Center for Independent Experts
Consultant Report on:

SEDAR 19 Stock Assessment Review
South Atlantic Red Grouper and South Atlantic and Gulf of Mexico Black Grouper
January 25 - 29, 2010

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Executive Summary

The SEDAR 19 covered South Atlantic red grouper and South Atlantic and Gulf of Mexico black grouper stock assessments. As well as this report, a SEDAR 19 Review Panel Report contains a consensus review of the assessments and the scientific advice. This report does not conflict with any findings in the review panel report, but extends and discusses various issues raised and makes additional recommendations. The main findings, recommendations and conclusions are:

- The data and assessments reported by the review panel form a good basis for scientific advice. While there are uncertainties associated with and reported by the assessment, these do not obscure the results. The results represent the best scientific advice available for these stocks.
- Both species are protogynous hermaphrodites, which is only partially accounted for in the assessments. The effect of protogyny might most easily be considered through its contribution, if any, to the Beverton and Holt stock recruitment steepness parameter.
- Communication between managers, scientists and other stakeholders needs to be improved. Management controls appear to have undermined monitoring indices. Catch limits might have increased discarding, which may still attract high mortality, when alternative measures might be considered. There are various problems with obtaining data from the fishery which might be reduced through improved understanding among stakeholders.
- There needs to be greater development of the relationship with the recreational fishing community, particularly in obtaining data. Recreational catches are significant, but a significant source of uncertainty.
- The review workshop should be required to bracket the uncertainty in assessment results. This task was completed for the Review Workshop.
- Harvest control rules should be developed for these fisheries as a way of managing uncertainty. Harvest control rules are useful not only as a mechanism to apply management decision-making but also as a tool to communicate and discuss uncertainty among managers, scientists and other stakeholders.
- The management of these stocks should move towards an ecosystem approach. A first step would be to consider the whole snapper/grouper complex caught by these fisheries within one SEDAR process, and identify, then focus, on those stocks most at risk or most constraining the fishing activities.
- A more strategic approach to developing research plans than the lists of research recommendations currently produced by SEDAR would be more efficient, particularly if the grouper/snapper stocks are considered together. For the red and black grouper stocks, research should focus on improving estimates of discard mortality, which is the main source of uncertainty, which can be addressed by scientific research.

Introduction

The red and black grouper stocks assessed through the SEDAR 19 process are within the jurisdiction of the South Atlantic Fishery Management Council and respective southeastern states. SEDAR is organized around three workshops: data, assessment, and review. This report concerns the review workshop, which took place at the Hilton Garden Inn in Savannah, GA, from 1:00 p.m. Monday, January 25, 2010 through 1:00 p.m. Friday, January 29, 2010. The independent peer review covers the data, assessment models, and results previously developed for and by the data and assessment workshops. The SEDAR documents include working papers prepared for each workshop, supporting reference documents, and the SEDAR Stock Assessment Reports.

NMFS-SEFSC requested the assistance of three fisheries assessment scientists from the CIE to serve as technical reviewers that would consider the assessments of South Atlantic red and black groupers. The review workshop produced a peer review consensus report. The external reviewers were Gary Grossman (USA), Sean Powers (USA), Stuart Reeves (UK, CIE), Neil Klaer (Australia, CIE), and Paul Medley (UK, CIE) and the panel was chaired by Chris Legault (USA). The assessment team attending the workshop consisted of presentations by Robert Muller (black grouper), and Kyle Shertzer (red grouper) on behalf of their assessment teams.

This report discusses my independent views on each ToR for the review workshop meeting. These are all broadly consistent with those of other panellists, but discussion is extended to further personal recommendations which the other panellists may not share. The intent of this report is to be constructive in terms of recommendations for the future direction of research and development of the stock assessment and SEDAR process.

The tenth Term of reference for the review panel, which is to prepare a Peer Review Consensus Summary summarizing the Panel's evaluation of the stock assessment, is not addressed in this report as no separate response is necessary. The Review Panel will provide separate consensus reports for red and black grouper.

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

Findings

The data were adequate for stock assessment, although difficulties in data collection made the biggest contribution to uncertainty in results. Data on total catch (including discards), abundance indices and age and size composition of the catches were available for both species. Data treatment is as good as might be expected, and problems are recognised. There are no clear, simple solutions to those problems which can be proposed.

The data used in both assessments were provided as a spreadsheet, which helped the review enormously. This allowed the reviewers to become familiar with the data, check issues with data directly and conduct simple analyses without having to bother the assessment team.

There is significant uncertainty associated with discard mortality and recreational catches (MRFSS). There were no data on discard mortality and a mortality rate for this

had to be assumed in the model. For the MRFSS catches, the intercept interview data may be reasonably reliable, but the raising factor (total number of trips) obtained from random phone calls seems to have created problems in the past. Raising factors can lead to unrealistic changes in catch estimates.

Central to the MRFSS data problem for red grouper was the lack of species-specific landings to 1986, when grouper was treated as an aggregate category. Unfortunately, correction of historical data is generally not possible, although the smoothing process applied was probably the best that could be done. In addition, the age composition data, used in both assessments, provides independent information on unexploited stock size and appropriate reference points (MSY), thereby reducing the reliance on a long time series of reliable catch data, and it may be possible in future to avoid using these data altogether.

There was no empirical data to support the discard mortality of 20% used in the assessments. Without supporting information, this seems low to me, and I would have expected higher mortality in practice. However, careful treatment of fish caught could result in them being released undamaged, and therefore this low level is by no means impossible.

