Center for Independent Experts (CIE) review report for the 2013 SEDAR 31 Stock Assessment of Gulf of Mexico Red Snapper

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Executive Summary

This report is prepared for the Center for Independent Experts (CIE). It contains an independent and impartial review of the assessment of Gulf of Mexico Red Snapper, as presented in the assessment report and background documents listed in Appendix 1.

The process for this review was not optimal. The assessment report was received only three days prior to the beginning of the review meeting. With travel time included it allowed only limited time to review the assessment report itself prior to the meeting. In addition to the material arriving late, it was also substantially incomplete. Complete sections were missing on sensitivities, model results, evaluation of uncertainty, reference points, and projections. After arriving at the review meeting the base model was altered, so large parts of the submitted report needed to be changed. Much of the missing material was produced during the review meeting, presented via slides, but not documented as report sections to be reviewed. The reviewers (including this one) worked with what was produced, since we had all traveled there anyway, but with a substantially incomplete and undocumented assessment it was impossible to either accept or reject the findings in the assessment. This reviewer would suggest that a complete assessment report, approved by the assessment team itself should be submitted before the assessment is finally evaluated.

For the assessment itself the data was processed in a sound and robust way. They were likely applied properly in the assessment model, which is a highly configurable widely used standard model (Stock Synthesis), which is capable of handling the complex setup and the many different data sources. The results appear to be robust to a range of sensitivities. The uncertainty estimates of the final quantities of interest would be more convincing if fewer observation variance parameters were fixed at chosen values. The reference points and forward projections need more work, but an outline was presented. The main issue was the delayed and incomplete assessment report.

This is however not a critique of the assessment team. At the review meeting the assessment team worked constantly and was impressively efficient at producing the missing parts and the additional analysis requested by the reviewers. It was clear that they were able to answer any question posed by the panel, and that the fairly complex assessment setup for red snapper was carefully constructed.

Main recommendations to improve this assessment in the future are:

- Allow the assessment team time to finalize a complete assessment report.
- Setup a model configuration, which allows separate stock-recruitment relationships to be estimated for the separate areas (east and west).
- Investigate the appropriateness of the assumed uncertainties for the different data sources.

Background

This review was done at the request of the Center for Independent Experts (CIE). It reviews the 2013 SEDAR 31 assessment of Gulf of Mexico Red Snapper, which is led by assessment experts from the National Marine Fisheries Service in Miami. The meeting was held in Gulfport Mississippi from April 29 to May 3 2013. A prior SEDAR review was in 2005, with an update workshop in 2009. Prior to the meeting the review panelists were given a link to an ftp site with background documents (Appendix 1). This reviewer's statement of work can be found in Appendix 2, and a list of review meeting participants in Appendix 3.

Description of the reviewers role

This reviewer independently read all documents deemed necessary in preparation for the review, traveled and participated actively in the review meeting, contributed to the review panel's summary report, and independently authored this review report.

Findings for each term of reference

To ensure that all terms of reference are covered, and that comments are interpreted with reference to the correct terms, the terms are listed in gray boxes with corresponding reviewer comments following.

1. **Evaluate the data used in the assessment, addressing the following:**
    - **Are data decisions made by the Data and Assessment Workshops sound and robust?**
    - **Are data uncertainties acknowledged, reported and within normal or expected levels?**
    - **Are data applied properly within the assessment model?**
    - **Are input data series reliable and sufficient to support the assessment approach and findings?**

The review panel only received an incomplete draft of the assessment report on April 26th (three days prior to the review meeting). Missing sections included sensitivity analysis, some model diagnostics, some model outputs, reference points, and forward projections. The missing information was developed and presented during the review meeting in the form of slides and not as written paragraphs. The late and incomplete delivery of needed material has impeded an optimal review process.

The data decisions are generally well described in the assessment report, and were clearly and thoroughly presented on the first day of the meeting. It was clear that this part had already been processed by the data workshop, as this part of the report was complete, compared to the sections that followed. In only a few places had the assessment team deviated from the recommendations from the data workshop, and in those cases the reason was clearly stated and reasonable. Some documentation of methods is however missing for some of the data updates, and the report should be amended. The data are overall found to be sufficient and reliable to support the assessment approach, but certain inputs should be further validated.

The consistency strengthens confidence in the data processing, and data decisions are overall judged to be sound and robust. This reviewer also found that data were applied properly in the assessment model, especially since the assessment team were able to easily answer any question from the reviewers, and because the author of Stock Synthesis (Richard D. Methot) had been involved in setting up the model

for red snapper.

The input on growth was updated in the assessment report to use data from the period of 2003-2011, instead of only from 2009-2011. The fork-length (FL) to total-length (TL) and whole weight to maximum TL conversion factors were also updated.

The natural mortality data, which is used as a fixed input in the assessment model, is set based on the maximum observed age. The maximum age observed is 57, but the maximum radiocarbon validated age is 38. The assessment team used the midpoint. The two endpoints of this interval were investigated in a sensitivity analysis presented at the review meeting, but no major changes were seen in the recent time period.

In a couple of places in the data section (e.g., natural mortality and growth) data had to be time-scale adjusted to match the setup in Stock Synthesis, which assumes that recruitment occurs at the start of the year, where July 1st is a better match for red snapper. It is important to note that content of the data were not altered.

The discard data are important to this assessment, and here two issues are worth mentioning. First, the commercial discards have been updated for the period (2007-2011). The details of the update method should be in the report. Secondly, the discard mortality, as a function of depth, is derived from a meta analysis, which is a weighted logistic regression. This analysis should be further validated. From the figure in the assessment report (figure 2.7.1) it seems that the data points and the fitted curves do not match. At the review meeting an updated (color enhanced) figure was presented, but even that appeared to have a mismatch between the data points and the fitted curves. There could be two different reasons for this. Either something went wrong in fitting the curves (it is somehow parameterized wrong, or the internal optimizer in R failed), or the weighting of the data points is very unbalanced around the curve. If the latter is the case, then a suggestion could be to plot the data points scaled in size corresponding to their relative weighting, thereby illustrating exactly how much each point is contributing to the fitted curves.

A typo in the assessment report on page 16 in formula: log*x_i / (n_i - x_i), which should be replaced by something like es_i=log(x_i / (n_i – x_i)), was also repeated in the presentation.

The assessment report mentions that the annual bycatch estimates of red snapper from the shrimp fishery are having very large uncertainties in all years. For this reason it was decided to use the median of the annual median estimates from a Bayesian bycatch analysis for the years 1972-2011 in combination with the shrimp effort time series to get less uncertain annual bycatch estimates. This sounds appealing, but there is a potential risk of exchanging a large but known uncertainty with a bias of unknown size. If the bycatch fraction, which is assumed to be the median of the medians in all years, is in fact varying over time, then this procedure will introduce a bias, and this bias will not be part of the uncertainties assumed in the model.

Uncertainties are acknowledged, reported and within normal levels, but the extent to which they are followed through to the final estimates of interest will be addressed under Term of Reference 5.

2. Evaluate the methods used to assess the stock, accounting for only the available data:

- **Are the methods scientifically sound, robust, and appropriate for the available data?**
- **Are assessment models properly configured and used consistent with standard practices?**

The review panel only received an incomplete draft of the assessment report on April 26th (three days

prior to the review meeting). Missing sections included the sensitivity analysis, some model diagnostics, some model outputs, reference points, and forward projections. The missing information was developed and presented during the review meeting in the form of slides and not as written paragraphs. The late and incomplete delivery of needed material has impeded an optimal review process.

The assessment team should be complimented for setting up a model that actually attempts to describe an entire complex system of the two separate stock components, and the multitude of data sources.

The method Stock Synthesis itself is an obvious and well-tested model candidate. Stock Synthesis is more than a single model, as it can be configured to match a wide range of situations both in terms of describing the stock dynamics (the process), but also in terms of allowing many different observational likelihoods to match different data types. There is also great flexibility in specifying model parameters as unknowns to be estimated, as known parameters, or in-between (utilizing prior distributions). Stock Synthesis is widely used, and supported by many scientific publications (e.g. Methot 2009 and Methot & Taylor 2011). Stock Synthesis itself is scientifically sound, robust, and appropriate for the available data.

This reviewer struggles to answer if the model is properly configured and used consistent with standard practices. The assessment team is very experienced and has been assisted by the developer of Stock Synthesis (Richard D. Methot) in the application for red snapper, so it is unlikely that there are simple errors in the application. On the other hand, the assessment presented in the assessment report sent only three days prior to the review meeting was substantially different from the assessment presented at the meeting - due to changes in the setup of recruitment at virgin levels R0, and certain variance prior settings. This, in combination with the late arrival of the report, and the in-meeting presentation of key sections of the report with no documentation except slides and oral presentation, forces this reviewer to question if the assessment team, at this point in time, have arrived at their final assessment candidate. With the documentation currently available it is not possible to finally state that the assessment model has been properly configured and used consistent with standard practices, but equally it is not possible to state that is has not. It is recommended that the assessment team be allowed time to finish the documentation of their work, which can then be reviewed.

