

**Report on the
Gulf of Mexico and South Atlantic Goliath Grouper Review Workshop
(SEDAR 23)**

Prepared for:
The Center for Independent Experts

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EXECUTIVE SUMMARY

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.

The Gulf of Mexico and South Atlantic Goliath Grouper Review Workshop (SEDAR 23 RW) took place at the Marriott Beachside Hotel, Key West, from 15th to 17th November 2010. The facilities were excellent and the arrangements by SEDAR staff first rate. The RW Panel comprised an independent chair and six other members, including three CIE appointees and three SSC appointees. The RW was conducted in an open, friendly, and professional manner and the Assessment Team was helpful in providing presentations and explanations, and in undertaking additional work requested by the RW Panel. At the time of submitting this report, the RW Panel report is still being compiled, ready for editing.

Fishing for goliath grouper in the Gulf of Mexico and South Atlantic has been subject to a moratorium since 1990, following concerns as to stock status and apparent rapid decline in the 1980s. After twenty years of closure, and with a widespread perception of an increasing stock and of possible predation pressures caused by goliath grouper on other stocks, there is growing pressure to consider at least a limited opening of the goliath grouper fisheries. Because of this pressure, the SEDAR 23 process to consider goliath grouper was set up.

Information on historic removals of goliath grouper is very poor, as is information on the efficacy of the moratorium. To compound difficulties, understanding of life history and stock structure is also limited. It is against this background of limited data and understanding that the Data Workshop (DW) and Assessment Workshop (AW) Terms of reference (ToR) were set up.

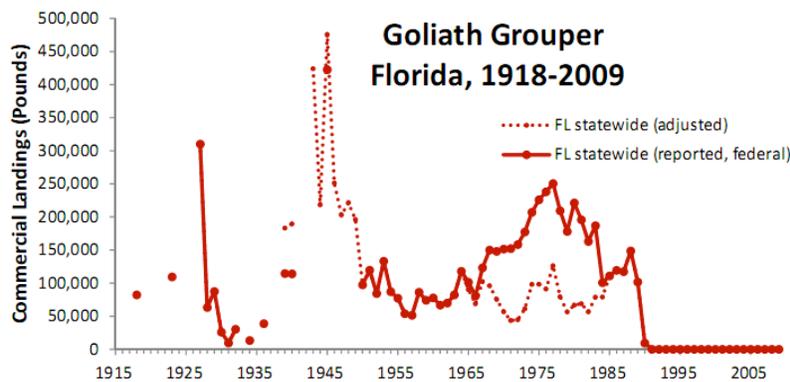
Generally, the DW and AW met their ToR. Methods used were generally deemed well applied and presented. However, there is a fundamental difficulty with delivering against expectations from the SEDAR 23 process because the methods used are not structured to provide the required estimates in the case of goliath grouper. Specifically, the primary assessment tool is a catch-free method which, while of general utility for alternative purposes (e.g. advising on recovery times) or for the specified purpose in an alternative context (e.g. where catches are continuing), is not able to provide estimates of quantities of interest for goliath grouper because a) there are no existing data to scale estimates to absolute values, and b) there is no information on potential exploitation patterns.

BACKGROUND

Gulf of Mexico and South Atlantic Goliath Grouper Review Workshop

As reported by the SEDAR 23 Data Workshop (DW), and as discussed during the Review Workshop (RW), it is clear that there are fundamental gaps in knowledge about goliath grouper biology, ecology and fisheries (historic directed and recent incidental).

Prior to a moratorium implemented in 1990 commercial and recreational catches were substantial although there is major uncertainty as to the nature, size and trends in removals from various sources. Even the commercial landings are poorly estimated with highly variable statistics pre-war and major uncertainty as to catches from the mid 1960s to mid 1980s (see embedded graphic below, copied from AW Report Fig 3.4).



Information on recreational catches, and on discard mortality of released fish since the moratorium was implemented, is also poor. During discussions outside of the RW, it was also apparent that despite the moratorium it is possible that there remains substantial illegal take.

The moratorium was implemented in 1990 following concern about a declining goliath grouper stock. That concern was driven in particular by observations from limited locations in the Gulf of Mexico. Discussions during and outside the RW suggested that even at that time there were alternate views as to stock status. Regardless, as would be expected following twenty years of closure, all indications are that the stock has increased in numbers (though likely declined in the most recent years) and distribution although the numbers of very large fish may still be limited. With increasing numbers, there is interest in re-opening of the goliath grouper fishery(ies), at least on a limited basis. There is also interest in goliath grouper from a fishery interaction perspective. It is these interests that have prompted the current work on goliath grouper with Fishery Management Councils (FMCs) (Gulf of Mexico, GM, and South Atlantic, SA) waiting on SEDAR 23 outputs before considering management options.

At the outset of the RW, during discussion on the context for the review, it was made clear that the desired outcome is advice on status of the goliath grouper stock in relation to overfishing and overfished thresholds, and on OFL/ABC-related estimates. It was made clear that the SSCs will need to advise the FMCs on OFL to help Councils move forward with ABC setting to meet legislative requirements.

As stated above, there is a very high degree of biological, ecological and fishery uncertainty surrounding goliath grouper. It is also unclear from discussions at the RW, what management options (and hence exploitation patterns) might be contemplated by Councils. *A priori*, therefore, it is to be expected that development of credible outputs relevant to management needs will be fraught with difficulty. The use of a catch-free assessment approach (due to data limitations) makes it particularly difficult to provide OFL/ABC-related advice due to an in-built inability to scale productivity estimates to calculate potential catches and the lack of any consideration of future exploitation (selection) patterns.

REVIEW PROCESS

The Gulf of Mexico and South Atlantic goliath Grouper Review Workshop (SEDAR 23 RW) took place at the Marriott Beachside Hotel, Key West, from 15th to 17th November 2010. The facilities were excellent and the arrangements by SEDAR staff first rate. The now standard SEDAR ftp arrangements worked well and all materials were able to be downloaded in advance to allow prior reading. There were no pre-meeting conference calls.

The RW was chaired by Luiz Barbieri. As a member of the SAFMC SSC and as a participant in both the SEDAR 23 Data Workshop (DW) and Assessment Workshop (AW), Luiz was unable formally to act as a RW Panel member and it was made clear at the outset that his role was to facilitate and coordinate and to act as an independent chair but not to actively participate in discussion as was expected of other Panel members. This is a slightly unusual arrangement but Luiz was careful throughout to ensure his role was properly carried out. I am confident that independence was maintained. My only criticism is that it would in fact have been helpful at times if Luiz had been able more actively to participate; his input would have been welcome.

The RW Panel comprised the chair and six other members - three CIE appointees (Gibson, Kupschus, Stokes), two GMFMC SSC appointees (Cass-Calay, Dorf) and one SAFMC SSC appointee (Hoenig). For a single stock, short (three day) meeting, the Panel size may have been overly wieldy. However, the relatively large size did provide for wide expertise and also ensured that the Panel Summary Report writing could be well distributed. At the time of writing, all Panel members have provided agreed (brief) Summary Report inputs to Luiz Barbieri who is in the process of consolidating it for circulation and further editing. It is not anticipated that the Summary Report will be available prior to the deadline for individual CIE Reviewer reports.

The RW was also attended by the Analytical team (O'Hop as main analyst and presenter, and Munyandorero, primarily to present an alternative assessment), GMFMC and SAFMC representatives, official and other observers. Full details of all SEDAR 23 RW participants are provided in Appendix 3.

At the beginning and end of the meeting, the chair provided ample opportunity for statements by representatives and observers. Throughout the meeting, opportunity was also given for comment. At various times, observers came to the table to provide input. All discussions took place in open forum. I am confident the process was transparent and that appropriate opportunities were provided for input.