The primary abundance indices are fishery dependent indices, the most reliable of which are the commercial longline data. Longline CPUE, being a passive gear covering a significant area, probably reflects abundance well if the fishing effort is high enough. However, it would appear that the index for black grouper has probably been compromised by the introduction of trip catch limits which I suspect has led to unreported discarding over the last three years. The index shows the significant dip after the introduction of trip limits which appears too abrupt to represent real change in biomass. Although abrupt changes are possible due to natural events, this change is not consistent with other indices or the catches.

The black grouper assessment used two fishery independent sampling techniques, the Florida Wildlife Commission Visual Survey (FWC), and the NMFS-UM Reef Visual Census (RVC). The red grouper assessment used two fishery independent sampling techniques: 1) Marmap survey data, and NMFS-UM Reef Visual Census (RVC). In order to interpret these appropriately within a stock assessment, more information is required on the survey and how to model the data.

For red grouper, neither MARMAP nor RVC data were collected from depths that were representative of the fishery, and the trap data (MARMAP) have a gear selectivity curve (dome-shaped) that differs from typical gear used in the fishery. Both black grouper visual census indices conflicted with other sources of information, and CV's for both indices were very high. Therefore, their contribution to these assessments has been very low. However, given that they cover many species, it is not possible to make strong recommendations as to their general value. It does suggest that a specific review of these data may be worth conducting to assess the costs and benefits of the data, either leading to improved design of the data collection or more details on how the data are to be modelled. For this assessment, costs for the data collection are not justified.

For black grouper, length was converted to age using separate growth curves for each fishing gear. While the probabilistic method used was very good, better practice would

apply the same growth model for all gears. Due to the relatively narrow range of sizes for each gear, this would make very little difference in practice to the age composition, but nevertheless it is best practice to keep models as realistic as well as parsimonious as possible.

Excluding data should be avoided where possible. For the black grouper length and age compositions, many years were rejected where sample size is low. Where sample sizes are low, it would be a good test of the statistical treatment of data to check that weights are reduced to an appropriate level. Small sample size is not a good reason to leave data out. On the other hand, small data sets usually are not influential, and in this case leaving them out had little impact.

Both species are protogynous hermaphrodites. Dichogamy is a complicated area in terms of physiology, behaviour and purpose. What is clear is that the dynamics will not be better understood by assuming a fixed rate of sex change at age or size as has been used in one of the assessments. The only way to understand how dichogamy might affect the assessment would be to monitor the sex ratio, the main concern being whether fisheries affect the ratio to an extent that threatens recruitment. It might be expected that the protogynous species would be more robust to fishing than protoandrous species, and in addition, there are many reasons to suspect that the population has internal mechanisms that avoid highly skewed sex ratios under high mortality (Shapiro 1988), but it is not assured (Heppell et al. 2006). The only way to assure that this is not a problem is monitor the sex ratio and routinely to collect information on sex and maturity.

However, the general result indicates that an optimal target exploitation rate is likely not to have adverse effect on sex ratio, and therefore that sex ratio is not likely to be the limiting factor (Heppell et al. 2006). Skewed sex ratios are only likely to become significant when well below the target biomass. It seems likely therefore that while various management actions protecting the spawning stock such as seasonal closed areas may be beneficial, the primary concern is fishing mortality which the assessments address.

Conclusions and Recommendations

The data are adequate for providing management advice, but problems with data are still the biggest source of uncertainty in the assessments. It is a fundamental requirement that all fisheries have good accurate records of total catch (all mortality due to fishing) and indices of abundance. Longline is potentially an excellent source of information and every effort should be made to protect this source.

Fisheries management and data collection should focus on developing at least one consistent abundance index. Controls based on fishing effort, such as a limit on days-at-sea, are preferable controls because they affect indices much less than catch limits which encourage discarding. Days-at-sea limits could be enforced through satellite vessel monitoring systems.

If catch limits are used, innovative ways to reduce discarding may be required. In New Zealand, where management is almost entirely conducted through total allowable catches and individual transferable quotas, the demersal fishery is implementing “deemed values” which apply an additional tax to landings above designated limits (NZ MFish 2010). The aim is to set the tax at a level to discourage targeting of the stock

concerned, but also discourage discarding so the entire catch is landed. The system is complicated and has not been operating for so long that it can be shown a clear success. Nevertheless, a system is required that discourages discarding unless survival is high, and this sort of innovation might be considered for some US commercial fisheries.

Improvements in MRFSS total catch data would increase the reliability of the assessments. MRFSS catches are always a source of significant uncertainty, mainly because it appears to be difficult to obtain a reliable raising factor for the catch rates. Estimates of recreational catch could be significantly improved if the system to capture recreational fishing activity (number of trips) could be improved. There is no obvious solution to this beyond more extensive outreach to the recreational fishing community. Recreational fishermen need to be convinced that they should be taking more responsibility for providing information for management as they cause a significant proportion of the fishing mortality.

An additional area which might benefit from the involvement of recreational fishermen is tagging released fish. The number of fish tagged and recaptured should be useful for estimating discard mortality. The United States has a strong tradition for such programmes which could be extended to all fisheries with a significant recreational component.

The effect of protogyny might most easily be considered through its contribution if any to the Beverton and Holt stock recruitment steepness parameter. The more robust the stock is to sex ratio change, the lower the stock size must become before fertility success begins to impact the productivity of the stock. This would suggest that the fewer the number of eggs which a male could successfully fertilize, the lower the Beverton and Holt steepness might be. There are of course other density dependent effects after the eggs have been fertilized that might obscure this effect, but nevertheless it may provide an argument for lower steepness than, say, a default 0.9 if it can be shown that a relatively high sex ratio is required for full reproductive output.