Two issues of minor importance with respect to the predefined options in Stock Synthesis were noticed during the meeting.

The year start issue, where multiple data sources had to be time-adjusted to match Stock Synthesis assumption of recruitment in the beginning of the year. The ideal solution would naturally be if Stock Synthesis was modified to allow the user to specify recruitment time. Another simple solution could be to define the years to start July 1st. If that would require a lot of other data sources (e.g. landings) to be re-compiled, then that would not be any simpler after all.

The recruitment function in this model is fairly complex. The model contains two stocks (east and west), but only one stock-recruitment relationship, which has a fixed steepness of almost one indicating no relationship between stock size and number of recruits. On top of this common recruitment, deviants with a fixed log-scale standard deviation of 0.3 are included. Finally the recruits are divided into the two areas via an average fraction with annual white noise deviations. The combined effect of this setup can be very difficult to predict. If the common recruitment deviations are dominating the annual fraction deviations, then the recruitment in east and west should be expected to be highly positively correlated. However, if the annual fraction deviations are dominating the common recruitment deviations then, the recruitment in east and west should be expected to highly negatively correlated. The resulting east-west recruitment can be seen in figure 1, and it is seen that there is a positive correlation, but it is not dramatically high. It is however difficult to judge to what extent this is caused

by the data, and to what extent this is caused by the combined effect of the fixed standard deviations (controlling the deviations). This would be a lot simpler if it was possible directly to specify independent stock-recruitment functions for the two stocks.

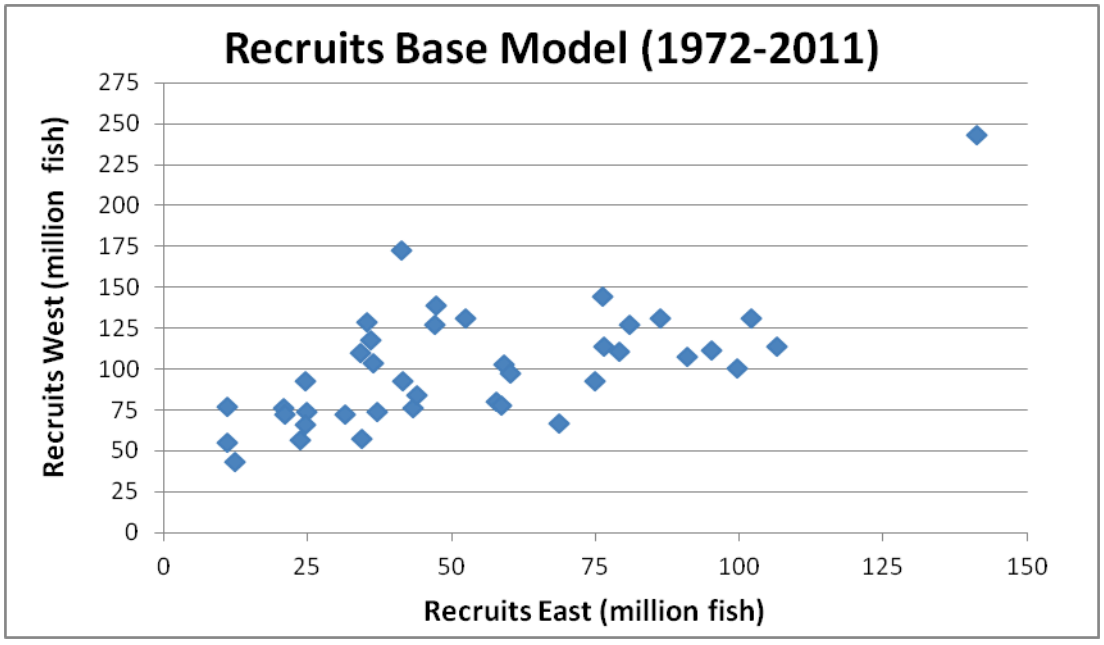

Figure 1: The estimated recruitment in west plotted against the estimated recruitment in east.

To strengthen confidence in the presented model and to further understand its workings it is also important that the comparisons with the previously used model CATCHEM and the many sensitivity runs, which were presented at the review meeting, are documented in a future version of the assessment report.

3. Evaluate assessment findings with respect to the following:

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

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process.

The abundance, exploitation, and biomass estimates are likely reliable, consistent with input data and population biological characteristics, and if so, useful to support inferences on stock status. However, given the present status of the documentation, and the comments already made under Term of Reference 2, it is not possible to make a final statement.

The results of the assessment model finally presented at the review meeting were shown to be very robust to a wide selection of suggested sensitivity analysis (e.g., changes in natural mortality, changes in discard mortality, removed indices, re-weighting of certain data sources). The sensitivities generally showed little or no changes in the recent data period, but some changes in the historic period. This is partly explained by the models variance assumptions, which are set up to match the landings very closely, and partly by the constant process controlling parameters such as steepness and recruitment at virgin levels R0.

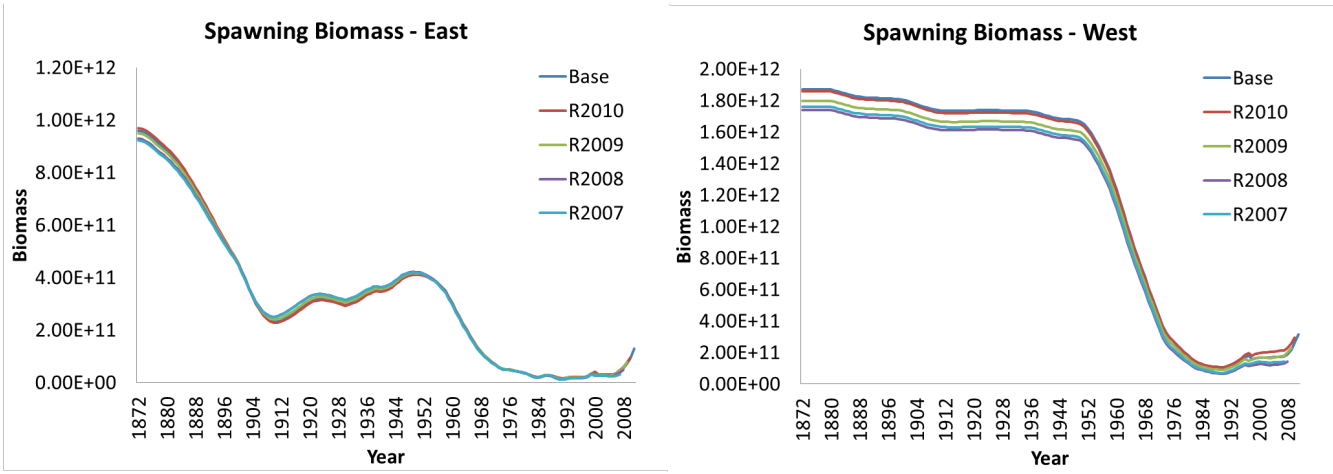

Figure 2: Retrospective analysis of spawning stock biomass

The retrospective analysis did not show any problems with systematic bias. The only slightly counter-intuitive model behavior seen from the retrospective analysis is that slicing off only the most recent 1-4 years of data can have a noticeable effect (5-10%) on the biomass estimate more than a hundred years back in time (figure 2). This is however the nature of these highly parameterized models, in which everything is connected, and the first long period only has sparse data.

Another interesting sensitivity analysis was requested by Jamie Gibson, one of the CIE reviewers, which was to change the assumed fixed steepness parameter from the value of 0.99 to 0.8. Changing this parameter showed big changes (a few outputs from the slides `SEDAR31_RW_Sensitivites2' page 7 are collected in table 1, and the effect on recent biomass is seen in figure 3).

Quantity	Baserun	Steepness 0.8
SSB unfished	4.71e12	6.81e13
TotBio unfished	326,409	4,723,500
SSB_MSY	9.46e11	1.95e13

Table 1: Changing steepness from 0.99 to 0.8.

