

Chair Report to the Center of Independent Experts (CIE) on the Atlantic Croaker SEDAR
Assessment Review Panel

Stephen J. Smith
Department of Fisheries and Oceans
Bedford Institute of Oceanography
Dartmouth, N.S. Canada B2Y 4A2

Summary of Meeting

The **South East Data, Assessment, and Review (SEDAR)** process for stock assessment and review is used in the National Marine Fisheries Service-Southeast Fisheries Science Center's (NMFS-SEFSC) area of responsibility. This program provides a framework for independent peer review of stock assessments undertaken jointly by NMFS-SEFSC, three Regional Fishery Management Councils, two Interstate Fishery Commissions, and state fishery agencies. This process involves separate workshops to review the data and then the models used in the workshop. The data workshop and assessment workshop were convened by the ASMFC under its established protocols for stock assessment of species managed under the Atlantic Coastal Fisheries Cooperative Management Act. The Commission assessments come to SEDAR in the Review Panel meeting. I represented the Center of Independent Experts as chair for the Peer Review panel held in Raleigh, NC, 6 to 9 October, 2003. The two assessments reviewed by this SEDAR Peer Review Panel were for Atlantic menhaden and Atlantic croaker from the Atlantic States Marine Fisheries Commission's area of jurisdiction.

The assessment for Atlantic croaker was judged to be inadequate for the determination of stock status at the Raleigh meeting. The commercial landings did not include catch from the scrap or bait fishery and it was shown that prior to 1996, landings from the scrap fishery in North Carolina were between 10 and 50 percent of the total commercial landings from that state. Problems were also identified with the population model and with the interpretation of the input data, particularly the National Marine Fisheries Service trawl survey data.

The ASMFC technical committee has finalized an update to the Atlantic croaker stock assessment based on advice from the SEDAR assessment review panel that met in October 2003. The committee addressed five of the seven short-term recommendations made by the panel (Appendix 1). I chaired a two and half hour conference call starting at 9:30 am EDT on June 8, 2004 of the SEDAR review panel to evaluate the technical committee's responses to the five recommendations (SOW, Appendix 2).

The technical committee had conducted a thorough investigation of the data available in North Carolina on the scrap fishery and on the question of applying these results to estimate the landings from Virginia. In the end, the committee determined that the situation in Virginia was different enough from North Carolina and investigated using field samples of lengths from the Virginia harvest to estimate the Virginia scrap component of the landings. The panel accepted these analyses and estimates as the best available. Unfortunately, bycatch data from the shrimp

fishery were not adequate to estimate removals of croaker by this fishery. Given the current size distribution of croaker in the population, catches of croaker in the shrimp fishery are likely to be low at present but research recommendations were drafted to investigate estimates of the historical and current croaker bycatch in future assessments.

Details on the technical committee's response to issues concerning the models and the survey data are presented in Appendix 4. The main issues arising during the conference call concerned the dramatic change in our view of the status of the stock in the early 1970s and the lack of coherence of year-class strength across the different survey series used in the assessment. In the case of the first issue, the difference lay in the fact that in the previous assessment, the ratio of spawning stock biomass in 1973 to the virgin biomass was set to 0.75, whereas, this ratio was estimated in this assessment (as recommended by the review panel) as 0.30. The panel did not have any information available on the fishery in the late 1960s/early 1970s to determine if this was a realistic view of the stock in the early 1970s relative to recent years. The VIMS survey was used as a recruitment index for the model and indicated large year-classes in 1983, 1985–87, and 1991 that were not always picked up as older fish in the other surveys. A research recommendation was drafted to look at all of the survey indices used in the model with respect to the components of the population being monitored.

The stock assessment was limited to the mid-Atlantic fishery for croaker. The panel accepted the revised assessment as the best available and adequate enough to determine that the stock was not overfished, nor was overfishing occurring at the present time.

Meeting Process

The five research recommendations were adopted by the ASMFC as the terms of reference for the conference call. Three documents had been provided to the panel on May 17 as background for this meeting (Appendix 3). The presentation of the material by Janaka DeSilva (FLMRI) during the conference call concentrated on the document entitled "Atlantic croaker 2004 stock assessment supplement". The format of this report laid out the technical committee's response to the 5 terms of reference along with supporting material in a very accessible manner allowing the panel to easily follow the presentation during the conference call. Dr. DeSilva presented a brief outline of the technical committee's response to each term of reference and then responded to questions from the panel members.

The panel was satisfied that the technical committee had adequately responded to the terms of reference and accepted the revised stock assessment as the best available. The research recommendations from the October meeting were revised by removing those that had been dealt with during the conference call and adding some new ones that had come up during the current review. A draft report had been prepared as a template beforehand by ASMFC staff and this was supplied to all panel members before the call. Geoff White kept notes throughout the conference call and used these to revise the draft report. I edited this version of the report within a day and Geoff distributed it to all panel members for comments by June 18. These comments were used to prepare a new version and this was distributed to panel members for comments and an additional conference call was scheduled for 10:00 am EDT June 30.

I chaired the conference call on June 30, and we took two hours to go through the report and prepare the penultimate version of the report. A few grammatical corrections were sent in after the meeting. The final report dated June 30 is attached in Appendix 4.

Other observations on the meeting process

This panel had provided excellent peer review in the October 2003 meeting and continued to do so for this reassessment of the croaker stock. The ASMFC staff, as always, were diligent, helpful and prompt with material and drafts. The technical committee did an outstanding job in responding to the terms of reference. I believe that together we achieved the best assessment of the mid-Atlantic croaker stock possible for the data at hand.

