Center for Independent Experts Review

46th Northeast Regional Stock Assessment Workshop (SAW46)
Stock Assessment Review Committee (SARC) Meeting for
Striped Bass

Northeast Fisheries Science Center
Woods Hole, Massachusetts

November 26 - 30, 2007

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1 Review activities

The 46th Stock Assessment Review Committee (SARC) was chaired by Mr Mike Murphy (Florida Fisheries AND Wildlife Commission). Other members of the review committee were Dr Chris Darby and Dr Geoff Tingley (CEFAS) and myself. As required, the chair and committee members drafted and completed a summary report of the meeting. There were no areas of disagreement among committee members about the content of the summary report, so for all major findings against the terms of reference (TORs) I will refer to the summary report as representing my own views. In preparing the summary report, initial drafting for each TOR was divided among the committee members. I drafted the sections of the summary report related to TOR 2 on abundance indices and TOR 4 on Baranov's catch equation.

2 Terms of Reference

1. Characterize the commercial and recreational catch including landings and discards.
2. Characterize the fisheries independent and dependent indices of abundance.
3. Evaluate the Statistical Catch at Age (SCA) model and its estimates of F, spawning stock biomass, and total abundance of Atlantic striped bass, along with the uncertainty of those estimates.
4. Evaluate the Baranov's catch equation method and associated model components applied to the Atlantic striped bass tagging data. Evaluate estimates of F and abundance from coastwide and Chesapeake Bay specific tag programs along with the uncertainty of those estimates.
5. Review the Instantaneous Rates Tag Return Model Incorporating Catch-Release Data (IRCR) and estimates of F on Atlantic striped bass. Provide suggestions for further development of this model for future use in striped bass stock assessments.
6. Review the Forward-Projecting Statistical Catch-At-Age Model Incorporating the Age- Independent Instantaneous Rates Tag Return Model and estimates of F, spawning stock biomass, and total abundance of striped bass. Provide suggestions for further development of this model for future use in striped bass stock assessments.
7. Evaluate the current biological reference points for Atlantic striped bass from Amendment 6 and determine stock status based on those reference points.

3   Findings by Terms of Reference

3.1   Characterize the commercial and recreational catch.

The SARC concluded that the commercial and recreational catch had been well characterized and that this term of reference was met. I agree with the details contained in the summary report compiled by the review committee for this term of reference.

The striped bass stock assessment has a start year of 1982 and the assessment team has documented the processes undertaken to produce complete fishery catch and discard estimates since then. As the stock had been driven to a low level in 1982 by heavy fishing pressure, the stock assessment has no great need of catch data prior to that year. However, the stock has been at higher levels and driven down in the past. Assuming that there have not been fundamental changes to stock conditions, such as environmental regime shifts or new sources of natural mortality, levels of historical catch can provide us with information about what levels might be sustainable in the long term.

During the meeting we were shown a graph of commercial catches since about 1900. There was a peak in commercial catch in 1972, and then followed by a decline. The assessment team informed us that the average size of the fish in those earlier catches was much smaller than recent average size. That probably indicates that those large early catches were being taken from a stock experiencing more fishing pressure than the current stock.

I believe that if reasonable estimates can be made of total catch in periods prior to 1982, then simple models such as stock reduction analysis can be used to help inform us about catch sustainability. There is probably some scope to create better estimates of total annual catches for the fishery prior to 1982. Whatever effort and abundance indices also apply to these earlier times should also be compiled, preferably into a single document that can be referenced and updated as required.

For the assessed period since 1982 it would also be useful to compile all of the sources of catch data and the assumptions used to create the total catch and discard data into a single source. In other places such catch source data and estimation procedures are standardized and documented within a database system. Consideration should be given for the development of a catch database for striped bass that contains the data, metadata and processing assumptions that can also provide historical catch and discard documentation as standard reports.

3.2   Characterize the fisheries independent and dependent indices of abundance.

The SARC concluded that the fisheries independent and dependent indices of abundance had been well characterized and that this term of reference was met. I agree with the comments and recommendations in the summary report for this TOR.

