

**Chair's Report of SEDAR 4 Review Panel
South Atlantic Snowy Grouper and Tilefish
July 26 – 29, 2004
Charlotte, NC**

R. K. Mohn

Prepared for

**CIE
University of Miami**

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Synopsis/summary of Meeting

The Southeast Data, Assessment and Review (SEDAR) is a sequence of three workshops. This report is of the third of these, which is a technical, peer review of the previous two. The first workshop reviews and assembles the available data, while the second assesses the resource(s) and produces standard population parameters and benchmarks. The purpose of the third workshop is to assure quality and provide transparency.

The Review Workshop commenced on July 26, 2004. After introductions and opening remarks from John Carmichael (SEDAR Coordinator), the agenda was approved. Before commencing with the review, NMFS personnel provided an introduction to reference points and legal requirements within U.S. Fishery Management.

As neither of these stocks (snowy grouper and tilefish) had been fully assessed before, a fair amount of time was spent on the underlying data. The data for snowy grouper that were available, especially abundance indices, were limiting, which is weaker than the norm for assessments. The Panel's discussion on the data focused on stock definition, aging and natural mortality. A presentation of the assessment model and results followed. The model chosen was a statistical catch-at-age model that fit length frequency, age frequency, gear selectivity and abundance indices. Uncertainty in the results was assessed using a Monte Carlo/Bootstrap (MCB) approach. Clarifications and some additional analyses were requested. The requests that were feasible within the meeting were done promptly and well.

The data and analysis for tilefish were then presented to the Panel. Because the data and model were very similar in nature to the snowy grouper, fewer questions were posed. The tilefish data were weaker both in terms of quality and quantity than seen for the snowy grouper.

The Panel accepted both assessments as they were formulated in the Assessment Workshop. The snowy grouper was seen to have been fished down to some degree at successive locations and is currently estimated (median values) to be at less than 20% of SSB_{msy}. The tilefish SSB is slightly below SSB_{msy}.

Views on the Meeting Process

Process

The Review flowed well because of NMFS staff preparedness and the quality of the personnel in attendance. The dedication and application of the NMFS staff, Panel and observers meant that the Review concluded one day early. As well as performing review roles, the Panel provided technically innovative ideas and performed some analyses. The decision to adjourn a day early was reached early enough on Thursday that most of the attendees could leave that day. The few that could not stayed and worked on the draft Summary Report, for which I, as the Chair, am thankful.

The Panel was small which meant that it progressed fairly rapidly. It also contained sufficient technical expertise that the approach, data, model and analysis were easily assimilated. Although a small panel can move relatively quickly, it does not present the breadth of criticism and interpretation that a larger panel would. The details of the fishery and the implications of the assessments would have benefited from wider participation, especially from members of the industry. Wider participation would have meant that the data and models, as well as their assumptions and results, could have been put in the context of experience as a form of “ground truthing”. This would have addressed the question “Do these results make sense?” from a number of points of view. It would also have meant that a wider variety of relevant questions might have been brought forward to direct future research and analyses. In summary, the Panel, NMFS personnel, and observers knew what was to be done and did it. The Panel did not become bogged down in back and forth argumentation or re-iteration of points of view.

During the review the Panel requested three sets of further analyses for snowy grouper and one set for tilefish. These requests were mostly exploratory into the models’ behavior. Having a second meeting room available adjacent to the Review facilitated such analyses. As two stocks were being reviewed, one could be worked on while the other was being discussed, which provided the efficiency of some degree of parallel processing. Of course the downside is that fewer participants were available for the review.

Outcome

The outcome in terms of population status and biological advice was as good as could be expected given the data, and to a much lesser degree, analytical limitations. The implications of analytical limitations were not in terms of the stock status, but rather in terms of confidence in the stock status. Although not likely to affect the outcome, the diagnostics and arguments used in the selection of models and of the “initial” run could have been better developed and communicated. The outcome as described in the recommendations for future data and analysis was based on those provided by the Data and Assessment Workshops. The recommendations had been well thought out, although the Panel did add some observations and expanded detail.

The Data and Assessment documents were sufficiently well prepared that their outcomes were not amended in the Review. Reruns and related analyses suggested by the Panel were mainly to diagnose model performance.

The Panel’s, and that of subsequent readers’, ability to review the Workshop Reports was compromised in that details of analysis and discussion were lost through the multi-step process. One example is the definition of the “initial” runs for both stocks. During discussion at the Review, it was obvious that care had been taken in defining the initial runs, but the arguments were not captured in the written documentation. A second, and related, example was the determination of the parameter ranges used in the MCB analysis.

Materials provided

Background materials (Appendix B) in the forms of e-mailed files, a CD-ROM, and reprints were distributed before the Review. The SEDAR coordinator was helpful in assuring that the materials were received and readable. The reprints were about three inches thick, and many were never referred to during the review. Although the Data Workshop Report was received on a CD-ROM, a second edition of the Data Workshop Report was handed out at the Review, and it became the official version.

Some small confusion was occasioned by duplicate terms of reference for the Review Panel and the presence of two Data Workshop Summaries. Such updates are not surprising given the time

constraints in this many-step process. The duplications did not materially affect the performance of the review.

Guidance provided

Guidance was provided in three manners: 1) printed material from SEDAR and CIE, 2) input from the SEDAR coordinator during the meeting, and 3) comments from various Panel members and observers. Both the formal and informal guidance were of the expected quality, i.e. focused and useful. The attendance of the SEDAR coordinator for the entire Review was valuable.

Other Observations

Technical

There are number of interrelated technical issues that deserve further comment. They are based on questions as to how the resource and fishery are qualitatively understood to act, how they are modeled, and what data are available to quantify this understanding.

One example regards information on the spatial distribution of the resource. About a third of MCB runs for snowy grouper were clustered in a (parameter) region characterized by high biomass and low fishing mortality (refer to the figure in Appendix C). The Assessment Workshop, and subsequently the Review Panel, both deemed these results to be unrealistic. Data were not available for the Panel to take this qualitative definition of “unrealistic” to a quantitative basis. Furthermore, it was suggested that the snowy grouper was successively fished out as new concentrations were found. If plotted by decade, for instance, aggregated, MARMAP data with expanding symbols might provide a stronger basis for this assertion. If this could be done, the length frequency and abundance data might be open to different interpretation. I do not know what other geo-referenced data are available to aid in this sort of exploration.

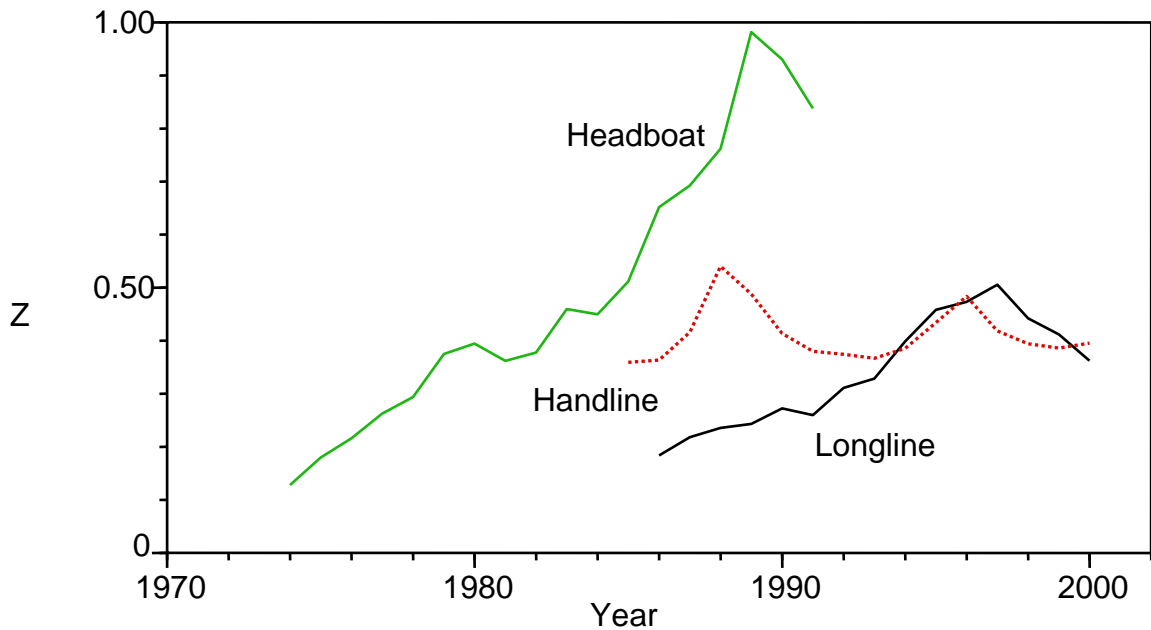
When embarking on new assessments such as these, a wide variety of modeling approaches is desirable; it is also expensive in terms of time needed to perform the analysis. Conflicts between divergent approaches stimulate debate and allow one interpretation to be compared to another. Resources that have a history have winnowed out inappropriate analyses and they need not be reported. The snowy grouper and tilefish assessments focused on one modeling framework. The

model chosen for both assessments was a highly parameterized (relative to the data available) statistical catch-at-age model. The snowy grouper model had just over 200 parameters while the tilefish had about 150 parameters. More parametrically parsimonious models should have been developed as well. Besides serving as a contrast to the bigger model, they often focus on a single aspect of the resource and are more easily communicated to clients. At the end of the day, the best description must be chosen, but the insights given by several models adds value to the analysis and a broader understanding of the uncertainty.