Panel membership for June 8 conference call:

ASMFC Staff - Geoff White, Nancy Wallace
CIE - Stephen Smith
Chesapeake Bay Foundation - Bill Goldsborough
RI-Dept Env. Mgmt - Najih Lazar
NMFS - Rick Hart (for Jim Nance)
NMFS - Paul Nitschke
NC-Dept Mar. Fish - Lee Paramore
SC - Dept Nat. Res. - Elizabeth Wenner
MD Saltwater Sportfish Assoc Bill Windley

Tech Comm Members: Janaka Disilva (FL-Fish Wild Cons. Comm), Rob O'Reilly (VA Mar Fish Comm), Paul Piavis (MD-Dept. Nat. Res)

Panel membership for June 30 conference call:

ASMFC staff - Geoff White, Patrick Kilduff
CIE - Stephen Smith
NMFS - Paul Nitschke
CBL - Tom Miller
NMFS - Jim Nance
NC-Dept Mar. Fish - Lee Paramore

Appendix 1: Terms of reference for Atlantic Croaker 2004 SEDAR

1. Evaluate the adequacy and appropriateness of fishery-dependent and independent data used in the assessments (i.e. was the best available data used in the assessment).
 - Evaluate North Carolina unculled bait (“scrap”) fishery data and include in the commercial landings.
 - Evaluate the potential of applying the North Carolina unculled bait fishery data to other states.
 - Consider at-sea observer data for discards and bycatch.
2. Evaluate the adequacy, appropriateness and application of models used to assess these species and to estimate population benchmarks.
 - Extend the NMFS NEFSC bottom trawl survey data to 1973 for inclusion in the model.
 - Evaluate the difference between the Delta lognormal and stratified mean estimates from NMFS NEFSC bottom trawl survey.
 - Evaluate the VIMS survey data for possible inclusion in the model.
 - Re-evaluate after inclusion of the full time series of NMFS NEFSC and VIMS trawl survey data.
 - Evaluate the consequences of alternative weighting schemes.
 - Provide detailed justification for the final choice of weighting scheme.
3. Evaluate the adequacy and appropriateness of the Technical Committee’s recommendations of current stock status based on biological reference points.
 - Estimate the error distribution for current estimates of F, and reference points.
 - Determine whether, given error distributions determined above, target F and threshold F could be distinguished from estimates derived from the assessment model.
 - Consider revising F target reference point relative to the previous bullet.
4. Develop recommendations for future research for improving data collection and the assessment.

Appendix 2: Statement of Work:

STATEMENT OF WORK

Consulting Agreement between the University of Miami and Dr. Stephen Smith

March 10, 2004

Introduction

The **South East Data, Assessment, and Review (SEDAR)** process for stock assessment and review is used in the NMFS-Southeast Fisheries Science Center's area of responsibility. This program provides a framework for independent peer review of stock assessments undertaken jointly by NMFS-SEFSC, three Regional Fishery Management Councils, two Interstate Fishery Commissions, and state fishery agencies. The SEDAR process uses a three-phase approach: a data workshop, an assessment workshop, and a peer review panel workshop. The peer review panel is composed of stock assessment experts, other scientists, and representatives of the Councils/ Commissions, the fishing interests, and non-governmental conservation organizations. The communication elements of SEDAR include a stock assessment report from the Assessment Workshop, a review panel report evaluating the assessment(s) (drafted during the Review Panel Workshop), presentation of the peer-reviewed assessment results to the Council(s)/Commission(s) and public, and publication of collected documents for stock assessments in that cycle of SEDAR.

The assessment to be reviewed by this SEDAR Peer Review Panel is for Atlantic croaker from the Atlantic States Marine Fisheries Commission's (ASMFC's) area of jurisdiction. A data workshop, assessment workshop, and an assessment review workshop were convened by the ASMFC for Atlantic croaker under its established protocols for stock assessment of species managed under the Atlantic Coastal Fisheries Cooperative Management Act. The assessment review workshop met in October 2003, and was chaired by Stephen Smith, and independent scientist contracted by the Center of Independent Experts (CIE).

The ASMFC is now finalizing an update to the Atlantic croaker stock assessment based on advice from the SEDAR assessment review panel that met in October 2003. The ASMFC technical committee will be addressing five of the seven recommendations made by the panel in the short term. This panel will include up to 12 members: a senior assessment scientist from NMFS, a Commission/Council staff scientist, up to 4 assessment scientists from the ASMFC member states, a commercial or recreational fisherman from the species advisory panel on croaker, a scientist representative from a non-governmental organization, and Dr. Stephen Smith, who will continue in his role as an independent panel chair.

Specific Tasks

The CIE shall provide a chair of the SEDAR stock assessment review panel: Stephen Smith. The primary responsibility for the panel shall be to peer-review the updated stock assessment document. As panel chair, Dr. Smith shall coordinate this process.

The ASMFC coordinator shall provide the CIE with copies of the following documents for distribution to the Chair. Individual panel members will receive the same documents from the ASMFC.

Revised report of Atlantic croaker stock assessment.

Working documents in support of the revised stock assessment.

SEDAR review panel summary report on croaker from the October 2003 workshop.

It is estimated that the Chair's duties will occupy a total of 10 working days – several days prior to the review panel conference call, and several days after the conference call to finalize the SEDAR review panel report and the chair's report for the CIE.

The review process and schedule, and the chair's responsibilities, are summarized below.

Activity/Milestone	Date	Chair Responsibility
1. Atlantic croaker technical committee meeting to review updated assessment.	March - May	None
2. Final assessment document sent to SEDAR review panel and to the CIE by ASMFC.	May 14	None
3. Comments on final assessment document due back to ASMFC from SEDAR review panel.		Read and review documents to gain an in-depth understanding of the revisions to the stock assessment and the resources and information considered in the revised assessment; compile comments of other SEDAR panellists into draft review panel report.
4. Conference call among the SEDAR review panel members to identify and address all significant differences of opinion. The ASMFC staff shall assist the Review Panel Chair prior to the conference call to ensure that final documents/results for review are distributed to panelists in a timely fashion. Scientists from the ASMFC Technical Committee and Stock Assessment subcommittee will present the assessments and be available during the meeting to provide supplemental information as	June 8	Set up and chair conference call; control and guide the meeting, including the coordination of presentations and discussions, and the flow of documents, if necessary; reconcile all significant differences of opinion among panellists where possible. A minority report shall be included where consensus is not reached.