The Terms of Reference (ToR) for the review are given in Appendix 2, Annex 2. Although the review was for only one stock and the assessment is relatively simple, in my view the time allotted was a little too short to allow full attention to all ToR. A particular problem is that the ToR are not crafted to make the review process as helpful and sensitive as possible for the case in hand (advising on goliath grouper status to allow subsequent management processes to make important decisions in the face of strong public interest). Rather, the ToR are "boilerplate" and effectively presume that the work of the DW and AW is structured to provide, as a matter of course, outputs that are standard and of direct use for simple uptake by the SSC of the GMFMC and SAFMC. This, however, is not the case for goliath grouper for which there are severe data deficiencies, poor biological understanding and the assessment model employed is not structured to provide absolute estimates of quantities of interest to management. The poorly considered ToR were cause for a degree of frustration and tension during the meeting. In my view, there is a need for much improved planning of DW, AW and RW processes to ensure that appropriate work is fed through to the next management phase. This needs to be reflected in clearer context statements and, where necessary, case specific ToR to avoid unrealistic expectations as to products and frustrations during the development of those products. My understanding is that the SSC and SEDAR do generally consider ToR in detail and that the Councils provide final approval of the ToR. In this case, with goliath grouper added late to the list of activities, and driven substantially by public interest, the usual planning of ToR, and DW and AW work plans, seems to have been less than ideal.

In advance of the RW, but after the AW, an alternative assessment model was noted as of potential value. Background to the model (Stochastic Stock Reduction Analysis, SSRA) was posted on the ftp site and a presentation was made during the RW. In principle, SSRA could provide useful quantities of interest to management. However, key inputs for SSRA were not fully considered or developed during the DW and the method, though discussed during the AW, was not substantially explored. Because the work on SSRA for goliath grouper was finalized only after the AW, and although it was provided to the RW, the RW was instructed that SSRA could not be explored during the RW to provide estimates as required at ToR 3 and 4. In my opinion, the DW and AW could have done more to explore how relevant information could have been developed for management purposes. SSRA exploration, with suitable data considerations and sensitivity testing, would have been one approach. It is frustrating that the SEDAR 23

process generally did not widen its scope to beyond updating an existing method and frustrating also that at the RW such matters might not be fully considered. The frustration was compounded by a strongly asserted insistence that the process must deliver products to the SSC in a form desired.

REVIEWER'S ROLE IN THE REVIEW ACTIVITIES

The role of the reviewer is set out in the CIE Statement of Work, Attachment A, attached here in Appendix 2, Attachment A. All three CIE reviewers are tasked with producing an independent report. The reviewers were also tasked with contributing to a panel report.

I read both the DW and AW reports in advance of the RW, together with numerous background documents. During the RW I participated in all discussions during the open meeting and discussed a variety of issues during adjournments both with fellow CIE reviewers, other Panel members and various observers.

As agreed during the RW, I provided draft text for the Summary report (ToR 3 and 4).

SUMMARY OF FINDINGS

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

Stock structure

The DW briefly reported on stock structure issues, including consideration of relevant studies on population genetics, tagging, larval transport, and general distribution. Overall, it is difficult to draw detailed conclusions from the available data. It is apparent that in the USA, goliath grouper are distributed from Texas in the west through to the Carolinas on the east coast, and southward towards the Caribbean. Within that wide distribution, temperature gradients likely constrain preferred habitats. Within the distribution, changing land use has also likely affected habitat for spawning and for juveniles.

While genetic analyses appear to distinguish the US stock(s) from others, there are insufficient data to allow an analysis of structure within US waters. Given the patchy distribution of goliath grouper, and noting that tagging studies suggest both strong site fidelity and relatively long distance movements (of up to 175 km), it seems plausible and perhaps likely that there is important structure within US waters. Certainly, there is ontogenetic structure of potential importance to assessment and management, and it is possible if not likely that there is sub-stock structure (at least as evidenced by concurrent spawning in various locations). Such structure (and life history) needs to be understood in order to make judgments about the appropriateness of assuming a single stock for assessment and/or management purposes.

It is common for stock assessment to assume a single stock for analysis. Often, the choice of stock definition follows from management and consequent data flows (e.g. catch data recorded only by gross area to match management delineations). In the case of goliath grouper data are in fact very limited and in principle, therefore, depending on potential management routes that might be contemplated, the assessment process is less constrained. The RW noted that the various indices of abundance (see below) may not be good indices of total stock abundance and that it would be helpful at least to look at the spatial and temporal aspects of the different indices.

The issue of stock structure and definition, assessment appropriateness, and research recommendation cannot be divorced from management needs and the costs and benefits of acquiring relevant information. If the over-riding management need is to set an OFL/ABC for goliath grouper as a single US stock, then even if the stock is “shoehorned” into standard stock assessment approaches, good portrayal of uncertainty will still require a better understanding of plausible stock structure scenarios. If the management need is more flexible and non-ABC controls are contemplated, then more refined spatial information would also be required to help guide decision-making.

Indices

A number of indices are available, covering early and late life history stages but also different time periods. Only one index series (ENP – covering younger fish in the Everglades National Park) spans a substantial period prior to the moratorium as well as to the present. One index (DeMaria) includes some pre-moratorium years but is restricted to just adult fish on four offshore GM wrecks. The other indices used in the assessment all start post-moratorium.

The DW report briefly covers each index but does not provide detailed diagnostics or statistics. Details are of course more readily available in the source working papers. Having presented the indices, the DW consensus recommendation is that all indices be further reviewed at the AW. The AW did further consider indices and made a number of changes and decisions as to use. Neither the DW nor AW provided sufficient information on the various indices to provide insight or guidance as to the credibility of the indices and their relative utility in stock assessment, either for a total stock or potentially for alternative stock structure hypotheses.

During the RW, there was some discussion as to appropriate presentation of index diagnostics and fits and a brief, *ad hoc* presentation on the ENP was provided by a working paper author and RW Panel member (Cass-Calay). Generally, the Panel felt it needed more information on each index as evaluation of the assessment depends on the credibility of the indices. In the previous assessment (SEDAR 6), a different set of indices was used. In this new assessment, an expanded set was used and some of the previous indices were dropped. Given the importance of the indices, especially to the catch-free assessment model, fuller exposition and explanation is required. It should be emphasized that the issue of presentation of analysis and of exploring the

indices would have been pressed more during the RW if it was not quickly apparent that the assessment (the catch-free model) was in any case likely to be rejected. If rejection had not been likely (on other grounds), and if time had not been constrained, the indices would have been pursued more fully.

Regardless of the lack of diagnostics, I am comfortable that standard and credible statistical modelling was used in the various analyses. RW Panel discussions did, however, lead to the noting of some issues, index by index.

ENP creel survey: As noted above, this survey is the longest time series available and is the only index that spans the implementation of the moratorium. The survey covers fish in the range 0.2 – 1.0 m (approximately ages 2-8). As such, it is a potentially good index of recruitment (though smeared across a range of poorly identified year classes). The survey is based on intercept interviews with recreational fishers in the ENP. Although the ENP is regarded as a core area, the distribution of goliath grouper has expanded since the moratorium. It is unclear how to interpret the index with respect to total stock size because a) it represents a changing proportion of the stock and b) it is expected that substantial changes in fisher behaviour may have occurred throughout its duration.

The ENP index generally indicates improved abundance of young fish since the moratorium was implemented, with an especially strong increase in the mid 2000s followed by rapid decline in 2008/2009 (consistent with signals in the MRFSS-derived index).

REEF: The REEF (Reef Education and Environmental Foundation) surveys are carried out by trained, volunteer observers using a standardised roving diver methodology. Separate indices were derived for the southeast and southwest regions; an index was used for the southeast only in SEDAR 6 and the use of the southwest index is new in SEDAR 23.

