will notify the Contractor within 10 working days after receipt of all required information of the decision on substitutions. The contract will be modified to reflect any approved changes. The Terms of Reference (ToR) and list of pre-review documents herein may be updated without contract modification as long as the role and ability of the CIE reviewers to complete the SoW deliverable in accordance with the ToR are not adversely impacted.

Agenda

SEDAR 16: South Atlantic and Gulf of Mexico King Mackerel

August 4 - August 8, 2008

**Monday**
1:00 p.m.	**Convene**	
1:00 – 1:30	**Introductions and Opening Remarks**	
	Coordinator	
	- Agenda Review, TOR, Task Assignments	
1:30 – 3:30	**Assessment Presentation**	**TBD**
3:30 – 4:00	**Break**	
4:00 – 6:00	**Continue Presentation/Discussion**	**Chair**

**Tuesday**
8:30 a.m. – 11:30 a.m.	**Assessment Presentation**	**Chair**
11:30 a.m. – 1:30 p.m.	**Lunch Break**	
1:30 p.m. – 3:30 p.m.	**Panel Discussion**	**TBD**
	- _Assessment Data & Methods_	
	- Identify additional analyses, sensitivities, corrections	
3:30 p.m. – 4:00 p.m.	**Break**	
4:00 p.m. – 6:00 p.m.	**Panel Discussion**	**Chair**
	- Continue deliberations	
	- Review additional analyses	

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

**Wednesday**
8:30 a.m. – 11:30 a.m.	**Panel Discussion**	**Chair**
	- Review additional analyses, sensitivities	
	- Consensus recommendations and comments	
11:30 a.m. – 1:30 p.m.	**Lunch Break**	
1:30 p.m. – 3:30 p.m.	**Panel Discussion**	**TBD**
3:30 p.m. – 4:00 p.m.	**Break**	
4:00 p.m. – 6:00 p.m.	**Panel Discussion**	**Chair**

**Wednesday Goals:** Final sensitivities identified, Preferred models selected, Projection approaches approved, Consensus report drafts begun

**Thursday**
8:30 a.m. – 11:30 a.m.	**Panel Discussion**	**Chair**
	- Final sensitivities reviewed.	
	- Projections reviewed.	
11:30 a.m. – 1:30 p.m.	**Lunch Break**	
1:30 p.m. – 3:30 p.m.	**Panel Discussion or Work Session**	**Chair**
3:30 p.m. - 4:00 p.m.	**Break**	
4:00 p.m. - 6:00 p.m.	**Panel Work Session**	**Chair**
	- Review Consensus Reports	

**Thursday Goals:** Complete assessment work and discussions. Final results available. Draft Consensus Reports reviewed .

**Friday**
8:30 a.m. – 1:00 p.m.	**Panel Work Session**	**Chair**
1:00 p.m.	**ADJOURN**	