requested by the review panel.		
5. Finalize SEDAR review panel report. ASFMC shall distribute this report to the Atlantic croaker technical committee.	July 1	Facilitate completion of SEDAR review panel report by ASMFC staff as necessary, including minority opinions where agreement is not possible. This report is NOT a CIE product. On May 21, the final review panel report shall be provided to Dr. Nancy Thompson, NMFS-SEFSC, 75 Virginia Beach Drive, Miami, FL 33149 (e-mail, Nancy.Thompson@NOAA.GOV); Dr. Lisa Kline, ASMFC, 1444 Eye Street NW, Sixth Floor, Washington, DC 20005 (e-mail, lkline@asmfc.org); Dr. David Sampson of the CIE shall also be provided a courtesy copy via e-mail at david.sampson@oregonstate.edu .
6. Provide chair's report to the CIE ¹ . The chair's report shall document all stages of the final review process. See Annex 1 for details of outline and contents.	June 23	Write CIE chair's report. The report shall be sent to: Dr. David Sampson, via email at David.Sampson@oregonstate.edu , and Mr. Manoj Shivlani, via email at mshivlani@rsmas.miami.edu . Respond to comments from the CIE's internal review.
7. ASMFC sends SEDAR review panel report and any response by the Atlantic croaker technical committee to the Board.	August 16	None

Contact person:

ASMFC contact: Dr. Lisa Kline, ASMFC Director of Research and Statistics, 1444 Eye Street NW, Sixth Floor, Washington, DC 20005. Phone 202-289-6400. FAX 202-289-6051. E-mail lkline@asmfc.org.

¹ The written chair 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.

ANNEX I: Contents of Chair Report

1. Synopsis/summary of the meeting – to provide context for the comments rather than to rewrite the SEDAR review panel report. (The latter is a product of the meeting, and is not a CIE product.)
2. Views on the meeting process, including recommendations for improvements on:
 - The meeting process itself;
 - The outcome(s) of the meeting;
 - Materials provided for the meeting, including their 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;
 - SEDAR review panel report (if available at the time of report submission).

Appendix 3: Bibliography of the materials provided for the meeting.

1. Atlantic croaker 2003 stock assessment report.
2. Atlantic croaker 2004 stock assessment supplement.
3. SEDAR review panel summary report on croaker from the October 2003 workshop.

Appendix 4: SEDAR review panel report (30 June 2004)

Preface

Summary of the Commission Peer Review Process

The Stock Assessment Peer Review Process, adopted in October 1998 by the Atlantic States Marine Fisheries Commission, was developed to standardize the process of stock assessment reviews and validate the Commission's stock assessments. The purpose of the peer review process is to: (1) ensure that stock assessments for all species managed by the Commission periodically undergo a formal peer review; (2) improve the quality of Commission stock assessments; (3) improve the credibility of the scientific basis for management; and (4) improve public understanding of fisheries stock assessments. The Commission stock assessment review process includes evaluation of input data, model development, model assumptions, scientific advice, and review of broad scientific issues, where appropriate.

The Stock Assessment Peer Review Process report outlines four options for conducting a peer review of Commission managed species. These options are, in order of priority:

1. The Stock Assessment Workshop/Stock Assessment Review Committee (SAW/SARC) conducted by the National Marine Fisheries Service (NMFS), Northeast Fisheries Science Center (NEFSC) or the Southeast Data and Assessment Review (SEDAR) conducted by the National Marine Fisheries Service (NMFS), Southeast Fisheries Science Center (SEFSC).
2. A Commission stock assessment review panel composed of 3-4 stock assessment biologists (state, federal, university) will be formed for each review. The Commission review panel will include scientists from outside the range of the species to improve objectivity.
3. A formal review using the structure of existing organizations (i.e. American Fisheries Society, International Council for Exploration of the Sea, or the National Academy of Sciences).
4. An internal review of the stock assessment conducted through the Commission's existing structure (i.e. Technical Committee, Stock Assessment Committee).

Twice annually, the Commission's Interstate Fisheries Management Program (ISFMP) Policy Board prioritizes all Commission managed species based on species Management Board advice and other prioritization criteria. The species with highest priority are assigned to a review process to be conducted in a timely manner.

In November 2002, the Atlantic croaker stock assessment was prioritized for a SEDAR peer review. A review panel was convened of stock assessment biologists and representatives from the fishing community and non-government organizations. Panel members had expertise in

Atlantic croaker life history and stock assessment methods. The SEDAR review for the Atlantic croaker stock assessment was conducted October 8-9, 2003 in Raleigh, North Carolina.

The Panel described in their report several major issues that required additional work by the Technical Committee (TC). There were seven short-term issues the panel felt should be addressed to update the stock assessment. The South Atlantic State-Federal Fisheries Management Board directed the TC to address five of the short-term issues. These five issues are presented in detail in the Atlantic Croaker 2004 Stock Assessment Supplement. The other two issues; a coast wide versus regional stock assessment, and the exploration of additional models will be addressed at a later time. The detailed descriptions below and the updating of the assessment only refer to the mid-Atlantic model. The status of the South Atlantic stock remains unknown.

Purpose of the Terms of Reference and Advisory Report

The Terms of Reference and Advisory Report provides summary information concerning the Atlantic croaker stock assessment and results of the SEDAR review to evaluate the accuracy of the data and assessment methods for this species. Specific details of the assessment are documented in a supplemental report entitled Atlantic Croaker Stock Assessment Report for Peer Review. To obtain a copy of the supplemental report please contact the Commission at (202) 289-6400.

Acknowledgments

Thanks are due to the many individuals who contributed to the Commission's Atlantic croaker Stock Assessment Peer Review. Special thanks are extended to the Atlantic Croaker Peer Review Panel (William Goldsborough, Chesapeake Bay Foundation, Najih Lazar, Rhode Island Division of Environmental Management Marine Fisheries Section, Dr. Tom Miller, Chesapeake Biological Laboratory, Dr. Jim Nance, NOAA Fisheries NMFS SEFSC, Dr. Paul Nitschke, NOAA Fisheries, NMFS NEFSC, Lee Paramore, North Carolina Division of Marine Fisheries, Dr. Stephen Smith, Bedford Institute of Oceanography, Dr. Elizabeth Wenner, South Carolina Department of Natural Resources, William T. Windley, Jr., Maryland Saltwater Sportfish Association) for their hard work in reviewing the meeting materials and providing advice on improvements to the Commission's Atlantic croaker stock assessment. The Commission would like to extend its appreciation to the members of the Atlantic Croaker Technical Committee and Stock Assessment Subcommittee for development of the Atlantic Croaker Stock Assessment Report for Peer Review ([Stock Assessment Peer Review Report 04-01 Supplement](#)) and specifically to the following members for presenting this report at the Peer Review meeting: Dr. Janaka DeSilva (Florida Fish and Wildlife Commission), and Dr. Eric Williams (National Marine Fisheries Service, Beaufort Laboratory).