The REEF surveys are fishery independent with wide spatial coverage. In principle, therefore, they are of potential value in the assessment – for which all other indices are fishery based. A major problem with the surveys is that the observer counts are binned in logarithmic categories (1 = single fish; 2 = 2-10 fish; 3 = 11-100 fish; 4 = >100 fish). The statistical modelling of the data uses a censored Poisson approach which seems appropriate. However, the RW Panel was aware that several other DW and AW for other stocks have rejected the REEF surveys because of the unequal/logarithmic binning and difficulty of interpretation. It was noted in the RW that in the extreme the methodology cannot detect abundance changes beyond the terminal (greater than 100) category. I am uncomfortable with the REEF survey indices for reasons of methodology and statistics, but also because of the split of southeast and southwest.

The stock is considered to be a single unit (rightly or wrongly). If it is a single stock then development of a single index would be appropriate. If separate indices are to be developed, then it would be useful to do so in the context of the RW suggestion under stock structure (above). That is, it would be helpful at least to look at the spatial and temporal aspects of the REEF data.

The indices as presented do in fact show different behavior with the (shorter) southwest index having both a slower overall increasing trend but low, and unexplained, value in 2005-7. Far more consideration of the indices is required by the DW to understand and explain differences in the indices.

Notwithstanding the low REEF southwest index values in 2005-7, both REEF indices show apparent stock increases from the mid 1990s onwards. Unlike the ENP and MRFFS indices, however, there is no indication of lower values in 2008/09.

MRFFS: The DW report does not include any comment on the MRFFS survey or any index. The index used in the assessment was presented as a Working Paper (WP) and discussed at a webinar following the AW. The WP (S23_AW_03_MRFFS_revised) on the revised index contains some diagnostics and discussion but nothing is included in the AW report even though this is a new and potentially influential index used for the first time in the goliath grouper assessment. Given the potential importance of the index (showing a strong increase post moratorium but large decline in 2008/09) the analysis required greater exposition in the AW report.

The new index, unusually, is a proportion positive index for private boats only. The RW Panel noted that it may have been more appropriate to consider trips only in areas where goliath grouper are likely targeted. There are also concerns that recreational targeting and practices may have changed during the duration of the survey. As a proportion positive index the steep increase may be appropriately structured. However, the Panel was concerned about how the assessment model treats the index (with errors treated as log-normal instead of binomial).

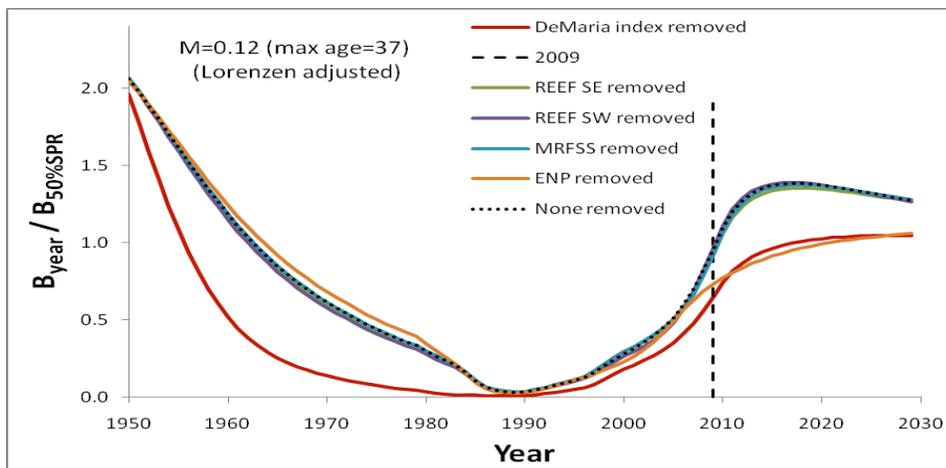
Generally, as for many of the indices, I am not comfortable that the analytical methods have been fully presented or that strengths, weaknesses and general issues have been fully explored sufficiently to give confidence that indices are appropriately used and weighted in the assessment. As noted under the stock structure heading, more could have been done to explore data used to develop indices to provide insight as to stock structure and distribution and to help guide the use of indices in the assessment.

Taken at face value, the proportions positive MRFFS index suggests a strong post moratorium increase in abundance but with an indication of substantially reduced abundance in 2008/09. As with other indices, it is not obvious that the apparent rate of increase and recent decline are biologically plausible and quantitative as opposed to qualitative interpretation is therefore difficult.

DeMaria: Observations by DeMaria during SCUBA spearfishing trips on five artificial structures were important in motivating the moratorium imposed in 1990. After the moratorium was implemented, DeMaria and researchers continued to monitor the same sites, making visual counts. Observations by deMaria (pre and post moratorium) have subsequently been developed in to an index using standard statistical approaches.

The resultant index is important in the assessment. It is the primary information used to determine the pre-moratorium trajectory and (together with the ENP index) strongly influences the projections. This is apparent from simple tests carried out during the RW in which the proposed assessment was run removing each index individually (see graphic below). It is noticeable also that the only other information presented to the assessment pre-moratorium is the ENP index – removal of the ENP index results in the model simply tracking the DeMaria index.

Given that the DeMaria index is derived from just five artificial reefs in a relatively small area of goliath grouper distribution, and includes only six pre-moratorium index values, it is very difficult to treat it as a credible index to be afforded such weight in the assessment. That the post-moratorium DeMaria index values, using researchers to count fish in the same areas, are so variable inter-annually is also cause for concern.



Generally, I am very uncomfortable about the credibility and interpretability of the various indices used in the goliath grouper assessment. In my view, the DW and AW needed to spend considerably more time in the development of indices and in exploring diagnostics. As noted above, if it had not been quickly apparent during the RW that the assessment would be rejected on other grounds, the RW Panel would have placed much more emphasis on the need for exploration of indices, relative utility, appropriate weighting, etc.

Reproduction

It is surprising that so little is known about goliath grouper reproduction and that most of the available data are dated. The assessment is strongly predicated on the assumption of gonochorism. The most recent reported work in the DW (S23_DW_03_Collins&Barbieri) casts some doubt as to the gonochorism assumption, providing at least some support for the possibility

of protogyny. The reference points (SPR based) used also strongly depend on the assumption of constant sex ratio and age at maturity.

