

# SEDAR 10 Review Workshop Report

## *Gulf of Mexico Gag Grouper*

Prepared by the SEDAR 10 Review Panel  
June 26 - 30, 2006  
Atlanta GA

## **Executive Summary**

The SEDAR 10 Review Workshop took place in Atlanta, Georgia, June 26-30, 2006 and reviewed two stock assessments: South Atlantic gag grouper and Gulf of Mexico gag grouper. On Monday, June 26, the Review Workshop Panel received a presentation from the South Atlantic gag grouper assessment team, and on Tuesday, June 27, a similar presentation from the Gulf of Mexico gag grouper assessment team. The balance of the week, through Thursday afternoon, was devoted to additional discussion with the assessment teams to refine and better understand the assessments. Draft versions of the two advisory reports were discussed on Thursday. All parts of the meeting, with the exception of Friday morning, were open to the public. On Friday, the Panel discussed initial drafts of the Consensus Summary documents.

The Review Panel commends the two assessment teams and was especially impressed by the responsiveness of both teams to requests for additional analyses and clarifying information. The Review Panel was also very appreciative of the helpful feedback and suggestions from all SEDAR 10 attendees as we discussed initial drafts of Review Workshop documents.

The Review Panel also appreciates the organization of SEDAR 10 in that two gag grouper stocks were assessed via a common Data Workshop and concurrent and complementary Assessment Workshops. This allowed the Review Panel to not only better understand the individual stock assessments but to offer more consistent advice to the two managing Councils.

From that point of view the Review Panel notes that the development of the stocks has been similar, presumably because the fisheries have followed similar paths.

In both stock areas, recruitment has increased in recent years, although the increase is more pronounced in the Gulf of Mexico than in the South Atlantic. Recruitment is estimated to have been about 5 times higher, on average, in the Gulf of Mexico than in the Atlantic.

For both stocks, relative SSB's were high in the early 1960s, declined more or less regularly until the early 1990s when both started to increase. The 2004 SSB in the Gulf of Mexico is almost 60% above average, close to the maximum observed in the early 1960s, while for the South Atlantic, the 2004 SSB is 20% above average.

Estimated fishing mortality increased at a very similar rate from the early 1960s to the early 1980s. Since then, both have fluctuated without a clear trend around an average of 0.48 in the South Atlantic and about 0.30 in the Gulf of Mexico.

An important result of the Review Workshop is determination of current stock status relative to biological reference points established in the respective FMPs.

In both stock areas, the stock and recruitment data do not suggest that recruitment is strongly linked with SSB. In the South Atlantic, the Beverton-Holt stock-recruitment relationship indicates little change in recruitment for a wide range of SSB's and that  $B_{MSY}$  falls in the range of SSB's observed in the past. On the other hand, the Ricker stock-recruitment relationship indicates that maximum recruitment occurs at SSB's lower than those observed over the period

of the assessment, which implies that  $B_{MSY}$  would also be lower than those observed in the period of the assessment. In the Gulf of Mexico both the Beverton-Holt and Ricker relationships suggest that considerably higher recruitment would result from larger SSB's and  $SSB_{MSY}$  is estimated to be higher than SSB's observed in the past. The Review Panel considers that the stock recruitment relationships in the two stock areas are equally uncertain. The derived benchmarks are considered useful for management in the South Atlantic, because they are within the range of past observed values. In the Gulf of Mexico, more stock and recruitment observations are necessary to confirm that the benchmarks estimated in the current assessment are indeed attainable.

The Minimum Stock Size Threshold (MSST) for the Gulf of Mexico gag grouper stock,  $(1-M)*SSB_{MSY}$ , is very close to  $SSB_{MSY}$  because age-averaged natural mortality rate,  $M$ , is estimated as 0.14. Given the uncertainties in the assessment, the biomass would be expected to fall below MSST with a relatively high frequency even if true biomass were close to  $SSB_{MSY}$ . In the Gulf of Mexico, there are indications that recruitment could become impaired below a SSB of 20 million lbs and the Review Workshop suggested that MSST could be set at this level as a temporary operational definition, to be re-examined at the next assessment.

The current (2004) fishing mortality rate on this stock is estimated as 0.39. Relative to the current proxy for  $F_{MSY}$  ( $F_{SPR30\%}$ ), estimated as 0.17, overfishing of the Gulf of Mexico gag grouper is occurring. For the Gulf of Mexico, a MFMT of 0.17 is not consistent with the recent dynamics of gag grouper: fishing mortality has been fluctuating around  $F = 0.30$  for more than twenty years and the stock biomass is near its historical maximum. The Review Panel could not provide advice on target  $F$  and biomass reference points, but noted that the stock has apparently increased as a result of good recruitment under estimated fishing mortality rates that have fluctuated around an average value of  $F = 0.30$  since the early 1980s. The Review Panel advised that it would be prudent to reduce fishing mortality below  $F = 0.30$ .