Special appreciation is given to the staff dedicated to the performance of the peer review and finalization of peer review reports, specifically – Dr. Lisa Kline, Dr. John Merriner, Nancy Wallace, and Geoffrey White.

Table of Contents

Preface	i
Acknowledgments	iii
List of Figures	v
Terms of Reference for the Atlantic Croaker Peer Review	1
1. Evaluate the adequacy and appropriateness of fishery-dependent and independent data used in the assessment (i.e. was the best available data used in the assessment).	4
2. Evaluate the adequacy, appropriateness and application of models used to assess the species and to estimate population benchmarks.	4
3. Evaluate the adequacy and appropriateness of the Technical Committee’s recommendations of current stock status based on biological reference points.	4
4. Develop recommendations for future research for improving data collection and the assessment.	5
Atlantic Croaker Advisory Report	8
Status of Stocks	8
Stock Identification and Distribution	8
Management Unit	8
Landings	8
Data and Assessment	9
Biological Reference Points	9
Fishing Mortality	9
Recruitment	10
Spawning Stock Biomass	10
Bycatch	10
Sources of Information	10

List of Tables and Figures

Table 1: Landings estimates used in revised model (metric tons)	12
Figure 1. Observed and predicted commercial landings from base Mid-Atlantic model	13
Figure 2. Observed and predicted recreational landings from base Mid-Atlantic model	13
Figure 3. Fishing mortality reference points relative to average fishing mortality rates across the time series for mid-Atlantic base model (steepness=0.76, natural mortality=0.3). $F_{msy}=0.39$	14
Figure 4. Biomass reference points relative to SSB estimates for the mid-Atlantic base model (steepness=0.76, natural mortality=0.3). $SSB_{msy}= 28,932$ MT.....	14

Terms of Reference for the Atlantic Croaker Peer Review

5. Evaluate the adequacy and appropriateness of fishery-dependent and independent data used in the assessments (i.e. was the best available data used in the assessment).

The Atlantic croaker stock assessment used commercial and recreational landings data, the National Marine Fisheries Service (NMFS) Northeast Fisheries Science Center (NEFSC) bottom trawl indices, Marine Recreational Fisheries Statistics Survey (MRFSS) CPUE indices, Southeast Area Monitoring and Assessment Program (SEAMAP) nearshore trawl survey indices, and the Virginia Institute of Marine Science (VIMS) bottom trawl indices.

- **Evaluate North Carolina unculled bait (“scrap”) fishery data and include in the commercial landings.**

For the revised assessment the Atlantic Croaker Technical Committee (TC) has included the Atlantic croaker scrap estimates developed by the North Carolina Division of Marine Fisheries (NCDMF) from 1986-2002. After evaluation of several methods, the TC also included North Carolina scrap estimates for 1973-1985 based on the average ratio of scrap to total unclassified finfish landings (1986-1990) and included in this assessment. The Panel agreed that given the limited data to develop estimates, the methods used were appropriate and provided the best available data on scrap landings for use in the assessment.

- **Evaluate the potential of applying the North Carolina unculled bait fishery data to other states.**

Four methods to estimate Virginia’s scrap landings from North Carolina data were evaluated. The TC also developed an alternate method to estimate Virginia’s scrap landings using the bio-profile data collected by the Virginia Marine Resources Commission (VMRC). The TC concluded that using the field samples of lengths from the Virginia harvest to estimate Virginia scrap was preferable to using data from North Carolina because there are distinct regional differences among the gear, area, and seasonal contributions to the Atlantic croaker landings and scrap. The Panel agreed with the methods and data used to characterize the Virginia scrap fishery. The panel questioned if scrap landings should be applied to other states, and determined that it was not necessary since 90% of all landings are from North Carolina and Virginia.

- **Consider at-sea observer data for discards and bycatch**

The TC evaluated the use of the Northeast Fisheries Science Center (NEFSC) observer database to estimate at-sea discards of Atlantic croaker in the gill net and trawl fisheries. For the at-sea discards, both ratio and trip based estimators were developed for the gill net and trawl fisheries. The TC endorsed using estimates based on the ratio of discards to landings in the final model. The Panel requested clarification on what trips were selected and how sampled hauls were

expanded for the trip estimates of discards to create the ratio-based estimates. The Panel agreed that the ratio approach was appropriate for the NMFS observer data.

The TC also evaluated all available data on shrimp bycatch and made preliminary estimates of Atlantic croaker bycatch in the North Carolina shrimp fishery. Estimates of Atlantic croaker bycatch in the shrimp fishery are highly uncertain. The majority of data were collected in one year of the NMFS observer program (1994). While, the shrimp bycatch is likely to be an important source of mortality, there appears to be little data to support an annual estimate of discards. The technical committee concluded further work needed to be carried out on estimating Atlantic croaker bycatch in the shrimp fishery and therefore did not include it in the assessment at this time. While the Panel agreed with the exclusion of the shrimp bycatch data for this assessment because of low current levels of bycatch, improved methods for monitoring future bycatch were recommended.

Finally, the Panel agreed the TC had done the best job possible to account for the major source of landings data for all fisheries present.

6. Evaluate the adequacy, appropriateness and application of models used to assess the species and to estimate population benchmarks.