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

Findings

The methods applied were appropriate to the available data, which is the main limiting factor on assessment methods used. For both fisheries, a catch-at-age statistical model was preferred as the base model due to the presence of size and age data, but non-equilibrium production models were also fitted as well as simple catch curves. Diagnostics provided for the model fits were extensive, but some additional material was requested during the meeting to help in making decisions on the base model and suitable sensitivity analyses. Most significant of these additional outputs was a table of the objective function (log-likelihood) for each information component in the fit.

The catch curves were most useful in providing an upper likely limit on natural mortality. The catch curve estimating Z did not take account of the Lorenzen natural mortality model used in the age-structured assessments, but assumed constant mortality with size. For the stocks considered, this is not likely to be important because natural

mortality does not change much over the range of sizes considered, younger age frequencies being excluded due to concerns over selectivity.

For all models, a constant catchability was assumed for all the abundance indices. A 2% increase in catchability for the abundance indices would possibly be more precautionary and was applied for the Gulf of Mexico red grouper, for example. The only significant improvement in catchability that has been identified is the adoption of GPS equipment. This however was introduced over a relatively short period and is not likely to be well modelled by a constant increase. Therefore, there is no strong objection to this difference.

Attempts were made to obtain information from fishermen on catchability changes, although any information obtained was not used in the stock assessment. It is important that the information they provide can be used and more thought needs to be put into how such information is collected so that it can be used. A suggestion was given in a previous CIE report from Medley for SEDAR 12 as to how this might be done based on Press (1989).

For the black grouper assessment, the use of an age structured assessment was pushing the available age and size data to the limit. However, the data did seem informative on the selectivity parameters, suggesting that selectivity, if nothing else, was well estimated. The main problems seem to be with the abundance indices which would adversely affect any stock assessment, age structured or not. Therefore, given that age and size data are available, the assessment approach used was justified.

Production models are appropriate for these fisheries considering their size. Production models do not provide accurate or even realistic population models, but they can provide good empirical predictions of the behaviour of the abundance indices in response to changes in catches. For the purposes of management, this is the basic requirement for good decisions and therefore is adequate.

However, age structured production models may be a good step between full catch-at-age models and production models where limited size and age data are available. These do not pretend to follow cohorts, but do attempt to estimate selectivity, and account for what is known of the biology. Correctly formulated statistical catch-at-age models behave like age structured production models when age data are limited.

Conclusions and Recommendations

The assessments were well structured and took account of most of the concerns with the data. Some changes were made to the models based on the review, but there were no significant changes in the general results.

A set of standardised diagnostics output should be developed for assessment scientists and working groups to make reviews at every stage easier. Expectations are generally met, but what is provided does vary from assessment to assessment, likely based upon what the assessment team tends to think is important in each case. The standard list of diagnostics would cover much of the output already presented in assessment documents, such as residual and observed-expected plots. Other diagnostics, even if not included in the assessment documents, could be prepared as a separate unprinted document for review purposes. I would suggest the following, which I have found useful, are included where appropriate:

- Observed and expected plots of abundance index and size/age compositions.

- Bubble plots of residuals by age class and year, even if fitted to size data.
- A table of the contribution to the objective function for each information component should be constructed. These need to be comparable, so even if a component's weight is zero in the objective function, the unweighted log-likelihood for each component should be reported so that values can be directly compared. A large change among components' log-likelihood scores indicates influence and/or sources of information that are in conflict.
- Retrospective analyses to test the predictive capability of the model.

The following also should be considered:

- Other residual plots, for example expected values against residuals for various model components, may provide useful information on the fit.
- Reported maximum likelihood fits from random parameter start positions to ensure the final parameter fit is not a local maximum.
- Parameter estimate standard errors and correlation matrix (or a cut down version if large number of parameters).
- Autocorrelations and cross-correlations of residuals for time series models gives indications of model problems and possible improvements.

If it is decided to reduce monitoring costs by stopping the collection of size and age data for these stocks, the production models should provide adequate management advice. However, I would recommend adopting a Bayesian approach as the standard for fitting production models. Apart from theoretical arguments as to the improvements that Bayesian approaches offer, importantly they can be used to include information which otherwise cannot be used. For example, population simulations based on life history parameters can be used to estimate a prior for the maximum rate of population increase. This allows these models to make use of a wide variety of information to keep results within realistic ranges and provide reliable, but narrower confidence intervals for the indicators of interest.

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

Findings

The final estimates of stock size and exploitation rates are clearly well founded and provide good scientific advice. There is considerable uncertainty in the assessments, however, which need to be taken into account. The estimates and ranges will be reported in the review panel report.

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. A. In addition, for black grouper, the Gulf Council requests that the Panel evaluate the methods used to estimate OFL.

Findings

The methods to estimate benchmarks were appropriate, but it was questionable whether the MSY based reference points could be estimated reliably. MSY reference points will depend on the estimate of steepness for the Beverton and Holt stock-recruitment. Steepness can rarely be estimated with precision unless data cover a period of extreme depletion from which the stock has recovered. This is not really the case for either red or black grouper. With the relatively flat stock-recruitment relationships observed from the models, steepness tends to default to values close to 1.0, which could lead to very risky decisions. The choice of steepness is more a policy decision and depends on the attitude to risk, a lower steepness being more precautionary.