# 1. Introduction

## 1.1. Workshop Time and Place

The SEDAR 10 Review Workshop met at the Doubletree Atlanta Buckhead in Atlanta, Georgia from June 26 - 30, 2006.

## 1.2. Terms of Reference

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*, *F<sub>msy</sub>*, *B<sub>msy</sub>*, *MSST*, *MFMT*, or their proxies); provide values for management benchmarks, range of ABC, and declarations of stock status.
5. Evaluate the adequacy, appropriateness, and application of the methods used to project future population status; recommend appropriate estimates of future stock condition.
6. 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.
7. Evaluate the performance of the Data and Assessment Workshops with regard to their respective Terms of Reference; state whether or not the Terms of Reference for those previous workshops were met and are adequately addressed in the Stock Assessment Report.
8. Review research recommendations provided by the Data and Assessment workshops and make any additional recommendations warranted.
9. Prepare a Peer Review Consensus Summary summarizing the Panel's evaluation of the stock assessment and addressing each Term of Reference. Prepare an Advisory Report summarizing key assessment results. (Reports to be drafted by the Panel during the review workshop with a final report due two weeks after the workshop ends.)

## 1.3. List of Participants

### ***Review Panel***

Terry Smith, Chair .....NOAA Fisheries/Sea Grant  
Din Chen ..... CIE  
Jean-Jacques Maguire ..... CIE  
John Wheeler ..... CIE

### ***Presenters***

Mauricio Ortiz.....SEFSC  
Clay Porch.....SEFSC  
Steve Turner.....SEFSC  
Doug Vaughan .....SEFSC  
Erik Williams .....SEFSC

### ***Appointed Observers***

Brian Chevront.....SAFMC SSC

Phil Conklin .....SAFMC AP  
 Marianne Cufone ..... GMFMC NGO Representative  
 George Geiger .....SAFMC  
 Will Patterson.....GMFMC SSC  
 Roy Williams .....GMFMC  
 Bob Zales II.....GMFMC AP

**Observers**

Roy Crabtree ..... SERO  
 Elizabeth Fetherstone..... Ocean Conservancy  
 Dennis O’Hern .....GMFMC AP  
 Andy Strelchek..... SERO

**Staff**

Steven Atran.....GMFMC  
 John Carmichael..... SEDAR  
 Tyree Davis.....SEFSC  
 Rick DeVictor .....SAFMC

1.4. List of Review Workshop Working Papers & Documents

The Review Panel was provided all SEDAR Working Papers and associated research documents considered at the SEDAR 10 Data and Assessment Workshops. Additional resources provided for the Review Workshop are listed below.

SEDAR Working Papers		
SEDAR10-RW01	Virtual population analysis of the Gulf of Mexico gag grouper stock: the continuity case.	Sladek-Nowlis, J.
SEDAR10-RW02	Status review of gag grouper in the US Gulf of Mexico, SEDAR 10.	Ortiz, M
SEDAR DRAFT ASSESSMENT REPORS		
SEDAR10-SAR1 <i>Review Draft</i>	South Atlantic Gag Grouper SEDAR Assessment Report	
SEDASR10-SAR2 <i>Review Draft</i>	Gulf of Mexico Gag Grouper SEDAR Assessment Report	

## 2. Consensus Summary

### 2.1 Terms of Reference

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

The Review Panel concluded that the Data and Assessment Workshops explored a full range of available data sources and selected those that were most appropriate and scientifically sound for the assessment. The data were considered to be adequate, although the Review Panel did concur with the observations of the Data and Assessment Workshops regarding the limited availability of biological sampling data (lengths and ages) prior to the 1980's. The Review Panel concluded that the data selected by the Assessment Workshop were applied appropriately in the assessment.

The Data Workshop categorized available information under four headings: 1) life history, 2) commercial fishery, 3) recreational fishery, and 4) abundance indices. Life history information included: estimates of total, natural and release mortality, age data, growth, reproduction, movements and migration, stock definition, and meristic conversions. Commercial fishery information included: landings, discards, and biological sampling. Recreational fishery information included: landings, discards, total catches, and length frequency distributions. There were six abundance indices; four of which were fishery dependent and two that were fishery independent.

The Data Workshop reviewed several recent studies on estimates of release mortalities and recommended further investigation into the practicality of applying depth-mortality functions. The Assessment Workshop concurred and recommended using size-depth release mortality estimates rather than a fixed proportion, as used in the previous assessment. The Review Panel noted that although data were limited, information was consistent between the South Atlantic and Gulf of Mexico.

