



**Review of 2007 SEDAR Grouper  
Assessment Review**

**for**

**University of Miami Independent System for Peer Review**

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**COMMERCIAL IN CONFIDENCE**

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## Executive Summary

The SEDAR grouper assessment review panel examined the key decisions of the SEDAR 10 and SEDAR 12 stock assessments for red grouper, Gulf of Mexico gag and Atlantic gag, and in particular the outputs of the 2007 Evaluation Panel that reviewed those assessments. The aim of the review was to ensure confidence in both the assessment process and assessment findings, verifying that all decisions were scientifically sound and adequately scrutinized within the assessment process.

The review was held May 8-10<sup>th</sup> 2007 at the Hilton St Petersburg, Florida. The Panel examined the Evaluation Panel report, as well as the individual data, assessment and review workshop findings, in order to gain a better idea of the rationale for particular decisions made during the process and to determine whether the Evaluation Panel's responses to its Terms of Reference were adequate, complete, and scientifically sound. The Panel also examined the outputs of the studies performed at the request of the Evaluation Panel, in order to determine whether such analyses were preferred for determining stock status and developing management references.

This reviewer found that the Evaluation Panel's responses to its Terms of Reference were scientifically sound, complete, and generally adequate (although additional information would have been welcome for particular elements – see recommendations). Furthermore with some refinement, the new analysis performed for Gulf of Mexico gag following the request of the Evaluation Panel and refinements arising from Review Panel suggestions should form the basis of a revised assessment for this stock.

The CIE reviewer's findings on the Evaluation Panel report were fully incorporated in the SEDAR Review Panel consensus report. These findings are expanded upon within this report, addressing points 1-3 under the SEDAR Grouper Assessment Review Panel Terms of Reference (Appendix 1).

### **1. Review the Evaluation Panel (EP) report and determine whether the Panel's responses to its Terms of Reference are adequate, complete, and scientifically sound.**

EP TOR 1a. The length of the time series to be used for the base cases in each assessment (Gulf gag, Atlantic gag, Gulf red grouper)

The length of the time series chosen for inclusion within an assessment model can be critical to the results of biological stock assessments, particularly where management reference points include considerations of unexploited biomass levels. However, the data across the time series must be reliable or biases can lead to considerable uncertainty in results. This reviewer supports the Review Panel's endorsement of the Evaluation Panel's conclusion that producing the best assessment possible should not be compromised by imposing similar lengths of time series on the various assessments. This reviewer also fully agrees that the rationale for the starting times of each assessment time series was scientifically sound. The assessment scientists had sensibly and appropriately compared the results of assessment runs with the different

time series, and the resulting trends (and to an extent unexploited biomass levels) within these were comparable.

EP TOR 1b. The treatment of the catchability coefficient for fishery-dependent indices of abundance in each assessment.

Different Assessment Workshops made different assumptions of constant or constantly increasing catchability within the base case assessment. The Review Panel discussed the issue of catchability in detail, but did not have sufficient information to either endorse or reject the observations of the Evaluation Panel. A greater range of sensitivity analyses for catchability would have helped discussions. However, without further analysis the actual level of catchability change cannot be known, and hence the Review Panel felt (and this reviewer agrees) that there was no justification to change the base case runs.

The magnitude and timing of changes in catchability should be considered. Given the influence of catchability on the outputs of the assessment model, this reviewer endorses the Evaluation Panel's recommendation of a workshop on catchability.

EP TOR 1c. The estimation of the number and size composition of discarded fish, as well as the fraction of the discards that die in each assessment.

One of the major topics of discussion during the panel meeting was the issue of discarding, particularly in the Gulf of Mexico gag assessment. This was considered highly important, given the large proportion of fish discarded in the recreational fishery.

Although there was concern that the method used to estimate this size composition might be biased, data available from a recent FWC study on headboats suggested that the length distributions used within the assessment models were reasonable.

Further discussion focused on the depth distributions of discard samples used to parameterise the model, which determined the discard mortality. The data used were spatially limited, and hence could bias the estimates of discard mortality applied within the model. Additional analyses performed at the Review Panel's request suggested that the overall average mortality of discarded fish could be 20%, rather than ~29%. A further model run was performed to examine the impact of this change on the assessment.

Assessment runs performed so far (the Review Workshop runs and the minimum landing size run performed at the request of the Evaluation Panel) are likely to bracket the patterns of discarding in the fishery. Furthermore, based upon the additional information provided from the analyses requested by the Evaluation Panel on the impact on bag limits, and the observations from fishermen, modelling discarding based upon the minimum landing size appears warranted for Gulf of Mexico gag and is currently the most appropriate basis for the assessment of this species.

EP TOR 1d. The treatment of the natural mortality rate and, in particular, the method used to scale the Lorenzen curve in each assessment.

Assessment results were highly sensitive to the value of natural mortality selected, which was estimated by applying Lorenzen's approach and scaling the results to the overall natural mortality value from Hoenig's equation. Given a lack of alternative information or criteria on which to base alternative estimates of natural mortality, the Review Panel accepted those estimates used within the different assessments.

The sensitivity of the assessment to the level of natural mortality needs to be examined in more detail. This should encompass both the overall estimate of natural mortality used (comparing Hoenig's method to alternative empirical approaches) and the age ranges used to scale the Lorenzen curve to the overall estimate of natural mortality. A workshop is recommended at the national or international scale to examine this.

EP TOR 1e. Recommended reference points (minimum stock size threshold, maximum fishing mortality threshold and optimal yield) and whether those choices are consistent with the goals of the respective Fishery Management Plans and the Magnuson-Stevens Reauthorization Act.

This reviewer agrees that the reference points recommended by the SEDAR 12 review panel for Gulf of Mexico red grouper and the SEDAR 10 review panel for South Atlantic gag were consistent with the management requirements stated in the respective assessment reports. The empirical F limit recommended by SEDAR 10 for Gulf of Mexico gag was inconsistent with FMP requirements and yield per recruit defined references were recommended. However, in a hermaphroditic stock, the definition of reproductive potential needs further investigation.

EP TOR 2. Discuss how consistency in methodology should be balanced against the need to address differences in the data, fisheries and biology of the three stocks in question. Include in this discussion the significance of using different stock assessment algorithms for each stock.