Furthermore, the highly parameterized model space meant that it was difficult to interpret the cause of the bimodal clusters of the MCB runs for snowy grouper. Panel requests for simpler runs, having about one-tenth the number of parameters, aided the understanding of the bimodal results.

It is noted that simpler production models had been attempted at the Assessment Workshops for both stocks but had (correctly) been dismissed. As these production models depend upon abundance data, which were not considered to be highly informative, they could not be expected to perform well.

Within the snowy grouper catch-at-age model, a conflict was seen between the length frequency data, which suggested a reduced stock in which the resource, especially older fish, had been significantly depleted, and the abundance data, which suggested some degree of recovery since about 1990 (see Figure 13 of the Assessment Report III.A). In order to illustrate the utility of simpler models of the data, I tried a catch curve analysis and presented it to the Panel. The results are summarized in the following figure below. The data were the headboat, handline and longline length frequency data for snowy grouper. The data were binned into 4-year blocks to smooth the results. It is reiterated that the results of this crude analysis are just meant as illustrations and are not an alternative analysis to the Assessment Workshop Report.



The longest time series, headboats, shows a low Z initially that continues to increase until about 1990. Recent headboat data were too sparse to continue the analysis past the early 1990s. This could be interpreted as the fishing down of a virgin resource. In most fishery models there is an implicit assumption that the resource is homogenous; local dynamics are assumed to average out. However, when the handline data were introduced, it was mentioned that they were affected by the discovery of two hot spots, known as Adrian's Mark and Snowy Wreck. The reduction in the early 1990s and again in the late 1990s in the handline Z 's is consistent with the timing of the discoveries. Finally, the longline Z 's start low in the late 1980s and peak a decade later, again suggesting a fishing down process. I believe that simpler analyses of this type are a constructive complement to the full model. When I presented these results, NMFS staff mentioned that a similar analysis had been done, but that it had been dropped. A record of these sorts of analyses would help readers and future assessors of snowy grouper. The development of a spatially heterogeneous model is probably well beyond what the available data could support, even in the sense of scenario sensitivity.

Other Comments

The Panel was advised that it did not need to prepare an Advisory Document. The reasons for this were not clear. Is it meant to be a precedent and review panels will be similarly instructed in the

future? While it does represent a time savings for a process having non-trivial costs, it can mean that subtleties and nuances may be lost between the technical review and the Advisory Summary.

As chair, I greatly appreciated the participation of the second CIE reviewer, especially one as experienced and statistically sophisticated as Dr. Chris Francis. As well as participation in the review, having a second independent panelist aided the chair with both the flow of the meeting and some specifics of summary document preparation.

Finally, I would like to commend the developers of and participants within the SEDAR framework. I happened to have chaired the first assessment review for this region and am impressed at how rapidly SEDAR has attained a mature and operational assessment process.

Appendix A. Statement of Task

Note that the Terms of Reference in this Appendix differ slightly from those provide by the SEDAR Coordinator which are presented in Appendix B. The Panel was informed that those in Appendix B were drafted after those listed below, and the more recent Terms were followed.

Consulting Agreement between the University of Miami and Dr. Robert Mohn

General

South East Data, Assessment, and Review (SEDAR) is a joint process for stock assessment and review of the South Atlantic, Gulf of Mexico, and Caribbean Fishery Management Councils; NOAA Fisheries, SEFSC and SERO; and the Atlantic and Gulf States Marine Fisheries Commissions. SEDAR is organized around three workshops: data, assessment, and review. Input data are compiled during the data workshop, population models are developed during the assessment workshop, and an independent peer review of the data and assessment models is provided by the review workshop. The peer review panel is composed of stock assessment experts, other scientists, and representatives of council, fishing industries, and non-governmental conservation organizations. Final SEDAR documents include a stock assessment report produced by the data and assessment workshops, a review panel report evaluating the assessment (drafted during the review panel workshop), a review panel report that summarizes the peer-reviewed assessment results, and collected stock assessment documents considered in the SEDAR process.

NMFS-SEFSC requests the assistance of two assessment scientists from the CIE: one to serve as Chair and one to serve as a technical reviewer for the SEDAR 4 Review Panel that will consider assessments for two species from the South Atlantic deepwater snapper-grouper complex: tilefish and snowy grouper.

These species are within the jurisdiction of the South Atlantic Fishery Management Council and respective southeastern states. The review workshop for SEDAR 4, South Atlantic deepwater complex stock assessments, will take place at the Holiday Inn Center City, Charlotte, NC from July 26 (beginning at 2:00 pm) through July 30, 2004 (ending at 1:00 pm). Meeting materials will be forwarded electronically and in hard copy. Please contact John Carmichael (SEDAR Coordinator; 843-571-4366 or John.Carmichael@safmc.net) for additional details.

Hotel arrangements

Holiday Inn Center City, 230 N. College Street, Charlotte, NC 28202. Phone: (704) 335-5400, (800) 465-4329; Fax (704) 376-4921. Please make reservations by June 16 and to receive the 'SEDAR Workshop' group rate of \$91.94 (including tax).

SEDAR Assessment Review Panel Tasks

The SEDAR Assessment Review Panel will evaluate the tilefish and snowy grouper stock assessments, input data, assessment methods, and model results as put forward in stock assessment reports. The Assessment Review Panel will:

1. Evaluate the adequacy and appropriateness of all data used in the assessment, and state whether or not the data are scientifically sound and the best available.
2. Evaluate the adequacy, appropriateness, and application of the methods used to estimate population parameters such as abundance, biomass, and exploitation; state whether or not the methods are scientifically sound and the best available;
3. Recommend appropriate or best estimated values of population parameters such as abundance, biomass, and exploitation.
4. Evaluate the adequacy, appropriateness, and application of the methods used to estimate population benchmarks (MSY, Fmsy, Bmsy, MSST, MFMT, etc.). State whether or not the methods are scientifically sound and the best available,
5. Recommend appropriate values for population benchmark criteria.
6. Evaluate the adequacy, appropriateness, and application of the methods used to project future population status and, if appropriate, evaluate stock rebuilding; state whether or not the methods are scientifically sound and the best available.
7. Recommend probable values of future population condition and status.
8. Develop recommendations for future research for improving data collection and the assessment.
9. Prepare a Peer Review Panel Consensus Summary summarizing the peer review panel's evaluation of the tilefish and snowy grouper stock assessments and addressing the Terms of Reference. (Drafted during the Assessment Review Panel workshop with a final report due three weeks after the workshop ends.)
10. Prepare a Stock Advisory Report summarizing the stock assessments. (Drafted during the Assessment Review Panel workshop with a final report due three weeks after the workshop ends.)

The Assessment Review Panel's primary duty is to review the assessments presented. In the course of this review, the Chair may request a reasonable number of sensitivity runs, additional details of the existing assessments, or similar items from technical staff. However, the review panel is not authorized to conduct an alternative assessment or to request an alternative assessment from the technical staff present. If the review panel finds that an assessment does not meet the standards outlined in Items 1 through 4, above, the panel will outline in its report the remedial measures that the panel proposes to rectify those shortcomings.

The Review Panel Report is a product of the overall Review Panel, and is NOT a CIE product. The CIE will not review or comment on the Panel's report, but shall be provided a courtesy copy, as described below under "Specific Tasks." The CIE product to be generated is the Chair's report, also discussed under Specific Tasks.

Specific Tasks

The CIE designee shall serve as Chair of a SEDAR Stock Assessment Review Panel workshop for SEDAR 4, South Atlantic tilefish and snowy grouper, July 26 - 30, 2004 (See attached agenda.). The workshop panel shall review stock assessments for South Atlantic tilefish and snowy grouper

in the jurisdiction of the South Atlantic Fishery Management Council and applicable southeastern states.

It is estimated that the Chair's duties will occupy a total of 17 days - several days prior to the Review Panel meeting for document review; four days at the SEDAR meeting; several days following the meeting to ensure that the final documents are completed, and several days to complete a Chair's report for the CIE.

Roles and responsibilities:

- (1) Prior to the Assessment Review Panel workshop the Chair shall be provided with the stock assessment reports and associated documents for South Atlantic tilefish and snowy grouper. The Chair shall read and review all documents to gain an in-depth understanding of the stock assessments under consideration and the data and information considered in the assessments.
- (2) During the Assessment Review Panel workshop the Chair shall control and guide the meeting, including the coordination of presentations, discussions, and document flow.
- (3) The Chair shall facilitate the preparation and writing of the Peer Review Panel Consensus Summary (Item 9 above) and a Stock Advisory Report (Item 10 above). Review panel members, SEFSC staff and stock assessment scientists present at the meeting will assist the Chair as needed. The Chair shall be responsible for the editorial content of the two review panel reports, and the Chair shall be responsible for overseeing that both reports are produced and distributed to appropriate contacts on schedule (see "Final Reports" below).
- (4) The SEDAR coordinator shall assist the Assessment Review Panel Chair prior to, during and after the meeting to ensure that all final documents with results are distributed in a timely fashion.
- (5) No later than August 20, 2004, the Chair shall submit a written Chair's Report¹ addressed to the "University of Miami Independent System for Peer Review," and sent to Dr. David Sampson, via e-mail to David.Sampson@oregonstate.edu, and to Mr. Manoj Shivlani, via e-mail to mshivlani@rsmas.miami.edu. See Annex 1 for the contents of the Chair's report.