Several new growth studies were available for review by the Data Workshop. These updated datasets provided increased sample sizes for improved temporal coverage and contrast. As growth models can be influenced by size-biased samples due, for example, to minimum size limits, the Data Workshop calculated a modified von Bertalanffy growth model accounting for size limited data. Model fits used area, sector and temporal specific size limits. The new von Bertalanffy model, in combination with new age-length keys, resulted in a substantial change in catch in age between the current and previous assessment. There were fewer fish aged 1 to 3 and more fish aged 4 and older. This resulted in an overall lower number of fish caught in the current assessment relative to estimates for the same time period in the previous assessment. The Review Panel noted that, in the recreational fishery since 1990, discards far exceeded landings, suggesting that management measures regarding minimum sizes may not have had as large an effect as anticipated. Catch at age, which includes mostly discards, has increased substantially with the implementation of these measures in the 1990s.

The Data Workshop examined several aspects relating to aging of fish, including age structure samples, age reader precision, and age patterns. With regard to age structure samples, they noted that pre-1998 sample sizes of otoliths collected from the longline fishery were low compared to

recent years and that samples from the recreational fishery and fishery independent samples were not well represented throughout the time series. Results from an age reading workshop in 2005 indicated that all labs used comparable procedures and that there was very good agreement and precision among readers. The Review Panel noted the importance of this initiative and recommended that exchange of otoliths between labs continue in the future. In the South Atlantic, the age range tabulated in the analyses extend to age 20 while in the Gulf of Mexico it extends to age 12. In the GOM, the age range used in the assessment could be extended to age 20, as in the assessment for the South Atlantic.

The Data Workshop examined the results of two relatively large tagging studies designed to estimate the degree of exchange between Atlantic and Gulf stock units. In general, the results suggested an ontogenetic movement to deeper waters with smaller gag exhibiting relatively high site fidelity. The Data and Assessment Working Groups concluded that recoveries from the tagging data were inconclusive and that council boundaries should continue to be used as the dividing line for the two stocks. The Review Panel noted that some movement occurred from the South Atlantic to the Gulf. The Florida Keys also represented an area of overlap. Further information was provided to the Panel regarding the results of an ultrasonic tagging study off the west coast of Florida. Tag recoveries indicated extensive migrations by at least two fish, one that was recaptured off Texas and one off Vera Cruz Mexico. The management unit for Gulf of Mexico gag grouper, as defined by the Data Workshop, and endorsed by the Assessment Workshop, extends from the United States – Mexico border in the west through northern Gulf of Mexico waters and west of the Dry Tortugas and the Florida Keys (waters within the Gulf of Mexico Fishery Management Council Boundaries). The Review Panel accepted the current stock definition but recommended a further examination of stock structure before the next assessment. This should include a detailed analysis of existing tagging data and the initiation of new tagging experiments (see SEDAR 10 Consensus Summary Report for South Atlantic gag grouper).

In anticipation that a statistical age-structured model would be used in this assessment, the Data Workshop tabulated commercial landings for 1963 to 2004. The previous stock assessment used landings from 1986. This assessment also examined issues concerning stock boundaries, the misidentification of gag as black grouper, and the adjustment of gag landings to include a portion of unclassified grouper species, primarily prior to the mid-1980s. The proportions of gag and black grouper from 1986 to 1989 were used to calculate the amount of unclassified groupers from 1963 to 1985. This time period was used as size limits had not yet been imposed and it was thought that these proportions would best reflect the historical time period. The Review Panel accepted this method, noting, however, that it introduced a further source of uncertainty in historical commercial landings.

Size limits, which have been in effect since 1990, are thought to have resulted in discarding of undersized fish in the commercial fishery. The Data Workshop examined estimates of total discards by the handline fishery from 2001 to 2004. The Assessment Workshop accepted the handline discard estimates but also used size frequency distributions from catch-at-size files for three periods, prior to 1990 when no size limits existed, 1990 to 1999 when the size limit was 20", and 2000 to 2004 when the size limit was increased to 24".

The Data Workshop examined several issues regarding recreational catches, including assignment of catches in the Florida Keys, the misreporting of gag as black grouper, catches from MRFSS shore mode, and extending recreational catches back through time. In back-calculating catches, they examined three possible relationships: a correlation with commercial catches, a correlation with coastal human populations, and a linear relationship starting at a time when the stock was considered to be close to unexploited. Two series of recreational catches and discards from 1963 to 2004 were generated, one based upon a correlation with commercial catches and one based upon a linear increase from 1945. The Assessment Workshop rejected the historical recreational time series and recommended an alternative approach using a relationship between the MRFSS fishing effort and the number of boats built between 1981 and 2004. The issue of extending recreational (and commercial) catches back through time generated considerable debate among the Review Panel. Concerns were expressed regarding the accuracy of such catches and the impact they may have within the assessment model. However, it was concluded that although back-calculated historical catches may not be accurate, they do provide valuable information and should be included in the assessment.