Providing the best advice on which to sustainably manage a stock should not be constrained by a desire for consistency between similar stocks. Differences in biology, available data, the certainty of that data, and the backgrounds of the scientists performing assessments will mean that differences should be expected. However there is benefit in, at least occasionally, applying alternative assessment methods to a single stock to investigate the impacts of model uncertainty on results. This observation also holds for the models and approaches used to prepare the data and estimated parameters for the assessment models, including the natural mortality and discarding algorithms, which are of particular importance in these assessments. Upon doing this,

the differences that may arise between the outputs of the alternative methodologies need to be explained.

**2. Review any analyses prepared as a result of Evaluation Panel recommendations and determine whether there is sufficient evidence to justify using these new analyses in place of those adopted by the preceding review panels as the basis for determining stock status and developing management references.**

This reviewer reiterates the Review Panel's thanks to the assessment staff for their prompt response to requests for additional analysis, both at the request of the Evaluation Panel and during the Review Panel's deliberations.

Discussion and additional investigations during the Review Panel concentrated on the assessment for Gulf of Mexico gag. As already noted, results of Evaluation Panel requests showed bag limits were seldom reached in the recreational fishery, supporting the views of fishermen. This suggested that the assessment run modelling discarding as a function of the minimum size limit alone was a more realistic approach than used in previous assessments. Additional work on the depth distribution of discards, and their corresponding depth-specific mortality pattern in the Gulf of Mexico will further refine the assessment for this species. This reviewer therefore supports the opinion of the Review Panel that with subsequent refinement (the results not being available prior to the end of the Review Panel meeting), the new analysis performed following the request of the Evaluation Panel will form the basis of a revised assessment, with corresponding updates to benchmark calculations and stock projections.

**3. Document Panel discussions and recommendations in a Review Panel Consensus Summary Report.**

The Review Panel Consensus Summary Report was drafted during the meeting, and reviewed by the Review Panel members during the weeks of the 14<sup>th</sup> and 21<sup>st</sup> May 2007.

**Recommendations**

Recommendations have been noted throughout this report, and are clearly detailed in the Conclusions and Recommendations section.

## **Background**

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

SEDAR is a public process conducted by the Fishery Management Councils in the Southeast US. All workshops, including the review, are open to the public and noticed in the Federal Register. All documents prepared for SEDAR are freely distributed to the public upon request and posted to the publicly accessible SEDAR website. Public comment during SEDAR workshops is taken on an 'as needed' basis; the workshop chair is allowed discretion to recognize the public and solicit comment as appropriate during panel deliberations. The names of all participants, including those on the Review Panel, are revealed. Oversight of the SEDAR process and assessment workload is handled by the SEDAR Steering Committee which is composed of the Executive Directors and Chairs of the South Atlantic, Gulf of Mexico, and Caribbean Fishery Management Councils; the NOAA Fisheries SEFSC Director, the NOAA Fisheries Southeast Regional Administrator, and the Executive Directors of the Gulf States and Atlantic States Marine Fisheries Commission.

SEDAR Review Workshops provide independent peer reviews of SEDAR stock assessments based on tasks specified in Terms of Reference. The Workshop panel consists of a chair appointed by the SEFSC Director, several reviewers appointed through the CIE, and a reviewer appointed by the Council having jurisdiction over the species being assessed.

Each SEDAR assessment is judged on its own merit and participants are clearly instructed that any decisions made in previous assessments are to be thoroughly evaluated in light of current knowledge. There is no requirement or expectation that decisions made regarding one assessment should be consistent with those in prior assessments, and, in fact, justifications based solely on past decisions are explicitly discouraged. As a result, SEDAR participants are compelled to continually improve assessment quality and it is acknowledged within the Southeast fisheries management community that SEDAR has improved assessment methods, data evaluation techniques, and awareness of critical data collection program characteristics.

One consequence of continually evaluating all prior decisions and striving to improve methods is that current assessments may develop solutions to data deficiencies and analytical challenges that differ from solutions applied in previous assessments. Previous SEDAR assessments have faced post-approval criticism brought on by technological advancements and improved understanding of data sources stemming from later assessments, and the accepted solution has been to apply the most up to date methods to each problem at the next available opportunity. For example, updates to SEDAR 1 and 2 assessments included model configurations and data treatments developed through subsequent assessments.

A similar situation arose recently when the findings of assessments for Gulf of Mexico and South Atlantic gag grouper were compared with those for Gulf of Mexico red grouper. Although many of the same datasets were included in the assessments for gag and red grouper in the Gulf of Mexico, the two species are exploited by similar fisheries, and there is potential overlap in the species range, the SEDAR 10 (gag) and SEDAR 12 (red grouper) assessments differed in key areas including data time series, discard mortality rates, estimation of natural mortality, and analysis of fishery-dependent catchability. Similar differences are also noted within the SEDAR 10 assessments for South Atlantic gag grouper and Gulf of Mexico gag grouper. It should be noted that the assessments prepared during SEDAR 10 and SEDAR 12 were judged separately on their individual merits and found adequate and acceptable by independent scientific review panels. In addition, the SEDAR 10 assessment of Gulf of Mexico gag grouper was also reviewed and deemed acceptable by the Gulf of Mexico Fishery Management Science and Statistics Committee. Nonetheless, the SEDAR Steering Committee determined that additional scrutiny should be devoted to recent grouper assessments.

The Review Panel was convened by request of the SEDAR Steering Committee to evaluate key decisions of the SEDAR 10 and SEDAR 12 stock assessments. The Steering Committee determined that additional evaluation should be devoted to these issues to ensure confidence in both the assessment process and assessment findings. The Steering Committee recognizes the inherent challenge in balancing demands to scientists to prepare each assessment with the best available data and most up to date methods, with constituents' expectations that similar fisheries should receive similar analytical treatments. By convening the review, the SEDAR Steering Committee intended to ensure that every effort would be made to verify that all decisions would be scientifically sound and adequately scrutinized within the assessment process.

This document represents the individual CIE Reviewer Report on the results of the Review Panel deliberations on the assessments of red grouper (*Epinephelus morio*) and gag grouper (*Mycteroperca microlepis*) on which the reviewer sat, at the request of the Center for Independent Experts (see Appendix 1). The author was provided with the Evaluation Panel report, downloaded the data review, stock assessment review panel and review panel documents (see bibliography), and participated in the SEDAR review panel process.

## **Description of review activities**

The review was undertaken by Dr Graham Pilling at Cefas (Lowestoft, UK) and during the SEDAR Review Panel held in St Petersburg, Florida, at the Hilton St Petersburg hotel. The SEDAR Review Panel was convened during May 8<sup>th</sup> to 10<sup>th</sup> 2007. The panel membership is listed in Appendix 2.