Workshop Final Reports

The Chair shall send final review workshop reports to the University of Miami Independent System for Peer Review, Dr. David Die via email to ddie@rsmas.miami.edu.

Final workshop reports (in Word or WordPerfect format and in hardcopy) shall also be sent to:

Nancy Thompson, NMFS Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, FL 33149 (email, Nancy.Thompson@NOAA.gov)

Larry Massey, 101 Nina Drive #302, Virginia Beach, VA 23462 (email, Larry.Massey@NOAA.gov)

John Carmichael, SAFMC, One Southpark Circle, Suite 306, Charleston, SC 29407 ([email, John.Carmichael@safmc.net](mailto:John.Carmichael@safmc.net))

¹ The written Chair's report will undergo an internal CIE review before it is considered final. After completion, the CIE will create a PDF version of the Chair's report that will be submitted to NMFS and the consultant.

Robert Mahood, South Atlantic Fishery Management Council, One Southpark Circle, Suite 306, Charleston, SC 29407 (email, Robert.Mahood@safmc.net)

For Additional Information or Emergency:

SEDAR contact: John Carmichael, One Southpark Circle, Suite 306, Charleston, SC 29407.
Phone: 843-571-4366; cell phone (843) 224-4559. Email: John.Carmichael@safmc.net.

Draft Agenda
SEDAR 4: South Atlantic tilefish and snowy grouper
Review Workshop
July 26-30, 2004
Holiday Inn Center City, Charlotte NC

Monday, July 26, 2004

2:00 – 5:30	1. Introduction	SEDAR Coordinator
	2. Review of Agenda	SEDAR Coordinator
	3. Tilefish Assessment	
	3.1 Assessment Presentation	AW Representatives

Tuesday, July 27, 2004

8:30 – 12:00	3.2 Assessment Discussion	Chair
12:00 – 1:30	Lunch	
1:30 – 5:30	3.2 (Continued) Assessment Discussion	Chair

Wednesday, July 28, 2004

8:30 – 12:00	4. Snowy Grouper Assessment	
	4.1 Assessment Presentation	AW Representatives
12:00 – 1:30	Lunch	
1:30 – 5:30	5. Draft Panel Reports – Advisory Report	Chair

Thursday, July 29, 2004

8:30 -12:00	5. Draft Final Reports – Consensus Summary	
12:00 – 1:30	Lunch	
1:30 – 5:30	5. Draft Final Reports – Advisory Report	

Friday, July 30, 2004

8:30 – 1:00	Final Review of Panel Reports	Chair
1:00	Adjourn	Chair

ANNEX I: Contents of Chair Report

1. Synopsis/summary of the meeting – to provide context for the comments rather than to rewrite the summary report, which is a product of the meeting and not a CIE product.
2. Views on the meeting process, including recommendations for improvements on:
 - The meeting process itself;
 - The outcome of the meeting;
 - Materials provided for the meeting, including timeliness, relevance, content, and quality;
 - The guidance provided to run the meeting.
3. Other observations on the meeting process.
4. Appendices, including:
 - Statement of Work;
 - Bibliography of the materials provided for the meeting;
 - Summary report (if available at the time of report submission).

Appendix B. Materials Provided

The following materials by the SEDAR Coordinator. Both paper copies and a CD-ROM were provided

1. Terms of Reference and Panel Instructions for SEDAR 4 Review Workshop, Atlantic Deepwater Snapper-Grouper: Tilefish and Snowy Grouper (see below)
2. SEDAR 4 Data Workshop Summary, Deep Water Complex, November 3-7, 2003
3. Assessment of Snowy Grouper (*Epinephelus niveatus*) in the South Atlantic Fishery Management Council Management Area. Section III.A of SEDAR Stock Assessment Report.
4. Assessment of Tilefish, *Lopholatilus chamaeleonticeps*, in the South Atlantic Fishery Management Council Management Area. Section III.B of SEDAR Stock Assessment Report.
5. Documents from SEDAR4 Atlantic and Caribbean Deepwater Snapper Grouper (see below)
6. Reference papers from SEDAR4 Atlantic and Caribbean Deepwater Snapper Grouper (see below)

Terms of Reference and Instructions for the Review Panel

I. Terms of Reference

The SEDAR Assessment Review Panel will evaluate the tilefish and snowy grouper stock assessments, input data, assessment methods, and model results as put forward in stock assessment reports. The Assessment Review Panel will:

1. Evaluate the adequacy and appropriateness of all data used in the assessment and state whether or not the data are scientifically sound;
2. Evaluate the adequacy, appropriateness, and application of the methods used to estimate population parameters such as abundance, biomass, and exploitation and state whether or not the methods are scientifically sound;
3. Evaluate the adequacy, appropriateness, and application of the methods used to estimate population benchmarks (*e.g., MSY, Fmsy, Bmsy, MSST, MFMT, or their proxies*) and state whether or not the methods are scientifically sound;
4. Evaluate the adequacy, appropriateness, and application of the methods used to project future population status and, if appropriate, evaluate stock rebuilding; state whether or not the methods are scientifically sound;

5. Ensure that all available required assessment results (*as listed in the SEDAR Stock Assessment Report Outline*) are clearly and accurately presented in the Stock Assessment Report and that such results are consistent with the Panel's decisions regarding adequacy, appropriateness, and application of the data and methods;
6. Evaluate the performance of the Data and Assessment Workshops with regards to their respective Terms of Reference, and state whether or not the Terms of Reference for those previous workshops are adequately addressed in the Stock Assessment Report;
7. Review the assessment workshop's recommendations of future research for improving data collection and the assessment, and make any additional recommendations warranted;
8. Prepare a Peer Review Consensus Summary summarizing the Panel's evaluation of the tilefish and snowy grouper stock assessments and addressing each Term of Reference. (Drafted by the Panel during the Review Workshop with a final report due three weeks after the workshop ends.);
9. Prepare a Stock Advisory Report summarizing the stock assessments. (Drafted during the Assessment Review Panel workshop with a final report due three weeks after the workshop ends.).

II. Review Panel Instructions

The Assessment Review Panel is charged with reviewing the technical aspects of the presented stock assessment and making judgements regarding the assessment that are based solely upon scientific merit. At no point during the deliberations should the Review Panel consider the implications that the assessment and its results may have upon management decisions or resource users. This is not to imply in any way that such considerations are not important, but rather to acknowledge several important facts: (1) consideration of management impacts is beyond the scope of the charge to the Review Panel, (2) SEDAR specifically strives to separate management considerations from assessment decisions, (3) Review Panel participants are selected based on technical, biological, and assessment knowledge, not social and economic knowledge of a fishery, (4) consideration of social and economic consequences is specifically mandated to the Council and various Council Committees composed of experts qualified to evaluate the social and economic consequences of management actions.

The Assessment Review Panel is discouraged from holding formal votes. Decisions should be based upon the unanimous consensus of the entire panel. In the event that the Chair feels that all avenues for agreement have been exhausted and unanimous consensus is not achievable, the Chair may instruct that the majority opinion be reflected in the report and allow the minority opinion holders to prepare and submit a minority report.

The Assessment Review Panel's primary duty is to review the assessments presented. In the course of this review, the Chair may request a reasonable number of sensitivity runs, additional details of the existing assessments, or similar items from technical staff. However, the review panel is not authorized to conduct an alternative assessment nor to request an alternative assessment from the technical staff present.

If the review panel finds that an assessment does not meet the standards outlined in Items 1 through 6, above, the panel will outline in its report the remedial measures to be taken by the assessment analysts to rectify those shortcomings.

Review Panel members are expected to participate in the entire workshop from start to finish. The supporting Council's strongly discourage panel members from leaving early. Panelists should expect that the Workshop will require the entire time allotted and plan travel accordingly. To this end, workshops are scheduled for an afternoon start and early adjournment to reduce the need for weekend travel.