3.3   Evaluate the Statistical Catch at Age (SCA) model.

The assessment team met this term of reference. I agree with the details contained in the summary report compiled by the review committee for this TOR.

Modeling of the striped bass stock is in a period of rapid evolution. Previous assessments were based on VPA, and now SCA is being used. Modeling of the tag and recapture process is being included within the assessment in an attempt to integrate the analysis of all major data sources within one assessment (see TOR 6). The current assessment is single-stock, single-sex and purely age based.

I believe that there is sufficient information to create a multi-stock, two-sex, both length and age based assessment that can make better use of detail within the source data that is not currently used, and can produce assessment results that are better able to guide management actions – particularly for different sub-stocks.

An important aspect of the striped bass fishery is the sub-stock structure. The young of year indices leave little doubt that a number of sub-stocks are at least differentiated by different recruitment trends by area. The current assessment is for a single coast-wide stock and can not provide information on the different sub-stocks. A population decline in a sub-stock may be missed with application of the single stock assessment model. The assessment team has indicated that the assessment next year will likely include multiple sub-stocks. The review committee has made this a major recommendation and all agree that the assessment will be much enhanced by this development.

Incorporation of spatial detail or sub-stocks within assessments often lead to management actions – particularly for different sub-stocks' models that require the estimation of movement rates between areas and therefore many more potentially annual estimated model parameters. I would like to record here that a simpler framework that just estimates the 3 or 4 sub-stocks as separate populations and then fractions by age of those sub-stocks that combine to apply to the available indices may be all that is required. My own advice would be to try simple sub-stock models first to see whether they can sufficiently capture the spatial structure to be useful. The definition of "useful" here means that they provide expected indices that better match the spatial structure of the observed ones – particularly the young of the year and age 1. An approach such as this avoids the need to estimate migration/diffusion rates, and the additional complexity that entails.

The current assessment does not divide the sexes, and to calculate female spawning biomass makes the assumption that numbers at age are split 50:50. Growth differences are large between males and females. Until about age 3 males and females grow similarly, and after that age females grow faster than males. Striped bass may reach 125lb, but almost all fish greater than 30lb are female. Fishery selectivity which is mostly size-based would operate differentially on numbers at age by sex. Adult migration patterns differ by sex with larger, typically female fish traveling further, again potentially leading to different fishery selectivity patterns by sex and age. Therefore, it is unlikely that age structures by sex are equally divided among the sexes. I recognize that much of the input data are not available by sex, but it is possible to construct two sex models that combine expected numbers by sex for comparison with combined indices or age/length compositions. After adding spatial structure to the model, my recommendation would be to add sex structure.

Finally, fishery selection and management actions primarily apply to striped bass length and not age. Catches by fishing method such as trawl or net operate primarily according to size/length. Discarding of most methods is size/length based, and size limits imposed by management operate purely on length and not age. Background documents state that a 10lb striped bass can be anywhere from 7 to 15 years of age. An assessment that also includes population length-structure would better estimate population effects of selectivity and discarding. After inclusion of spatial structure and sex, I recommend length structure in addition to age structure.

I would not expect that all of the above recommendations be incorporated into the next stock assessment - the continued evolution of the striped bass stock assessment is to be encouraged. At each SARC an assessment that used the same procedure as that presented at the previous SARC should accompany any modified assessment so that the impact of method changes can be judged.

The assessment team has carried out model verification to date by running their stock assessment model on known simulated data. This approach is commendable and should be continued.

3.4   Evaluate the Baranov's catch equation method.

The review committee felt that this term of reference was met; however, the committee had reservations about the validity of the estimated fishing mortality and therefore used the SCA model output to compare to the biological reference point values. I agree with the comments and recommendations in the summary report for this TOR.