Six abundance indices were considered by the Data Workshop to be appropriate measures of abundance. These included four fishery dependent indices, commercial handline, commercial longline, headboat survey, and the marine recreational fisheries statistical survey (MRFSS). Two independent indices were also available, the SEAMAP video survey, and the Florida Estuaries Index. The Data Workshop described each of these indices in detail, along with concerns and advantages of each index. The Assessment Workshop accepted this set of indices for inclusion in the assessment model. There was a limited discussion by the Review Panel regarding the abundance indices. A question was raised regarding the spatial coverage of the fishery independent indices. The Review Panel concurred with the inclusion of the six indices in the assessment model.

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

The Review Panel generally endorsed the method used in the assessment and considered it to be scientifically sound. The Panel did, however, have concerns regarding the choice of a Beverton-Holt stock recruit function and recommended that a Ricker function be used to examine the sensitivity of the model to assumptions about the form of the stock recruitment function. The Panel was impressed with the number of alternative runs provided by the Assessment Workshop and the thorough presentation regarding model inputs and results presented by the assessment team at the Review Workshop.

The Assessment Workshop selected a statistical age-structured forward reconstruction model (CASAL) as the primary method for the assessment. CASAL was chosen as it provides flexibility in specifying population dynamics, parameter estimation, and model outputs. Most importantly, unlike Virtual Population Analysis (VPA), CASAL does not assume that the catch at age is known exactly, an important feature in the case of Gulf of Mexico gag grouper where catch at age is not well estimated. Additionally, the assessment model used in the 2001 assessment (VPA) was run to show the effects of updated data and the effects of adding indices

of abundance not available in 2001. In addition to CASAL and VPA models, the Assessment Workshop provided a stochastic stock reduction analysis (SRA) using a long term historical (1880 to 2004) catch time series.

The Assessment Workshop considered six scenarios for CASAL model runs. It recommended using the longest possible catch series. Two time series were considered, one with commercial and recreational catches from 1963 to 2004, and a second with commercial catches from 1880 to 2004 and recreational catches from 1945 to 2004. The Assessment Workshop also recommended including potential changes in catchability. Two groups of model runs were made, one assuming constant catchability and a second assuming a 2% annual increase since 1984 to reflect improvements in gear and electronics available to both the commercial and recreational fisheries. The Assessment Workshop also discussed the recent report of NRC regarding MRFSS estimates and concluded that available estimates of recreational catch and indices of abundance were the best available information. However, to estimate the sensitivity of the model to these data, two runs were made, one where the MRFSS total estimated catch was increased by 25% for the entire time series, and a second where it was decreased by 25%.

The Assessment Workshop presented two model runs to the Review Panel as base case scenarios, one with commercial and recreational catches from 1963 to 2004, assuming constant catchability, and the second with the same catch series, assuming 2% annual increase in catchability. Each base run was provided as the basis for estimation of benchmarks and stock status. After considerable discussion, the Review Panel concluded that catchability has changed over time. However, the Panel does not believe that a constant 2% increase per year adequately describes the change in catchability that is likely to have occurred. Step changes with the introduction of new equipment or management measures are more likely than monotonic changes. Learning and technological changes in navigation, fish detection, and fishing gear have no doubt increased the efficiency of nominal fishing effort. However, management measures (increases in minimum size, time and area closures, bag limits) and changes in fishing behaviour (moving on when enough fish have been caught) would likely result in decreased catchability. The Review Panel believes that, overall, catchability is likely to have increased and recommends that a special workshop be convened to estimate and quantify changes in catchability over the last 25 to 30 years.

The base case CASAL model run included commercial and recreational catches from 1963 to 2004. As indicated earlier, the Review Panel expressed concerns regarding the back-calculation of catch data and asked the assessment team to provide a CASAL run with actual catch data only (1986 to 2004). The assessment team was also asked to provide the results of two VPA runs for comparison with the CASAL model. The results indicated similar trends in stock size and fishing mortality estimates with higher biomass and lower fishing mortalities for the shorter time series.

The Assessment Workshop assumed a Beverton-Holt stock recruitment relationship in all CASAL model runs. Examination of stock-recruit scatter plots indicated that recruitment is not strongly linked to SSB. Given the variability in the stock recruit data, the Review Panel requested further evaluation using Ricker and 'hockey stick' (Barrowman and Myers 2000) stock recruitment relationships. The assessment team provided these comparisons during the Review

Workshop; the Beverton-Holt and Ricker curves were virtually identical through the range of data. However, both the Beverton-Holt and Ricker relationships suggest that considerably higher recruitment would result from larger SSBs, and  $B_{MSY}$  is estimated to be higher than SSBs observed in the past. It was noted that the Assessment Workshop preferred the Beverton-Holt relationship over the Ricker. However, the Review Workshop concluded that both might over estimate virgin recruitment and thus  $MSY$  and  $SSB_{MSY}$ . More stock and recruitment observations are necessary to confirm that the benchmarks estimated in the current assessment are indeed attainable.