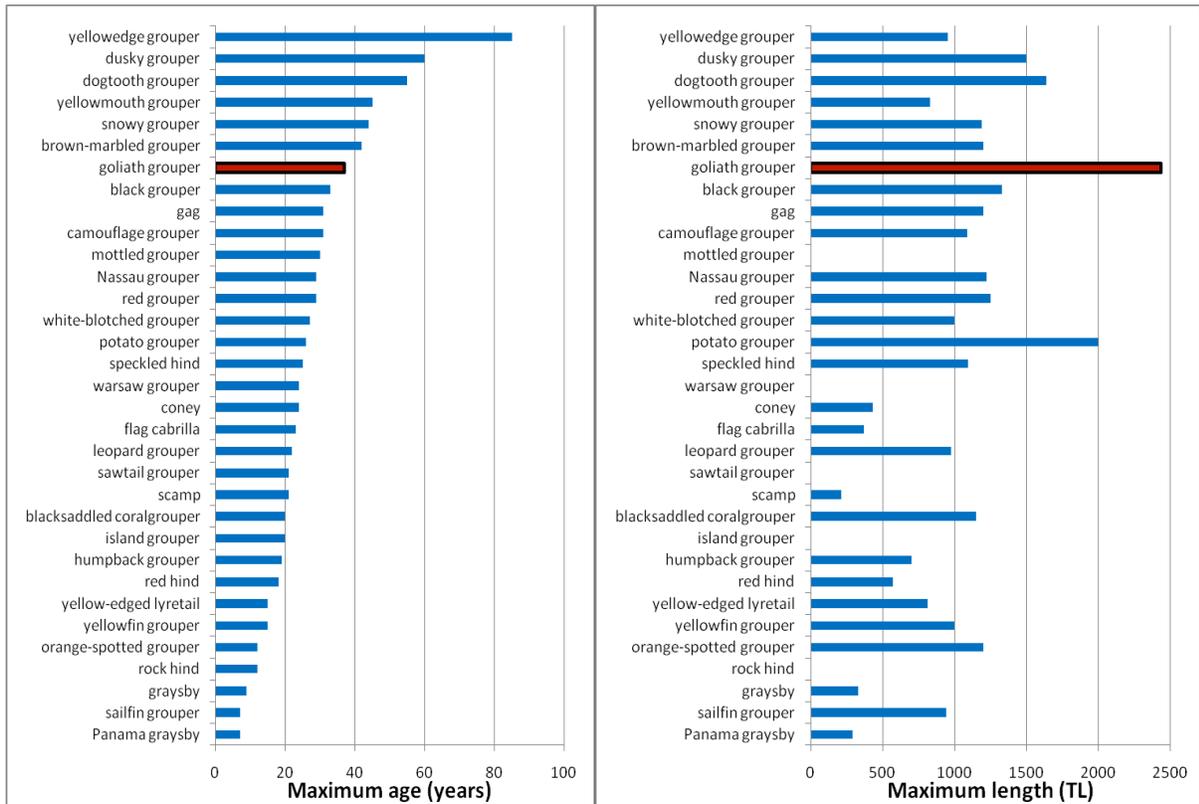
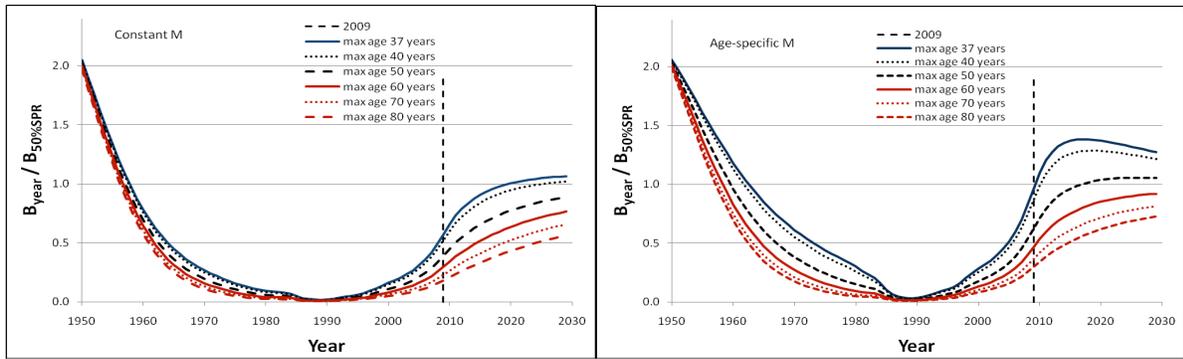
Generally, lack of information and understanding of reproductive strategy and parameters (and other life history traits) is problematic. The assessments do not attempt to explore the implications of this major uncertainty.

Natural Mortality

The DW developed a new vector of natural mortality at age following now standard methods due to Lorenzen. Given other uncertainties (removals, indices, other life-history factors) but especially lack of knowledge about T_{max} , the maximum age of goliath grouper, this effort seems misplaced, certainly in the context of attempted application of the catch-free model. It is clear that the important aspect to consider with respect to natural mortality is T_{max} , the maximum age, and its effect on overall natural mortality – either as a constant (calculated typically using the Hoenig relationship) or an age-dependent vector. The importance of presumed T_{max} is clearly seen in the sensitivity runs shown in the AW (Fig 3.3.8) or in the embedded graphics below (produced during the RW on request). This is mentioned not because it is wrong to estimate age-dependent natural mortality, but because it appears symptomatic of poor planning of the DW and AW in which critical issues needed to be identified *a priori* and suitable ToR established.

With respect to maximum age, there seemed to be good agreement at the RW that the value of 37 years, the oldest observed/estimated fish, is likely an underestimate of the true value. The AW explored a range of T_{max} up to 80 years in sensitivity trials, based on knowledge of groupers and their relative sizes. A useful summary of these data was provided on request at the RW and is embedded below. I am comfortable that the range of maximum age explored in sensitivity testing (37 to 80 years) is appropriate.

During the RW it became apparent that the way in which the DW/AW had calculated the natural mortality at age vector (based on Lorenzen and scaled to Hoenig) may have been incorrect, or at least different to standard SEDAR practice. Essentially, an age-dependent M vector was calculated for all ages and then the whole vector was scaled to ensure the average M was the same as that calculated using the Hoenig method. Generally, the practice is to use the Hoenig constant M across the exploited age range and to substitute the Lorenzen-derived M values only for the younger ages, scaled to match the Hoenig value where they join (but forming discontinuous vectors). I am in favour of this latter approach. I am also not concerned in this case because I think it would make relatively little difference given that T_{max} is the dominating issue. However, it is important that SEDAR standardises the approach or ensures that adequate explanations are provided for alternative implementations.



Removals

The DW reported extensively and usefully the background on commercial fisheries and landings. The DW recommended continuation of adjustment to commercial landings between the early 1960s and early 1980s, in effect since 1990, due to credibility issues with reports from a single dealer in Lee County. In addition, due to high variability in reported landings prior to 1950, the DW recommended smoothing the 1918-1950 landings data (using a LOESS smoother). Discussion during the RW explored the justification for the landings adjustments; I am not

convinced that the adjustments are appropriate. I am also uncomfortable about the use of the smoother to create 1918-1950 catches.

The assessment model presented in the AW does not use information on stock removals. The alternative stochastic stock reduction analysis (SSRA) and all other stock assessments intended to inform catch limit setting do. There is a need, therefore, to explore as fully and carefully as possible historical removals from all sources. In the absence of good reasons for adjusting catches, it would be sensible at least to develop multiple plausible removal scenarios for sensitivity testing of future assessments.

It is clear that the DeMaria index (see ToR 1) drives the perception of very rapid stock decline in the 1980s (and a consequential many fold increase in fishing mortality). The perception driven by that index is at odds with the adjusted commercial catch series which suggests a stable fishery for a long period with no apparent increase in effort. It may, however, be consistent with the unadjusted catches which showed a very strong increase in the 1970 and a subsequent decline (see DW Fig 3.3 or embedded graphic in Background, above).

Figures for recreational removals are not provided. When considering the SSRA, recreational removals were set to zero. This is perplexing given that the admittedly poor information suggests that recreational catches of goliath grouper could be substantial, perhaps even exceeding commercial catches pre-moratorium (see e.g. DW Table 4.9). It appears that the DW did not have time to consider this issue and was also disincentivised by the use of the catch-free model.

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

The AW presented two assessments of goliath grouper using the catch-free method developed by Porch et al. (SEDAR23_RD_12) and as used in SEDAR 6. The first assessment (the “continuity run”) used the settings adopted in SEDAR 6 but with updated data. The second assessment (the “proposed base model”) differed in a number of respects; these are summarized in the AW report (Table 3.2.3).

A number of changes were made to the indices used. In SEDAR 6 three primary indices were used (deMaria, REEF southeast and ENP) together with an interview-derived two-point index relating abundance in 1950 and 1990. In SEDAR 23 the DeMaria index was retained (same years), the interview-derived index was dropped, ENP and REEF southeast indices were again used but with updated years, and two new indices were used (MRFFS proportions positive and REEF southwest). A change was also made to the important parameter Φ_3 (effectively a prior on the effectiveness of the moratorium). In addition, the constant natural mortality at age used in the continuity run was replaced by age-dependent natural mortality (see ToR 1) and selectivities were reassessed using the procedure described in SEDAR 6.