The documentation (see bibliography) was reviewed at Cefas, prior to travel. Dr Pilling actively participated in the SEDAR panel meeting in St Petersburg and assisted with the development of the SEDAR Review Panel meeting report. This separate report to CIE was completed on return to Cefas.

Observers, including members of the fishing industry, attended the SEDAR panel meeting. The Evaluation Panel report findings were presented to the Panel, and the issues considered against the Evaluation Panel's Terms of Reference through open discussion. In turn, the additional assessment runs requested by the Evaluation Panel were examined and further consideration to the runs performed was made. The Review Panel examined whether the Evaluation Panel's responses to its Terms of Reference were adequate, complete, and scientifically sound, along with analyses prepared as a result of Evaluation Panel recommendations, and determined whether such analyses were preferred for determining stock status and developing management references.

## Summary of findings

The meeting of the SEDAR Review Panel for the Evaluation Panel report on the 2006 Gulf of Mexico Red Grouper and Gag and the South Atlantic Gag stock assessments represented the culmination of a protracted period of scientific analysis, data, assessment, review, and evaluation meetings. Overall, the data workshop (DW) assessment workshops (AW), review workshops (RW) and Evaluation Panel (EP) should be commended in developing and refining assessments for these stocks. In turn, this author would like to thank the stock assessment team for their responsiveness to requests during the review panel meeting, and the clarity of their reporting.

The CIE reviewer's findings on the Evaluation Panel report were fully incorporated in the SEDAR Review Panel consensus report. Below, these findings are expanded upon within relevant sections, addressing points 1-3 under the SEDAR Review Panel Terms of Reference (Appendix 1). Numbered recommendations (in bold) refer to the correspondingly numbered items within the conclusions and recommendations section of this report.

### **1. Review the Evaluation Panel report and determine whether the Panel's responses to its Terms of Reference are adequate, complete, and scientifically sound.**

My responses are detailed under each of the Evaluation Panel TORs.

#### EP TOR 1a. The length of the time series to be used for the base cases in each assessment (Gulf gag, Atlantic gag, Gulf red grouper)

As noted by the Evaluation Panel, the length of the time series chosen for inclusion within an assessment model can be critical to the results of biological stock assessments, particularly where management reference points include considerations of the unexploited biomass levels. It is critical, however, that when extended time series are used the data across the time series can be relied upon. Unknown biases in the data can lead to considerable uncertainty in results, and hence the time series of data available to an assessment must be carefully considered.

This reviewer supports the Review Panel's endorsement of the Evaluation Panel's conclusion that producing the best assessment possible should not be compromised by imposing similar lengths of time series on the various assessments. This reviewer also fully agrees that the rationale for the starting times of each assessment time series was scientifically sound. The assessment scientists had sensibly and appropriately compared the results of assessment runs using the different time series, and the resulting trends (and to an extent unexploited biomass levels) were comparable.

However, there is a need within the SEDAR process to better document the reasons why particular decisions were taken. For example, in the GOM red grouper assessment the data workshop indicated that "after some discussion it decided to accept landings beginning in the year 1937, it being the first year of available data". However, this recommendation was not carried forward into the documented

assessment workshop discussions and no indication for the reason for deciding to reject this time series was given. **See recommendation 1.**

In all assessments, retrospective runs were performed examining the influence of the most recent years of data on the model. However, given the uncertainty over the starting time period for the data, it would be useful to examine the results of performing a similar examination for the starting period of the data. **See recommendation 2.**

EP TOR 1b. The treatment of the catchability coefficient for fishery-dependent indices of abundance in each assessment.

Different assessment groups made different assumptions over whether the base case assessment should assume constant or a constantly increasing catchability. The Evaluation Panel agreed that catchability had likely increased over time. They also felt that the treatment of catchability between the stocks should be consistent, and that a constant catchability assumption should not be the default. The Review Panel discussed the issue at length, but did not have sufficient information to either endorse or reject this observation.

While a sensitivity analysis was performed in the red grouper assessment (analyses included a 4% increase in catchability run), this was not performed for the other stock assessments. Having these runs available may have allowed the Review Panel to draw a stronger conclusion on the impact of the catchability assumption. **See recommendation 3.** However, without further analysis the actual level of catchability change cannot be known, and hence the Review Panel felt that there was no justification to change the base case runs.

The magnitude of any change in catchability is one issue. Another is when in a time series changes occur. Changes in catchability are not likely to be consistent over time, but more likely to show step changes as new technology (e.g. GPS, fish finders, increased engine power) is implemented within the fishery. Furthermore, the environment will also affect catchability (availability) with hurricanes, red tides etc. all influencing the aggregation of individuals.

Given the influence of catchability on the outputs of the assessment model, this reviewer endorses the Evaluation Panel's recommendation of a workshop on catchability. **See recommendation 4.**

EP TOR 1c. The estimation of the number and size composition of discarded fish, as well as the fraction of the discards that die in each assessment.

One of the major topics of discussion during the panel meeting was the issue of discarding, particularly in the Gulf of Mexico gag assessment. This was considered highly important, given the large proportion of fish discarded in the recreational fishery (see figure).

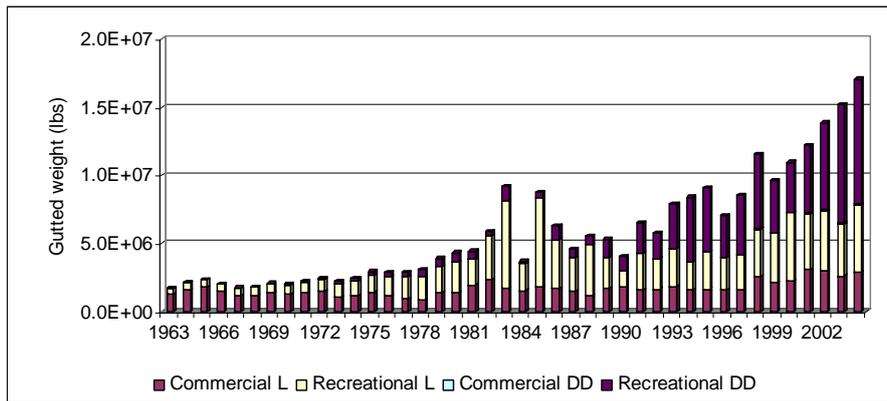


Figure. Landings (L) and dead discards (DD) of Gulf of Mexico gag from commercial and recreational fisheries (gutted weight in pounds).