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

The Review Panel evaluated the various assessment runs provided by the Assessment Workshop. It agreed upon a base run as reported above (terms of reference #2); the base run is described in the addendum to the assessment report. The accepted estimates of stock abundance, biomass, and exploitation are provided in the SEDAR 10 Gulf of Mexico Gag Grouper Advisory Report.

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

In both stock areas, the stock and recruitment scatter plots do not suggest that recruitment is strongly linked with SSB. In the South Atlantic, the Beverton-Holt relationship indicates little change in recruitment for a wide range of SSBs and that  $B_{MSY}$  falls in the range of SSBs observed in the past. The Ricker relationship indicates that maximum recruitment occurs at SSBs lower than those observed over the period of the assessment, which implies that  $B_{MSY}$  would also be lower than those observed in the period of the assessment. In the Gulf of Mexico, both the Beverton-Holt and Ricker relationships suggest that considerably higher recruitment would result from larger SSBs and  $SSB_{MSY}$  is estimated to be higher than SSBs observed in the past. The Review Workshop considered that the stock recruitment relationships in both stock areas are equally uncertain. The derived benchmarks are considered useful for management in the South Atlantic, because they are within the range of past observed values. In the Gulf of Mexico, more stock and recruitment observations are necessary to confirm that the benchmarks estimated in the current assessment are indeed attainable.

$MSST$ , defined as  $(1-M) * SSB_{MSY}$ , would be very close to  $SSB_{MSY}$  because an  $M = 0.14$  is used. Given the uncertainties in the assessment, the biomass would be expected to be estimated to fall below  $MSST$  with a relatively high frequency even if in true biomass were close to  $SSB_{MSY}$ . In the Gulf of Mexico, there are indications that recruitment could become impaired below 20 million lbs and the Review Workshop suggested that  $MSST$  could be set at 20 million lbs as an operational definition, also to be re-examined at the next assessment.

For the Gulf of Mexico, a  $MFMT$  of 0.17 (current value of  $F_{30\%SPR}$ ) is not consistent with the recent dynamics of gag grouper: fishing mortality has been fluctuating around  $F = 0.30$  for more than twenty years and the stock biomass is near its historical maximum. The Review Panel could

not provide advice on target  $F$  and biomass reference points, but noted that the stock has apparently increased as a result of good recruitment under estimated fishing mortality rates that have fluctuated around an average value of  $F = 0.30$  since the early 1980s. The Review Panel advised that it would be prudent to reduce fishing mortality below  $F = 0.30$ .

5. *Evaluate the adequacy, appropriateness, and application of the methods used to project future population status; recommend appropriate estimates of future stock condition.*

The Review Panel requested stock projections assuming constant catchability and geometric mean recruitment from 1984 through 2004. These projections were not available during the Review Workshop as they could not be completed using CASAL. They were subsequently provided by the assessment team using an alternative age-structure projection software (PRO-2BOX).

The following output data from CASAL were used as input for PRO-2BOX:

- a) Stock size at age (NAA) from 1963 to 2004 ages 1-12+,
- b) Fishing mortality rate at age (FAA) from 1963 to 2004,
- c) Catch-at-age 1963-2004 all fisheries,
- d) Weight at age 1963-2004 for spawning component and mean WAA for fisheries
- e) Natural mortality at age 1963-2004.

Because of differences between the software programs, particularly regarding the estimation of mean weight at age and age composition for the plus group, estimates of biomass between CASAL and PRO2BOX differed prior to 1984, when age composition data were not available. However, the SSB and overall stock biomass estimates were similar for the latest years, which are the important components for the projection of current stock status.

As PRO2BOX can distinguish between landed and discarded (dead) numbers at age, the discard proportions were estimated (from CASAL) by age for 1984 - 2004, when age composition data were available; discards by age prior to 1984 were assumed to be the same as in 1984. With this information, estimates and benchmarks were then generated for total yield (landings only) versus total removals (landings plus dead discards).

Stock projections were completed for 2006 to 2010 and included scenarios of constant catch, constant fishing mortality, total yield, and total removals.

Estimates of fishing mortality rates were similar between total yield and total removals. However, estimated retained yields were much lower (~ 50%), due to the large proportion of dead discards in the recreational fishery. Landed yield per recruit (YPR) also dropped by 50% compared to total removals.

Projections indicated that total removals over 6,614 MT or landed catches over 3,268 MT in 2006 and in following years are not sustainable, and would generate a fishing mortality rate at or above 2 (upper limit of fishing mortality rate).