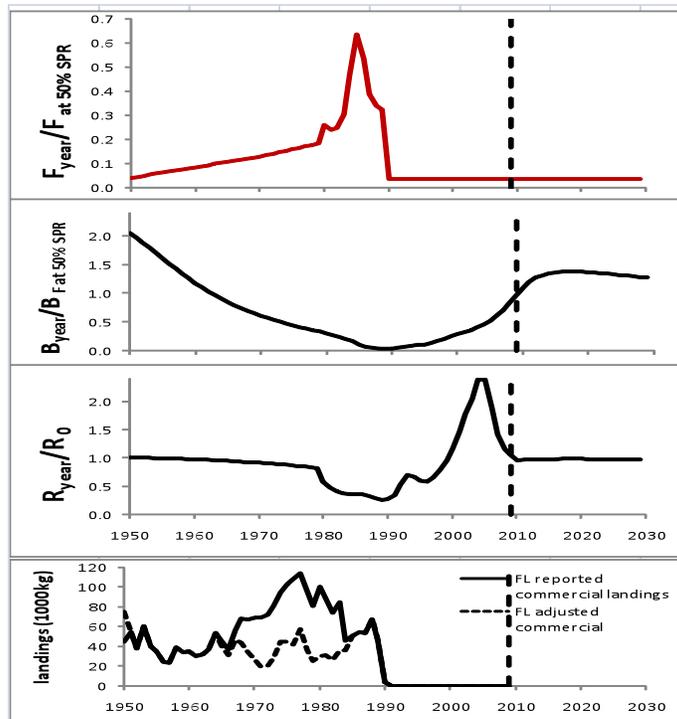
Full MCMC runs were presented for both the continuity and proposed model runs. The effects of uncertainty in some key parameters such as T_{\max} and Φ_3 were explored for the proposed base model (see ToR 6).

The continuity and proposed models indicated a sharp decline in SSB from 1950 until 1990, the time at which the moratorium was implemented. This is inevitable given that both runs use primarily the same information as input until 1990 (DeMaria and ENP indices are the same but SEDAR 23 does not use the interview-derived two-point index) with the only real differences between the runs taking place post moratorium, at which point different indices are used and the Φ_3 prior is changed (plus, of course, age-dependent mortality is used in the proposed run). While the continuity and proposed runs do not therefore differ in their perspective before 1990, they do provide alternative views on recovery since that time (largely driven by the changed prior on moratorium effectiveness).

Regardless of detailed configuration, all runs essentially tell the same story, driven by the indices in use. All show a dramatic peak in F (relative to $F_{50\%SPR}$) in the 1980s, preceded by a precipitous fall off in recruitment. With implementation of the moratorium, given the very high apparent increases in abundance indicated by the indices, estimated recruitment rises to a peak far in excess of the mean before dropping back to the mean as information on recruiting year-classes is lost. The general picture is shown in the many sensitivity plots in the AW Report (Fig 3.3.7). The recruitment pattern was shown on request during the RW. The stacked graph (below) of relative F , relative biomass, and relative R for the proposed base model, together with commercial landing, is included below. The commercial landings plot is included to serve diagnostically; the data are not used in the catch-free model.

Essentially, with almost 40 years of constant commercial catch and no suggestion of changing catch rates in any fishery, the model interprets the short DeMaria index to imply a rapid decline in recruitment and then biomass. The model can only attempt to fit the very fast trending post moratorium indices by creating a large amount of recruitment, peaking at more than twice the mean in 2005 (the subsequent decline is then due to insufficient age information to determine recruitment estimates which shrink back to the mean). In my view, from a biological and fishery perspective, the model is not credible. Even making inferences as to current relative status is a flawed exercise.

Given the high uncertainty as to removals and effectiveness of the moratorium, use of the catch-free model potentially to provide estimates of relative status and potential recovery under zero exploitation (as originally intended) is arguably logical. Certainly, the catch-free model is an interesting approach that has value in the right circumstances. Unfortunately, in my view, the catch-free model does not help in the particular circumstance of needing to advise the FMCs on appropriate levels of absolute MSY and potential catches (which require biomass scaling and assumptions about future exploitation pattern(s)).



The RW Panel examined the proposed base model run and raised a number of concerns which generally relate to the foregoing overall concern.

Fishing mortality is estimated within the assessment but in fact it is effectively fixed or constrained. This arises because of a number of factors. First, the post moratorium fishing mortality is largely determined by Φ_3 . Runs performed on request at the RW using a uniform prior for Φ_3 suggest that the model converges to a solution of complete (100 per cent) moratorium effectiveness. This is driven, presumably, by the fast increasing biomass indices which the model can only try to fit both by creating large amounts of recruitment and forcing the moratorium to be completely effective. As noted above, this is not credible from either a fishery or biological perspective.

Second (in relation to fishing mortality), although there are no direct data, relative changes in fishing mortality between 1950 and 1978 are guided by an index of historic fishing pressure based on the US census and indicating a slow exponential increase. Available landings data for that period (not used in the assessment) appear to be inconsistent with this assumption.

Third (in relation to fishing mortality), in the period from 1980 to 1990 fishing mortality is less constrained (either by the census data prior or Φ_3 post moratorium). In this period, the model estimates fishing mortality to increase dramatically (a fivefold increase in five years). Catches were relatively stable in that period and there is no supporting evidence, even anecdotal, to support the estimates. Indeed, industry representatives at the meeting indicated that any decline in goliath grouper population as likely due to serial depletion over a long time period as the fishery expanded spatially.

Most importantly (in relation to fishing mortality), even in the period 1980 to 1990 the model estimates of fishing mortality are effectively determined externally by the way in which selectivities are estimated. Selectivity estimation requires a value of total mortality to develop age length keys – that value, through the derived selectivities, effectively gets fed back in to the assessment. Model outputs related to fishing mortality are therefore effectively fixed by the assumption made external to the model.

Moving from fishing mortality issues to residual patterns in the model fits, further concerns arise. For all indices, especially post moratorium, there are strong residual patterns (see AW Report, Fig 3.3.5). It is clear that whilst the overall impression from the indices is of an increase since 1990, some of the indices (DeMaria and the new REEF southwest) contain little consistent information post moratorium, while the increases in others (ENP and the new MRFFS) cannot be fit in recent years. It is also clear that the ENP and DeMaria indices are the determinants of pre-moratorium estimation (as noted at the outset of this section).

Given problems with the model (effective pre-definition of fishing mortality, lack of credibility as to inferred trajectories/dynamics) the RW Panel quickly came to the conclusion that as presented it is inappropriate for providing guidance on stock status or benchmarks. I agree with this Panel view. This is not to say that the model does not have value as an exploratory tool, nor that it was poorly applied – just that the model as implemented is not adequate as a basis for recommending quantities of interest as required at ToR 3 and 4 for a fishery that has been closed for twenty years. The model could be used to guide annual changes in catches where catches have been continuous or where external information on absolute scale could be supplied (e.g. from various types of survey).

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

The assessment runs presented by the AW utilize a catch-free model with limited data input and a wide range of assumptions and constraints. By definition, the model used can only provide estimates of relative abundance, biomass and exploitation (and related benchmarks) – there are no data provided to the model to allow scaling to absolute values.

At SEDAR 6 the catch-free model was adopted to provide relative estimates and to provide guidance on the possible recovery time of goliath grouper. At SEDAR 23 the same model was employed but the context has changed with a management need for information to guide possible OFL/ABC setting. The catch-free model cannot provide this information as it does not use data on removals to scale necessary estimates and because it cannot take account of possible future exploitation patterns.