The Review Panel discussed the derivation of estimated size composition of discarded Gulf of Mexico gag in detail. There was concern that the method used to estimate this size composition might be biased. The majority of the information used to estimate these relationships came from fish landed at the dock (TIP samples) and hence would not include components of the catch discarded prior to landing. As a result, the lengths discarded in the fishery were potentially under-represented and hence down-weighted in the analysis. Data were available from a recent FWC study on headboats (presented by Beverly Sauls), which provided additional length frequency information from direct sampling of discarded fish. Visual comparison of the size distribution of landed and discarded gag from the two years of information available from this study (2005, 2006) suggested that the length distribution of the fish used within the updated assessment model was reasonable. However, further work could be performed. **See recommendation 5.**

The second area of discussion was the depth distributions of discard samples used to parameterise the model, which determined the discard mortality. On examination during the Review Panel meeting, data available to assess mortality at depth was spatially limited, mostly being from deeper waters off the west coast of Florida (e.g. the Mote data concentrates off Tampa area and further north in ‘Dustin’). These areas are generally deeper than other areas within the Gulf, and hence could bias the estimates of discard mortality applied within the model. To examine this further, the MRFSS data on the distance of fishing from shore was investigated. The results suggested that 50% of the discarded fish (B2) data came from inside state waters and hence would suffer lower mortality. Further analysis during the meeting suggested that the overall average mortality of discarded fish could be 20%, rather than ~29%. A further model run was performed to examine the impact of this change on the assessment. **See recommendation 6.**

The importance of dead discards within the fishery, and influence on the assessment model, suggests this is a key area for further study. The assessment runs performed so far (the Review Workshop runs and the minimum landing size run performed at the request of the Evaluation Panel) are likely to bracket the patterns of discarding in the fishery. Furthermore, based upon the additional information provided from the analyses requested by the Evaluation Panel on the impact on bag limits, and the observations from fishermen, modelling discarding based upon the minimum landing

size appears warranted for Gulf of Mexico gag and is currently the most appropriate basis for the assessment of this species.

Given the limited information available to develop a similar approach to modelling dead discards in the South Atlantic gag and Gulf of Mexico red grouper, the different approaches used in those assessments appear warranted. However, the examination of the sensitivity of assessments to the assumptions made should be examined. **See recommendation 7.**

EP TOR 1d. The treatment of the natural mortality rate and, in particular, the method used to scale the Lorenzen curve in each assessment.

The Review Panel noted that the assessment results were highly sensitive to the value of natural mortality selected. Estimation of natural mortality is highly difficult, and often relies on the use of generalised empirical formulae. These assessments rely on the use of the Hoenig equation, but noting the potential importance of differential natural mortality rates on the younger individuals (which are also heavily affected by discarding practices) the assessment workshops elected to estimate natural mortality at age using Lorenzen's equation. Noting the results of that equation were not consistent with the overall mortality level estimated from the Hoenig method, they then scaled the overall mortality to the Hoenig estimate, based on the level across different age ranges.

Given a lack of alternative information or criteria on which to base alternative estimates of natural mortality, the estimates used within the different assessments were accepted by the Review Panel. However, the sensitivity of the assessment to the level of natural mortality needs to be examined.

There are two aspects to the approach used to estimate natural mortality. The first is the overall estimate of natural mortality used. Hoenig's method relies in part on knowledge of the oldest individuals within the population. In an exploited population, the oldest individuals are likely to have been caught. Hence the oldest age present in the catch following exploitation will not represent the oldest age to which the species has the potential to reach. While the use of Hoenig's method is as good as any other, alternative approaches (e.g. that of Pauly, or in particular that of Ralston, which was specifically developed for snappers and groupers) could be compared. **See recommendation 8.**

The second issue is on the approaches used to scale the Lorenzen curve to the overall estimate of natural mortality. Different age ranges were used within the different assessments, starting at either what was considered the 'fully exploited' age class, or using all ages in the population. While there is little information to select either approach as being 'better' (although the Hoenig method was based upon the fully selected ages in the population), a sensitivity analysis of the implications of different selected age ranges for each stock is advisable. **See recommendation 9.**

Given the influence of natural mortality on the results of the assessment, further examination is warranted. **See recommendation 10.**

EP TOR 1e. Recommended reference points (minimum stock size threshold, maximum fishing mortality threshold and optimal yield) and whether those choices are consistent with the goals of the respective Fishery Management Plans and the Magnuson-Stevens Reauthorization Act.

This reviewer agrees with the Review Panel decisions that a) the reference points recommended by the SEDAR 12 review panel for Gulf of Mexico red grouper and the SEDAR 10 review panel for South Atlantic gag were consistent with the management requirements stated in the respective assessment reports, and b) that the Evaluation Panel was correct in considering that the empirical F limit recommended by SEDAR 10 for Gulf of Mexico gag was inconsistent with FMP requirements, and that yield per recruit defined references should be used.

It is worth noting that in a hermaphroditic stock, the definition of reproductive potential is not straightforward. **See recommendation 11.**

EP TOR 2. Discuss how consistency in methodology should be balanced against the need to address differences in the data, fisheries and biology of the three stocks in question. Include in this discussion the significance of using different stock assessment algorithms for each stock.

Providing the best advice on which to sustainably manage a stock should not be constrained by a desire for consistency between similar stocks. Differences in biology, available data, the certainty of that data, and the backgrounds of the scientists performing assessments will mean that differences should not be unexpected.

However there is benefit in, at least occasionally, applying alternative assessment methods to a single stock to investigate the impacts of model uncertainty on results. This observation also holds for the models and approaches used to prepare the data for the assessment models, including the natural mortality and discarding algorithms, which are of particular importance in these assessments. Upon doing this, the differences that may arise between the outputs of the alternative methodologies need to be explained. This does occur within SEDAR, where continuity runs are performed as a matter of routine, but explanation of the reasons behind differences in results might be more explicit.

This reviewer supports the observations made by the Evaluation Panel under TOR 1E of their report, that international reviewers are unlikely to be “well-versed in US Federal fisheries management requirements”. While this reviewer is familiar with the general reference points used, I relied on those US scientists to indicate whether specific reference points were appropriate within the framework of the Magnuson-Stevens Sustainable Fisheries Act. I therefore support the view of the Evaluation Panel that Assessment Panels provide ample reference point and stock recruitment relationship options for consideration.

**2. Review any analyses prepared as a result of Evaluation Panel recommendations and determine whether there is sufficient evidence to justify using these new analyses in place of those adopted by the preceding review panels as the basis for determining stock status and developing management references.**

This reviewer reiterates the Review Panel's thanks to the assessment staff for their prompt response to requests for additional analysis, both at the request of the Evaluation Panel and during the Review Panel's deliberations.