I believe that more supporting evidence for changes in natural mortality (whether due to mycobacteriosis or other causes) needs to be gathered. Recent developments in the tag data analysis have relied on changing natural mortality rates to produce F values that seem plausible. There is an inconsistency in using a changing M in the tag analysis and

not in the SCA model which needs to be resolved. Progress to bring the SCA and tag analysis within the one framework should allow this to be better explored (see TOR 6).

3.5   Review the Instantaneous Rates Tag Return Model.

An instantaneous rates tag return model has been developed by the assessment team for review by the SARC. At this time the method has not been used for stock assessment advice, but the stock assessment team sees this method as the development direction for future assessments. This TOR was met, and I agree with the review committee comments in the summary report.

3.6   Review the Forward-Projecting Statistical Catch-At-Age Model Incorporating the Age- Independent Instantaneous Rates Tag Return Model.

The assessment team presented a method that incorporates catch-at-age and tag return data within the same framework. At this time the method has not been used for stock assessment advice, and was provided for review only. This TOR was met, and I agree with the review committee comments in the summary report.

Development of an assessment model that can accept all of the main sources of available data is highly desirable. The implications of changes to fundamental assumptions such as constant or time-varying M can be better evaluated using an integrated model. The appropriate value for natural mortality is a major uncertainty in all fisheries assessments, but perhaps more so for striped bass as there is some evidence for spatial and temporal differences. An integrated model is the best way to evaluate alternative hypotheses in a rigorous manner. The SCA that incorporates tagging should become the primary model used for striped bass stock assessment at some point in the future, presumably after acceptance following additional review. Recommendations described under TOR 3 also apply here.

3.7   Evaluate the current biological reference points.

This TOR was met, and I agree with the review committee comments in the summary report.

There is an increasing need to more directly link the output of the stock assessment to the reference point calculation because recent fishing mortality has been estimated at close to the target level. Should fishing mortality increase, there need to be well documented and understood procedures for translating stock assessment results into management actions. I believe that the SARC has made good recommendations to assist in translating stock assessment results into comparable reference points.

Appendix 1. Bibliography of materials provided by the SARC

List of Files for the SARC46 Striped bass assessment Review		Nov. 2007	
Working Paper	**Files**		**Description**
A1	Assessment Summary Report		Summary; primarily used for management.
A2	Assessment Report		Text of Scientific report -- 2007 assessment.
A2	Assessment Report		Tables of Scientific report.
A2	Assessment Report		Figures of Scientific report.
A2	Assessment Report	Appendix 1	Documentation of Mixed Stock status and GIS
A2	Assessment Report	Appendix 2	Commer. Landings data sources.
A2	Assessment Report	Appendix 3	Estimation ofVirginia and NC harvests.
A2	Assessment Report	Appendix 4	Recreational Fishery Monitoring.
A2	Assessment Report	Appendix 5	Analysis and discussion of 1998-2002 coastwide weight at age.
A2	Assessment Report	Appendix 6	VPA indices workshop.
A2	Assessment Report	Appendix 7	AD Model Builder code for Stat. Catch at Age Model.
A2	Assessment Report	Appendix 8	Plots of SCA Model O-put
A2	Assessment Report	Appendix 9	ADAPT VPA
A2	Assessment Report	Appendix 10	Age-Structured Assessment Program (ASAP).
A2	Assessment Report	Appendix 11	Catch Curve Analysis.
A2	Assessment Report	Appendix 12	Estimation of F on Ages 8+, from landings and survey indices,1982-2006.
A2	Assessment Report	Appendix 13	Input Tagging Matrices for MARK/Catch Method etc.
A2	Assessment Report	Appendix 14	Tables about Tagging Data.
A2	Assessment Report	Appendix 15	AD Model Builder code for Instant rates catch/release model (IRCR).
A2	Assessment Report	Appendix 16	Plots of results from SCATAG model.
	Background		Large pdf with background papers from earlier work; previous assessment.