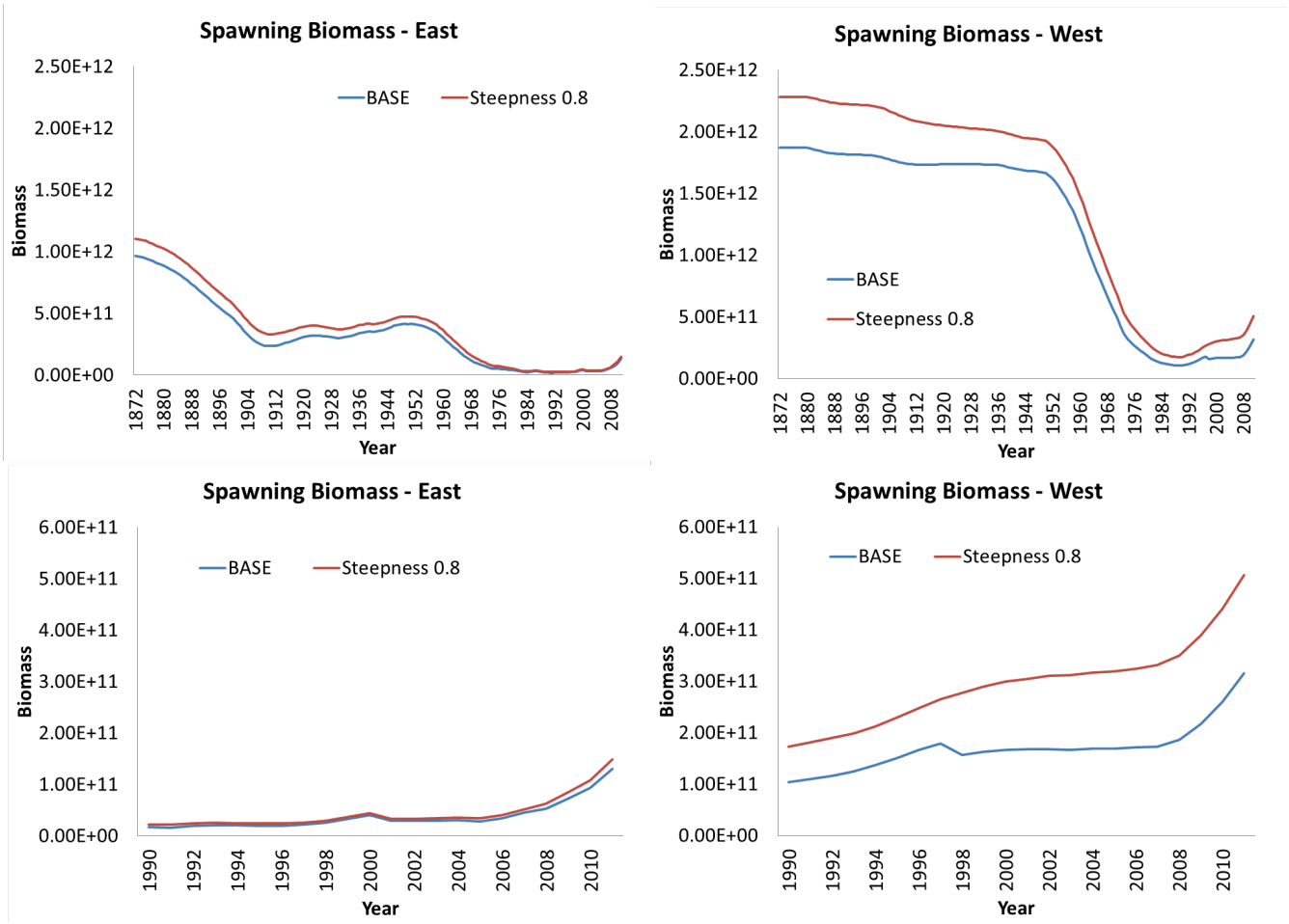

Figure 3: Effect on spawning stock biomass of changing assumed steepness to 0.8.

The collected lesson from the sensitivity analysis was that it was very difficult to change the recent abundance, exploitation, and biomass estimates, by altering the data inputs, or their relative weightings. This is positive in that the results are robust to these sometimes uncertain inputs, but on the other hand data should be informing the model, so changing the data should affect the estimates of interest.

Comparison to the previous model used for red snapper was presented on the last day, and the results showed a close match between the two models (figure 4). The differences are no greater than what was seen in the retrospective analysis within Stock Synthesis. This comparison strengthens confidence in both models, as these are two independent implementations of model code, presumably the data formatting is also different, so the data has been interpreted twice. The models have a lot of common assumptions, but even so this is a useful validation.

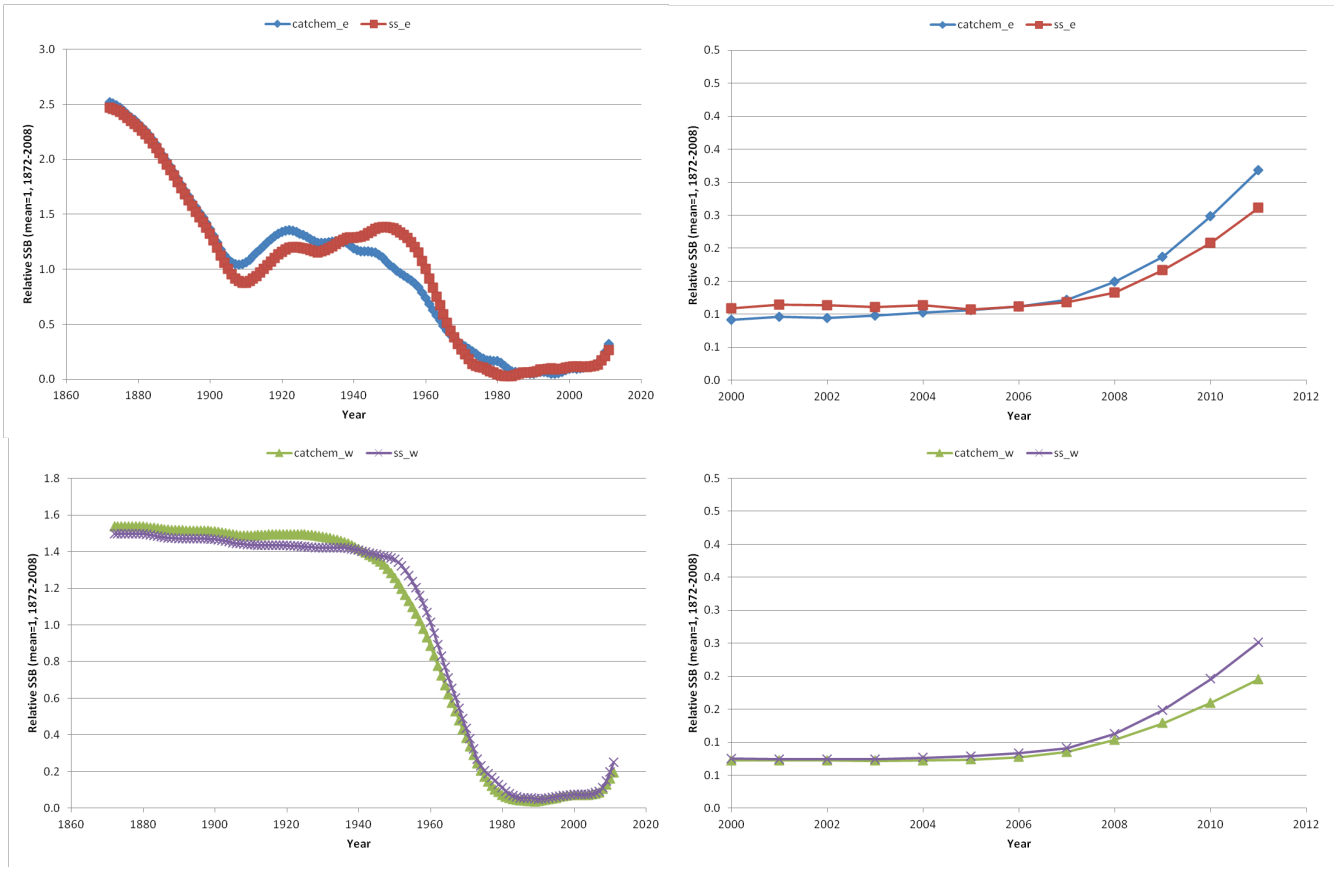

Figure 4: Spawning stock biomass estimates compared between CATCHEM and Stock Synthesis.

A stock is generally said to be overfished if the current spawning stock biomass estimate is below an agreed reference point, and similarly said to be undergoing overfishing if the current fishing mortality estimate is above an agreed reference point. However these reference points were not provided in the assessment report or determined during the review meeting, so these status questions cannot currently be answered.

The review panel participated in discussions about how to derive a proxy for MSY, and agreed that the marginal fishing mortality approach (setting fishing mortality based on the parts of fishing mortality that can be controlled) was sensible. It was also discussed if previously used proxy 26%SPR should still be used and whether that meant using 26%SPR, or using the same logic that was used then to derive the proxy, to derive a new SPR-based proxy. This reviewer's opinion is that, if the rationale for a reference point is that it is a proxy for MSY, then it should be updated if conditions change such that it is no longer a proxy for MSY.