Discussion and additional investigations concentrated on the assessment for Gulf of Mexico gag. The Review Panel agreed with the Evaluation Panel that the SEDAR 10 assessment of this stock did not contain the most accurate estimate of the age composition of recreationally caught dead discards. As already noted, the additional information provided by the analyses performed following the requests of the Evaluation Panel on bag limits indicated that this limit was seldom reached in the recreational fishery, supporting the view of fishermen. This suggested that the requested assessment run that modelled discarding as a function of the minimum size limit alone was a more realistic approach than previous assessments. Furthermore, additional length frequency information of discarded and retained gag provided by the FWC headboat study was in basic agreement with that assumed for the model run, further supporting this assessment assumption. The Evaluation Panel assessment appeared to have an estimated depth distribution skewed towards deeper depths (where higher mortality was assumed) due to a potential bias in the geographic distributions of the source of discard information. Additional work on the depth distribution of discards, and their corresponding depth-specific mortality pattern in the Gulf of Mexico will further refine the assessment for this species. This reviewer therefore supports the opinion of the Review Panel that with subsequent refinement (the results not being available prior to the end of the Review Panel meeting), the new analysis performed following the request of the Evaluation Panel will form the basis of revised assessment.

**3. Document Panel discussions and recommendations in a Review Panel Consensus Summary Report.**

The Review Panel Consensus Summary Report was drafted during the meeting, and reviewed by the Review Panel members during the weeks of the 14<sup>th</sup> and 21<sup>st</sup> May 2007.

**4. General comments**

**The review process**

The Evaluation Panel was highly familiar with the stocks, data and assessments. Despite having a number of days prior to the meeting to assimilate the information contained in the reports, the sheer size of the documents (summing to over 1,100 pages) meant it was impossible to fully comprehend the different issues within the

fisheries. Therefore, a proportion of the two day meeting was inevitably spent getting up to speed with the system, filling in knowledge gaps, etc. The presence of those with background knowledge of the local fishery, management system etc. was invaluable, given the relatively short time period available. **See recommendation 1.**

### **The model**

The models underlying the assessments were essentially similar, and basically straightforward. However, as a reviewer I always have some concern where models, even for apparently ‘data poor’ species such as South Atlantic gag, estimate over 150 parameters. Some would argue that other approaches (e.g. VPA) estimate similar numbers of parameters, but as I see it the difference is that a VPA could be implemented within a spreadsheet, whereas ADMoDelBuilder implementations are often black boxes that makes it difficult to identify how changes in data affect the outputs of models (e.g. when trying to extract mortality at age from the model). I acknowledge, however, that the outputs of assessments are compared between different approaches (although the presentation of sensitivity analyses was often within appendices or supporting papers, and not easily identifiable within reports).

Many of the data models used within the subsequent assessment model were presented as the mean fit, without the accompanying data to which that model was fit. This made it difficult to visualise how good the fit was likely to be. **See recommendation 12.**

### **Uncertainty**

While this reviewer notes that the policy customer often does not want to see the uncertainty within the assessment process (preferring to see an individual set of numbers of stock status from the base case run), there is a need to acknowledge and address uncertainty within assessments. In these assessments, particular uncertainty rested with the selection of natural mortality values, and the modelling of catchability. As discussed, the use of sensitivity analyses is appropriate, particularly where there is little information to choose one parameter value over another. However, more complete evaluations of uncertainty are possible. **See recommendation 13.**

## **5. Conclusions/Recommendations**

This reviewer found that the Evaluation Panel’s responses to its Terms of Reference were scientifically sound, complete, and generally adequate (although additional information would have been welcome for particular elements – see recommendation 1). Furthermore with some refinement, the new analysis performed for Gulf of Mexico gag following the request of the Evaluation Panel and refinements arising from Review Panel suggestions should form the basis of a revised assessment for this stock.

Specific recommendations from this reviewer are presented here. Recommendations were also noted in the Review Panel consensus report, and some of the recommendations below support and expand upon these.

**Recommendation 1.** In general, there is a need to ensure that the key decisions made within the Data workshop, Assessment workshop and Review Workshop are fully documented to ensure future scientists (and reviewers) can trace the ‘audit trail’. This could be performed at each stage of the process by noting the key final decisions taken within the corresponding reports. Subsequent stages of the process can then note under each whether these decisions were agreed with or refuted, as well as the reasons behind that decision.

**Recommendation 2.** In future assessments where the length of the time series of data is a concern, assessment scientists should undertake a sensitivity analysis of the impact of including or excluding early years of data upon assessment results.

**Recommendation 3.** The chosen level of the trend in catchability strongly influences the assessment results for red grouper. As a result, sensitivity analyses including a rate of change in catchability of 4% (beyond the 2% increase rate examined) are recommended for the gag stocks in order to better understand the impact on assessment results for these stocks.

**Recommendation 4.** Given the potential impact of uncertainties in catchability on the outputs of the assessment, there is a need to better understand the causes and patterns of changes in catchability within the fishing fleets prosecuting the gag and grouper stocks. This reviewer therefore endorses the Evaluation Panel’s recommendation for a workshop on the modelling of catchability, which should include other species within the multispecies catch complex. Furthermore, there is the potential to compare the fishery dependent information with the limited fishery independent (and standardised) information available.

**Recommendation 5.** Despite the reasonable visual comparison between the FWC length frequency data and the recreational discard size frequency used within the model, a direct comparison of the size distributions of fish sampled at sea and those sampled on landing (which comprise the majority of the samples) is recommended.

**Recommendation 6.** The analysis of the available depth/discard information should be continued in an attempt to further refine estimates of recreational dead discards by depth. The spatial limitation of the MRFSS data should be considered (it being primarily from vessels off Tampa, lacks headboat information etc.). If warranted, results should be used to refine the assessment for Gulf of Mexico gag.

**Recommendation 7.** The Goodyear probabilistic approach for estimating dead discards should be applied to all stocks at least once, as an alternative assessment run. This will better quantify the sensitivity of assessment results to assumptions made when estimating dead discards in the red grouper and South Atlantic gag.

**Recommendation 8.** Examine overall mortality estimates derived using alternative empirical approaches, in particular that of Ralston (Ralston, S. (1987). Mortality rates of snappers and groupers. In J.J. Polovina and S. Ralston (Eds.), *Tropical Snappers and Groupers: Biology and Fisheries Management*. Westview Press, Boulder and London, p. 375-404.), and hence their impact on assessment results. This consideration may be best placed within a potentially national review workshop (see recommendation 10).