Conclusions and Recommendations

A maximum steepness could be assumed based on risk rather than estimates from models, leading to standard proxies for MSY rather than attempting to estimate MSY. Steepness values in the region of 0.8 are reasonable assumption for these species, and higher steepness should be avoided, unless well supported by observations and research. A steepness of 0.8 implies that 90% of unexploited recruitment will be achieved at SPR36% or higher. An SPR30% should achieve 87% or more of the unexploited recruitment in the long term. Strong evidence is required to argue for steepness values greater than 0.9, as this would allow the stock to be depleted to relatively low levels.

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).

Findings

Within the limitations imposed by the management structure, projections were adequate and appropriate, and methods were applied correctly. Future population states based on management actions are reported in the review panel consensus report. Using the Monte Carlo simulations, the uncertainty was taken into account for the base model. The available evidence suggests that red grouper is below the biomass at MSY, whereas black grouper is above its MSY level (as measure using the SPR30% proxy).

Conclusions and Recommendations

While the approach used was correct, more consideration might be given as to how this information is likely to be used. If fishing mortality is used as the control variable, it is

necessary to link various management actions to fishing mortality. However, it is not realistic to fix fishing mortality in a projection, as this would never be achieved in practice. In cases where there is an overall total allowable catch (TAC), it is fairly straightforward to fix the catches and project various TACs. However, for these groupers, management options are less clear cut as controls are limited and different controls apply to different components of the fishery. Action appears to be predominantly directional (determining whether the exploitation rate needs to be curtailed or not) rather than estimating a direct quantitative control. With the fishery having such a significant recreational component, quantitative controls beyond minimum sizes will be difficult to apply.

Nevertheless, in principle projections are better if they simulate the management actions being proposed. For example, in this case, changes to the minimum size or trip limits on commercial fisheries could be projected to see what the likely impact would be. This would report the fishing mortality as an outcome to be compared to objectives rather than pretend it is a controlled variable. This would require, however, a set of possible management actions to be tested, which were not available to this assessment.

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.

Findings

The methods used to quantify uncertainty in assessments included Monte Carlo Bootstrap methods, Markov Chain Monte Carlo (to make a random draw from the likelihood) and sensitivity analyses, which are standard and appropriate methods for these assessments. These report uncertainty in the form of mathematical probability, confidence intervals and ranges of values. As structural uncertainty is usually the main issue with stock assessment, the sensitivity analyses are probably the most important source of information on uncertainty.

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

Conclusions and Recommendations

Bracketing the uncertainty should form part of the terms of reference for the review workshop. This is appropriate for reviewers to do with the assessment team, and should aid in communicating uncertainty to fisheries managers.

Even given reporting a simple range summarising uncertainty, it is not clear to me what managers are expected to do with this information. They are likely to still base their decisions on “best” point estimates, unless given additional methods to account for uncertainty.

Decision tables are one option which help focus on the actions taken in response to uncertainty rather than the uncertainty itself. Decision tables require a definition of the decision which will be made and some indication of the costs resulting from the

interaction between the management decision and the state of nature. Clearly scientists cannot develop these tools alone, but will require management to help specify what is required.

In my experience, harvest control rules represent the best way to communicate uncertainty as well as provide a clearer management plan for controlling stock size. This focuses on actions taken to respond to uncertainty, and in particular the feedback control system which ensures that the stock is not depleted. Importantly, the harvest control rule can be couched in terms that non-scientists can understand. A harvest control rule can be built on observations treated as random variables rather than derived estimates of arcane quantities, such as fishing mortality. For example, a harvest control rule could link actions such as reducing fishing effort or increasing the size limit to CPUE abundance indices or landed mean size respectively (CRFM, in prep). Fishermen in particular not only understand catch rates and size in relation to stock condition, but also can link these variables to their economic performance which may have more relevance to them.

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.

Findings

As far as possible this term of reference was met by the Review Panel. However, it is not clear that it was possible for the review panel to “ensure” the term of reference was met, given the timing of report production. It will be checked that the Addendum to the assessment report is consistent with the consensus view.

Conclusions and Recommendations

I would suggest that this term of reference be dropped from the Review Panel’s work. It should be possible using a technical editor to ensure that management advice reflects the contents of the Review Panel’s final report, since the report will contain final estimates of stock status and management advice.

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

Findings

The SEDAR process is an excellent, if expensive, approach to ensuring that the scientific advice is the best available. However, the process is still working on a species-by-species process, which does not seem ideal with a multispecies fishery. The two species of grouper assessed under SEDAR 19 are not generally the subject of targeted fisheries, but are caught as relatively minor components of a general reef-fish fishery.

The Data Workshop recommended using particular data sets, but gave no direct indications of which were more reliable. Choices related to the use of data within stock assessments are typically more complex than simply the inclusion/exclusion of

particular datasets. Full evaluation of whether data should be included can only be made during and after the stock assessment. Satisfactory decisions were made on the available information at the review workshop, where some visual census indices were excluded, but it was clear that improvements in this process were possible.

Conclusions and Recommendations

As part of the SEDAR process, a road-map could be developed, moving the assessments from separate single species to an ecosystem approach. Full ecosystem models, which might be used to guide the approach, require considerable investment and time to develop. A simpler risk assessment might be used, such as Productivity-Susceptibility Analysis (PSA) which is only semi-quantitative, but could identify stocks which are most at risk from overfishing as the focus of research and assessment. A more quantitative approach, but applying the same principle, might use outputs from past assessments to identify not only the stock most at risk, but the stock which should constrain fishing activity, based on estimates of catchability, selectivity and fishing mortality at MSY (or equivalent proxy). The focus in terms of SEDAR activities and research would then apply to that stock.