At the SEDAR 23 RW a stochastic stock reduction assessment (SSRA) was also presented. In principle, with appropriate attention to better quantifying removals and to sensitivity testing, the SSRA could be used to provide more relevant information for management purposes. The RW briefly considered the SSRA but could not review it to draw conclusions as it had not already been considered by the AW. In any case, results from the SSRA would critically depend on

credible inputs on removals, which have not been well considered by the DW as the catch-free model did not require such an input (see ToR 1 and 2).

ToR 4 Evaluate the methods used to estimate population benchmarks and management parameters (e.g., MSY, F_{msy}, B_{msy}, MSST, MFMT, or their proxies); recommend appropriate management benchmarks and provide estimated values for management benchmarks, and declarations of stock status.

In principle, use of the catch-free model to estimate F and SSB relative to SPR-based benchmarks is appropriate. The AW has provided such estimates for continuity and proposed bases runs of the catch-free model, including wide sensitivity testing to assumed values of T_{max} (Fig 3.3.8 of the AW Report). Interpretation of the estimated ratios is, however, problematic, especially the F ratio, for reasons outlined at ToR 2.

The RW did not discuss the use of the F_{50%SPR} proxy as a BMY-related reference point (as opposed to alternative %SPR values or for the species generally given uncertain life-history). However, even if the F and SSB ratios were accepted at face value, estimation of current (and projected) status is highly dependent on the assumed level of natural mortality (see Fig 3.3.8 of the AW Report) and the assumed level of moratorium efficacy, Φ_3 . This latter point was not investigated by the AW but limited runs during the RW demonstrated the dependency.

The issue of sensitivity to natural mortality is significant. At an assumed T_{max} of 37 years, the point estimate of F₂₀₀₉/F_{50%SPR} is 0.821. As T_{max} increases, the point estimate exceeds 1.0 at T_{max} = 50 years and rises linearly to greater than 1.5 at T_{max} = 80 years. The ratio of SSB₂₀₀₉/SSB_{F50%SPR} declines exponentially from over 0.9 to less than 0.3 over the same range of T_{max}. As noted in ToR 1, the exploration of sensitivity to T_{max} in the range 37 (maximum observed age) to 80 years was deemed appropriate (based on comparison of other grouper species).

It is not possible, therefore, for the RW to recommend appropriate benchmarks or to provide estimates. Nevertheless, some qualitative statements can be made about abundance, biomass and exploitation, and stock status, based solely on data. Whilst interpretation of indices is not straightforward (see ToR 1), all indices suggest that abundance and biomass have increased since 1990 when the moratorium was implemented. The extent of that increase is difficult to gauge given the nature of the indices which all suggest faster rates of increase, and in some cases greater variability, than seems plausible given the biology of the species. There are also clear indications from indices representative of younger fish that recent recruitment may be less than in the preceding years. It is difficult to interpret the degree of previous stock decline as the perceived status in 1990 is strongly driven by the way the assessment must interpret the available index information (see ToR 1 and ToR 2).

ToR 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).

The methods used to project future relative biomass and fishing mortality were adequate, using a standard approach to projecting future trajectories based on the model-estimated population state in 2009. The methods, while technically adequate and consistent with the assessment approach used, are not, however, appropriate for estimating absolute future stock conditions or providing insight as to possible sustainable catch levels. This is not a problem with the projection methods *per se* but is a consequence of the choice of assessment model.

The projection methods adequately and appropriately include a projection of uncertainty flowing from the MCMC simulations. Uncertainty in natural mortality is included in the projections through a wide set of sensitivity runs (AW Fig. 3.3.8). Limited sensitivity to the Φ_3 informative prior is also considered (AW Fig. 3.3.7). Structural uncertainty (e.g. to stock structure, alternative life history) is not considered but it is noted that the AW was aware of many potential factors related to fecundity, distributional changes, the effects of cold kills, etc. A number of important parameters (AW Table 3.2.2; note pdf coding) are presented as informative priors rather than fixed parameters; this is preferable for allowing uncertainty in the parameters to be incorporated in to the characterization of uncertainty in biomass and fishing mortality relative to benchmarks (e.g. AW Fig. 3.3.9). Generally, given the limited starting point (the catch-free model base run) uncertainty in projections (and the assessment, with which the projections are integrated) was sufficiently well explored.

ToR 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.

The assessment integrates projections, with uncertainty characterization common to both historical fitting and future projection aspects. Comments on characterizing uncertainty in projections (in the second paragraph at ToR 5) are therefore pertinent. The assessment uses a Bayesian approach (MCMC) which is appropriate for characterizing uncertainty in model outputs due to uncertainty in parameters within the modeled structure. The AW explored the sensitivity to a number of parameters (e.g. the prior on Φ_3 and specified values of T_{\max}). During the RW further testing was carried out on request, including retrospective runs, sequential dropping of indices, and comparing constant natural mortality *versus* age-dependent natural mortality. I believe the MCMC was correctly applied and that the display of outputs at AW Figs. 3.3.8-11 is a useful summary.

Unfortunately, consistent with comments at ToR 2-5, and due to fundamental problems with deriving estimates of parameters of interest, it is not helpful to derive measures of uncertainty for those estimated and derived parameters.

ToR 7 Ensure that stock assessment results are clearly and accurately presented in the Stock Assessment Report and that reported results are consistent with Review Panel recommendations.

The RW Panel has not recommended any changes to the AW Report. Some discussion took place as to whether or not, in rejecting the assessment as inadequate to provide estimates as required under ToR 3 and 4, it would be appropriate to ask for changes to the AW report. It was made clear that in fact the RW could not seek to change the AW report but that the RW Panel Report could be added as an appendix. At the time of submitting the CIE Individual reports, the RW Panel report is not finalized.

ToR 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.

Please see Review Process above.

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

The AW did not provide any research recommendations though did indicate that discussion took place on the possibility of a research fishery. The AW usefully summarized this in its Report (section 1.2) in which statements are made addressing each ToR. In contrast, the DW did not include a summary section of statements, making it difficult to extract information on research recommendations made. The DW Report list of contents does not point to any section covering research recommendations and a search on the report (for “recommendation”) did not easily reveal any specific research recommendations.

During the RW, no systematic attempt was made to identify and discuss AW and DW research recommendations as, for example, took place in the SEDAR 18 RW.

The draft RW Panel Report does contain some research recommendations but these have yet fully to be discussed by the panel members.

Given the high degree of uncertainty, I am reluctant to propose any research recommendations until it is clear what management is contemplated by the FMCs. If ABCs must be set based on estimates of status and with reference to absolute values of e.g. MSY, then it is essential to conduct assessments able to provide such information. In the absence of information to scale outputs from the catch-free model, it is necessary to consider alternative assessment approaches.

If the catch-free model is the model of choice then thought needs to be given to estimating abundance. This is not straightforward given uncertainty as to stock distribution and structure. Even, for example, if an extensive tagging program was contemplated, designing the program and structuring a model to infer abundance would require a substantial increase in understanding of stock structure and movements.

In the absence of obtaining an independent estimate of abundance, use e.g. of SSRA could be attempted but including a broad consideration of removal scenarios. In order to work to this end the DW would need to progress considerably the discussion it started, but did not finish, on commercial and recreational landings. My expectation, from discussion during the RW, is that the plausible range of removals scenarios is so great that this route might also not be successful.

Use of Management Strategy Evaluation is feasible as a means of developing robust management approaches, including ABC setting, but the credibility of the approach would depend critically on the ability to construct plausible operating (system) models. This returns again to the issue of the need to understand stock structure, distribution, linkage, basis life-history, etc.