This assessment implies that spawning stock biomass has declined from a 2003 peak. Projections indicate that stock spawning biomass, and also catch (removals or landed yield) would continue to decline at current (2004) fishing mortality rates. The decline would continue if fishing occurred at a rate equivalent to  $F_{20\%SPR}$ . Fishing rates of  $F_{30\%SPR}$ ,  $F_{40\%SPR}$ ,  $F_{0.1}$ ,  $F_{MAX}$  and  $F_{MSY}$  would reverse the declining trend

The Review Panel endorsed the inclusion of dead discards with landings to provide an estimate of total removals and recommended that these estimates be used in the Advisory Report.

6. *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.*

Initial stock assessment results were clearly and accurately presented in the report of the Assessment Workshop (SEDAR10-SAR2-Section III). Additional analyses requested by the Review Panel will be incorporated as an addendum to the stock assessment report.

7. *Evaluate the performance of the Data and Assessment Workshops with regard to their respective Terms of Reference; state whether or not the Terms of Reference for those previous workshops were met and are adequately addressed in the Stock Assessment Report.*

The Review Panel agreed that the terms of reference of the Data and Assessment Workshops were met and were adequately addressed in the Stock Assessment Report.

8. *Review research recommendations provided by the Data and Assessment workshops and make any additional recommendations warranted.*

The Review Panel reviewed research recommendations offered by the Data and Assessment Workshops (see respective reports). The Panel also developed the three additional recommendations listed below.

**Age determination:** The Review Panel noted the importance of age reading comparisons and recommended that exchange of otoliths between labs continue in the future.

**Stock structure:** The Review Panel recommended a further examination of stock structure before the next assessment, including a detailed analysis of existing tagging data and the initiation of new tagging experiments.

**Time-varying catchability:** The Panel is of the opinion that catchability has changed over time, however, it does not believe that a constant 2% increase per year adequately describes the changes in catchability that are likely to have occurred. Step changes with the introduction of new equipment or management measures are more likely than monotonic changes. Learning and technological changes in navigation, fish detection and catching equipment have no doubt increased the efficiency of nominal fishing effort. However, management measures (increases in minimum size, time and area closures, bag limits) and changes in fishing behavior (moving on when “enough” fish have been caught) would be expected to result in decreased catchability. The Panel believes that, overall, catchability is likely to have increased. The Panel recommends that a special workshop be convened to estimate and quantify changes in catchability over the last 25 to 30 years.

9. *Prepare a Peer Review Consensus Summary summarizing the Panel’s evaluation of the stock assessment and addressing each Term of Reference. Prepare an Advisory Report summarizing key assessment results. (Reports to be drafted by the Panel during the review workshop with a final report due two weeks after the workshop ends.)*

First drafts of the Consensus Summary and Advisory Report were completed during the Review Workshop. All Review Panel members contributed to the Consensus Report. The assessment team completed the first draft of the Advisory Report which was then reviewed by the Review Panel. The Consensus Report and Advisory Report were completed by email subsequent to the Review Workshop.

## 2.2 Additional Comments

Participants in the Data and Assessment Workshops are to be highly commended for their detailed compilation and analysis of diverse data sets. Information was summarized well in their respective reports. During the Review Workshop, the assessment team provided a clear presentation of the assessment model and results and was highly capable and willing to accede to requests for further analyses from the Review Panel.

## 2.3. General recommendations to SEDAR

There was large volume of documentation associated with this RW. The Review Panel recommends a clear executive summary for all substantive Data and Assessment Documents.

It could be more informative to distribute a succinct table of model equations and parameters (estimated and observed) to be provided for each assessment along with, if appropriate, a table of management options (e.g. a decision table) and the risks associated with them.

## 2.4 Special Comments

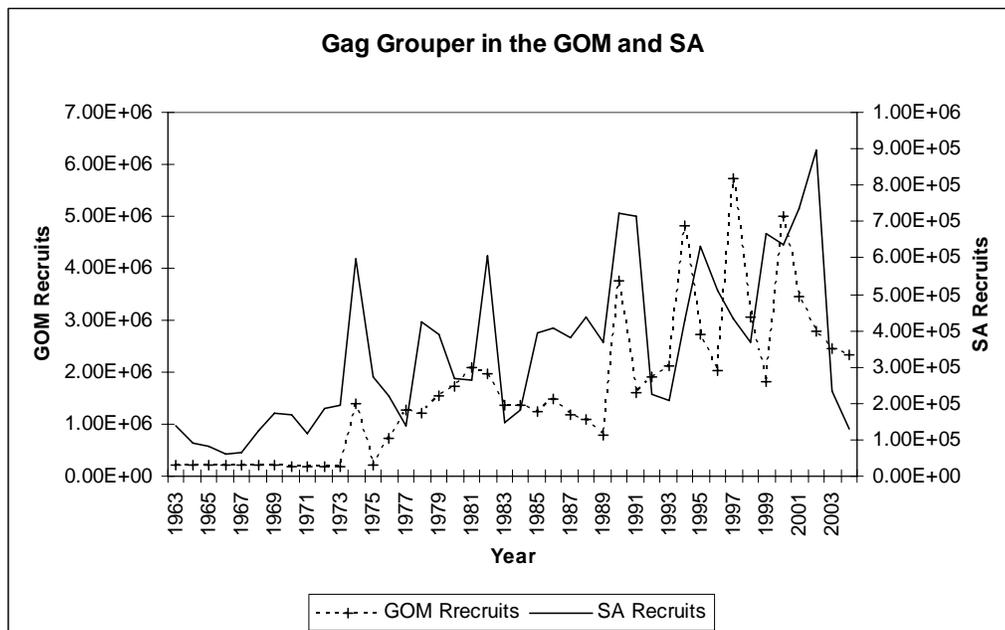
### Comparing and Contrasting the Two Gag Grouper Assessments