**Recommendation 9.** Given the sensitivity of assessment results to the age ranges selected for scaling the Lorenzen curve within the red grouper assessment, the sensitivity of the other assessments to the age range selected for scaling should be examined.

**Recommendation 10.** This reviewer endorses the Evaluation Panel's recommendation of a workshop on natural mortality estimation including the application of the Lorenzen method. Given the national and international importance of this issue, expanding this to a wider workshop (at the national or international level) should be considered. In turn, the Review Panel's recommendation of using information collected on these species from closed areas (taking into account immigration/emigration studies) is worth investigating.

**Recommendation 11.** The investigation of appropriate reference points that fit within the Magnusson-Stevens act framework but are suitable for hermaphroditic stocks should be investigated. Ultimately, testing of such reference points should be performed within Management Strategy Evaluation simulations to ensure they are robust to the uncertainties present within the system.

**Recommendation 12.** Where possible, the raw data should be shown in the sub-model fits to allow a clearer review of these models, at least where the raw data would not obscure the mean fit itself!

**Recommendation 13.** Given uncertainties in the input data and the potential to incorporate information from fishermen, other stakeholders and other stocks within the assessment parameters, the potential to develop assessment methods within a Bayesian framework should be investigated. This approach would allow the uncertainty within assessment outputs to be better understood and implicitly considered. An issue remains on explaining uncertainty (particularly within Bayesian models) to managers and stakeholders, but approaches are available to help with this (e.g. Bayesian networks).

## **Bibliography**

### **Primary documentation**

SEDAR (2007). SEDAR Grouper Assessment Review Evaluation Panel Report. 18p.

Analyses of Gulf of Mexico Gag Grouper in response to the recommendations of the SEDAR Grouper Assessment Review Panel. April 2007. 1) Spatio-temporal distribution of size-depth samples for gag GOM used to generate size-depth distribution matrices to estimate dead discard of recreational and commercial fisheries. 11p.

Analyses of Gulf of Mexico Gag Grouper in response to the recommendations of the SEDAR Grouper Assessment Review Panel. April 2007. 2) Spatio-temporal distribution of size samples for converting catch to catch-at-size data for Gag GOM. 13p.

Analyses of Gulf of Mexico Gag Grouper in response to the recommendations of the SEDAR Grouper Assessment Review Panel. April 2007. 3) The panel recommends constructing an analysis of Gulf of Mexico gag grouper based on assigning discarded fish to sizes below the minimum limit. 11p.

Gag and aggregate grouper bag limits. Southeast Regional Office. April 26, 2007. 3p.

### **Additional documentation used by the reviewer**

SEDAR (2006). SEDAR 10 Stock Assessment Report 1. South Atlantic Gag Grouper. 485p.

SEDAR (2006). SEDAR 10 Stock Assessment Report 2. Gulf of Mexico Gag Grouper. 250p.

SEDAR (2006). SEDAR 12 Stock Assessment Report 1. Gulf of Mexico Red Grouper. 358p.

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

Hoenig, J.M. (1983). Empirical use of longevity data to estimate mortality rates. *Fishery Bulletin* 82(1), 898-903.

## **Appendix 1. Statement of work**

### **CIE REQUEST**

SEDAR Grouper Assessment Review  
South Atlantic Gag Grouper, Gulf of Mexico Red Grouper and Gag Grouper  
May 8 - 10, 2007  
Tampa, Florida

#### **SEDAR Overview:**

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

SEDAR is a public process conducted by the Fishery Management Councils in the Southeast US. All workshops, including the review, are open to the public and noticed in the Federal Register. All documents prepared for SEDAR are freely distributed to the public upon request and posted to the publicly accessible SEDAR website. Public comment during SEDAR workshops is taken on an 'as needed' basis; the workshop chair is allowed discretion to recognize the public and solicit comment as appropriate during panel deliberations. The names of all participants, including those on the Review Panel, are revealed. Oversight of the SEDAR process and assessment workload is handled by the SEDAR Steering Committee which is composed of the Executive Directors and Chairs of the South Atlantic, Gulf of Mexico, and Caribbean Fishery Management Councils; the NOAA Fisheries SEFSC Director, the NOAA Fisheries Southeast Regional Administrator, and the Executive Directors of the Gulf States and Atlantic States Marine Fisheries Commission.

SEDAR Review Workshops provide independent peer reviews of SEDAR stock assessments based on tasks specified in Terms of Reference. The Workshop panel consists of a chair appointed by the SEFSC Director, several reviewers appointed through the CIE, and a reviewer appointed by the Council having jurisdiction over the species being assessed.

Each SEDAR assessment is judged on its own merit and participants are clearly instructed that any decisions made in previous assessments are to be thoroughly evaluated in light of current knowledge. There is no requirement or expectation that decisions made regarding one assessment should be consistent with those in prior assessments, and, in fact, justifications based solely on past decisions are explicitly discouraged. As a result, SEDAR participants are compelled to

continually improve assessment quality and it is acknowledged within the Southeast fisheries management community that SEDAR has improved assessment methods, data evaluation techniques, and awareness of critical data collection program characteristics.

One consequence of continually evaluating all prior decisions and striving to improve methods is that current assessments may develop solutions to data deficiencies and analytical challenges that differ from solutions applied in previous assessments. Previous SEDAR assessments have faced post-approval criticism brought on by technological advancements and improved understanding of data sources stemming from later assessments, and the accepted solution has been to apply the most up to date methods to each problem at the next available opportunity. For example, updates to SEDAR 1 and 2 assessments included model configurations and data treatments developed through subsequent assessments.

A similar situation arose recently when the findings of assessments for Gulf of Mexico and South Atlantic gag grouper were compared with those for Gulf of Mexico red grouper. Although many of the same datasets were included in the assessments for gag and red grouper in the Gulf of Mexico, the two species are exploited by similar fisheries, and there is potential overlap in the species range, the SEDAR 10 (gag) and SEDAR 12 (red grouper) assessments differed in key areas including data time series, discard mortality rates, estimation of natural mortality, and analysis of fishery-dependent catchability. Similar differences are also noted within the SEDAR 10 assessments for South Atlantic gag grouper and Gulf of Mexico gag grouper. It should be noted that the assessments prepared during SEDAR 10 and SEDAR 12 were judged separately on their individual merits and found adequate and acceptable by independent scientific review panels. In addition, the SEDAR 10 assessment of Gulf of Mexico gag grouper was also reviewed and deemed acceptable by the Gulf of Mexico Fishery Management Science and Statistics Committee. Nonetheless, the SEDAR Steering Committee determined that additional scrutiny should be devoted to recent grouper assessments.