Ultimately, development of a useful research program will need to take account of the various costs and potential benefits of pursuing alternative routes. One of advantage of the Management Strategy Evaluation approach is that it can provide a framework for doing cost-benefit analysis. In itself, however, this is a costly exercise.

Overall, without advocating a specific methodology, I would recommend a review of alternative research options to yield information of relevance to identified management options. That review should consider not just the information needs of alternative management approaches, and the likelihood of different research programs to meet those needs, but also the costs and relative benefits of each approach. The identification of viable management options is an important step in this exercise and it is possible that economic analyses would be helpful in this respect.

ToR 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.

The RW Panel report is in preparation at the time of submission of this CIE Reviewer individual report.

CONCLUSIONS AND RECOMMENDATIONS

There is a fundamental difficulty with delivering against expectations from the SEDAR 23 process. The difficulty, providing credible estimates of quantities of interest to management, arises because the methods used are not structured to provide those estimates. From the outset, the ToR for the whole SEDAR 23 process needed to be better formed to ensure appropriate outputs would ensue. The SEDAR 23 process for goliath grouper included the updating of a previous assessment which was fit for an alternative purpose (advising on possible recovery times) and which could be used to guide management in other fisheries (where either an absolute scalar on biomass is available or where catches have been continuing). The assessment approach

adopted, however, cannot usefully inform management for goliath grouper at this time, in the absence of an independent scalar and following a twenty-year moratorium.

Even if an appropriate assessment model had been pursued (e.g. SSRA), problems with data availability would remain a fundamental block. Nevertheless, noting the need for information to feed in to alternative assessment models, it would have been useful if the DW had been tasked explicitly with developing the best possible and plausible scenarios for all historic removals.

I agree with the opinion of the RW that the assessment method has utility generally but not in this specific instance. Drawing conclusions as to stock status and potential yields to aid management deliberations is therefore problematic. I do not think that any specific quantitative guidance can be drawn from the assessments presented. This is not a criticism of the assessment practitioners who have thoroughly applied the method, explored sensitivities, provided well-constructed outputs, etc. My criticism is of the lack of attention to setting up the SEDAR 23 process and the need to ensure that ToR are focused on both management needs and technical feasibility.

I would not recommend a wide range of research projects without better understanding the management context and potential costs and benefits of alternate approaches. It is important, in my view, first to consider viable management options, then to identify consequent analytical needs to support those options, and finally to consider the data/information needs for the alternative techniques with a strong emphasis on relative costs and benefits. Rather than make any particular research recommendations my single recommendation would therefore be to undertake a systematic review of management options and required research to provide a foundation for orderly research planning.

APPENDIX 1

BIBLIOGRAPHY

Prior to the Workshop, extensive materials were provided via a dedicated ftp site. The materials were extensive and comprehensive, and relevant to all terms of reference in varying degrees. The documents included reference documents, reports from the Data and Assessment Workshops, various Working Papers from those Workshops, and some General Information papers. During the workshop two presentations were given, and additional materials were provided on request. The presentations were made available using the dedicated ftp site which was accessed using guest Wi-Fi throughout the meeting. Directory listings for all files are provided below for completeness.

Directory listing of reports:

02/11/2010 07:01 a.m. S23_AW_final.pdf
15/10/2010 02:22 a.m. S23_DW_report_FINAL.pdf
26/10/2010 08:08 a.m. S23_Research_recommendations_section4.docx
21/10/2010 06:17 a.m. Section1_Intro_v1.docx
04/11/2010 04:11 a.m. Section1_Intro_v1.pdf

Directory listing of reference documents:

13/08/2010 02:59 a.m. SEDAR23_RD28_CRP_goliath_finalreport.pdf
09/04/2010 03:14 a.m. SEDAR23_RD_01_Bullocketal1992.pdf
09/04/2010 03:14 a.m. SEDAR23_RD_02_CassCalayandSchmidt_09.pdf
09/04/2010 03:14 a.m. SEDAR23_RD_03_Craig et al_09.pdf
09/04/2010 03:14 a.m. SEDAR23_RD_04_Eklund_2005.PDF
09/04/2010 03:14 a.m. SEDAR23_RD_05_Eklund_Schull_2001.pdf
09/04/2010 03:15 a.m. SEDAR23_RD_06_FriasTorres etal_2007.pdf
09/04/2010 03:15 a.m. SEDAR23_RD_07_Koenig etal_2007.pdf
09/04/2010 03:15 a.m. SEDAR23_RD_08_Lara etal_2009.pdf
09/04/2010 03:15 a.m. SEDAR23_RD_09_Mann etal09.pdf
09/04/2010 03:15 a.m. SEDAR23_RD_10_McClenachan_09.pdf
09/04/2010 03:15 a.m. SEDAR23_RD_11_NMFS2006.pdf
09/04/2010 03:15 a.m. SEDAR23_RD_12_Porch etal2006.pdf
09/04/2010 03:15 a.m. SEDAR23_RD_13_PorchBarbieri_07.pdf
09/04/2010 03:15 a.m. SEDAR23_RD_14_Rhodes&Graham_09.pdf
09/04/2010 03:16 a.m. SEDAR23_RD_15_Sadovy_Eklund_1999.pdf
09/04/2010 03:16 a.m. SEDAR23_RD_16_SEDAR6_SAR_report.pdf
09/04/2010 03:14 a.m. SEDAR23_RD_17_FriasTorres_2006.pdf
14/04/2010 04:41 a.m. SEDAR23_RD_18_Porch&Eklund_GMS2004.pdf
23/04/2010 12:54 a.m. SEDAR23_RD_19_GoliathFINAL REPORT.pdf
24/04/2010 06:41 a.m. SEDAR23_RD_20_Gerber etal_2005.pdf
24/04/2010 06:42 a.m. SEDAR23_RD_21_Sala etal_2003.pdf
23/04/2010 07:39 a.m. SEDAR23_RD_22_Coleman etal2000_AFS_statement.pdf
23/04/2010 07:39 a.m. SEDAR23_RD_23_Colin_gcfi43.pdf
23/04/2010 07:39 a.m. SEDAR23_RD_24_Sadovy_gcfi43.pdf
23/04/2010 07:39 a.m. SEDAR23_RD_25_Gilmore etal_1978.pdf
24/04/2010 06:51 a.m. SEDAR23_RD_26_Murie etal_2009.pdf
24/04/2010 06:55 a.m. SEDAR23_RD_27_Evers etal_2009.pdf

Directory listing of working papers from DW and AW:

16/07/2010 02:33 a.m. S23_AW_01_Porch-REEF-survey of goliath.pdf
31/07/2010 05:29 a.m. S23_AW_02.pdf
13/08/2010 02:48 a.m. S23_AW_03_MRFSS_revised.pdf
13/04/2010 03:04 a.m. S23-DW-01_Hale 2010_Goliath Grouper SEDAR.pdf
21/04/2010 02:55 a.m. S23-DW-02_Goliath ENP Index_2010_Cass-Calay.pdf
27/04/2010 05:16 a.m. S23-DW-03_Collins&Barbieri.pdf
20/07/2010 03:34 a.m. S23-DW-04.pdf

Directory listing of presentations and additional material provided during RW:

16/11/2010 06:56 p.m. L_M12 F2mean rev.xlsx
18/11/2010 04:49 a.m. L_M12 uninformative F2mean rev.xlsx
04/08/2010 05:58 a.m. Porch-Catch-free-SEDAR23.ppt
18/11/2010 07:50 a.m. RW requested plots.xlsx
16/11/2010 03:08 a.m. SEDAR23 Goliath Grouper RW (Monday 11-15-2010).pptx

APPENDIX 2

Attachment A: Statement of Work for Dr. Kevin Stokes

External Independent Peer Review by the Center for Independent Experts

SEDAR 23 Gulf of Mexico and South Atlantic Goliath 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.org.