Documents from SEDAR4 Data Workshop

#	Title	Author(s)
SEDAR4-DW-01	Indices of Abundance from Commercial Logbook Data: South Atlantic stocks	Shertzer, K.; McCarthy, K.
SEDAR4-DW-02	MRFSS Landings and Length Data Summary for the South Atlantic	Vaughan, D. S.
SEDAR4-DW-03	General Canvass Landings Statistics for the South Atlantic Region	Poffenberger, J.
SEDAR4-DW-04	Summary information on commercial fishing operations in Puerto Rico from 1969-2001 and reporting rates needed to adjust commercial landings.	Cummings, N. Matos-Caraballo, D.
SEDAR4-DW-05	Summarized reported commercial landings in Puerto Rico from 1969-2001 with specific notes on the silk snapper landing category.	Cummings, N. Matos-Caraballo, D.
SEDAR4-DW-06	Not used	
SEDAR4-DW-07	Information on the general biology of silk and queen snapper in the Caribbean.	Cummings, N
SEDAR4-DW-08	Preliminary Estimation of Reported Landings, Expansion Factors and Expanded Landings for the Commercial Fisheries of the United States Virgin Islands.	Valle-Esquivel, M. Diaz, G.A.
SEDAR4-DW-09	Preliminary species composition estimates of TIP samples from commercial landings in the U.S. Virgin Islands.	Diaz, G. A. ; Valle-Esquivel, M.
SEDAR4-DW-10	Standardized Catch Rates of Silk Snapper, <i>Lutjanus vivanus</i> , from the St. Croix .S. Virgin Islands Handline Fishery during 1984 - 1997.	Cass-Calay, S.L.; Valle-Esquivel, M.
SEDAR4-DW-11	Standardized Catch Rates of Queen Snapper, <i>Etelis oculatus</i> , from the St. Croix U.S. irgin Islands Handline Fishery during 1984 – 1997	Cass-Calay, S.L.; Valle-Esquivel, M.
SEDAR4-DW-12	Discard Estimates for the South Atlantic Region.	Poffenberger, J.
SEDAR4-DW-13	Size Frequency Data from the Trip Interview Program, South Atlantic Region	Poffenberger, J.
SEDAR4-DW-14	Size frequency distributions of silk snapper and queen snapper from dockside sampling of commercial landings in the U.S. VI	Diaz, G. A.; Valle-Esquivel, M.
SEDAR4-DW-15	Preliminary information on the recreational catch of silk, queen, and blackfin snapper, from 2000 through 2002 in Puerto Rico with additional notes on sand tilefish	Cummings, N.; Slater, B.; Turner, S.
SEDAR4-DW-16	Preliminary analysis of some deepwater species in the South Atlantic headboat survey data.	Williams, E.; Dixon, B.
SEDAR4-DW-17	Age, growth and reproductive biology of the blueline tilefish, <i>Caulolatilus microps</i> , along the southeastern coast of the United States, 1982-99.	Harris, P. J.; Wyanski, D.M.; Powers, P.T.
SEDAR4-DW-18	Age, growth and reproduction of tilefish, <i>Lopholatilus chamaeleonticeps</i> , along the southeast Atlantic coast of the United States, 1980-87 and 1996-98.	Palmer, S.M.; Harris, P.J.; Powers, P. T.

SEDAR4-DW-19	Deep-water species report. South Carolina and Georgia.	Low, B.
SEDAR4-DW-20	South Atlantic Snapper-Grouper Regulatory Overview	Carmichael, J.
SEDAR4-DW-21	Summary of MARMAP sampling	Anon.
SEDAR4-DW-22	Blueline tilefish life history; How to assess reef fish stocks: Excerpts from NMFS-SEFC-80	various
SEDAR4-DW-23	Preliminary size frequency information for silk, queen, and blackfin snapper from the Puerto Rico commercial fisheries from 1985 through 2002 with additional notes on sand tilefish	Cummings, N.J. Phares, P
SEDAR4-DW-24	Brief summary of SEAMAP data collected in the Caribbean Sea from 1975 to 2002	Ingram, W.
SEDAR4-DW-25	Yellowedge Grouper age-length key	Bullock & Godcharles
SEDAR4-DW-26	Estimating catches and fishing effort of the southeast united states headboat fleet, 1972-1982	Dixon & Huntsman
SEDAR4-DW-27	Trends in Catch Data and Estimated Static SPR Values for Fifteen Species of Reef Fish Landed along the Southeastern United States, February 1998.	Potts, Burton & Manooch
SEDAR4-DW-28	Trends in Catch Data and Estimated Static SPR Values for Fifteen Species of Reef Fish Landed along the Southeastern United States, February 2001.	Potts & Brennan
SEDAR4-DW-29	Description of the Southeast Fisheries Science Center's Logbook Program for Coastal Fisheries	Poffenberger, J.

References from the SEDAR4 Data Workshop

- Bohnsack, J. A. and A. Woodhead. 1995. Proceedings of the 1987 SEAMAP passive gear assessment workshop at Mayaguez, Puerto Rico. NOAA Tech. Mem. NMFS SEFSC 365.
- Bullis, H. R. Jr. and A. C. Jones, *ed.* 1976. Proceedings: Colloquium on snapper-grouper fishery resources of the Western Central Atlantic Ocean. FL SeaGrant Report No. 17.
- Bullock, L. H., M. F. Godcharles, and R. E. Crabtree. 1996. Reproduction of yellowedge grouper, *Epinephelus flavolimbatus*, from the Eastern Gulf of Mexico. Bull. Mar. Sci. 59(1) 224-228.
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Appendix C. Panel Consensus Report

Snowy Grouper and Tilefish Peer Review Consensus Summary

**Report prepared for the
South Atlantic Fishery Management Council
National Marine Fisheries Service**

**Edited by R. Mohn for the
Southeast Data and Assessment Review
July 26 – 29, 2004
Charlotte, NC**

Executive summary

The Southeast Data, Assessment and Review (SEDAR) is a sequence of three workshops. The first is a Data Workshop (DW) which is charged with compiling and evaluating data that may be used for resource assessment. Its products, if judged to be adequate, are passed on to the Assessment Workshop (AW) where models are developed and assessment advice produced. The third step is an independent peer review workshop which assesses the technical merits of the data, analysis, stock status and prognosis. This Review Workshop (called the Panel hereafter) assures quality and transparency in the generation of the biological basis of management advice.

The Data Workshop reviewed eight deepwater species and concluded that there were sufficient data and personnel resources to assess two of them, snowy grouper (*Epinephelus niveatus*) and tilefish (*Lopholatilus chamaeleonticeps*). Neither of these stocks had been assessed before. The Panel concluded that the data were weaker than those generally expected in fisheries assessments, especially for the tilefish. For both species the model chosen was forward-projecting statistical catch-at-age model. The models and analysis were well developed and presented. The population benchmarks are scientifically sound considering the limitation of the data.

The Panel also accepted, with some additional comments, the recommendations from both the DW and AW.

Introduction.

The format of this report requires some explanation. Because the Panel's terms of reference (Appendix A) included the reviews of both the Data Workshop (DW) and Assessment Workshop's (AW) terms of reference care has been taken to assure that all of the items were addressed. For this reason, the portion of report dealing with the DW follows their terms of reference in order form rather than narrative to facilitate the tracking the essentially hierarchical terms of reference. For convenience, the Panel's specific terms of reference are in the text and are in italics. The data and models used for snowy grouper and tilefish were quite similar, so the Panel decided to address each under each term of reference. When the observation was not applicable to both species, then the appropriate species was named.

Review of The Panel's Deliberations.

1. *Evaluate the adequacy and appropriateness of all data used in the assessment and state whether or not the data are scientifically sound;*

The terms of reference for the Data Workshop are given in Appendix C. The following section follows them in order.

A clear unit stock definition was not provided for either species from the data workshop. A single South Atlantic stock is apparently assumed for snowy grouper and for tilefish. This assumption is

considered reasonable, based on the likelihood of restricted movement of adults in or out of the region, as well as the likely broad dispersal of their planktonic larvae. Modeling of the dispersal of other snapper and grouper larvae has suggested both local and long-distance transport of larvae prior to settlement. Future assessments should consider whether to include the snowy grouper and tilefish from the Gulf of Mexico or Mid-Atlantic because of possible larval diffusion.

DW2. Evaluate the quality and reliability of life-history information (Age, growth, natural mortality, reproductive characteristics); develop models to describe growth, maturation, and fecundity by age, sex, or length as appropriate.

The Data workshop report provided life history data for eight deepwater species. The Panel only considered information related to snowy grouper and tilefish.

Age and growth

Aging differences between MARMAP and the NMFS Beaufort Lab indicate questions remain regarding age determination protocols, the validity of age-related data, and their use in age-structured models. Ages from bomb-radiocarbon indicate that the MARMAP ages are likely too low. However, the Assessment workshop concluded that NMFS' ages used in the assessments were preferable for determining von Bertalanffy growth curves.

Snowy Grouper: While age composition data were limited, they were important in determining selectivities by fishing sector, but were downweighted in the fitting process to account for the uncertainty involved.

Tilefish: Tilefish age compositions do not appear consistent with the length compositions, and are not fit well by the model. The RW recommended a sensitivity run in which tilefish age composition data are not included in the fitting process (objective function).