The estimated stock-recruitment relationship is not informative, and not useful for evaluation of productivity and future stock conditions. As explained above (TOR 2) the stock-recruitment relationship is complex in this model, the steepness is set to almost one, and as such the actual stock-recruitment relationship in each area (east and west) is unfolding only within the two sets of deviations with fixed variances. Possibly a more informative stock-recruitment relationship could be estimated separately in each area.

No final quantitative estimates of status determination criteria were provided in the assessment report, or in the review meeting.

4. Evaluate the stock projections, addressing the following:

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

The review panel only received an incomplete draft of the assessment report on April 26th (three days prior to the review meeting). Missing sections included the sensitivity analysis, some model diagnostics, some model outputs, reference points, and forward projections. The missing information was developed and presented during the review meeting in the form of slides and not as written paragraphs. The late and incomplete deliverance of needed material has impeded an optimal review process.

No stock projections were produced prior to this review meeting, but deterministic projections were presented during the last days of the review meeting.

The methods are consistent with accepted practices and available data, and appropriate for the assessment model, as they follow standard procedures. The only thing to notice is that changing fishing mortality only in the directed fishery had to be accounted for, which is the difference between the two sets of projections slides provided.

The projection results are based on the results from the assessment model, so given its current status of not being sufficiently documented the projection results cannot be considered informative and robust, and useful to support inferences of probable future conditions, but as stated above the method used to move forward is within an accepted standard.

As mentioned in the review summary report, the splitting of the projection into the two areas (east and west) according to the long-term average could be problematic, because it is unknown if the recent low recruitment in the east will continue. Several fishermen voiced this concern at the review meeting based on their observations at sea. Projections showing both scenarios could be conducted.

No stochastic projections were presented in the assessment report or at the review meeting, so at present, key uncertainties are not acknowledged, discussed, and reflected in the projection results.

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

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

The review panel only received an incomplete draft of the assessment report on April 26th (three days prior to the review meeting). Missing sections included the sensitivity analysis, some model diagnostics, some model outputs, reference points, and forward projections. The missing information was developed and presented during the review meeting in the form of slides and not as written paragraphs. The late and incomplete deliverance of needed material has impeded an optimal review process.

Uncertainties in assessments are generally used to calculate the risk of being below or above a specific target, and thereby to define safe ranges for future fishing. The assessment report contained no projections, and at the review meeting only deterministic projections were presented, so the potential consequences of the uncertainties cannot be addressed.

The assessment report supplies a table (Table. 3.1.1.2) of model parameter estimates with corresponding standard deviations derived from the inverse hessian matrix of the objective function at its minimum. This is a standard output based on a quadratic approximation. The rationale is that if the assessment model correctly describes the distribution of the observations (including their observation uncertainties), then those uncertainties are propagated to an uncertainty estimate for the estimated quantities of interest.

For the assessment presented it is chosen to fix the variance parameters to arbitrary values. For instance it is chosen to set the maximum sample size at 200 fish for the age composition data (p.79), which implies a certain variance in the multinomial distribution assumed, landings are assigned a small standard error of 0.05 (p.80), and discard time series are assigned a large CV of 0.5 (p.80). According to assessment report (p.70-80) and the assessment team's presentation, the values are chosen partly to obtain a certain relative weighting of the different sources of information, and partly from practical experience with using Stock Synthesis.

The important thing is that these values are not derived from data, but assign subjectively, and hence the uncertainties propagated to the final estimates of interest will be subjective as well.

Assuming the relative weighting of the separate sources of information are assigned correctly would give the correct estimate (point estimate), but not the correct estimate of its uncertainty. Getting the correct uncertainty estimates requires the actual value of each of the assigned observation variance parameters to be correct. Judging from scales of the supplied Pearson residual plots (e.g., Figures 3.2.1.48, 2.3.1.60, and 2.3.1.66) the distribution of the observations is not fully described.

In addition to the Hessian based standard deviations, a parametric bootstrap simulation was presented at the review meeting. In a parametric bootstrap multiple independent data sets are simulated according to the assumptions in the model, and estimation is carried out for each data set. Parametric bootstrap is an excellent tool for validating the model implementation, and to obtain a simulation based, but otherwise exact, error propagation. This is important to study if the non-linear model equations are causing biased estimates. The bootstrap simulation showed very consistent model outputs for all the simulated cases, and no problematic biases. However, the bootstrap simulations do not address the subjectivity of uncertainty specification, as all data sets are simulated from the assumed variance parameters.

If the assessment panel wanted to investigate the uncertainties in the data, and how these translate into uncertainties on quantities of interest a similar non-parametric bootstrap scheme could be used. Instead of sampling new data sets based on the model assumptions, new data sets could be simulated from the existing data sets, for instance by re-sampling the residuals.

Certain data sources (e.g., natural mortality, maturity, and discard mortality) are included in the model as known inputs. This is common practice in assessment models, and some of these uncertainties would be picked up as larger observation uncertainties, if the observation uncertainties were estimated. Sensitivity analyses were presented at the review meeting to study the effect of these inputs (e.g., different natural mortality, age error, and removing of selected indices). The overall conclusion was that changes were seen in the historic period (prior to ca. 1972), but in the recent period the model results were visually unchanged. This caused some concern, as for instance changing natural mortality would be expected to influence the estimates of fishing mortality.

A slightly related analysis is the so-called jitter analysis. Here 50 runs were presented where the initial values were varied by 10%. The goal is to demonstrate that the model finds the same solution (minimum) every time. For the base model presented at review meeting this was not the case, as the negative log likelihood alternated between two solutions about 6 units apart (figure 5). It was however demonstrated, that for the quantities of interest the results were the same for both solutions. The difference could be in the parts of the model controlling the uncertainties, and hence it should also be investigated if the two different solutions also produce the same uncertainty estimates for the quantities of interest.

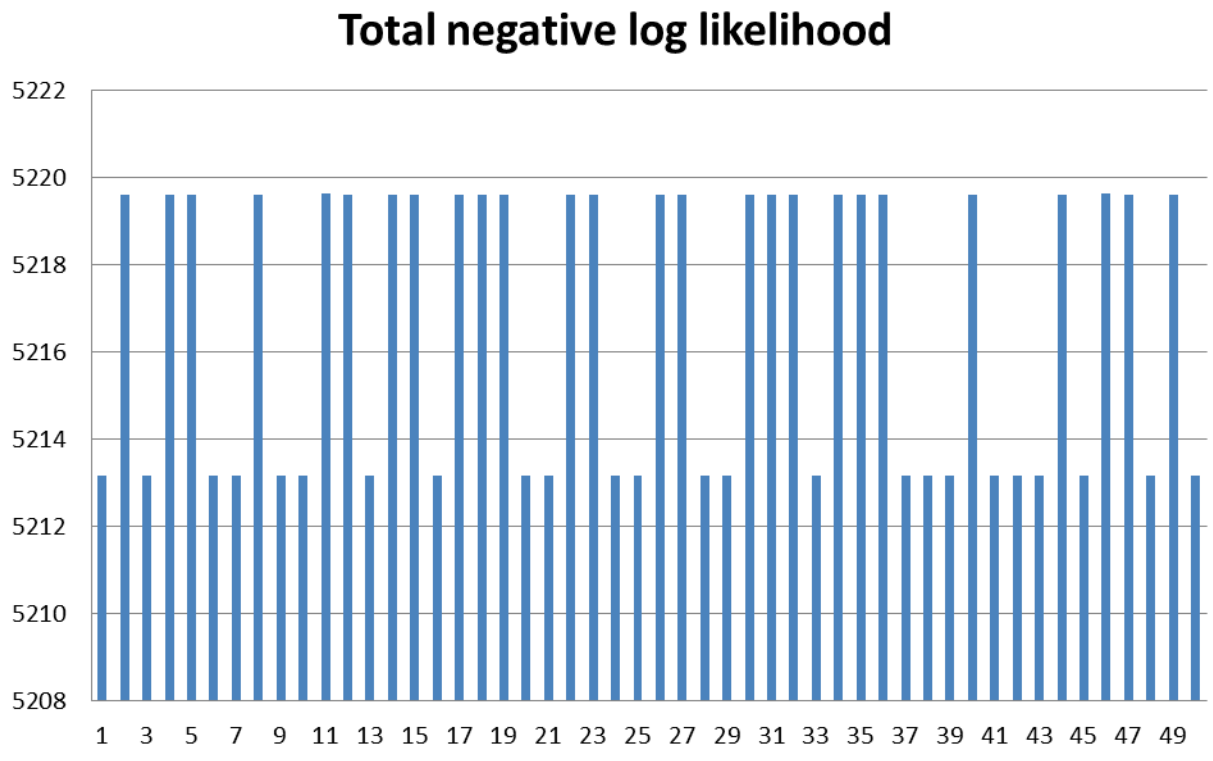

Figure 5: Result of 50 jitter runs for the total negative log likelihood.