- **Extend the NMFS NEFSC bottom trawl survey data to 1973 for inclusion in the model.**
- **Evaluate the difference between the Delta lognormal and stratified mean estimates from NMFS NEFSC bottom trawl survey.**

The National Marine Fisheries Service (NMFS) NEFSC trawl survey was re-examined, and data from 1973 through 2002 were included in the revised model. In the re-analysis of the NEFSC trawl index, estimates were based on numbers because the weight data was incomplete for fish weighing less than 100 grams. The panel was concerned that the survey index based on numbers rather than weight may exaggerate estimates of pre-recruits. The panel recommended comparing sensitivity of model results using survey indices as numbers or weights. Given the use of numbers, the panel recommended investigating the influence of using the assumed dome shape selectivity pattern in the survey rather than a flat-topped selectivity pattern. The panel also recommended an evaluation of separate indices for pre-recruits and adults rather than the single combined index using a selectivity function as was done in this assessment. Analysis of the data set was carried out and annual estimates based on the stratified means (CW-STRAT) were developed. Comparison of delta-lognormal estimates to the NMFS and CW-STRAT indicated that estimates from the delta-lognormal method were not consistent with the estimates derived from the stratified means, with extremely high estimates associated with the delta-lognormal method. The TC concluded that the stratified mean estimates (CW-STRAT) were the most appropriate for use in the model. These estimates were only based on strata that were judged to be suitable Atlantic croaker habitat. The Panel also noted that the delta-lognormal estimates looked unusual. The Panel questioned whether the post-stratifying (combining) of NEFSC strata by depth zone for croaker altered the survey estimates and whether this method produced appropriate variance estimates. Alternate runs of the model showed a Pearson correlation

coefficient of 0.95 between the estimates from the original stratification and those from strata based on depth zone. The Panel supported the use of the stratified mean data from 1973-2002 in the assessment.

The panel noted potential concerns could arise from a latitudinal shift of the stock apparent in the last few years of the survey because such shifts may impact the utility of the various fishery independent surveys as indices of abundance. The panel suggested further investigation into why these shifts are occurring and what impacts they may have to survey indices.

- **Evaluate the VIMS survey data for possible inclusion in the model.**

The spring VIMS index was included in the revised model run. The TC concluded that including the VIMS index into the revised model was beneficial, in that recruitment deviations would be more closely associated with the index and would improve the estimation of parameters in the Stock-Recruit relationship. Also, including these data reduces the overall variability of model results. The Panel questioned why the high recruitment values in the VIMS recruitment index in the mid 1980's are not being well fit by the model or seen as older fish in other indices in subsequent year. The panel recommended evaluation of why high recruitment was not well fit by the model or seen in other indices. The Panel accepted the inclusion of the VIMS index in this assessment.

- **Re-evaluate model estimates of population benchmarks after inclusion of the full time series of NMFS NEFSC and VIMS trawl survey data.**

Preliminary analyses revealed that unless the model included abundance indices that covered the early part of the time series (~1973), the initial SSB:SSB virgin ratio was poorly estimated. Therefore the ratio was deterministically fixed in the original version. In the revised model, two indices cover the early part of the time series, enabling the SSB 1973:SSB virgin ratio to be estimated by the model. In the previous assessment this ratio had been set to 0.75 but is now estimated to be 0.3 which implies a much more pessimistic view of the population in the early 1970s. There were no indications in the data or from the experts present what may have caused these low population levels at that time. The panel also noted the large increase in biomass estimates from the last assessment which fixed the virgin biomass ratio. The panel questioned whether the model is producing an optimistic status determination given the periodic fluctuations in landings from the past and apparent lack in corroboration of the estimated virgin biomass ratio with other data sources (survey length/age distributions). The panel noted the benefits including NMFS and VIMS indices which allowed the model to estimate SSB for all years of the model. The panel discussed survey compatibility given each survey has different geographical coverage and croaker size/age selectivity than other surveys. The Panel concluded that the TC adequately addressed the issues. The Panel recommended future evaluation of why trends in surveys are not closely correlated, and how to reconcile analysis of the various surveys by temporal and spatial coverage, as well as differences in the size/age selectivity.

- **Evaluate the consequences of alternative weighting schemes.**
- **Provide detailed justification for the final choice of weighting scheme.**

In the original version of the age structured production model, the TC gave the fleets, recruitment deviations and the MRFSS index a weight of $\lambda = 1$ and all fishery independent indices a weight of $\lambda = 2$. In this iteration of the model, alternate weighting schemes were explored while keeping the weight on the recruitment deviations constant at $\lambda = 1$. None of the weightings considered produced a fit substantially better than the base model. Simulations indicated that increasing an individual weighting component (to > 5) produced relatively little reduction in the standard deviation of the residuals. There is no objective basis to support an alternate weighting scheme. Therefore the TC used the original weighting scheme as a reasonable choice for the data. The Panel considered this a thorough evaluation of how the model compensates for various weighting schemes and approved the use of the original weights.

7. Evaluate the adequacy and appropriateness of the Technical Committee's recommendations of current stock status based on biological reference points.

The updated Mid-Atlantic assessment results indicate that reference points derived from the base run are robust, and suggest that there was less than a 10% chance that the population is overfished or undergoing overfishing. The Panel recognized that results of the updated assessment provide a more optimistic view of mid-Atlantic stock status than the October assessment. The Panel discussed historical fluctuations in landings that were likely driven by recruitment and noted the recent spike in landings has been maintained longer than historical periods of high landings. The Panel also raised concern on the assumption of a dome-shaped selectivity for the NMFS survey and recommended future evaluation of various selectivity patterns on model output. Model runs by Panel members resulted in less optimistic stock status, but similar trends and interpretation of stock status. The Panel accepted the stock status determination that the mid-Atlantic croaker stock is not overfished and overfishing is not occurring.

- **Estimate the error distribution for current estimates of F, and reference points.**
- **Determine whether, given error distributions determined above, target F and threshold F could be distinguished from estimates derived from the assessment model.**

For both fishing mortality and spawning stock estimates, reference point estimates determined from the base run appear to be more pessimistic (conservative) when compared to other potential weighting scheme (3,500 simulations). The inter quartile range (25-75th percentile) for F_{2002} from the simulations ranged from 0.015 to 0.11. For 2002, average fishing mortality rates from the base model was close to the 75th percentile of the simulation runs (average $F = 0.11$). The inter quartile range for 2002 spawning stock biomass estimates from the simulation ranged between 71,000 and 120,000 MT. In comparison, estimates of spawning stock biomass in 2002 from the base model was 80,000 MT, close to the value of 25th percentile of the simulation runs. Based on the sensitivity runs, it appears that ~25% of the runs had higher fishing mortality estimates than those for the base run and ~25% of the sensitivity runs had spawning stock biomass estimates lower than the base run.

Estimates of F_{msy} from the base mid-Atlantic model was 0.39 and SSB_{msy} was equal to 28,932 MT. Estimates of average fishing mortality rates from the base mid-Atlantic model of 0.11 indicate that 2002 estimates were below the target and threshold levels. Recent estimates of SSB (~80,000 MT) are above both the proposed target and threshold levels. For 2002, $F:F_{msy}$ ratio was 0.263 and $SSB:SSB_{msy}$ ratio 2.78.