The Data Workshops could provide a semi-quantitative or quantitative estimate (e.g. a score) of the relative reliability of each information source. This information could then be used to inform the choice of weightings to be used in stock assessments. This relative reliability given before the assessment and therefore independent of the analysis would be useful in determining which assessment should be selected as base where two or more information components conflict. For example, if two abundance indices indicate opposite trends after allowing for selectivity, the base assessment should be chosen assuming one is true, not choose the average between the two trends, as both cannot be true. If an “average” is required, it should be on the basis of a decision analysis, not maximum likelihood, which clearly is very unlikely to be correct.

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

Findings

While the research recommendations from the workshops are reasonable, they consist of a “wish list” rather than provide a strategic plan to reduce management risks. Criteria for choosing what research needs to be done needs to be decided on the basis of cost, likely success of the research and impact of the research on the outcome of the assessment.

Red and black grouper data acquisition for size and age compositions is hampered by low availability of samples from the fishery. It is questionable whether strategically spending limited resources on trying to monitor age, size or sex structure is strictly worthwhile for black grouper when other species probably constrain the fishery. However, it should be noted that reasonably good estimates of total catch and at least

one reliable abundance index is required if no age or size composition data are collected.

Both red and black grouper could come up for update assessments after 5 years and benchmark assessments after 10 years, dependent on the strategic approach adopted; for example whether assessments would focus on other groupers as limiting these fisheries. The choice of 5 years is arbitrary, but it represents a common time frame for economic changes, which are most likely to affect the fishery. Given that other grouper or snapper are likely to be the limiting factor on these stocks and the long-term trend is increasing, a more frequent assessment period is probably not justified. The other criterion that would trigger a re-assessment should be any substantial change in the fishery or indices that indicate a change in risks to these stocks. This should be formalised as much as possible, but any significant fall among abundance indices, changes in mean size or increase in fishing effort or catch should trigger at least an update assessment, if it occurs before the 5-year cycle is complete. This would require monitoring these indices annually for trends, but stops well short of the level of analysis required for a stock assessment.

Conclusions and Recommendations

A research strategy should be developed based on risk assessment and identifying where risks can be best reduced by research. This approach could become particularly efficient if the research strategy covered all stocks taken within these fisheries.

A review of the areas of uncertainty in the assessment could be used to draw out the major risks management is taking. Given these risks, if they are unacceptable, they can be reduced by:

- Taking management action: Management can reduce risk either by taking action assuming the worst case scenario, or apply specific action to reduce a specific risk e.g. spawning aggregation closures.
- Conducting further research which can be completed within a reasonable time frame, noting that under the precautionary approach, research cannot be used as a delay for management action.

While there are a number of recommendations in the Review Panel Report to increase the accuracy of the assessment, there are two which could change the results of the assessment significantly as identified from the sensitivity analyses.

1. Better estimates of natural mortality would be desirable, although difficult to obtain. Broadly, the total mortality is reasonably well estimated from the models, but the allocation of this mortality between natural and fishing mortality is uncertain.
2. Discard mortality is probably easier to estimate (although still hard) than natural mortality. For example, tagging the discarded catch should give some indication of survival rates from recaptures. Discard mortality is particularly important as it will determine the effectiveness of regulations which require discarding such as the minimum landing size.

References

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Appendix I: *SEDAR 19* Workshop Document List

Data Workshop

SEDAR19-DW-01 Black grouper, Mycteroperca bonaci, standardized catch rates from the Marine Recreational Fisheries Statistics Survey in south Florida,1991-2008 Robert G. Muller Indices

SEDAR19-DW-02 A fishery independent index for black grouper, Mycteroperca bonaci, from Florida Fish and Wildlife Research Institute's visual survey in the Florida Keys, 1999-2007 Robert G. Muller and Alejandro Acosta Indices

SEDAR19-DW-03 Construction of a headboat index for south Atlantic red grouper Paul Conn Indices

SEDAR19-DW-04 Construction of a headboat index for black grouper Paul Conn Indices

SEDAR19-DW-05 Evaluation of the 1960, 1965, and 1970 U.S. Fish and Wildlife Service salt-water angling survey data for use in the stock assessment of red grouper (Southeast US Atlantic) and black grouper (Southeast US Atlantic and Gulf of Mexico) Rob Cheshire and Joe O'Hop Recreational Statistics

SEDAR19-DW-06 Steepness of spawner-recruit relationships in reef fishes of the southeastern U.S.: A prior distribution for possible use in stock assessment Sustainable Fisheries Branch Life History

SEDAR19-DW-07 South Atlantic Region Recreational Fishery Catches of Red and Black Grouper, 1981 - 2008 and Gulf of Mexico Landings of Black Grouper. Tom Sminkey Recreational Statistics

SEDAR19-DW-08 Length Frequencies and Condition of Released Red Grouper and Black Grouper from At-Sea Headboat Observer Surveys in the Gulf of Mexico and Atlantic Ocean, 2005 to 2007. Beverly Sauls Recreational Statistics

SEDAR19-DW-09 Age, growth, and maturity of black grouper (Mycteroperca bonaci) – Crabtree and Bullock (1998) revisited Joe O'hop and Rick Beaver Life History

SEDAR19-DW-10 Ault-Smith Notes on Reef-fish Visual Census (RVC) Population Statistics Estimation for Black Grouper (Mycteroperca bonaci) and Red Grouper (Epinephelus mori) in the Florida Keys and Dry Tortugas Regions Jerald S. Ault and Steven G. Smith Indices/Life History

SEDAR19-DW-11 Patterns of annual abundance of black and red grouper in the Florida Keys and Dry Tortugas based on reef fish visual census conducted by NOAA NMFS. G. Walter Ingram, Jr. and Douglas E. Harper Indices