This review panel is being convened by request of the SEDAR Steering Committee to evaluate key decisions of the SEDAR 10 and SEDAR 12 stock assessments. The Steering Committee has determined that additional evaluation should be devoted to these issues to ensure confidence in both the assessment process and assessment findings. The Steering Committee recognizes the inherent challenge in balancing demands to scientists to prepare each assessment with the best available data and most up to date methods, with constituents' expectations that similar fisheries should receive similar analytical treatments. By convening this review, the SEDAR Steering Committee intends to ensure every effort is made to verify that all decisions are scientifically sound and adequately scrutinized within the assessment process.

**CIE Request:**

NMFS-SEFSC requests the assistance of two fisheries assessment scientists from the CIE to serve as technical reviewers for the SEDAR Grouper Assessment Review Panel that will evaluate key decisions of assessments prepared during SEDAR 10 and SEDAR 12. SEDAR 10 addressed assessments of Gulf of Mexico and South Atlantic gag grouper, and SEDAR 12 assessed Gulf of Mexico red grouper.

The gag grouper assessments conducted through SEDAR 10 are under the jurisdictions of the Gulf of Mexico Fishery Management Council, the South Atlantic Fishery Management Council, and respective southeastern states. The red grouper stock assessed through SEDAR 12 is within the jurisdiction of the Gulf of Mexico Fishery Management Council and respective southeastern states.

The review workshop will take place in Tampa, Florida, from 1:00 p.m. Tuesday, May 8, 2007 through 1:00 p.m. Thursday, May 10, 2007.

The review will be conducted through an open, publicly accessible meeting which will be recorded in accordance with Council administrative record keeping requirements. All documents produced by the review panel are made available to the public once the review process is complete.

Meeting materials will be forwarded electronically to review panel participants; printed copies of any documents are available by request. The names of reviewers will be included in workshop briefing materials.

Please contact John Carmichael (SEDAR Program Manager; 4055 Faber Place, North Charleston, SC 29405. Office (843) 571-4366; Cell (843) 224-4559; John.Carmichael@safmc.net) for additional details.

**SEDAR Grouper Assessment Review Workshop Panel Tasks:**

The SEDAR Grouper Assessment Review Workshop Panel will review the findings of the SEDAR Grouper Assessment *ad hoc* Evaluation panel with regard to gag and red grouper. The review will be guided by Terms of Reference that are specified below. The Review Workshop panel will document its findings in a Peer Review Consensus Summary (Annex 1). This document is a product of the SEDAR review panel and is not a product of the CIE. The CIE requires that each appointed reviewer prepare and submit a CIE reviewer report, as described in Annex II, to provide additional distinct, independent analyses of the technical issues discussed by the panel and addressed in the Peer Review Consensus Summary.

*SEDAR Grouper Assessment Review Workshop Terms of Reference:*

1. Review the Evaluation Panel report and determine whether the Panel's responses to its Terms of Reference<sup>1</sup> are adequate, complete, and scientifically sound.
2. Review any analyses prepared as a result of Evaluation Panel recommendations and determine whether such analyses are preferred for determining stock status and developing management references.
3. Document Panel discussions and recommendations in a Review Panel Consensus Summary Report.

*1. Evaluation panel TORs are provided for reference as Annex III.*

*SEDAR Review Workshop Panel Supplementary Instructions*

The review panel Chair is responsible for reading supporting documents prior to the workshop, working with SEDAR support staff and appointed reviewers in advance of the workshop to ensure panel responsibilities are understood, conducting the meeting during the workshop in an orderly fashion, and compiling and editing the Consensus Summary and submitting it to the SEDAR Coordinator by a deadline specified by the SEDAR Steering Committee. The review panel Chair may participate in panel discussions and deliberations when appropriate and may assist the reviewers in documenting panel discussions.

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

The review panel should not provide specific management advice. Such advice will be provided by existing Council Committees, such as the Science and Statistical Committee and Advisory Panels, following completion of the assessment.

## **Statement of Tasks for Technical Reviewers:**

### Roles and responsibilities:

1. Approximately 2 weeks prior to the meeting, the CIE reviewers shall be provided with the stock assessment reports of SEDAR 10 and 12, associated supporting documents, and review workshop instructions including the Terms of Reference. Reviewers shall read these documents to gain an in-depth understanding of the stock assessment, the resources and information considered in the assessment, and their responsibilities as reviewers.
2. During the Review Panel meeting, reviewers shall participate in panel discussions on assessment methods, data, validity, results, recommendations, and conclusions as guided by the Terms of Reference. The reviewers shall collectively prepare a Peer Review Consensus Summary report as described in Annex I.
3. Following the Review Panel meeting, the reviewers shall work with the chair to complete and review the Peer Review Panel Consensus report. Reports shall be completed, reviewed by all 3 panelists, and comments submitted to the Chair within 1 week of the conclusion of the workshop (May 17, 2007).
4. Following the Review Panel meeting, each reviewer shall prepare an individual CIE Reviewer Report. These reports shall be submitted to the CIE no later than May 24, 2007, addressed to the "University of Miami Independent System for Peer Review," and sent to Dr. David Sampson, via email to [David.Sampson@oregonstate.edu](mailto:David.Sampson@oregonstate.edu), and to Mr. Manoj Shivlani, via email to [mshivlani@rsmas.miami.edu](mailto:mshivlani@rsmas.miami.edu). See Annex II for complete details on the report outline.

The duties of each Review Panelist shall occupy a maximum of 12 workdays; several days prior to the meeting for document review; three days at the SEDAR meeting, and several days following the meeting to ensure that final review comments on documents are provided to the Chair and to complete a CIE review report.

### **Workshop Final Reports:**

The SEDAR Coordinator will send copies of the final Review Panel Consensus Report and Advisory Report to Mr. Manoj Shivlani at the CIE.

### ***Submission and Acceptance of CIE Reports***

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

The COTR shall provide the final CIE Reviewer Reports to:

SEFSC Director: Alex Chester, NMFS Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, FL 33149 (email, [alex.chester@noaa.gov](mailto:alex.chester@noaa.gov))

SEDAR Program Manager: John Carmichael, SAFMC, 4055 Faber Place, Suite 201, North Charleston, SC 29405 (email, [John.Carmichael@safmc.net](mailto:John.Carmichael@safmc.net))

CIE Reviewer Reports become part of the SEDAR Administrative Record and are therefore available for public distribution.