Based on the base run's sensitivity to weighting of the likelihood components, and the sensitivity of the model to alternate steepness and natural mortality estimates, estimates derived from the base run appear robust. From the sensitivity analysis on weighting of the likelihood terms, 90 % of the simulations had $F_{2002}:F_{msy}$ ratios less than 0.44. Biomass reference points from the weighting analysis indicated that 10% of the runs had $SSB_{2002}:SSB_{msy}$ ratios less than 2.27. Model sensitivity to steepness and natural mortality estimates also indicated the stock was most likely below the fishing mortality targets and thresholds and above the biomass targets and thresholds; 90 % of the simulations had $F_{2002}:F_{msy}$ ratios less than 0.44 and 10% of the runs had $SSB_{2002}:SSB_{msy}$ ratios less than 2.16.

The updated Mid-Atlantic assessment results indicate that reference points derived from the base run are robust, and suggest that there was less than a 10% chance that the population is overfished or undergoing overfishing. The Panel agreed that the TC had evaluated the major sources of uncertainty and the assessment can now determine that F is below the target and SSB is above the target.

- **Consider revising F target reference point relative to the previous bullet.**

Based on the simulation analysis, the TC feels there appears little need to revise the F target reference points. Of concern, would be management goals that define biomass reference points in absolute terms. Differences in Spawning stock biomass (SSB) estimates are most likely a result of the model accounting for the increased removals as part of the shrimp bycatch by increasing the population estimates. The Panel agreed that F target reference points are appropriate, and support relative SSB targets as the absolute value of SSB may change if shrimp bycatch data can be included in future model runs. The panel recommended that the next assessment include a run with and without shrimp bycatch and compare the impact on the F reference points.

8. Develop recommendations for future research for improving data collection and the assessment.

Issues Identified in This Report:

1. Issue: Commercial landings did not include all removals from the population.
 - Evaluate benefits of additional research on monitoring of the shrimp fishery and methods to estimate historical bycatch.

- The next assessment should include a run with and without shrimp bycatch data as best and worst case stock status scenarios.
2. Issue: Fisheries Independent Surveys show different trends and are difficult to compare based on variable temporal and spatial coverage, as well as differences in the size / age selectivity.
 - Investigate source of variable trends in surveys (not closely correlated), and explore methods to reconcile analysis of the various surveys by temporal and spatial coverage, as well as differences in the size / age selectivity.
 - Evaluate why high recruitment shown in the VIMS index was not well fit by the model or seen in other indices.
 3. Issue: NMFS survey indices based on numbers caught instead of weight, which may exaggerate impact of large catches of pre-recruits.
 - Compare sensitivity of model results to expressing survey indices as numbers or weights.
 - Investigate the influence of using the assumed dome shape selectivity pattern in the survey rather than a flat-topped selectivity pattern.
 - Evaluate splitting the number of pre-recruits and adults into two indices rather than the single combined index using a selectivity function as was done in this assessment.

Issues Remaining From Previous Advisory Report (ASMFC Stock Assessment Report No. 03-02: Terms of Reference & Advisory Report for the Atlantic Croaker Stock Assessment Peer Review October 2003)

High Priority Issues

4. Issue: Separate models were developed for the mid-Atlantic (North Carolina and north) and South Atlantic (South Carolina to Florida). The panel did not feel that there was sufficient biological motivation for such a division currently, but recommend more investigation into stock structure.
 - Investigate the distribution and movement of croaker by age and season.
 - Compare life history parameters over the full distribution of croaker.
 - Conduct tagging and otolith microchemistry studies to address the justification for regional assessments.
5. Issue: The assessment included an age structured production model only. This required development of an algorithm to generate an age structure for the population.
 - Compare non-age structured assessment models, such as the Collie-Sissenwine catch-survey and a delay difference model, to understand the implications of this age structure on derived reference points and stock advice.

The following research recommendations are lower priority, long-term research issues. These recommendations will provide improvements to future assessments.

6. Issue: Difficult to understand what component of the population the surveys were tracking.
 - Include maps of fishery and survey areas in future reports.
7. Issue: A single growth curve based on data from North Carolina (1999-2002) was applied over all years and for the whole area.
 - Evaluate the applicability of the North Carolina growth curve to all areas (spatial variability).
 - Investigate interannual variability in growth.
8. Issue: A single natural mortality estimate was used for all ages and years.
 - Develop age-specific M for inclusion in the model.
9. Issue: Trends in the recruitment deviations may indicate temporal bias in the recruitment model.
 - Assess whether changes in potential population reproductive capacities have changed by quantifying patterns in the maturity ogive and size- and age-dependent fecundity.
 - Assess whether density dependent shifts in age- or condition-dependent timing of age at maturity have occurred as in other sciaenids.
 - Assess whether temporal patterns in recruitment slope or asymptote have occurred.
10. Issue: There are no standard protocols for ageing of Atlantic croaker.
 - Conduct a workshop to develop and approve ageing standards for Atlantic croaker.
 - Continue collection of coastwide age samples from fisheries-independent surveys and length samples from the MRFSS.
11. Issue: Selectivity curves were used for both commercial and fisheries-independent indices.
 - Evaluate culling of the larger fish out of the survey indices to better match the assumed selectivity.
 - Evaluate dome vs. flat topped selectivity curves for survey indices.

Atlantic Croaker Advisory Report

Status of Stocks

Stock status for the mid-Atlantic region is currently not overfished and overfishing is not occurring. The Atlantic croaker stock status for the South Atlantic region is unknown at this time. The South Atlantic region makes up a relatively small component of the total stock biomass.

Stock Identification and Distribution

Genetic studies indicate a single genetic stock of Atlantic croaker on the Atlantic coast and separate, weakly differentiated stocks in the Atlantic and Gulf of Mexico.

Management Unit

The management unit for Atlantic croaker is the entire Atlantic coast from Delaware to Florida.

Landings

Commercial landings for Atlantic croaker exhibited two periods of peak landings: 1975-1980, and 1996 to the present (Table 1). The highest landings were in 1977 at 19,289 mt. The current period of elevated landings is more than seven years. Low levels of harvest were evident during the 1960s and 1970s. The commercial harvest has been dominated by North Carolina and Virginia since 1950.