SEDAR19-DW-12 A fishery independent index for red grouper, Epinephelus morio, from Florida Fish and Wildlife Research Institute's visual survey in the Florida Keys, 1999-2007 Robert G. Muller and Alejandro Acosta Indices

SEDAR19-DW-13 United States Commercial Vertical Line and Longline Vessel Standardized Catch Rates of Black Grouper the Gulf of Mexico and South Atlantic, 1993-2008 Kevin McCarthy Indices

SEDAR19-DW-14 United States Commercial Vertical Line Vessel Standardized Catch Rates of Red Grouper in the US South Atlantic, 1993-2008 Kevin McCarthy Indices

SEDAR19-DW-15 Calculated discards of black grouper from commercial vertical line and longline fishing vessels in the Gulf of Mexico and US South Atlantic Kevin McCarthy Commercial Statistics

SEDAR19-DW-16 Calculated discards of red grouper from commercial vertical line fishing vessels in the US South Atlantic Kevin McCarthy Commercial Statistics

SEDAR19-DW-17 Patterns of annual abundance of red grouper observed in chevron traps set during the MARMAP Survey (1990 – 2008) in the U.S. South Atlantic. G. Walter Ingram, Jr. and Jessica Stephen Indices

SEDAR19-DW-18 Standardized catch rates of Atlantic red grouper (Epinephelus morio) from the North Carolina Commercial Fisheries Trip Ticket Program. Walter Ingram, Stephanie McInerny, and Alan Bianchi

Indices

SEDAR19-DW-19 Red grouper standardized catch rates from the Marine Recreational Fisheries Statistics Survey for the southeastern U.S. Atlantic Ocean, 1991-2008 Chris Hayes and Robert G. Muller Indices

SEDAR19-DW-20 Standardized catch rates of black grouper. Mycteroperca bonaci, and red grouper, Epinephelus morio, from Florida's commercial trip tickets, 1991-2008 Robert G. Muller Indices

SEDAR19-DW-21 Estimated Landings and Discards of Red Grouper in the South Atlantic and Black Grouper in the South Atlantic and Gulf of Mexico Headboat Fishery, 2004-2008. Ken Brennan Recreational Statistics

Assessment Workshop

SEDAR19-AW-01 A hierarchical analysis of red grouper indices. Paul Conn

SEDAR19-AW-02 Red grouper: Regression and Chapman−Robson estimators of total mortality from catch curve data Sustainable Fisheries Branch

SEDAR19-AW-03 Additions and Updates to Red Grouper data since the SEDAR 19 Data Workshop Sustainable Fisheries Branch

SEDAR19-AW-04 Red Grouper: Predecisional Surplus–production Model Results Sustainable Fisheries Branch

SEDAR19-AW-05 A non-equilibrium surplus production model of black grouper (Mycteroperca bonaci) in southeast United States waters Robert G. Muller

SEDAR19-AW-06 Catch curves from two periods in the black grouper fishery Robert G. Muller

SEDAR19-AW-07 A statistical catch-age model for red grouper: mathematical description, implementation details, and computer code. Sustainable Fisheries Branch

SEDAR19-AW-08 Assessment history of black grouper (Mycteroperca bonaci) in the southeast U. S. waters Robert G. Muller

Review Workshop

SEDAR19-RW-01 A statistical catch-age model for red grouper: mathematical description, implementation details, and computer code Sustainable Fisheries Branch

Stock Assessment Reports

SEDAR19-SAR1

SEDAR19-SAR2

Reference Documents

SEDAR19-RD01 Reproduction in the protogynous black grouper (Mycteroperca bonaci (Poey) from the southern Gulf of Mexico Thierry Brulé, Ximena Renán, Teresa Colás-Marrufo, Yazmin Hauyon, and Armin N. Tuz-Sulub

SEDAR19-RD02 Life history of red grouper (Epinephelus morio) off the coasts of North Carolina and South Carolina Julian M. Burgos, George R. Sedberry, David M. Wyanski, and Patrick J. Harris

SEDAR19-RD03 Trends in catch data and estimated static SPR values for fifteen species of reef fish landed along the southeastern United States Jennifer C. Potts and Ken Brennan

SEDAR19-RD04 Density, species and size distribution of groupers (Serranidae) in three habitats at Elbow Reef, Florida Keys Robert Sluka, Mark Chiappone, Kathleen M. Sullivan, Thomas A. Potts, Jose M. Levy, Emily F. Schmitt and Geoff Meester

SEDAR19-RD05 Population genetic analysis of red grouper, Epinephelus morio, and scamp, Mycteroperca phenax, from the southeastern U.S. Atlantic and Gulf of Mexico M. S. Zatcoff, A. O. Ball and G. R. Sedberry

SEDAR19-RD06 The 1960 Salt-Water Angling Survey, USFWS Circular 153 J. R. Clark

SEDAR19-RD07 The 1965 Salt-Water Angling Survey, USFWS Resource Publication 67. D. G. Deuel and J. R. Clark

SEDAR19-RD08 1970 Salt-Water Angling Survey, NMFS Current Fisheries Statistics Number 6200 D. G. Deuel

SEDAR19-RD09 Age, growth, and reproduction of black grouper, Mycteroperca bonaci, in Florida waters Roy E. Crabtree and Lewis H. Bullock

SEDAR19-RD10 Age and growth of the warsaw grouper and black grouper from the southeast region of the United States Charles S. Manooch, III and Diane L. Mason