**For Additional Information or Emergency:**

SEDAR contact: John Carmichael, 4055 Faber Place, Suite 201, North Charleston, SC 29405. Phone: 843-571-4366; cell phone (843) 224-4559. Email: [John.Carmichael@safmc.net](mailto:John.Carmichael@safmc.net).

**Preliminary Agenda**  
 SEDAR Grouper Assessment Review Panel  
 May 8 - 10, 2007

**Tuesday, May 8, 2007**

1:00 p.m.	Convene	
1:00 – 1:30	<b>Introductions and Opening Remarks</b> <i>- Agenda Review, TOR, Task Review</i>	<b>SEDAR Coordinator</b>
1:30 – 3:30 p.m.	<b>Evaluation Panel Presentation</b>	<b>Carmichael/Williams/Porch</b>
3:30 – 4:00 p.m.	Break	
4:00 – 6:00 p.m.	Panel Discussion of TORS	<b>Chair</b>

**Wednesday, May 9, 2007**

8:00 a.m. – 12:00 p.m.	Assessment Analyses Presentations	<b>Calay/Ortiz</b>
12:00 p.m. – 1:30 p.m.	Lunch Break	
1:30 p.m. – 3:30 p.m.	Panel Discussion of TORS	<b>Chair</b>
3:30 p.m. – 4:00 p.m.	Break	
4:00 p.m. – 6:00 p.m.	Panel Discussion & Report Drafting	<b>Chair</b>

**Thursday, May 10, 2007**

8:00 a.m. – 1:00 p.m.	Panel Discussion, Draft Review	<b>Chair</b>
1:00 p.m.	ADJOURN	

## **Annex I. SEDAR Review Workshop Documents Contents**

### **Consensus Summary Outline**

#### **I. Statements Addressing Terms of Reference**

*List each Term of Reference, and include a summary of the Panel discussion regarding the particular item. Include a clear statement indicating whether or not the criteria in the Term of Reference are satisfied.*

#### **II. Further Analyses and Evaluations**

*Summary presentation of any review panel analytical requests not previously addressed in TOR discussion above.*

#### **III. Additional Comments**

*Provide a summary of any additional discussions not captured in the Terms of Reference statements.*

#### **V. Reviewer Statements**

*Each individual reviewer should provide a statement attesting whether or not the contents of this report provides an accurate and complete summary of their views on the issues covered in the review. Reviewers may also make any additional individual comments or suggestions desired.*

## **ANNEX II: Contents of CIE Reviewer Report**

1. The reviewer report shall be prefaced with an executive summary of findings and/or recommendations.
2. The main body of the reviewer report shall consist of a background, description of review activities, summary of findings, and conclusions/recommendations. Reviewers are encouraged to elaborate on any points raised in the Consensus Summary Report that they feel might require further clarification. Reviewers are also encouraged to provide any criticisms and suggestions for improvement of the SEDAR process. Reviewers are not required to duplicate the report prepared for SEDAR in response to the review Terms of Reference
3. The reviewer report shall include as separate appendices a copy of the CIE Statement of Work and a bibliography that includes all materials provided for review.

Please refer to the following website for additional information on report generation:  
<http://www.rsmas.miami.edu/groups/cie>.

### **Annex III. SEDAR Grouper Assessment ad hoc Evaluation Panel**

#### Terms of Reference

1. Review SEDAR 10 and SEDAR 12 assessment reports, relevant supporting documents, and recommendations, along with any additional research available since the SEDAR assessments. Address the following specific topics with:
  - A. The length of the time series to be used for the base cases in each assessment (Gulf gag, Atlantic gag and Gulf red grouper).
  - B. The treatment of the catchability coefficient for fishery-dependent indices of abundance in each assessment.
  - C. The estimation of the number and size composition of discarded fish, as well as the fraction of the discards that die in each assessment.
  - D. The treatment of the natural mortality rate and, in particular, the method used to scale the Lorenzen curve in each assessment.
  - E. Recommended reference points (minimum stock size threshold, maximum fishing mortality threshold and optimal yield) and whether those choices are consistent with the goals of the respective Fishery Management Plans and the Magnuson-Stevens Reauthorization Act.
2. Discuss how consistency in methodology should be balanced against the need to address differences in the data, fisheries and biology of the three stocks in question. Include in this discussion the significance of using different stock assessment algorithms for each stock.
3. Formulate recommendations for any additional analyses, sensitivity runs, or changes to the base cases that need to be made to the Gulf gag, Atlantic gag, and Gulf red grouper assessments based on the reviews of the specific issues addressed in TOR #1 and given the conclusions reached during the discussion of TOR #2.
4. Prepare a consensus report documenting committee discussions and recommendations. The report should be drafted during the workshop and finalized within one week of workshop conclusion.

## Appendix 2. SEDAR panel attendees

<b>NAME</b>	<b>Affiliation</b>
<i>Workshop Panel</i>	
Richard Methot, Chair .....	NMFS NWFSC
Robert Mohn .....	CIE
Mike Murphy .....	FL FWCC FWRI
Graham Pilling .....	CIE
Clay Porch.....	NMFS SEFSC
Bob Zales, II .....	GMFMC AP
Bill Teehan .....	FL FWCC /GMFMC
Dennis O’Hern .....	GMFMC AP
Erik Williams .....	SEFSC/SAFMC SSC
Gary Fitzhugh .....	SEFSC/Panama City
Mark Robson.....	FL FWCC /SAFMC
Martin Fisher.....	GMFMC AP
Mauricio Ortiz.....	NMFS SEFSC
Shannon Cass-Calay .....	NMFS SEFSC
Tom Burgess .....	SAFMC AP
<i>Observers</i>	
Andy Strelcheck.....	NMFS SERO
Beverly Sauls .....	FL FWCC FWRI
Libby Fetherston .....	The Ocean Conservancy
Luiz Barbieri .....	FL FWCC FWRI
Joe O’Hop .....	FL FWCC FWRI
Jim Gray .....	CCA FL/SAFMC AP
Peter Hood .....	NMFS SERO
Steve Bramstetter .....	NMFS SERO
<i>Staff</i>	
John Carmichael.....	SEDAR
Rachael Lindsay.....	SEDAR
Rick DeVictor .....	SAFMC
Stu Kennedy.....	GMFMC
Tyree Davis.....	NMFS SEFSC



**Cefas**