A comparison between current candidate model (Stock Synthesis) and the model previously used for red snapper (CATCHEM) was presented at the review meeting, and the results were in close agreement (figure 4). No attempt was made to quantify assessment method uncertainty.

This reviewer is concerned that the reported uncertainties on quantities of interest are a consequence of the assumed and fixed observation variance parameters, and the assessment panel did not present evidence of the appropriateness of these assumed values.

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

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

There were no recommendations listed in the in the assessment report.

The data report lists research recommendations to improve landings data, discard data, and length/age data. Of these any effort to improve the discard data is important to the assessment. The length/age data improvements could possibly help the long term development of an assessment where Stock Synthesis was also configured to use length data directly.

The assessment, but most importantly the projections, would be helped by a mapping of the areas likely to be affected long term by the Deepwater Horizon Oil Spill. If these are substantial it would be useful to including such information in the assessment model.

With this review in mind the most important improvement of the SEDAR process would be to not start the process before the assessment team hand in the final assessment report, and if unforeseen events delay the process, then it would be best to cancel or postpone the review meeting.

Another issue with respect to the SEDAR process is the time line of the joint summary report and the independent reports. To this reviewer it would seem more logical if the independent reports were completed and submitted before work on the joint report was started. As it is now input to both are required at the same, which will lead to overlapping subjects.

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

Recommendations are listed in the section on "conclusions and recommendations".

8. Prepare a Peer Review Summary Report 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 in accordance with the project guidelines.

The report was prepared in collaboration with the other reviewers. This reviewer especially helped shape the sections on uncertainties in the assessment.

Terms of reference from the assessment report.

This reviewer is asked to evaluate if each term of reference from the stock assessment working group report was completed successfully. Below follows the terms of reference, and below each is this reviewers comment following the `!'.

1. Review and provide justification for any changes in data following the data workshop and any analyses suggested by the data workshop. Summarize data as used in each assessment model.

! Done.

2. Develop population assessment models that are compatible with available data and document input data, model assumptions and configuration, and equations for each model considered. Consider past modeling approaches (SEDAR 7 (2004), SEDAR 7 Update (2009)).

! Done, but documentation not complete.

3. Incorporate known applicable environmental covariates into the selected model, and provide justification for why any of those covariates cannot be included at the time of the assessment.

! Done.

4. Provide estimates of stock population parameters, if feasible.

- Include fishing mortality, abundance, biomass, selectivity, stock-recruitment relationship, and other parameters as appropriate given data availability and modeling approaches
- Include appropriate and representative measures of precision for parameter estimates

! Done, but documentation incomplete.

5. Characterize uncertainty in the assessment and estimated values.

- Consider uncertainty in input data, modeling approach, and model configuration
- Provide appropriate measures of model performance, reliability, and ‘goodness of fit’
- Provide a continuity model consistent with the prior assessment configuration, if one exists, updated to include the most recent observations. Alternative approaches to a strict continuity run that distinguish between model, population, and input data influences on findings, may be considered
- Provide measures of uncertainty for estimated parameters

! Done, but could be improved by estimating more of the variance parameters from data. Documentation incomplete.

6. Provide yield-per-recruit, spawner-per-recruit, and stock-recruitment evaluations.

! Done, documentation incomplete.

7. Provide estimates of stock status for management criteria consistent with applicable FMPs, proposed FMPs and Amendments, other ongoing or proposed management programs, and National Standards for each model run presented for review.

- Evaluate existing or proposed management criteria as specified in the management summary
- Recommend proxy values when necessary

! Not finalized, but approach outlined.

8. Provide declarations of stock status relative to management benchmarks, or alternative data poor approaches if necessary.

! Not finalized due to previous TOR.

9. Project future stock conditions (biomass, abundance, and exploitation) and develop rebuilding schedules if warranted; include estimated generation time. Stock projections (in both biomass and number of fish) shall be developed in accordance with the following:

a) If stock is overfished:

F=0, FCurrent, FMSY, FOY

F=FRebuild (max that permits rebuild in allowed time)

b) If stock is undergoing overfishing:

F= FCurrent, FMSY, FOY

c) If stock is neither overfished nor undergoing overfishing:

F= FCurrent, FMSY, FOY

d) If data limitations preclude classic projections (i.e. A, B, C above), explore alternate models to provide management advice

! Done, documentation incomplete.

10. Provide a probability density function for the base model, or a combination of models that represent alternate states of nature, presented for review.

- Determine the yield associated with a probability of exceeding OFL at P* values of 30% to 50% in single percentage increments for use with the Tier 1 ABC control rule
- Provide justification for the weightings used in producing combinations of models

! Not completed.

11. Provide recommendations for future research and data collection.

- Be as specific as practicable in describing sampling design and intensity
- Emphasize items which will improve future assessment capabilities and reliability
- Recommend an appropriate interval and type for the next assessment

! No additional recommendations added in section 3.3.

12. Prepare a spreadsheet containing all model parameter estimates, all relevant population information resulting from model estimates, and projection and simulation exercises. Include all data included in assessment report tables and all data that support assessment workshop figures.

! Done.

13. Complete the Assessment Workshop Report (Section III: SEDAR Stock Assessment Report).

! Incomplete.

Conclusions and recommendations

Validate the discard release mortality. The meta analysis to describe the discard release mortality as a function of depth could be repeated and verified. Assuming it is correct a better graphical representation of the fit should be produced. This is not a big task provided that the data are still available, but the current plot indicates a lack of fit.

Separate stock-recruitment relationships. Setup a model configuration, which allow separate stock-recruitment relationships to be estimated for the separate areas (east and west). This will hopefully produce more informative stock-recruitment relationships, and remove the need for fixing the steepness at 0.99. It will also allow other more local effects (e.g., environmental) to be included in the relationship.

Appropriateness of the assumed variances. Investigate the appropriateness of the assumed uncertainties for the different data sources. A first step could be to try to estimate some of the observation parameters while keeping others fixed. Stock Synthesis (and AD Model Builder) is a good tool for these investigations.

Improved discard data. Follow the research recommendations for discard from the data report.

References

Methot, R.D. Jr. and I.G. Taylor 2011. Adjusting for Bias due to Variability of Estimated Recruitments in Fishery Assessment Models. Can. J. Fish. Aquat. Sci. 68: 1744-1760.

Methot, R.D. 2009. Stock Assessment: Operational Models in Support of Fisheries Management. In Beamish and Rothschild (ed) Future of Fishery Science - Proceedings of the 50th Anniversary Symposium of the American Institute of Fishery Research Biologists, Seattle, WA. Springer. Fish & Fisheries Series, Vol. 31: 137-165.

APPENDIX 1: Bibliography of materials provided for review

SECTION III: SEDAR Assessment Workshop Report

SECTION II: SEDAR Data Workshop Report

In addition slide packs:

RW NCummings PPT Wednesday[1].pptx
SEDAR31_reviewWorkshop_baseModelConfig_v2.pptx
SEDAR31_RW_AdditionalPlots_5-2-13.pptx
SEDAR31_RW_AgeCompReweight_5-1-13.ppt
SEDAR31_RW_AgeError_4-30-13.ppt
SEDAR31_RW_BaseResults_4-29-13.ppt
SEDAR31_RW_CATCHEMvsSS_4-30-13.ppt
SEDAR31_RW_DataInputs_4-25-13.ppt
SEDAR31_RW_Diagnostics.pptx
SEDAR31_RW_ModelWeight.pptx
SEDAR 31 RW Profiling and Sensitivity Presentation.ppt
SEDAR31_RW_Projections2.pptx
SEDAR31_RW_Projections.pptx
SEDAR31_RW_PropRetained_5-1-13.pptx
SEDAR31_RW_ReferencePts_5-1-13.pptx
SEDAR31_RW_Retrospectives.pptx
SEDAR31_RW_Sensitivites2.pptx
SEDAR31_RW_Sensitivity.pptx
SEDAR31_RW_StockRecruit_5-1-13.pptx
SEDAR31_RW_TimeVarySteepness_4-30-13.pptx
SEDAR31_RW_Uncertainty.pptx
SEDAR31_RW_YPRCurve_5-2-13.ppt