SEDAR19-RD11 The influence of spear fishing on species composition and size of groupers on patch reefs in the upper Florida Keys Robert D. Sulka and Kathleen M. Sullivan

SEDAR19-RD12 Aspects of fishing and reproduction of the black grouper Mycteroperca bonaci (Poey, 1860) (Serranidae: Epinephelinae) in the Northeastern Brazil Simone Ferreira Teixeira, Beatrice Padovani Ferreira and Isaíras Pereira Padovan**

SEDAR19-RD13 Diet composition of juvenile black grouper (Mycteroperca bonaci) from coastal nursery areas of the Yucatan Peninsula, MexicoThierry Brulé, Enrique Puerto-Novelo, Esperanza Pérez-Díaz, and Ximena Renán-Galindo

SEDAR19-RD14 Life history of the red grouper (Epinephelus morio) off the North Carolina and South Carolina coast Julian M. Burgos

SEDAR19-RD15 Mean Size at Age: An Evaluation of Sampling Strategies with Simulated Red Grouper Data C. Phillip Goodyear

SEDAR19-RD16 Evaluation of average length as an estimator of exploitation status for the Florida coral reef fish community. Ault, J.S., S.G. Smith, and J.A. Bohnsack

SEDAR19-RD17 A retrospective (1979-1996) multispecies assessment of coral reef fish stocks in the Florida Keys Ault, J.S., J.A. Bohnsack, and G.A. Meester

SEDAR19-RD18 Building sustainable fisheries in Florida's coral reef ecosystem: positive signs in the Dry Tortugas. Ault, J.S., S.G. Smith, J.A. Bohnsack, J. Luo, D.E. Harper, and D.B. McClellan

SEDAR19-RD19 Are the coral reef finfish fisheries of south Florida sustainable. Ault, J.S., S.G. Smith and J.T. Tilmant

SEDAR19-RD20 Fishery management analyses for reef fish in Biscayne National Park: bag & size limits Ault, J.S., S.G. Smith, and J.T. Tilmant

SEDAR19-RD21 Site characterization for Biscayne National Park: assessment of fisheries resources and habitats Ault, J.S., S.G. Smith, G.A. Meester, J. Luo, and J.A. Bohnsack

SEDAR19-RD22 Baseline Multispecies Coral Reef Fish Stock Assessment for the Dry Tortugas Jerald S. Ault, Steven G. Smith, Geoffrey A. Meester, Jiangang Luo, James A. Bohnsack, and Steven L. Miller

SEDAR19-RD23 Movement of yellowtail snapper (Ocyurus chrysurus Block 1790) and black grouper (Mycteroperca bonaci Poey 1860) in the northern Florida Keys National Marine Sanctuary as determined by acoustic telemetry James Lindholm, Les Kaufman, Steven Miller, Adam Wagschal and Melinda Newville

SEDAR19-RD24 Coral reef fish response to FKNMS management zones: the first ten years (1997-2007) James A. Bohnsack, Douglas E. Harper, David B. McClellan, and G. Todd Kellison and Jerald S. Ault, Steven G. Smith, Natalia Zurcher

SEDAR19-RD25 Reef fish movements and marine designs Nick Farmer

SEDAR19-RD26 A Cooperative Multi-agency Reef Fish Monitoring Protocol for the Florida Keys Coral Reef Ecosystem Marilyn E. Brandt, Natalia Zurcher, Alejandro Acosta, Jerald S. Ault, James A. Bohnsack, Michael W. Feeley, Doug E. Harper, John Hunt, Todd Kellison, David B. McClellan, Matt E. Patterson, Steven G. Smith1

SEDAR19-RD27 The Natural Mortality Rate of Gag Grouper: A Review of Estimators for Data-Limited Fisheries Trevor J. Kenchington

SEDAR19-RD28 Population Assessment of the Scamp, Mycteroperca phenax, from the Southeastern United States Charles S.Manooch, III, Jennifer C. Potts, Michael L. Burton, and Patrick J. Harris

SEDAR19-RD29 A Review for Estimating Natural Mortality in Fish Populations Kate. I. Siegfried & Bruno Sansó

SEDAR19-RD30 Bottom longline fishery bycatch of black grouper from observer data Loraine Hale and John Carlson

SEDAR19-RD31 Characterization of the shark bottom longline fishery: 2007 Loraine Hale, Lisa D. Hollensead, and John Carlson

SEDAR19-RD32 2009 Gulf of Mexico Red Grouper Update Report

SEDAR19-RD33 Aspects of the Life History of Red Grouper, Epinephelus morio, Along the Southeastern United States John C. McGovern, Julian M. Burgos, Patrick J. Harris, George R. Sedberry, Joshua K. Loefer, Oleg Pashuk and Daniel Russ

SEDAR19-RD34 User Manual for Stock Synthesis Model Version 3.04 Richard D. Methot Jr.

Appendix II: Statement of Work for Dr. Paul Medley

External Independent Peer Review by the Center for Independent Experts

SEDAR 19 South Atlantic red grouper and South Atlantic and Gulf of Mexico black grouper Review Workshop

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

Project Description: SEDAR 19 will be a compilation of data, a benchmark assessment of the stock, and an assessment review for conducted for Gulf of Mexico and South Atlantic black grouper and South Atlantic red grouper. The review workshop provides an independent peer review of SEDAR stock assessments. The term review is applied broadly, as the review panel may request additional analyses, error corrections and sensitivity runs of the assessment models provided by the assessment workshop panel. The review panel is ultimately responsible for ensuring that the best possible assessment is provided through the SEDAR process. The stocks assessed through SEDAR 19 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 Terms of Reference (ToRs) of the peer review are attached in **Annex 2**. The tentative agenda of the panel review meeting is attached in **Annex 3**.