The main assessment model for both stock areas is a statistical catch at age model, but the implementations differ. For the South Atlantic a customized model has been developed using ADMB while for the Gulf of Mexico, an existing software (CASAL (C++ algorithmic stock

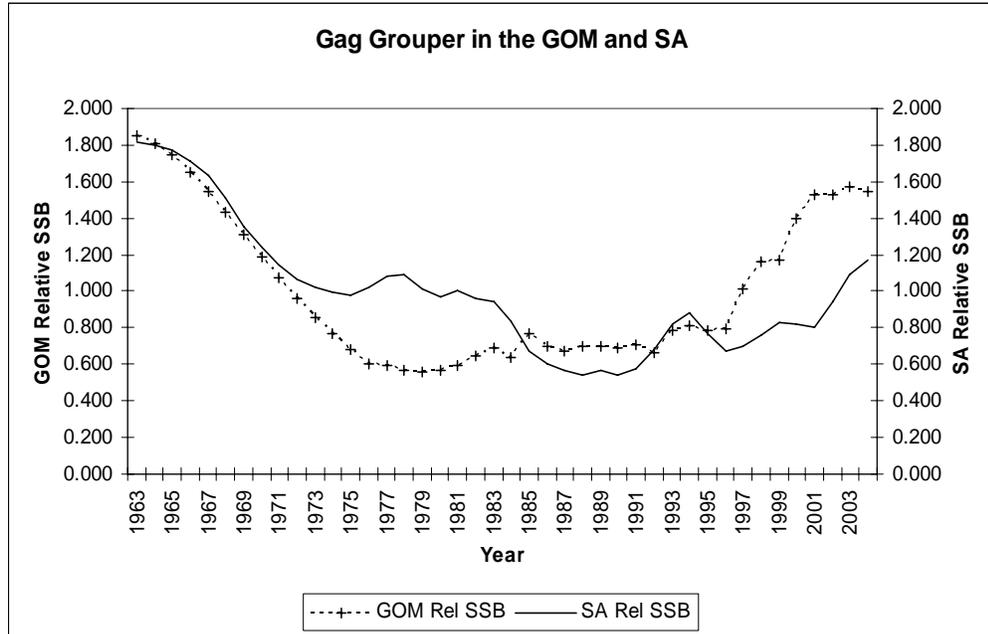
assessment laboratory) can be downloaded from <ftp://ftp.niwa.co.nz/software/casal>) was used. CASAL was one of several integrated assessment software recently evaluated by the IATTC; the report can be downloaded at <http://www.iattc.org/PDFFiles2/Assessment-methods-WS-Nov05-ReportENG.pdf> . For the South Atlantic, a production model (ASPIC) was also run and for the Gulf of Mexico two VPA's were run: one was a strict continuity run and the other one was parameterized to mimic the CASAL run. VPA was not used in the South Atlantic because of insufficient complete catch at age information. The RW Panel considers that the statistical catch at age approach has better statistical foundations and more flexibility in the type of information that can be used than VPA or general production models. The RW Panel recommends that alternate assessment approaches (ASPIC for the South Atlantic and VPA for the Gulf of Mexico) continue to be used in parallel and that the results be presented in the report of the Assessment Workshops. Standard inputs (catch at age, length at age, weights at age, indices of stock size (by age and length if appropriate) and outputs (population numbers at age, population biomass at age, spawning biomass, fishing mortality at age) should be provided in a format easily readable by spreadsheet programs. Neither of the assessments considers gender explicitly.

Although the approach has been used in the assessment of other species, it is not clear that the ADMB statistical catch at age implementation conforms to the Model Acceptance Note 1 in the ToRs of the AW. The assessment team is encouraged to provide the required documentation and work towards including the assessment in the NFT packages. Presumably, the evaluation performed by the IATTC implies that the CASAL does conform to the Model Acceptance Note 1.