Document Number	Title	Authors
Data Workshop Documents		
SEDAR31-DW01	Relative abundance of juvenile red snapper, *Lutjanus campechanus* in the northern Gulf of Mexico	Parsons
SEDAR31-DW02	Brief overview on Gulf of Mexico Red Snapper IFQ Program	Stephen
SEDAR31-DW03	Working Paper for Red Snapper Data Workshop (SEDAR 31)	Cowan, Boswell, Simonsen, Saari, and Kulaw
SEDAR31-DW04	Recreational Survey Data for Red snapper in the Gulf of Mexico	Matter
SEDAR31-DW05	Red snapper (*Lutjanus campechanus*) otolith ageing summary for collection years 2009-2011	Allman, Barnett, Trowbridge, Goetz, and Evou
SEDAR31-DW06	An Update to the Age Composition, Growth,	Gazey, Gallaway, and

	and Density-Dependent Mortality in Juvenile Red Snapper Estimated from Observer Data from the Gulf of Mexico Penaeid Shrimp Fishery	Cole
SEDAR31-DW07	Expanded Annual Stock Assessment Survey 2011: Red Snapper Reproduction	Fitzhugh, Lang, and Lyon
SEDAR31-DW08	SEAMAP Reef Fish Video Survey: Relative Indices of Abundance of Red Snapper	Campbell, Rademacher, Felts, Noble, Felts, and Salisbury
SEDAR31-DW09	Index of Abundance for Pre-Fishery Recruit Red Snapper from Florida Headboat Observer Data	O'Hop and Sauls
SEDAR31-DW10	Length frequency distributions for red snappers in the Gulf of Mexico from 1984-2011	Chih
SEDAR31-DW11	A Summary of Data on the Size Distribution and Release Condition of Red Snapper Discards from Recreational Fishery Surveys in the Gulf of Mexico	Sauls
SEDAR31-DW12	A comparison of the size and age of red Snapper, *Lutjanus campechanu*s, to the age of artificial reefs in the northern Gulf of Mexico	Syc and Szedlmayer
SEDAR31-DW13	Use of Ultrasonic Telemetry to Estimate Natural and Fishing Mortality of Red Snapper	Topping and Szedlmayer
SEDAR31-DW14	Fine-scale Movements and Home Ranges of Red Snapper *Lutjanus campechanus* Around Artificial Reefs in the Northern Gulf of Mexico	Piraino and Szedlmayer
SEDAR31-DW15	Spatio-temporal dynamics in red snapper reproduction on the West Florida Shelf, 2008-2011	Lowerre-Barbieri, Crabtree, Switzer, and McMichael
SEDAR31-DW16	Spatial distribution and occurrence of red snapper, *Lutjanus campechanus*, sampled off the Louisiana coast during nearshore trawl sampling efforts	Adriance and Sweda
SEDAR31-DW17	Summary report of the red snapper (Lutjanus campechanus) catch during the 2011 expanded annual stock assessment (EASA)	Campbell, Pollack, Henwood, Provaznik, and Cook
SEDAR31-DW18	On the comparisons of regional differences in the growth of red snappers from the Gulf of Mexico	Chih
SEDAR31-DW19	Abundance Indices of Red Snapper Collected in NMFS Bottom Longline Surveys in the northern Gulf of Mexico	Ingram and Pollack
SEDAR31-DW20	Red Snapper Abundance Indices from SEAMAP Groundfish Surveys in the Northern Gulf of Mexico	Pollack, Ingram, and Foster
SEDAR31-DW21	Examining delayed mortality in barotrauma afflicted red snapper using acoustic telemetry and hyperbaric experimentation	Stunz and Curtis
SEDAR31-DW22	Release mortality in the red snapper fishery: a synopsis of three decades of research	Campbell, Driggers, and Sauls

SEDAR31-DW23	Release Mortality Estimates for Recreational Hook-and-Line Caught Red Snapper Derived from a Large-Scale Tag-Recapture Study in the Eastern Gulf of Mexico	Sauls
SEDAR31-DW24	Fisheries-independent data for red snapper from reef-fish surveys on the West Florida Shelf, 2008-2011	Switzer, Keenan, and McMichael
SEDAR31-DW25	Estimated Conversion Factors for Adjusting MRFSS Gulf of Mexico Red Snapper Catch Estimates and Variances in 1981-2003 to MRIP Estimates and Variances	Rios, Matter, Walter, Farmer, and Turner
SEDAR31-DW26	Developing a survey methodology for sampling red snapper, *Lutjanus campechanus*, at oil and gas platforms in the northern Gulf of Mexico	Moser, Pollack, Ingram, Gledhill, Henwood, and Driggers
SEDAR31-DW27	Red Snapper (*Lutjanus campechanus*) larval indices of relative abundance from SEAMAP fall plankton surveys, 1986 to 2010	Pollack, Hanisko, Lyczkowski- Shultz, Jones, and Ingram
SEDAR31-DW28	Red Snapper Findings from the NMFS Panama City Laboratory Trap & Camera Fishery-Independent Survey – 2004-2011	DeVries, Ingram, Gardner, and Raley
SEDAR31-DW29	Artificial Structure and Hard-Bottom Spatial Coverage in the Gulf of Mexico	Mueller
SEDAR31-DW30	Shrimp Fishery Bycatch Estimates for Gulf of Mexico Red Snapper, 1972-2011	Linton
SEDAR31-DW31	Calculated red snapper discards in the Gulf of Mexico commercial vertical line and bottom longline fisheries: preliminary results	McCarthy
SEDAR31-DW32	Observer reported size distribution of Gulf of Mexico red snapper from the commercial vertical line and bottom longline fisheries	McCarthy
SEDAR31-DW33	Using a Censored Regression Modeling Approach to Standardize Red Snapper Catch per Unit Effort Using Recreational Fishery Data Affected by a Bag Limit	Saul and Walter
Assessment Workshop Documents		
SEDAR31-AW01	Headboat Discards for Red Snapper in the Gulf of Mexico	Matter and Walter
SEDAR31-AW02	Accounting for changes in fishing mortality when comparing density-dependent to density-independent mortality in Gulf of Mexico red snapper	Vincent
SEDAR31-AW03	Modeling the dependence of batch fecundity and spawning frequency on size and age for use in stock assessments of red snapper in U.S. Gulf of Mexico waters	Porch, Fitzhugh, and Linton
SEDAR31-AW04	The Effect of Hook Type on Red Snapper Catch	Saul, Walter, Shipp, Powers, and Powers

SEDAR31-AW05	Age Composition of Red Snapper Bycatch in the Gulf of Mexico Shrimp Fishery, 1997-2011	Linton
SEDAR31-AW06	Shrimp trawl index of abundance for Gulf of Mexico red snapper, 1967-1989	Linton
SEDAR31-AW07	Red Snapper Abundance Indices from Combined Bottom Trawl Surveys in the Eastern Gulf of Mexico	Pollack, Ingram, and Henwood
SEDAR31-AW08	A proposed methodology to incorporate ROV length data into red snapper stock assessments	Walter, DeVries, Drymon, Patterson, Powers, and Williams
SEDAR31-AW09	Reconstructed time series of offshore shrimp trawl effort in the Gulf of Mexico from 1945 to 1972 for use in the SEDAR 31 Gulf of Mexico red snapper assessment	Porch
SEDAR31-AW10	Use of the Connectivity Modeling System to estimate movements of red snapper recruits in the northern Gulf of Mexico	Karnauskas, Walter, and Paris
SEDAR31-AW11	Estimating historical recreational angler effort in the Gulf of Mexico for the private, charter, and headboat fishing modes	Rios
SEDAR31-AW12	Estimation of hook selectivity on red snapper (*Lutjanus campechanus*) during a fishery independent survey of natural reefs in the Gulf of Mexico	Pollack, Campbell, and Driggers
SEDAR31-AW13	Dauphin Island Sea Lab Bottom Longline Survey incorporation into the NMFS Bottom Longline Survey	Ingram
SEDAR31-AW14	Combined Index for Florida Fish and Wildlife Research Institute and NMFS Panama City Video Surveys	Ingram
SEDAR31-AW15	Age frequency distributions estimated with reweighting methods for red snappers in the Gulf of Mexico from 1991 to 2011	Chih
SEDAR31-AW16	Changes in lengths-at-age and size selectivity of red snappers in the Gulf of Mexico from 2002 to 2011	Chih
SEDAR31-AW17	Response to comments on: *Age Composition, Growth and Density-Dependent Mortality in Juvenile Red Snapper Estimated from Observer Data from the Gulf of Mexico Penaeid Shrimp Fishery*	Gazey, Gallaway, and Cole
Review Workshop Documents		
SEDAR31-RW01		
Reference Documents		
SEDAR31-RD01	SEDAR 7 Stock Assessment Report	SEDAR
SEDAR31-RD02	2009 SEDAR 7 Update Assessment Report	SEDAR