Requirements for CIE Reviewers: Three CIE reviewers shall conduct an impartial and independent peer review in accordance with the SoW and ToRs herein. CIE reviewers shall have working knowledge and recent experience in the application of stock assessment, statistics, fisheries science, and marine biology sufficient to complete the primary task of reviewing the technical details of the methods used for the assessment. Each CIE reviewer's duties shall not exceed a maximum of 14 days to complete all work tasks of the peer review described herein.

Location of Peer Review: Each CIE reviewer shall conduct an independent peer review during the panel review meeting scheduled in Savannah, Georgia during 25-29 January 2010.

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

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

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

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

The NMFS Project Contact will update this section with a list of background document and estimated number of pages no later than 15 October 2009.

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

understands the contractual role of the CIE reviewers as specified herein. The CIE Lead Coordinator can contact the Project Contact to confirm any peer review arrangements, including the meeting facility arrangements.

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

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

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

1) Conduct necessary pre-review preparations, including the review of background material and reports provided by the NMFS Project Contact in advance of the peer review.
2) Participate during the panel review meeting in Savannah, Georgia during 25-29 January 2010.
3) During the 25-29 January 2010 meeting in Savannah Georgia, the CIE reviewers shall conduct an independent peer review in accordance with the ToRs (**Annex 2**).
4) No later than 8 February 2010, 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 David Sampson CIE Regional Coordinator, via email to david.sampson@oregonstate.edu. Each CIE report shall be written using the format and content requirements specified in Annex 1, and address each ToR in **Annex 2**.

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

20 December 2009	CIE sends reviewer contact information to the COTR, who then sends this to the NMFS Project Contact
11January 2010	NMFS Project Contact sends the CIE Reviewers the pre-review documents
25-29 January 2010	Each reviewer participates and conducts an independent peer review during the panel review meeting
8 February 2010	CIE reviewers submit draft CIE independent peer review reports to the CIE Lead Coordinator and CIE Regional Coordinator
22 February 2010	CIE submits CIE independent peer review reports to the COTR
28 February 2010	The COTR distributes the final CIE reports to the NMFS Project Contact and regional Center Director

Modifications to the Statement of Work: Requests to modify this SoW must be approved by the Contracting Officer at least 15 working days prior to making any permanent substitutions. The Contracting Officer will notify the COTR within 10 working days after receipt of all required information of the decision on substitutions. The COTR can approve changes to the milestone dates, list of pre-review documents, and ToRs within the SoW as long as the role and ability of the CIE reviewers to complete the deliverable in accordance with the SoW is not adversely impacted. The SoW and ToRs shall not be changed once the peer review has begun.

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

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

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

Key Personnel:

William Michaels, Contracting Officer's Technical Representative (COTR)
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

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

Julie Neer, SEDAR 19 Coordinator, NMFS Project Contact
South Atlantic Fishery Management Council
4055 Faber Place, Suite 201
North Charleston, SC 29405
Julie.Neer@SAFMC.net Phone: 843-571-4366

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

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

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

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

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

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

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

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

3. The reviewer report shall include the following appendices:

   Appendix 1: Bibliography of materials provided for review
   Appendix 2: A copy of the CIE Statement of Work
   Appendix 3: Panel Membership or other pertinent information from the panel review meeting.

Annex 2: Terms of Reference for the Peer Review

SEDAR 19 South Atlantic red grouper and South Atlantic and Gulf of Mexico black grouper Review Workshop

Below or the correct TORs for the 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.
    A. In addition, for black grouper, the Gulf Council requests that the Panel evaluate the methods used to estimate OFL.
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 as applied to the reviewed assessments and identify any Terms of Reference which were inadequately addressed by the Data or Assessment Workshops.
9. Consider the research recommendations provided by the Data and Assessment workshops and make any additional recommendations or prioritizations warranted. Clearly denote research and monitoring needs that could improve the reliability of future assessments. Recommend an appropriate interval for the next assessment, and whether a benchmark or update assessment is warranted.
10. Prepare a Peer Review Summary summarizing the Panel's evaluation of the stock assessment and addressing each Term of Reference. Develop a list of tasks to be completed following the workshop. Complete and submit the Summary Report within 3 weeks of workshop conclusion.

Annex 3: Tentative Agenda
SEDAR 19 South Atlantic red grouper and South Atlantic and Gulf of Mexico black grouper Review Workshop
Savannah, Georgia during 25-29 January 2010

Monday

1:00 p.m.	**Convene**	
1:00 – 1:30	**Introductions and Opening Remarks** *- Agenda Review, TOR, Task Assignments*	**Coordinator**
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** *- Assessment Data & Methods* *- Identify additional analyses, sensitivities, corrections*	**TBD**
3:30 p.m. – 4:00 p.m.	**Break**	
4:00 p.m. – 6:00 p.m.	**Panel Discussion** *- Continue deliberations* *- Review additional analyses*	**Chair**

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

Wednesday

8:30 a.m. – 11:30 a.m.	**Panel Discussion** *- Review additional analyses, sensitivities* *- Consensus recommendations and comments*	**Chair**
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** *- Final sensitivities reviewed.* *- Projections reviewed.*	**Chair**
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** *- Review Consensus Reports*	**Chair**

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**	

Appendix III: SEDAR 19 Panel Membership

Gary Grossman (USA)
Sean Powers (USA)
Stuart Reeves (UK, CIE)
Neil Klaer (Australia, CIE)
Paul Medley (UK, CIE)
Chris Legault (USA)