Recreational landings are from the National Marine Fisheries Service Marine Recreational Fishery Statistics Survey (MRFSS). From 1981-2002, recreational landings of Atlantic croaker (Type A+B1 in numbers) from New Jersey through North Carolina have varied between 366 metric tons (1982) and 4,955 metric tons (2001), with landings showing a strong linear increase over this period (Table 1, Figure 2). Average landings for the period 1981 – 1990 were 786.9 metric tons, while more recent landings (1993-2002) averaged 3,065.2 metric tons. The increased landings in recent years have been at the northern range of the fishery (Massachusetts to North Carolina).

Aggregate, unculled (“scrap”) bait fisheries landings data were included for North Carolina and Virginia. At-sea discard data was included from gill net and trawl fisheries. Scrap landings and discards were combined in the model. Between 1973 and 1995 scrap/discards accounted for an average 20% of removals (ranged between 14-30%). From 1996 to 2002, scrap/discards accounted for an average 3% of removals (Table 1).

Data and Assessment

The Atlantic croaker stock assessment used commercial landings from NOAA general canvas reports for all states from New Jersey through North Carolina. Scrap fishery data for North Carolina and Virginia were included in the assessment model. Observer data from gillnet and trawl fisheries were used to quantify discards. Biological samples were from state surveys from North Carolina since 1982, Virginia since 1989, and limited age/weight data from Maryland since 1999. Recreational landings data from 1981 to the present were from the MRFSS. Recreational landings from 1973-1980 were estimated from the commercial landings to recreational landings ratio from 1981 to the present. A fishery dependent survey index of the MRFSS CPUE index was also used in the assessment for 1981-2002.

Fishery independent surveys included the National Marine Fisheries Service (NMFS) Northeast Fisheries Science Center (NEFSC) fall bottom trawl indices from 1973 to the present, the Southeast Area Monitoring and Assessment Program (SEAMAP) nearshore trawl survey indices from 1989 to the present, and the Virginia Institute of Marine Science from 1973 to the present.

The assessment model used a deterministic age-structured surplus production model to explain the population dynamics of Atlantic croaker, where the population in successive years was linked using a Beverton-Holt stock recruitment relationship. For modeling purposes, the Atlantic croaker population was divided into two geographic regions: mid-Atlantic (all states north of and including North Carolina) and south Atlantic (all states south of and including South Carolina). This review is focused on an updated mid-Atlantic model only.

Biological Reference Points

No biological reference points have been determined for the South Atlantic region. The benchmarks for the mid-Atlantic region listed in the stock assessment report are:

- F threshold - F_{msy}
- Biomass threshold - $0.7 SSB_{msy}$
- F target – $0.75 F_{msy}$
- Biomass target – SSB_{msy}

Estimates of F_{msy} from the base mid-Atlantic model was 0.39 and SSB_{msy} was equal to 28,932 MT. Estimates of average fishing mortality rates from the base mid-Atlantic model of 0.11 indicate that 2002 estimates were below the target and threshold levels (Figure 2). Estimates of SSB from the base mid-Atlantic model relative to the proposed target and threshold SSB levels are shown in Figure 3. Recent estimates of SSB (~80,000 MT) are above both the proposed target and threshold levels. For 2002, $F:F_{msy}$ ratio was 0.263 and $SSB:SSB_{msy}$ ratio 2.78.

Fishing Mortality

Fishing mortality rates for Atlantic croaker exhibit a cyclical trend over the time series. From 1977 to 1979, F rose rapidly reaching a maximum of 0.5 in 1979. From 1980 onwards, F rapidly

declined reaching its lowest levels in 1992. Since 1993, F has gradually increased and between 1997 and 2002 remained relatively stable at around 0.11. Average fishing mortality rates from 1973–2002 from simulations were consistent with patterns observed for the base model. Fishing mortality estimates determined from the base run appear to be more pessimistic (conservative) when compared to other potential weighting schemes.

Recruitment

Three indices tracked recruitment in varying seasons and areas. The fall offshore NMFS NEFSC bottom trawl indices shows a strong peak in 1976 and an increasing trend from 1980 forward with peaks in 1995, 1999, and 2002. The SEAMAP nearshore trawl survey indices, calculated from tows throughout the year, indicates high recruitment in 1992, 1995, and 1999. The VIMS spring Chesapeake Bay bottom trawl indices shows moderate recruitment from 1973-1982, high recruitment from 1983-1991 with peaks in 1983, 1985, 1987, and 1991, and a period of moderate recruitment from 1992 to the present.

Spawning Stock Biomass

Spawning stock biomass estimates (estimated as the proportion of mature females) exhibit a cyclical trend over the time series. From the early 1970s to 1983 spawning stock biomass declined to its lowest level (11,746 MT). Since 1984, spawning stock biomass has increased in three distinct phases, with estimates reaching a maximum in 1996. Between 1999 and 2002 spawning stock biomass estimates have ranged between 80,000-91,000 metric tons. Spawning stock biomass trends from simulation runs also show a similar trend to estimates derived from the base run. Spawning stock estimates determined from the base run appear to be more pessimistic (conservative) when compared to other potential weighting schemes.

Bycatch

Discard information was included in this stock assessment for commercial ocean gillnet and ocean trawl fisheries. While the shrimp bycatch is likely to be an important source of mortality, there appears to be little data to evaluate its magnitude. The technical committee concluded further work needed to be carried out on estimating Atlantic croaker bycatch in the shrimp fishery and therefore did not include it in the assessment at this time. Recreational discards were accounted for in the assessment.

Sources of Information

Atlantic States Marine Fisheries Commission. 2003. Atlantic Menhaden Stock Assessment Report for Peer Review. ASMFC Stock Assessment Peer Review Report No. 03-02 (Supplement). Washington, DC. 154 p.

Restrepo, V.R., G.G. Thompson, P.M. Mace, W.L. Gabriel, L.L. Low, A.D. MacCall, R.D. Methot, J.E. Powers, B.L. Taylor, P.R. Wade, and J. F. Witzig. 1998. Technical guidance on the use of precautionary approaches to implementing National Standard 1 of

Final Croaker Advisory report – June 30, 2004

the Magnuson-Stevens Fishery Conservation and Management Act. NOAA Tech. Memo. NMFS-F/SPO-31. 56 p.