Natural mortality

The Assessment workshop used the shape coefficient for ocean fish (-0.305), and its associated confidence interval (-0.351,-0.257), from Lorenzen (1996) and scaled the series such that the proportion surviving at the oldest observed age (35 and 54 years for snowy grouper and tilefish, respectively) was 1.4%. This value of 1.4% came from a re-analysis of Hoenig's (1983) earlier work with total mortality and maximum ages. The Review Panel acknowledges that this approach is a proper step towards capturing the idea that it is unlikely that natural mortality is constant across all ages. However, the Panel noted that the confidence intervals used in the Lorenzen model for ocean fish regarding the shape coefficient may be too narrow when applied to a specific species. Literature supports the use in the sensitivity analysis of values ranging from 0.1% to 5% surviving to the observed maximum age. The Panel noted that it would be more appropriate to calculate Hoenig's total mortality taking sample size into account, but the analyst responded that the dome-shaped recruitment to sampling gear means selectivity confounds natural mortality, so one cannot tease them apart when looking at the descending limb of the curve. Panel members questioned the resulting distributions of natural mortality at age, especially the relatively narrow range of values at older ages. Lorenzen's method may be more realistic in capturing the variation in natural mortality by age; however, the question as to whether the added realism outweighs the additional assumptions and complexity needs to be investigated. Moreover, total mortality (Z) and natural mortality (M) are confounded when estimated from an observed maximum age derived from a fished stock.

The Panel conducted a simulation exercise to examine the maximum age expected to be observed from a population following a Lorenzen natural mortality pattern versus a population following a constant natural mortality pattern because of differences in the implied number of fish still alive after the maximum observed age in the two populations. The constant natural mortality was set such that the two equilibrium populations had the same proportion of fish alive at age 54. Samples of 100 fish were randomly sampled from each population and the maximum age in each sample determined. There were 10,000 random samples collected from each population. Comparison of the distribution of maximum age from the samples of the two populations showed that the Lorenzen population had a larger maximum age than the constant M population. This implies that the Lorenzen M cannot be scaled to the same proportion alive at a given age as the constant M to produce an equivalent expected maximum age observed. The Panel recommends further analyses be conducted to determine an appropriate scaling for Lorenzen M vectors to produce an estimated maximum age equivalent to the constant M assumption.

The Panel asked NMFS staff to conduct a trial run of the model using constant mortality, in order to assess the impact of the Lorenzen-based natural mortality assumption on model performance. The results suggested that the model was relatively robust to any error in this assumption. Overall, the Panel did not consider the possible inaccuracy of the Lorenzen approach at the lower ages to be of much importance, given the high age of selectivity to the fishery.

Reproduction and sex ratios

A maturity ogive by age was developed with a logistic regression using MARMAP data after adjusting the ages to be consistent with NMFS' aging. The fit was not particularly good -- possibly due to the low numbers of older fish -- but the equation was deemed adequate for determining spawning biomass at age.

Snowy Grouper: Snowy grouper is a protogynous hermaphrodite, changing from female to male with age; hence, it is important to estimate the proportion of females by age. Age-specific sex ratios were calculated from a logistic regression.

Tilefish: Tilefish are gonochoristic, but sexually dimorphic, with sex-specific growth curves. The use of female weights is therefore appropriate; use of female only weights in SSB calculations required an assumption regarding age-specific sex ratios; all were set to 0.5 for all ages.

The Panel recommended that better information should be collected related to sex ratios at age, and that the fisheries implications of protogynous hermaphroditism in snowy grouper be more fully evaluated in future assessments.

The Data workshop provided fishery-independent (MARMAP) and fishery-dependent (headboat and commercial logbook) abundance indices.

Snowy Grouper: The Data Workshop identified four time series of information that could be used as indices of abundance for snowy grouper: MARMAP trap and longline surveys, commercial logbook reports, and the headboat catch rates. The Assessment Workshop did not use the commercial logbook index in the snowy grouper analysis because they thought that the index did not track abundance because of fishers shifting to areas of greater abundance, concerns for identifying directed trips, regulatory changes, technology creep, etc. The Assessment Workshop used the other three indices in their analyses. Pairwise correlations between indices were not significant.

The fishery-independent indices came from the MARMAP survey. The Panel noted the poor fits in the model and expressed concern regarding the zero value in 1992 in the MARMAP chevron trap series and questioned how that was handled in the analyses. Because these indices were assumed to follow a log-normal distribution, the concern regarded the extra value added to the zero. They also questioned why the coefficients of variation (CVs) for the chevron traps were similar to those used for longlines even though the longline index was less variable. The analysts responded that the CVs are used to provide estimates of inter-annual variation within an index. The MARMAP chevron trap series is considered an index of younger fish (ages 2 to 5 approximately) because the sampling only goes to 100 m which is shallow for snowy grouper. MARMAP's deeper longline sampling is more appropriate for snowy grouper at older ages. Neither of these indices had much of an influence the model's outcome. However, the Panel thought that these indices will be more valuable as the time series increases.

The only fishery-dependent index used in the analysis was the headboat index. The Panel questioned its use as a true measure of abundance, because headboats are fishing at the very edge of the distribution and changed their fishing from deeper waters in the early years to shallower waters of 100 m or less where snowy groupers are not a commonly caught species. Headboat trips were sub-set to those trips that caught deep-water species and effort was expressed in angler-hook days. The Assessment Workshop addressed these concerns by allowing selectivity to vary over time. Results showed that selectivity shifted toward younger ages over time, which is consistent with perceived changes in the fishery and expected availability by area. The model fit to this index was poor in the early years and better after 1984.

Tilefish: The Data Workshop identified two time series of information that could be used as indices of abundance for tilefish: MARMAP's fishery-independent, horizontal longline survey and commercial logbook CPUE. Although the MARMAP sampling was discontinuous, both time periods (1983-1986 and 1996-2002) were assumed to have the same catchability rate. As expected with the short time series of relatively noisy data, the model fits were poor.

The commercial logbook index was considered appropriate for tilefish because the logbook data had a large tilefish sample size and broad spatial coverage. The fit was as good as could be expected.

DW6. Evaluate the quality and reliability of commercial and recreational fishery-dependent data for determining harvest and discard by species; develop estimates of total annual catch including both landings and discard removals by species.

Prior to 1985, the commercial landings of both of these species were reported only in aggregated categories and so the historical species landings had to be estimated. The Commercial Statistics subcommittee of the Data Workshop used the landings data from 1985-1993 to estimate the average ratio of snowy groupers to unclassified groupers or tilefish to unclassified tilefish by state then applied these ratios to the aggregate to extend the time series back to 1962. Similarly, if gear was missing, the average ratio of gears was applied. An underlying assumption is that these ratios from the later years were constant back into the earlier years. The results were time series of landings by state and gear from 1962 through 2002 for both snowy grouper and tilefish. The Assessment Workshop captured some of the uncertainty in the early commercial landings by setting the commercial coefficient of variation (CV) for the early years at 50% until 1983 and then decreased the CV linearly until 1994 when the CV was set to 10%. There was some discussion as to whether this use of CVs is the best approach to address the uncertainty in landings, given that it is believed the uncertainty is a bias and not random error. An alternative approach worth evaluating would be to include a bias parameter in the model that is estimated.

Snowy Grouper: The snowy grouper commercial fishery began in Florida and expanded northward to South Carolina and North Carolina in the early 1980s. Handlines are the dominant gear in this fishery. Commercial discards were reported to be negligible for snowy grouper.

Tilefish: The tilefish commercial fishery began in Florida and expanded north to South Carolina and North Carolina in the early 1980s, but Florida remains the dominant state for landings. Longlines are the dominant gear. While the same approach used to estimate historical tilefish landings, the smaller number of species and large proportion due to tilefish reduced the uncertainty imposed by this approach. A similar decreasing function for CV of landings was applied, which the RW felt was not appropriate given the reported greater confidence in tilefish landings than in snowy grouper landings. However, since landings were matched closely in the model such changes in CV were not considered worth changing. Commercial discards are also reported to be negligible for tilefish.

Because snowy grouper and tilefish are caught in deep water, the recreational landings are small coming mostly from NMFS's Marine Recreational Fisheries Statistics Survey (MRFSS) charterboat and private boats and an even smaller amount comes from headboats. Again because of the deeper water, it is assumed that none of the released fish estimated by MRFSS survive and so these released fish are included as recreational catch. Proportional standard errors estimated by MRFSS are used as CVs for this sector. The headboat survey does not estimate CVs because it is assumed to be a census but Dixon and Huntsman (SEDAR4-DW-26) note that approximately 40% of headboat landings aren't reported and have to be estimated. The headboat CVs were 10% for 1972-1995 and higher (25%) afterwards because some boats operate in Florida waters not in federal waters offshore and they claim they don't have to report, so from 1996 on has a higher CV to account for it. As with commercial landings, the recreational CVs are not believed to be very important in what the model predicts because the model is configured to fit the landings. Some Panel members thought that since the headboat coverage has changed over time the CVs should be higher in the earlier years. Concern was expressed regarding the poor fits to the landings in the early years which suggested that the differences are not just random error but bias. Recreational fishing for tilefish is limited with landings less than 20 t annually.

Snowy Grouper: The only length data for snowy grouper prior to 1983 came from the headboat survey, and those data did not encompass the entire region. The fishery expanded north from Florida, while the headboat sampling began in North Carolina. Therefore, the early length samples may not be representative of the bulk of the fishery. Length sampling in the commercial handline and longline sectors after 1983 was deemed adequate, especially in the handline portion. There was an apparent contradiction from expectation in that the sizes of fish caught by longlines decreased after the longlines were restricted to fishing in 100 m or greater depths.