SEDAR31-RD03	Red Snapper 2011 Projections Update	SEFSC
SEDAR31-RD04	Estimation of Fisheries Impacts Due to Underwater Explosives Used to Sever and Salvage Oil and Gas Platforms in the U.S. Gulf of Mexico	Minerals Management Service
SEDAR31-RD05	Age Composition, Growth, and Density-Dependent Mortality in Juvenile Red Snapper Estimated from Observer Data from the Gulf of Mexico Penaeid Shrimp Fishery	Gazey, Gallaway, Cole, and Fournier
SEDAR31-RD06	A Life History Review for Red Snapper in the Gulf of Mexico with an Evaluation of the Importance of Offshore Petroleum Platforms and Other Artificial Reefs	Gallaway, Szedlmayer, and Gazey
SEDAR31-RD07	Addressing Time-Varying Catchability	SEDAR
SEDAR31-RD08	Fishery-Independent Catch of Young-of-the-Year Red Snapper in the Texas Territorial Sea, 1985–2007	Dorf and Fisher
SEDAR31-RD09	Red Snapper Management History	GMFMC
SEDAR31-RD10	Home range and movement patterns of red snapper (*Lutjanus campechanus*) on artificial reefs	Topping and Szedlmayer
SEDAR31-RD11	Genetic variation and spatial autocorrelation among young-of-the-year red snapper (*Lutjanus campechanus*) in the northern Gulf of Mexico	Saillant, Bradfield, and Gold
SEDAR31-RD12	Determining policy-efficient management strategies in fisheries using data envelopment analysis (DEA)	Griffin and Woodward
SEDAR31-RD13	Red Snapper Larval Transport in the Northern Gulf of Mexico	Johnson, Perry, Lyczkowski-Shultz, and Hanisko
SEDAR31-RD14	Estimation of the Source of Red Snapper Recruits to West Florida and South Texas with Otolith Chemistry: Implications for Stock Structure and Management	Patterson, Cowan, Barnett, and Sluis
SEDAR31-RD15	Trends in Gulf of Mexico Red Snapper Population Dynamics, 1979-85	Parrack and McClellan
SEDAR31-RD16	Effects of habitat complexity and predator exclusion on the abundance of juvenile red snapper	Piko and Szedlmayer
SEDAR31-RD17	Survival and movement of hatchery-reared red snapper on artificial habitats in the northern Gulf of Mexico	Chapin, Szedlmayer, and Phelps

SEDAR31-RD18	A Life History Review for Red Snapper in the Gulf of Mexico with an Evaluation of the Importance of Offshore Petroleum Platforms and Other Artificial Reefs	Gallaway, Szedlmayer, and Gazey
SEDAR31-RD19	The use of otolith shape analysis for ageing juvenile red snapper, *Lutjanus campechanus*	Beyer and Szedlmayer
SEDAR31-RD20	Validation of annual periodicity in otoliths of red snapper, *Lutjanus campechanus*	Szedlmayer and Beyer
SEDAR31-RD21	The Artificial Habitat as an Accessory for Improving Estimates of Juvenile Reef Fish Abundance in Fishery Management	Szedlmayer
SEDAR31-RD22	Home range and movement patterns of red snapper (*Lutjanus campechanus*) on artificial reefs	Topping and Szedlmayer
SEDAR31-RD23	Site fidelity, residence time and movements of red snapper *Lutjanus campechanus* estimated with long-term acoustic monitoring	Topping and Szedlmayer
SEDAR31-RD24	Proximity Effects of Larger Resident Fishes on Recruitment of Age-0 Red Snapper in the Northern Gulf of Mexico	Mudrak and Szedlmayer
SEDAR31-RD25	Estimates of Historic Recreational Landings of Spanish Mackerel in the South Atlantic Using the FHWAR Census Method	Brennan and Fitzpatrick
SEDAR31-RD26	Declining Size at Age Among Red Snapper in the Northern Gulf of Mexico off Louisiana, USA: Recovery or Collapse?	Nieland, Wilson, and Fischer
SEDAR31-RD27	Examination of Red Snapper Fisheries Ecology on the Northwest Florida Shelf (FWC-08304): Final Report	Patterson, Tarnecki, and Neese
SEDAR31-RD28	Site Fidelity, Movement, and Growth of Red Snapper: Implications for Artificial Reef Management	Strelcheck, Cowan, and Patterson
SEDAR31-RD29	Factors Affecting Catch and Release (CAR) Mortality in Fish: Insight into CAR Mortality in Red Snapper and the Influence of Catastrophic Decompression	Rummer
SEDAR31-RD30	Effect of Circle Hook Size on Reef Fish Catch Rates, Species Composition, and Selectivity in the Northern Gulf of Mexico Recreational Fishery	Patterson, Porch, Tarnecki, and Strelcheck
SEDAR31-RD31	Effect of trawling on juvenile red snapper (*Lutjanus campechanus*) habitat selection and life history parameters	Wells, Cowan, Patterson, and Walters

SEDAR31-RD32	Habitat use and the effect of shrimp trawling on fish and invertebrate communities over the northern Gulf of Mexico continental shelf	Wells, Cowan, and Patterson
SEDAR31-RD33	Site Fidelity and Movement of Reef Fishes Tagged at Unreported Artificial Reef Sites off NW Florida	Addis, Patterson, and Dance
SEDAR31-RD34	Fish Community and Trophic Structure at Artificial Reef Sites in the Northeastern Gulf of Mexico	Dance, Patterson, and Addis
SEDAR31-RD35	A Review of Movement in Gulf of Mexico Red Snapper: Implications for Population Structure	Patterson
SEDAR31-RD36	Size selectivity of sampling gears targeting red snapper in the northern Gulf of Mexico	Wells, Boswell, Cowan, and Patterson
SEDAR31-RD37	Delineating Juvenile Red Snapper Habitat on the Northern Gulf of Mexico Continental Shelf	Patterson, Wilson, Bentley, Cowan, Henwood, Allen, and Dufrene
SEDAR31-RD38	Habitat- and Region-Specific Reproductive Biology of Female Red Snapper (*Lutjanus campechanus*) in the Gulf of Mexico	Kulaw
SEDAR31-RD39	Comparison of the Age and Growth of Red Snapper (*Lutjanus campechanus*) Amongst Habitats and Regions in the Gulf of Mexico	Saari
SEDAR31-RD40	Oil Platforms and Red Snapper Movement and Behavior	McDonough
SEDAR31-RD41	Reconstructed time series of shrimp trawl effort in the Gulf of Mexico and the associated bycatch of red snapper from 1948 to 1972	Porch and Turner
SEDAR31-RD42	Individual-based modeling of an artificial reef fish community: Effects of habitat quantity and degree of refuge	Campbell, Rose, Boswell, and Cowan
SEDAR31-RD43	Literature Search and Data Synthesis of Biological Information for Use in Management Decisions Concerning Decommissioning of Offshore Oil and Gas Structures in the Gulf of Mexico	Versar, Inc.
SEDAR31-RD44	The Environmental Effects of Underwater Explosions with Methods to Mitigate Impacts	Keevin and Hempen
SEDAR31-RD45	Connections between Campeche Bank and Red Snapper Populations in the Gulf of Mexico via modeled larval transport	Johnson, Perry, and Lyczkowski-Shultz

SEDAR31-RD46	The commercial landings of red snapper in the Gulf of Mexico from 1872 to 1962	Porch, Turner, and Schirripa
SEDAR31-RD47	Estimates of Historical Red Snapper Recreational Catch Levels Using US Census Data and Recreational Survey Information	Scott
SEDAR31-RD48	MRFSS/MRIP Calibration Workshop: Ad-hoc Working Group Report	Salz, Miller, Williams, Walter, Drew, and Bray
SEDAR31-RD49	Survival of Red Grouper (*Epinephelus morio*) and Red Snapper (*Lutjanus campechanus*) Caught on J-Hooks and Circle Hooks in the Florida Recreational and Recreational-for-Hire Fisheries	Burns and Froeschke
SEDAR31-RD50	Circle Hook Requirements in the Gulf of Mexico: Application in Recreational Fisheries and Effectiveness for Conservation of Reef Fishes	Sauls and Ayala

APPENDIX 2: Statement of Work

SEDAR 31 Gulf of Mexico Red Snapper Review Workshop

BACKGROUND

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

SCOPE

Project Description: SEDAR 31 will be a compilation of data, a benchmark assessment of the stock, and an assessment review conducted for Gulf of Mexico red snapper. 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 stock assessed through SEDAR 31 is within the jurisdiction of the Gulf of Mexico Fishery Management Council and the state waters of Texas, Louisiana, Mississippi, Alabama, and Florida.