Table 1: Landings estimates used in revised model (metric tons)

<u>Year</u>	<u>Commercial</u>	<u>Recreational</u>	<u>Scrap/Discards</u>
1973	2,611	1,027	1,316
1974	3,515	1,284	1,727
1975	7,484	2,325	1,631
1976	10,300	3,292	1,761
1977	13,506	3,547	2,236
1978	13,292	3,211	2,680
1979	10,385	2,036	3,193
1980	9,923	1,019	2,579
1981	5,289	449	1,790
1982	4,967	366	1,627
1983	3,357	432	1,693
1984	4,570	619	2,002
1985	4,955	546	1,702
1986	5,459	1,067	930
1987	4,756	880	1,705
1988	4,678	1,958	1,715
1989	3,628	938	1,664
1990	2,709	614	1,275
1991	1,651	1,004	1,019
1992	1,905	1,005	858
1993	4,017	1,375	952
1994	4,866	2,116	1,268
1995	6,309	1,713	1,484
1996	9,452	1,821	710
1997	12,231	3,460	753
1998	11,471	3,533	459
1999	12,113	3,134	715
2000	12,091	4,375	596
2001	12,970	4,955	511
2002	11,717	4,170	424

Figure 1. Observed and predicted commercial landings from base Mid-Atlantic model

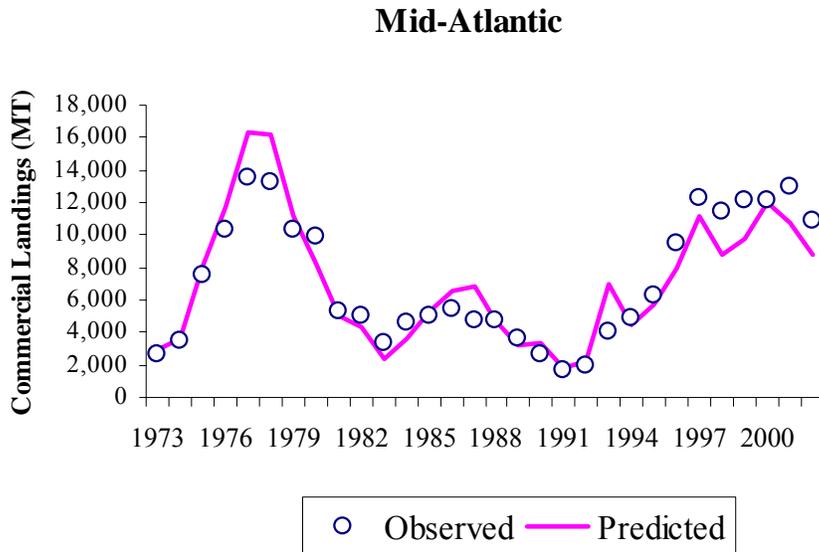


Figure 2. Observed and predicted recreational landings from base Mid-Atlantic model

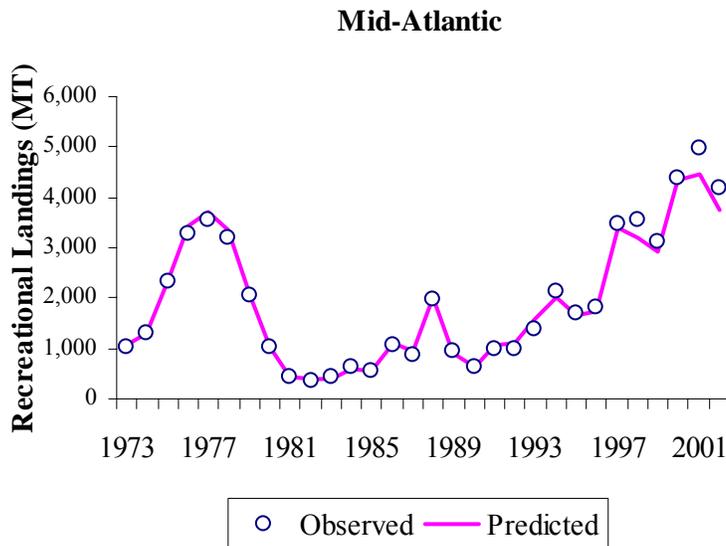


Figure 3. Fishing mortality reference points relative to average fishing mortality rates across the time series for mid-Atlantic base model (steepness=0.76, natural mortality=0.3). $F_{msv}=0.39$.

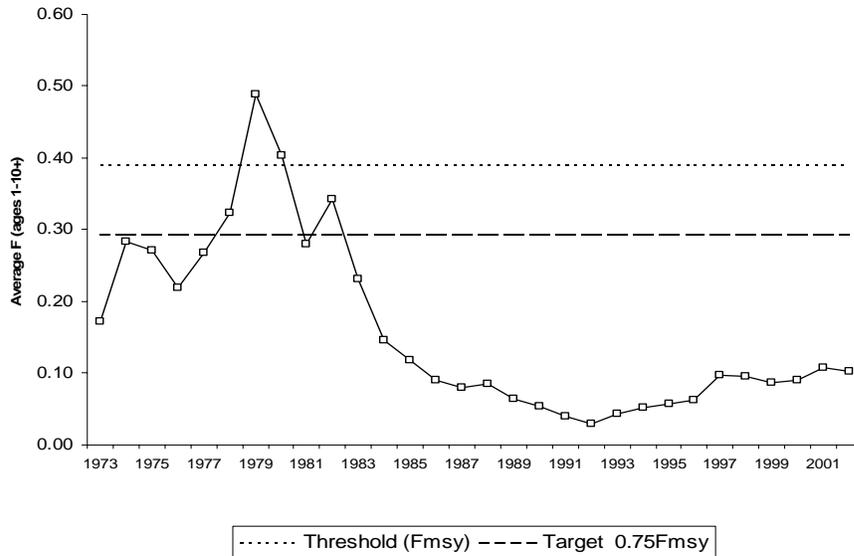


Figure 4. Biomass reference points relative to SSB estimates for the mid-Atlantic base model (steepness=0.76, natural mortality=0.3). $SSB_{msv}= 28,932$ MT