Tilefish: Length data for tilefish were only available beginning in 1983. The dominant source of length data was the commercial longline fishery, which has been well sampled each year since 1984, with more than 2,000 length measurements for most years. Length distributions for the commercial handline fishery and the MARMAP survey contained many fewer fish -- less than 200 length measurements for most years.

Age sampling

There was a lot of concern for the small number of age samples for both species, and for possible effects of clumped sampling, which would make the 'effective' sample size even smaller. The Stock Assessment Workshop did not include age composition data for years where there were fewer than 25 age samples. This cutoff meant that few years were included in the analyses, e.g.

only 1981 and 1986 could be included for the headboat/recreational sector in the snowy grouper assessment. On the commercial side, only data from 1997 and later could be included in the snowy grouper analyses. A question was raised as to whether 25 age samples were adequate, and whether such limited sampling enabled tracking of cohorts. The response was that age data actually served only to aid in determining selectivities. A suggestion was made to model selectivities based on size instead of age. The analysts said that they would move in that direction in future SEDAR assessments.

The length distribution of the tilefish age samples did not appear representative of the length samples from which they were chosen. The Panel recommended that these age composition data not be used within the model because of this lack of representativeness. To test the importance of this recommendation, a sensitivity run was performed, and this omission did not affect model results. Therefore, the Panel was satisfied with the model as configured, but recommended that value of retaining these data be considered in future assessments.

In summary, the Review Panel believed that an extensive amount of data had been introduced through the Data Workshop, but that the Data Workshop had provided little written evaluation of quality and reliability. The Review Panel considers the data were scientifically sound and used appropriately. However, the Panel and the Assessment report both note a number of data limitations, and conclude that the data were adequate, but allowed only limited inference as to population status.

2. Evaluate the adequacy, appropriateness, and application of the methods used to estimate population parameters such as abundance, biomass, and exploitation and state whether or not the methods are scientifically sound.

This section reviews the Assessment Workshop in light of its terms of reference; see Appendix D.

The Review Panel considered the terms of reference applied to the assessment workshop, and concluded that in general they were addressed adequately. The one problem noted that several arguments and rationales for the inclusion and exclusion of models were not well represented in the AW documents. A specific example would be the determination of the “initial runs”. In each assessment, the initial run is the configuration was deemed to be good enough to act as a basis for diagnostics and upon which the MCB replicates were based. As is noted below, the initial run was not used to directly determine stock status.

The model used for both species was a forward projecting, age-structured model that fit gear-specific landings, indices, age and length compositions to produce numbers of fish by age and fishing mortalities. The weights for the components of the likelihood functions were adjusted during the stock assessment workshop until the results were deemed reasonable and that run was labeled ‘initial run’. Uncertainty was evaluated through a Monte Carlo/Bootstrap (MCB) approach

The Panel supports the assessment teams’ use of MCB technique as a pragmatic method of characterizing uncertainty in the assessments. This technique addresses two types of uncertainty. The first derives from model parameters (such as natural mortality and steepness) that were held fixed in the initial run. The second type is associated with the data inputs (such as CPUE indices of length compositions). All data inputs include a random error component arising from sampling variation (e.g., the length compositions inputs would have been different had different landings been sampled). MCB answers the question “how different might the assessment results

have been if different (but plausible) values had been used for the fixed parameters and if the sampling error had been different?”.

Care should be taken in interpreting MCB results. For each model output the assessment teams presented the 10th and 90th percentile from the MCB analysis (e.g., for tilefish the 10th and 90th percentiles were 1792 mt and 3644 mt). These should be treated as indicating the approximate range of the uncertainty associated with each output. However, they should not be interpreted probabilistically. That is, we should not say that we can have 80% confidence that the true MSY for tilefish lies between 1792 mt and 3644 mt. There are two main reasons for this. First, consider the initial SSB, which was allowed to take any value between 0.5SSB(virgin) and 1.3SSB(virgin). This defines the range of uncertainty for SSB(initial) but it is not probabilistic because it is not true that all values in this range are equally likely. A similar comment applies to uncertainty in natural mortality. The second reason is that it is not appropriate to treat all MCB runs as having equal weight. In some runs, the randomly chosen parameter values will not produce a good fit to the data. For a formal probabilistic interpretation these runs would need to receive less weight than those for which the data are fitted well.

There was one type of probabilistic interpretation which the Panel felt was acceptable (although not strictly correct). Consider, for example, the forward projections with no fishing for snowy grouper (Figure 60). Here, the median line crosses 1 in about 2015. From this we can say that there is a more than 50% chance that snowy grouper would not rebuild to MSY in less than 10 years.

The Review Panel considered that the statistical catch-at-age model used for both snowy grouper and tilefish was appropriate for the available data and, within the limits of the data, adequately addressed questions of exploitation and relative abundance. It also believed that the median MCB values provide the best estimates of model outputs, but that it is useful, for comparative purposes, to include results from the initial run in all plots except for those from projections. The initial run is also important because it provides important diagnostic plots, such as those illustrating model fit to the data.

There is not a single median run as such chosen from the MCB replicates. For each parameter or model product (SSB2002, MSY etc) there is a median. Some of the products are expressed as ratios, (Figure 56 of snowy grouper report SSB2002/SSBmsy) in which case the median of the ratios is chosen and not the ratio of the medians. Thus, it may be that the median ratio will not be the ratio of the median SSB2002 and SSBmsy and such a discrepancy is not an error. The Panel did not have these results in tabular form so an example could not be presented.

The Panel suggested that a reduced-parameter run, with simpler assumptions, be made for both species. In these runs the effective number of parameters estimated was substantially reduced (from 204 to 24 for snowy grouper and from 147 to 13 for tilefish) by making recruitment deterministic and forcing the model to fit the landings exactly. This made the model into an age-structured production model.

The Panel concurred with the AW decision not to include the surplus production model results for either species.

Snowy Grouper: The snowy grouper assessment suggested that fishing mortality first exceeded F_{msy} in the mid 1970s and has fluctuated around $3F_{msy}$ since the early 1980s. This high fishing mortality rate caused the population biomass to decrease below SSB_{msy} in the early 1980s and it

has continued to decline ever since. The Panel concluded that the main information on population trends was coming from the length composition data rather than the abundance data.

Unfortunately, outputs from the 2316 MCB runs fell into two main groups: 1) a realistic group (1470 outcomes) in which population biomass was on the order of a few thousand tons and recent fishing mortalities were about $3F_{msy}$ and 2) an unrealistic group (846 outcomes) with very high population biomasses (on the order of 1 million tons) and very low exploitation (F essentially zero). See Figure 1 which shows a scatterplot of the runs relative to SSB_{msy} and E_{msy} . The Panel concurred with the AW's decision that the latter group was unrealistic, primarily because it implies that fishing mortality has had no impact on the population, but also because the biomass estimates appear highly implausible given known landings, perceptions of general grouper biomass/productivity, and perceptions of available habitat.

The Panel attempted to more objectively define the implausibility of the biomass estimates based on available habitat, but quantification of available habitat could not be provided at the meeting. The Panel recommends using estimates of available habitat and stock productivity to set reasonable upper bounds on biomass estimates when possible. The initial run fell in the realistic low population and high fishing mortality domain.

The Panel attempted to determine from the MCB results if there were combinations of parameter values that were associated with the unrealistic group. No such combinations were evident when the outcomes in ratio of spawning biomass to spawning biomass at MSY (SSB/SSB_{msy}) were plotted against relevant parameters. The bimodality of model estimates for stock condition probably is indicative that these data can only weakly be used to estimate the condition of the underlying stock. A suggestion was to run the model in more phases in the hopes that the high abundance/low mortality result would not occur. However, increasing the number of phases did not cause the model to avoid the unrealistic high abundance/low mortality domain.

The reduced-parameter model resulted in the high abundance/low mortality scenario when initial biomass ratio was set high (0.9) but more closely reproduced the initial run when the initial biomass ratio was estimated. However, the estimated initial biomass ratio was extremely low (0.2) given the low level of catches assumed to have occurred prior to 1961. From this it was inferred that the population decline implied by the length composition data was clearly greater than could have been caused by the observed landings in the early years, suggesting that these landings must have been substantially under-estimated.

The model for snowy grouper showed a sharp decline in biomass beginning in the late 1970s which was before the length composition data were available except for the headboat sector or any age data. The Panel recommends that in such cases of limited age or size composition data in the early years, a sensitivity analysis should be conducted which starts in the year that age or size composition data is available. Due to time constraints and the complexity of the requisite modeling, this recommendation could not be met at the meeting.

Tilefish: The tilefish assessment indicated that fishing mortality first exceeded F_{msy} in the early 1980s and has remained there since. This high fishing mortality rate caused the population biomass to decrease to near MSY levels in the mid 1980s, where it has remained ever since. Fishing mortality in recent years has exceeded F_{msy} , but the population has been maintained at B_{msy} because of better than average recruitment. As with snowy grouper, the main information on population trends appeared to be coming from the length composition data.