OBJECTIVES

Requirements for the reviewers: Three reviewers shall conduct an impartial and independent peer review of the stock assessments in accordance with the tasks, milestones, and terms of reference (ToRs) of this SoW. The reviewers shall have expertise in stock assessment, statistics, fisheries science, and marine biology sufficient to complete the primary task of providing peer-review advice in compliance with the workshop Terms of Reference.

PERIOD OF PERFORMANCE

The reviewers shall conduct the tasks according to the schedule of milestones and deliverables as specified in this statement of work (SoW). Each reviewer's duties shall not exceed a maximum of 14 days to complete all work tasks of the peer review described herein. The tentative schedule of milestones and deliverables is provided herein.

PLACE OF PERFORMANCE AND TRAVEL

Each reviewer shall conduct an independent peer review during a five day panel review meeting scheduled in Gulfport, Mississippi during April 29 through May 3, 2013.

STATEMENT OF TASKS

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

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

Foreign National Security Clearance: The reviewers shall participate during a panel review meeting at a government facility, and the NMFS Project Contact will be responsible for obtaining the Foreign National Security Clearance approval for the reviewers who are non-US citizens. For this reason, the

reviewers shall provide by FAX (not by email) the 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/.

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

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

Tasks after the panel review meeting: Each reviewer shall prepare an independent peer review report, and the report shall be formatted as described in **Annex 1**. This report should explain whether each stock assessment ToR was or was not completed successfully during the SEDAR meeting. If any existing BRP or their proxies are considered inappropriate, each independent report shall include recommendations and justification for suitable alternatives. If such alternatives cannot be identified, then the report shall indicate that the existing BRPs are the best available at this time. Additional questions and pertinent information related to the assessment review addressed during the meetings that were not in the ToRs may be included in a separate section at the end of an independent peer review report.

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

1) Conduct necessary pre-review preparations, including the review of background material and reports provided by the NMFS Project Contact in advance of the peer review.
2) Participate during the panel review meeting at the Gulfport, Mississippi during April 29 – May 3, 2013.
3) Conduct an independent peer review in accordance with the ToRs (**Annex 2**).
4) No later than May 17, 2013, each CIE reviewer shall submit an independent peer review report addressed to the "Center for Independent Experts," and sent to Mr. Manoj Shivlani, CIE Lead Coordinator, via email to shivlanim@bellsouth.net, and Dr. David Sampson, CIE Regional

Coordinator, via email to david.sampson@oregonstate.edu. Each CIE report shall be written using the format and content requirements specified in Annex 1, and address each ToR in **Annex 2**.

DELIVERY

Each reviewer shall complete an independent peer review report in accordance with the SoW. Each reviewer shall complete the independent peer review according to required format and content as described in **Annex 1**. Each reviewer shall complete the independent peer review addressing each stock assessment ToR listed in **Annex 2**.

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

March 24, 2013	Contractor sends reviewer contact information to the COR, who then sends this to the NMFS Project Contact
April 14, 2013	NMFS Project Contact provides reviewers the pre-review documents
April 29 – May 3, 2013	Each reviewer participates and conducts an independent peer review during the panel review meeting in Gulfport, Mississippi.
May 17, 2013	Reviewers submit draft independent peer review reports to the contractor's technical team for independent review
May 29, 2013	Contractor submits independent peer review reports to the COR who reviews for compliance with the contract requirements
June 5, 2013	The COR distributes the final 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 COR within 10 working days after receipt of all required information of the decision on substitutions. The COR can approve changes to the milestone dates, list of pre-review documents, and ToRs within the SoW as long as the role and ability of the 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: The deliverables shall be the final peer review report from each reviewer that satisfies the requirements and terms of reference of this SoW. The contract shall be successfully completed upon the acceptance of the contract deliverables by the COR based on three performance standards:

(1) each report shall be completed with the format and content in accordance with **Annex 1**,

(2) each report shall address each stock assessment ToR listed in **Annex 2**,
(3) each report shall be delivered in a timely manner as specified in the schedule of milestones and deliverables.

Upon the acceptance of each independent peer review report by the COR, the reports will be distributed to the NMFS Project Contact and pertinent NMFS science director, at which time the reports will be made publicly available through the government's website.

The contractor shall send the final reports in PDF format to the COR, designated to be William Michaels, via email William.Michaels@noaa.gov

Support Personnel:

William Michaels, Program Manager, COR
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Key Personnel:

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Ryan.Rindone@gulfcouncil.org Phone: 813-348-1630

Annex 1: Format and Contents of Independent Peer Review Report

1. The independent peer review report shall be prefaced with an Executive Summary providing a concise summary of whether they accept or reject the work that they reviewed, with an explanation of their decision (strengths, weaknesses of the analyses, etc.).

2. The main body of the report shall consist of a Background, Description of the Individual Reviewer's Role in the Review Activities, Findings of whether they accept or reject the work that they reviewed, and an explanation of their decisions (strengths, weaknesses of the analyses, etc.) for each ToR, and Conclusions and Recommendations in accordance with the ToRs. For each assessment reviewed, the report should address whether each ToR of the SAssessment Workshop was completed successfully. For each ToR, the Independent Review Report should state why that ToR was or was not completed successfully. To make this determination, the SEDAR chair and reviewers should consider whether the work provides a scientifically credible basis for developing fishery management advice.

   a. Reviewers should describe in their own words the review activities completed during the panel review meeting, including a concise summary of whether they accept or reject the work that they reviewed, and explain their decisions (strengths, weaknesses of the analyses, etc.), 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 SEDAR 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 independent report shall be a stand-alone document for others to understand the proceedings and findings of the meeting, regardless of whether or not others read the SEDAR Summary Report. The independent report shall be an independent peer review of each ToR, 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 this Statement of Work
   Appendix 3: Panel Membership or other pertinent information from the panel review meeting.

Annex 2: Terms of Reference

SEDAR 31 Gulf of Mexico Red Snapper Review Workshop

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

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

8. Prepare a Peer Review Summary Report 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 in accordance with the project guidelines.

The review panel may not request a new assessment. The review panel may request a limited number of additional sensitivity analyses and evaluations of alternative assumptions, and may correct errors identified in the assessment. Additional details regarding the latitude given to 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, alternate model configurations are recommended, or additional analyses are prepared as a result of review panel findings regarding the TORs above.**

Annex 3: Tentative Agenda

SEDAR 31 Gulf of Mexico Red Snapper Review Workshop

Gulfport, Mississippi during April 29 – May 3, 2013

Monday		
1:00 p.m.	**Convene**	
1:00 – 1:30	**Introductions and Opening Remarks**	**Rindone**
	- Agenda Review, TOR, Task Assignments	
1:30 – 5:00	**Assessment Presentations and Discussions**	**Linton, Saul**
5:00 p.m. - 6:00 p.m.	**Panel Work Session**	**Barbieri**
Tuesday		
8:00 a.m. – 11:30 a.m.	**Assessment Presentations**	**Linton, Saul**
11:30 a.m. – 1:00 p.m.	**Lunch Break**	
1:00 p.m. – 3:30 p.m.	**Panel Discussion**	**Barbieri**
	- Assessment Data & Methods	
	- Identify additional analyses, sensitivities, corrections	
3:30 p.m. – 3:45 p.m.	**Break**	
3:45 p.m. – 5:00 p.m.	**Panel Discussion**	**Barbieri**
	- Continue deliberations	
	- Review additional analyses	
5:00 p.m. - 6:00 p.m.	**Panel Work Session**	**Barbieri**

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

Wednesday		
8:00 a.m. – 11:30 a.m.	**Panel Discussion**	**Barbieri**
	- Review additional analyses, sensitivities	
	- Consensus recommendations and comments	
11:30 a.m. – 1:00 p.m.	**Lunch Break**	
1:00 p.m. – 3:30 p.m.	**Panel Discussion**	**Barbieri**
	- Final sensitivities reviewed.	
	- Projections reviewed.	
3:30 p.m. – 3:45 p.m.	**Break**	
3:45 p.m. – 5:00 p.m.	**Panel Discussion**	**Barbieri**
	- Review Consensus Reports	
5:00 p.m. - 6:00 p.m.	**Panel Work Session**	**Barbieri**

Wednesday Goals: Final sensitivities identified, preferred models selected, projection approaches approved, final results made available. Summary report drafts begun.

Thursday		
8:00 a.m. – 11:30 a.m.	**Panel Work Session**	**Barbieri**
11:30 a.m. – 1:00 p.m.	**Lunch Break**	
1:00 p.m. – 3:30 p.m.	**Panel Work Session**	**Barbieri**
3:30 p.m. - 3:45 p.m.	**Break**	
3:45 p.m. - 6:00 p.m.	**Panel Work Session**	**Barbieri**

Thursday Goals: Draft Summary Report reviewed.

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