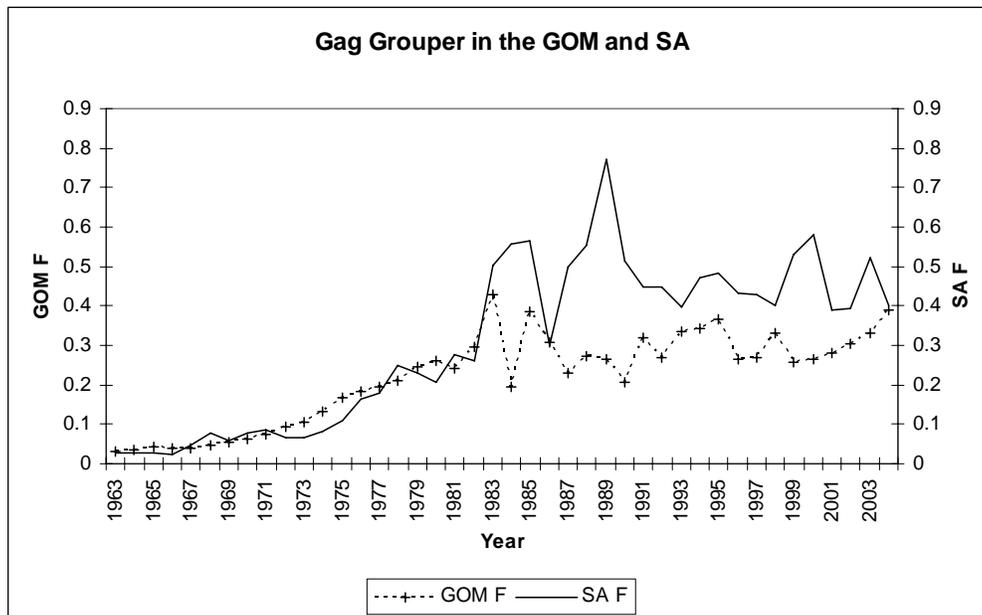
In both stock areas, recruitment has increased in recent years, although the increase is more pronounced in the Gulf of Mexico than in the South Atlantic. Recruitment is estimated to have been about 5 times higher, on average, in the Gulf of Mexico than in the Atlantic.



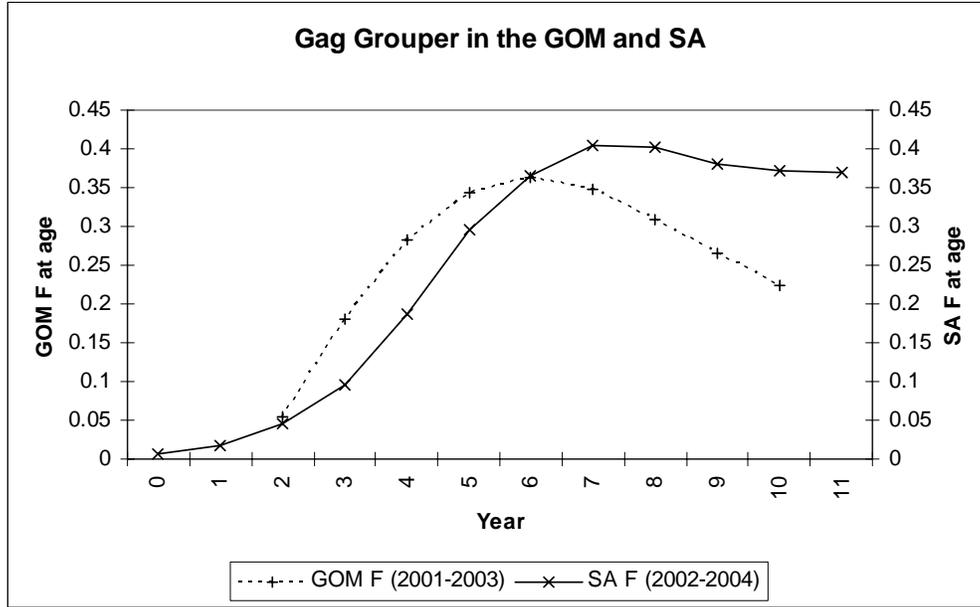
For both stocks, relative SSB's were high in the early 1960s, declined more or less regularly until the early 1990s when both started to increase. The 2004 SSB in the Gulf of Mexico is almost 60% above average, close to the maximum observed in the early 1960s, while for the South Atlantic, the 2004 SSB is 20% above average.



Estimated fishing mortality increased at a very similar rate from the early 1960s to the early 1980s. Since then, both have fluctuated without a clear trend around an average of 0.48 in the South Atlantic and about 0.30 in the Gulf of Mexico.



Average fishing mortality at age (2001-2003 for the GOM, 2002-2004 for the SA) show different patterns. F's are higher at age 3-5 in the Gulf of Mexico than in the South Atlantic but at older ages it is the opposite. The F at age pattern is clearly dome shaped in the Gulf of Mexico and nearly flat topped in the South Atlantic.



## References

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