In contrast to the two clusters of MCB results seen in the snowy grouper assessment, only two of the 1100 MCB runs were unsatisfactory (and so were not included in summary statistics). They were rejected because for these two the model did not converge.

The reduced-parameter run produced a biomass trajectory that was similar to that from the initial run, except that the biomass continued to decline below B_{msy} in the most recent years. This revealed how much the initial run's assessment of stock status depends on the parts of the length composition data which indicate above average recruitment in recent years. More comprehensive age data would have strengthened the model's inferences about these recruitments.

3. Evaluate the adequacy, appropriateness, and application of the methods used to estimate population benchmarks (e.g., MSY , F_{msy} , B_{msy} , $MSST$, $MFMT$, or their proxies) and state whether or not the methods are scientifically sound.

The Panel recommended using the median benchmarks.

Methods were considered appropriate and adequate for estimating benchmarks.

4. Evaluate the adequacy, appropriateness, and application of the methods used to project future population status and, if appropriate, evaluate stock rebuilding; state whether or not the methods are scientifically sound.

The Panel concludes that the methods used in the projections are appropriate, adequate, and scientifically sound, and recommends using the median of projection results. As mentioned above, the 10th and 90th percentiles shown in the projections are indicators of the range on uncertainty and are not to be taken as confidence limits.

5. Ensure that all available required assessment results (as listed in the SEDAR Stock Assessment Report Outline) are clearly presented in the Stock Assessment Report and consistent with the Panel's decisions regarding adequacy, appropriateness, and application of the data and methods.

Assessment results were clearly and adequately presented by the tables and figures in the Assessment Reports for snowy grouper and tilefish. Several members of the Panel found the complete documentation of equations and the inclusion of model code particularly informative, and recommend that such information become a standard component of SEDAR assessment reports. Further, it is recommended that model input data files also be included in future reports.

The Review Panel noted several minor errors and omissions in figures; these will be corrected by the analysts. The Review Panel suggests that two additional pieces of information be provided in future reports: 1) a table of model parameter estimates, and 2) a thorough documentation of the process that led to the initial model configuration. The Review Panel requested details of the seasonal and spatial coverage of the length and age samples.

6. Evaluate the performance of the Data and Assessment Workshops with regards to their respective Terms of Reference, and state whether or not the Terms of Reference for those previous workshops are adequately addressed in the Stock Assessment Report.

The Review Panel found it helpful to address the Data Workshop Terms of Reference during deliberations of TOR 1 above. The Review Panel concluded that all but one of the Data

Workshop Terms of Reference were addressed adequately for snowy grouper and tilefish in the Data Workshop Report. The one TOR that was not addressed is TOR 1, which required identifying the unit stock. The Review Workshop also recommends that future data workshop reports provide greater evaluation of input data. In many instances data are provided with little consideration of the ‘evaluation of quality and reliability’ as required in the Terms of Reference.

The Review Panel concluded that the assessment reports adequately addressed the AW Terms of Reference.

The Review Panel suggests for future SEDARs that confusion may be reduced by providing a brief description of the process that leads to assessing only a subset of those species addressed in the Data Workshop.

7. Review the assessment workshop’s recommendations of future research for improving data collection and the assessment, and make any additional recommendations warranted.

The Panel supports the research recommendations included in the snowy grouper and tilefish assessment reports. However, the Panel felt it was important to provide some specific additional detail.

Regarding ageing methods, the Review Panel recommends that ageing validation should be accomplished prior to addressing concerns over differences in age determinations between the various labs.

Regarding age sampling, the Panel recommends that the suggested initial sampling rate for age structures be clarified to avoid the suggestion of age as a sampling strata. The intent is to establish an initial age sample of 20 times the number of ages in the population. The Review Workshop also recommends that stratification by length and development of appropriate age-length keys be considered as a possibly more effective and economical approach to inferring age composition than attempting random age sampling. Regardless of the method ultimately chosen, it is most important to provide adequate age and length sampling through a rigorous and statistically valid sampling program.

The Panel recommends exploring the relative importance of age sampling in models of the type used here to assess snowy grouper and tilefish. Such analysis could help identify the best allocation of limited monitoring resources.

The Panel supports the snowy grouper recommendation # 7 regarding research into the implication of sex change. The Review Workshop adds that future assessment models addressing species which undergo sex change should provide model results that incorporate sex-specific information.

8. Prepare a Consensus Peer Review of Assessments summarizing the peer review panel’s evaluation of the tilefish and snowy grouper stock assessments and addressing the Terms of Reference. (Drafted during the Assessment Review Panel workshop with a final report due three weeks after the workshop ends.).

A draft was prepared during the meeting and a final version was circulated to the Panel afterwards.

9. *Prepare a Stock Advisory Report summarizing the stock assessments.* (Drafted during the Assessment Review Panel workshop with a final report due three weeks after the workshop ends.)

The Review Panel was advised that the Stock Advisory Report will be prepared by the analytical team reflecting the assessment results endorsed during the Review Workshop.

II. Additional Comments

During the Review, several requests were made by the Panel for additional explanation or analysis. See Appendix E. These requests were always dealt with promptly, professionally and reported clearly.

Simulations to examine the distribution of the initial to unfished biomass ratios:

The Panel conducted a simulation exercise to examine the distribution of the starting year biomass, given recruitment variability. The starting year biomass is modeled as the ratio of biomass in the first year to the unfished biomass (B1 ratio). The B1 ratio is one of the distributions assumed in the MCB approach. The Panel's simulation assumed tilefish biological parameters and projected a population for 100 years given only uncertainty in the annual recruitment deviations. The biomass in the final year of the projection was compared to the deterministic value of unfished biomass. Repeating this 100 year projection 10,000 times allowed formation of the distribution of the B1 ratio. This distribution was approximately lognormal in shape and ranged from approximately 0.8 to 1.5. The Panel recommends a similar simulation approach to determine appropriate distributions for MCB approaches requiring a distribution for the B1 ratio.

Rebuilding time frame:

The Panel observed that the median of the MCB projections for snowy grouper crossed quite close to SSB_{msy} in 2015. The decision whether or not to invoke the rebuilding rule is well within the distribution of projections. Although the Panel did not consider this issue in any detail, concern was mentioned about the difficulty caused by the abrupt transition from one harvest strategy to another when the trigger is the probable state of the resource which is poorly defined.

3. Stakeholder Comments

The stakeholder present commented that this SEDAR Review was an improvement in its openness to discuss ecological issues.

Given the weakness of the data, and that these were new assessments, it would have been useful to have had industry representation to respond to the assessments and their results.

4. Recommendations for Future Workshops

The Panel considered that the lack of representation by fisherman limited the scope of input and the points of view that were considered. A number of questions arose regarding selectivity and fishery practices that may have been addressed by industry participation.

Appendix A Terms of reference for SEDAR 4 Review: Tilefish and Snowy Grouper

The SEDAR Assessment Review Panel will evaluate the tilefish and snowy grouper stock assessments, input data, assessment methods, and model results as put forward in stock assessment reports. The Assessment Review Panel will:

- A1. Evaluate the adequacy and appropriateness of all data used in the assessment and state whether or not the data are scientifically sound;
- A2. Evaluate the adequacy, appropriateness, and application of the methods used to estimate population parameters such as abundance, biomass, and exploitation and state whether or not the methods are scientifically sound;
- A3. Evaluate the adequacy, appropriateness, and application of the methods used to estimate population benchmarks (*e.g.*, *MSY*, *F_{msy}*, *B_{msy}*, *MSST*, *MFMT*, or their proxies) and state whether or not the methods are scientifically sound;
- A4. Evaluate the adequacy, appropriateness, and application of the methods used to project future population status and, if appropriate, evaluate stock rebuilding; state whether or not the methods are scientifically sound;
- A5. Ensure that all available required assessment results (*as listed in the SEDAR Stock Assessment Report Outline*) are clearly and accurately presented in the Stock Assessment Report and that such results are consistent with the Panel's decisions regarding adequacy, appropriateness, and application of the data and methods;
- A6. Evaluate the performance of the Data and Assessment Workshops with regards to their respective Terms of Reference, and state whether or not the Terms of Reference for those previous workshops are adequately addressed in the Stock Assessment Report;
- A7. Review the assessment workshop's recommendations of future research for improving data collection and the assessment, and make any additional recommendations warranted;
- A8. Prepare a Peer Review Consensus Summary summarizing the Panel's evaluation of the tilefish and snowy grouper stock assessments and addressing each Term of Reference. (Drafted by the Panel during the Review Workshop with a final report due three weeks after the workshop ends.);
- A9. Prepare a Stock Advisory Report summarizing the stock assessments. (Drafted during the Assessment Review Panel workshop with a final report due three weeks after the workshop ends.).