Project Description: SEDAR 23 will be a compilation of data, a benchmark assessment of the stock, and an assessment review conducted for Gulf of Mexico and South Atlantic Goliath Grouper. The review workshop provides an independent peer review of SEDAR stock assessments. The review panel is ultimately responsible for ensuring that the best possible assessment is provided through the SEDAR process. The stocks assessed through SEDAR 23 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 expertise, working knowledge, and recent experience in 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 Key West, Florida during 15-17 November 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.

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

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

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

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

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

- 1) Conduct necessary pre-review preparations, including the review of background material and reports provided by the NMFS Project Contact in advance of the peer review.
- 2) Participate during the panel review meeting in Key West, Florida during 15-17 November 2010.
- 3) During 15-17 November in Key West, Florida as specified herein, conduct an independent peer review in accordance with the ToRs (**Annex 2**).

- 4) No later than 1 December 2010, each CIE reviewer shall submit an independent peer review report addressed to the “Center for Independent Experts,” and sent to Mr. Manoj Shivilani, CIE Lead Coordinator, via email to shivlanim@bellsouth.net, and CIE Regional Coordinator, via email to David Sampson david.sampson@oregonstate.edu. Each CIE report shall be written using the format and content requirements specified in Annex 1, and address each ToR in **Annex 2**.

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

<i>11 October 2010</i>	CIE sends reviewer contact information to the COTR, who then sends this to the NMFS Project Contact
<i>1 November 2010</i>	NMFS Project Contact sends the CIE Reviewers the pre-review documents
<i>15-17 November 2010</i>	Each reviewer participates and conducts an independent peer review during the panel review meeting
<i>1 December 2010</i>	CIE reviewers submit draft CIE independent peer review reports to the CIE Lead Coordinator and CIE Regional Coordinator
<i>15 December 2010</i>	CIE submits CIE independent peer review reports to the COTR
<i>22 December 2010</i>	The COTR distributes the final CIE reports to the NMFS Project Contact and regional Center Director

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

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

Applicable Performance Standards: The contract is successfully completed when the COTR provides final approval of the contract deliverables. The acceptance of the contract deliverables shall be based on three performance standards:

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

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

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

Support Personnel:

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Key Personnel:

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

1. The CIE independent report shall be prefaced with an Executive Summary providing a concise summary of the findings and recommendations, and specify whether the science reviewed is the best scientific information available.
2. The main body of the reviewer report shall consist of a Background, Description of the Individual Reviewer's Role in the Review Activities, Summary of Findings for each ToR in which the weaknesses and strengths are described, and Conclusions and Recommendations in accordance with the ToRs.
 - a. Reviewers should describe in their own words the review activities completed during the panel review meeting, including providing a brief summary of findings, of the science, conclusions, and recommendations.
 - b. Reviewers should discuss their independent views on each ToR even if these were consistent with those of other panelists, and especially where there were divergent views.
 - c. Reviewers should elaborate on any points raised in the Summary Report that they feel might require further clarification.
 - d. Reviewers shall provide a critique of the NMFS review process, including suggestions for improvements of both process and products.
 - e. The CIE independent report shall be a stand-alone document for others to understand the weaknesses and strengths of the science reviewed, regardless of whether or not they read the summary report. The CIE independent report shall be an independent peer review of each ToRs, and shall not simply repeat the contents of the summary report.
3. The reviewer report shall include the following appendices:
 - Appendix 1: Bibliography of materials provided for review
 - Appendix 2: A copy of the CIE Statement of Work
 - Appendix 3: Panel Membership or other pertinent information from the panel review meeting.

Annex 2: Tentative Terms of Reference for the Peer Review

SEDAR 23 Gulf of Mexico and South Atlantic Goliath Grouper 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, and declarations of stock status.
5. Evaluate the adequacy, appropriateness, and application of the methods used to project future population status; recommend appropriate estimates of future stock condition (*e.g., exploitation, abundance, biomass*).
6. Evaluate the adequacy, appropriateness, and application of methods used to characterize uncertainty in estimated parameters. Provide measures of uncertainty for estimated parameters. Ensure that the implications of uncertainty in technical conclusions are clearly stated.
7. Ensure that stock assessment results are clearly and accurately presented in the Stock Assessment Report 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.

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

** The panel shall ensure that corrected estimates are provided by addenda to the assessment report in the event corrections are made in the assessment, alternative model configurations are recommended, or additional analyses are prepared as a result of review panel findings regarding the TORs above.**

Annex 3: Tentative Agenda

SEDAR 23 Gulf of Mexico and South Atlantic Goliath Grouper Review Workshop

Key West, Florida during 15-17 November 2010

Monday

10:00 a.m.	Convene	
10:00 – 10:30	Introductions and Opening Remarks <i>- Agenda Review, TOR, Task Assignments</i>	Coordinator
10:30 – 11:30	Assessment Presentation	TBD
11:30 a.m. – 1:00 p.m.	Lunch Break	
1:00 p.m. – 3:30 pm	Continue Presentation/Discussion	Chair
3:30 – 4:00	Break	
4:00 – 6:00	Continue Presentation/Discussion	Chair

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

Tuesday

8:30 a.m. – 11:30 a.m.	Panel Discussion <i>- Assessment Data & Methods</i> <i>- Identify additional analyses, sensitivities, corrections</i>	Chair
11:30 a.m. – 1:00 p.m.	Lunch Break	
1:30 p.m. – 3:30 p.m.	Panel Discussion <i>- Continue deliberations</i> <i>- Review additional analyses</i>	Chair
3:30 p.m. – 4:00 p.m.	Break	
4:00 p.m. – 6:00 p.m.	Panel Discussion/Panel Work Session <i>- Recommendations and comments</i>	Chair

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

Wednesday

8:30 a.m. – 11:30 a.m.	Panel Discussion <i>- Final sensitivities reviewed.</i> <i>- Projections reviewed.</i>	Chair
11:30 a.m. – 1:00 p.m.	Lunch Break	Chair
1:30 p.m. – 3:30 p.m.	Panel Discussion or Work Session <i>- Review Reports</i>	Chair
4:00 p.m.	ADJOURN	

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

APPENDIX 3

PERTINENT INFORMATION FROM THE REVIEW

Participants List

Appointee	Function	Affiliation
<i>Review Panel</i>		
Luiz Barbieri	Review Panel Chair	SAFMC SSC/FWRI
Jamie Gibson	CIE Reviewer	Department of Fisheries and Oceans, CA
Sven Kupschus	CIE Reviewer	CEFAS
Kevin Stokes	CIE Reviewer	Stokes.net.nz Ltd
Shannon Cass-Calay	GMFMC SSC Reviewer	NMFS Miami
Barbara Dorf	GMFMC SSC Reviewer	TXPWD
John Hoenig	SAFMC SSC Reviewer	VIMS
<i>Analytical Team Representation</i>		
Joe O’Hop	Lead analyst	FWRI
Joseph Munyandorero	Analytic support	FWRI
<i>Official Observers</i>		
Ben Fairey	GMFMC AP	
<i>Council Representation</i>		
Ben Hartig	South Atlantic Council Member	SAFMC
Kay Williams	Gulf of Mexico Council Member	GMFMC
<i>Staff</i>		
Julie A Neer	SEDAR Coordinator	SEDAR
Rachael Silvas	Administrative Assistant	SEDAR
Karen Burns	Gulf of Mexico Council Staff Lead	GMFMC
Patrick Gilles	IT Support	NMFS Miami
<i>Other Observers</i>		
Don DeMaria		
Angela Collins		FWRI
Bill Causey		
Sarah Frias-Torres		Ocean Research & Conservation Association
Doug Gregory		FL SeaGrant
Bill Teehan		FWC