Appendix B : Attendees at SEDAR4 Assessment Review Panel Workshop

CIE Participants

Robert Mohn (Chair) Bedford Institute of Oceanography, P.O. Box 1006,
Dartmouth, N.S., CANADA B2Y 4A2
Phone: 902-426-4592.
Email: mohnr@mar.dfo-mpo.gc.ca

Chris Francis National Institute of Water and Atmospheric Research Ltd
P.O. Box 14-901, Kilbirnie, Wellington, NEW ZEALAND
Phone: +64-4-386 0300, Fax: +64-4-386 0574
Email: c.francis@niwa.cri.nz

Panel Members

Chris Legault Northeast Fisheries Science Center
166 Water Street, Woods Hole, MA 02543-1026
Phone: 508-495-2025, Fax: 508-495-2258
Email: chris.legault@noaa.gov

Scott Nichols Pascagoula Laboratory, PO Drawer 1207
Pascagoula MS 39568-1207
Phone: 228-762-4591 ext. 269, Fax: 228-769-9200
Email: scott.nichols@noaa.gov

Robert Muller FL Fish and Wildlife Conservation Commission
Fish and Wildlife Research Institute, 100 Eighth Avenue SE
St Petersburg, FL 33701
Phone: 727-896-8626 ext. 4118, Fax: 727-893-1374
Email: robert.muller@fwc.state.fl.us

Doug Rader Environmental Defense, 2500 Blue Ridge Road, Suite 330
Raleigh, NC 27607
Phone: 919-881-2601, Fax: 919-881-2607
Email: drader@environmentaldefense.org

SEDAR Coordinator

John Carmichael SEDAR, 1 South Park Circle, Suite 306
Charleston, SC 29407
Phone: 843-571-4366, Fax: 843-769-4520
Email: john.carmichael@safmc.net

Presenters

Mike Prager NOAA Beaufort Lab, Mike.Prager@noaa.gov
Doug Vaughn NOAA Beaufort Lab, Doug.Vaughan@noaa.gov
Kyle Shertzer NOAA Beaufort Lab, Kyle.Shertzer@noaa.gov
Erik Williams NOAA Beaufort Lab, Erik.Williams@noaa.gov

Appendix C: Terms of Reference for the Data Workshop.

DW1. Evaluate stock structure and develop a unit stock definition.

DW 2. Evaluate the quality and reliability of life-history information (Age, growth, natural mortality, reproductive characteristics); develop models to describe growth, maturation, and fecundity by age, sex, or length as appropriate.

DW 3. Evaluate the quality and reliability of fishery-independent measures of abundance; develop indices by appropriate strata (e.g., age, size, and fishery) for use in assessment modeling.

DW 4. Evaluate the quality and reliability of fishery-dependent measures of abundance; develop indices for use in assessment modeling.

DW 5. Evaluate the adequacy of the NMFS logbook data as a fishery-dependent measure of effort and catch rates; develop indices of abundance for use in assessment modeling.

DW 6. Evaluate the quality and reliability of commercial and recreational fishery-dependent data for determining harvest and discard by species; develop estimates of total annual catch including both landings and discard removals by species.

DW 7. Evaluate the quality and reliability of data available for characterizing the size and age distribution of the catch (landings and discard); characterize commercial, recreational, and headboat landings and discard by size and age.

DW 8. Evaluate the quality and reliability of available data for estimating the impacts of management actions.

DW 9. Recommend assessment methods and models that are appropriate given the quality and scope of the data sets reviewed and management requirements.

DW 10. If data are not adequate for assessment modeling of each species listed in the complex, evaluate the feasibility of (1) using specific members of the stock complex as indicator species, or (2) using other metrics to evaluate stock status.

DW 11. Provide recommendations for future research (research, sampling, monitoring, and assessment).

DW 12. Prepare complete documentation of workshop actions and decisions, and generate introductory, descriptive, and research needs sections (1-4, 9) of the stock assessment report.

Appendix D: Terms of Reference for the Assessment Workshop.

AW1. Select several appropriate modeling approaches, based on available data sources, parameters and values required to manage the stock, and recommendations of the Data Workshop.

AW2. Develop and solve the chosen population models, incorporating data that are the best available, the most recent and up-to-date, and scientifically sound.

AW3. Provide measures of model performance, reliability, and goodness of fit.

AW4. Estimate values and provide tables of relevant stock parameters (abundance, biomass, fishery selectivity, stock-recruitment relationship, etc; by age and year).

AW5. Consider sources of uncertainty related to input data, modeling approach, and model configuration. Provide appropriate and representative measures of precision for stock parameter estimates.

AW6. Provide Yield-per-Recruit and Stock-Recruitment analyses.

AW7. Provide complete SFA criteria: evaluate existing SFA benchmarks; estimate alternative SFA benchmarks if appropriate; estimate SFA benchmarks (MSY, Fmsy, Bmsy, MSST, and MFMT) if not previously estimated; develop stock control rules.

AW 8. Provide declarations of stock status relative to SFA benchmarks: MSY, Fmsy, Bmsy, MSST, MFMT.

AW 9. Estimate the Allowable Biological Catch (ABC) for each stock.

AW 10. Estimate probable future stock conditions and develop rebuilding schedules if warranted; include estimates of generation time.

AW 11. Evaluate the impacts of current management actions, with emphasis on determining progress toward stated management goals.

AW 12. Provide recommendations for future research and data collection (field and assessment); be as specific as possible in describing sampling design and sampling intensity.

AW 13. Provide thorough justification for any deviations from recommendations of the Data Workshop or subsequent modification of data sources provided by the Data Workshop.

AW 14. Fully document all activities: Draft Section III of the SEDAR Stock Assessment Report; Provide tables of estimated values; Prepare a first draft of the Advisory Report based on the Assessment Workshop's recommended base assessment run for consideration by the Review Panel. Reports are to be finalized within 3 weeks of the conclusion of the Assessment Workshop.

Appendix E. requests for additional analysis during Workshop.

With one exception, these were all performed in a prompt and complete fashion. That one exception was the request to start the model at a time in 1982 to more closely match the available data. At the time when the request was made, NMFS personnel explained that it would probably be too difficult to do in the time available.

These are still in the point form used in presentation and are included to chronicle the events at the Review. For more detail, the reader is referred to the Assessment Workshop

The Review Panel made three successive requests from Snowy grouper assessment team:

- 1)
 - Add MSY length compositions to Figure 58
 - Observed and predicted catch differences
 - Model output by sex
 - Scatter plots of input versus MCB criteria
 - Example of "bad" run
 - Initial model run with increased weight on landings
 - Initial model run with constant $M=0.12$
 - Initial model run starting in 1982
- 2)
 - Add deterministic initial run projections to projection figures
 - Try fitting "bad" MCB run with more phases
- 3)
 - Run age-structured production model (called reduced parametric model above)

Tilefish

- Distribution of SSB/MSST, where $MSST=0.75SSB_{msy}$

- Distributions of M at age
- Model run: $SSB(1961)=SSB_{\text{virgin}}$
- Model run: Drop age comps
- Model run: Logistic selectivity for MARMAP survey
- Model run: Age-structured production model equivalent

Citations

Hoenig, John. 1983. Empirical use of longevity data to estimate mortality rates. U.S. Fish. Bull. 81:898-903.

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

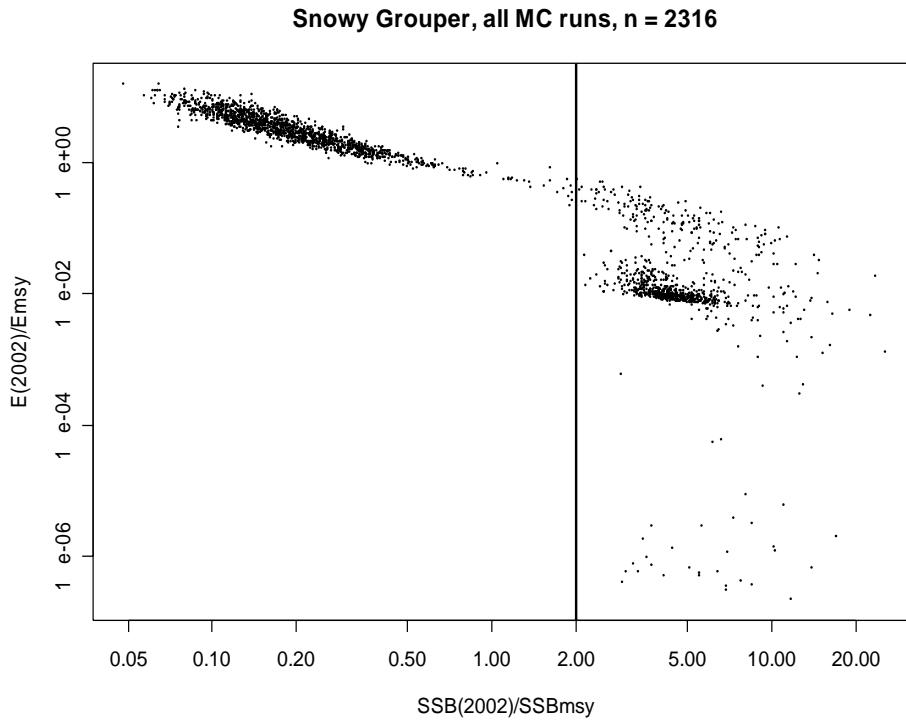


Figure 1. Scatter plot of the MCB replicates showing the two clouds of solutions. The region the Panel called “realistic” cloud is the on concentrated in the upper left corner.