Appendix 2. Statement of work

Consulting agreement between NTVI and Dr. Neil Klaer

Statement of Work

November 14, 2007

General

The Northeast Regional Stock Assessment Review Committee (SARC) meeting is a formal, multiple-day meeting of stock assessment experts who serve as a panel to peer-review tabled stock assessments and models. The SARC is the cornerstone of the Northeast Stock Assessment Workshop (SAW) process, which includes assessment development (SAW Working Groups or ASMFC technical committees), assessment peer review, public presentations, and document publication.

The SARC46 review panel will be composed of three appointed reviewers from the Center of Independent Experts (CIE), and an independent chair from the Florida Fish and Wildlife Conservation Commission. The panel will convene at the Woods Hole Laboratory of the Northeast Fisheries Science Center (NEFSC) in Woods Hole, Massachusetts, from November 26 - 30, 2007 to review one assessment (Striped bass, *Morone saxatilis*). In the days following the review of the assessments, the panel will write the SARC Summary Report and each CIE reviewer will write an individual independent review report.

Specific Activities and Responsibilities

The CIE's deliverables shall be provided according to the schedule of milestones listed on Page 5. The CIE reviewers, along with input from the SARC Chairman, will write the SARC Summary Report. In addition, each CIE reviewer will write an individual independent review report. These reports will provide peer-review information for a presentation to be made by NOAA Fisheries at meetings of the New England and Mid-Atlantic Fishery Management Councils in 2008. The SARC Summary Report shall be an accurate and fair representation of the SARC panel viewpoint on how well each SAW Term of Reference was completed (please refer to Annex 1 for the SAW Terms of Reference).

The three SARC CIE reviewers' duties shall occupy a maximum of 14 days per person (i.e., several days prior to the meeting for document review; the SARC meeting in Woods Hole; and several days following the open meeting to contribute to the SARC Summary Report and to produce the Independent CIE Reports).

Not covered by the CIE, the SARC chair's duties shall occupy a maximum of 15 days (i.e., several days prior to the meeting for document review; the SARC meeting in Woods Hole; several days following the open meeting for SARC Summary Report preparation.)

Charge to SARC panel

The panel is to determine and write down whether each Term of Reference of the SAW (see Annex 1) was or was not completed successfully during the SARC meeting. To make this determination, panelists should consider whether the work provides a scientifically credible basis for developing fishery management advice. Criteria to consider include: whether the data were adequate and used properly, the analyses and models were carried out correctly, and the conclusions are correct/reasonable. Where possible, the chair shall identify or facilitate agreement among the reviewers for each Term of Reference of the SAW.

If the panel rejects any of the current Biological Reference Point (BRP) proxies for B_{MSY} and F_{MSY}, the panel should explain why those particular proxies are not suitable <u>and</u> the panel should recommend suitable alternatives. If such alternatives cannot be identified, then the panel should indicate that the existing BRPs are the best available at this time.

Roles and responsibilities

(1) Prior to the meeting
(SARC chair and CIE reviewers)
Review the reports produced by the Working Groups and read background reports.

(2) During the Open meeting

(SARC chair)
Act as chairperson, where duties include control of the meeting, coordination of presentations and discussion, making sure all Terms of Reference of the SAW are reviewed, control of document flow, and facilitation of discussion. For each assessment, review both the Assessment Report and the Assessment Summary Report.

During the question and answer periods, provide appropriate feedback to the assessment scientists on the sufficiency of their analyses. It is permissible to discuss the stock assessment and to request additional information if it is needed to clarify or correct an existing analysis and if the information can be produced rather quickly.

(SARC CIE reviewers)

For each stock assessment, participate as a peer reviewer in panel discussions on assessment validity, results, recommendations, and conclusions. From a reviewer's point of view, determine whether each Term of Reference of the SAW was completed successfully. Terms of Reference that are completed successfully are likely to serve as a basis for providing scientific advice to management. If a reviewer considers any existing Biological Reference Point proxy to be inappropriate, the reviewer should try to recommend an alternative, should one exist.

During the question and answer periods, provide appropriate feedback to the assessment scientists on the sufficiency of their analyses. It is permissible to request additional information if it is needed to clarify or correct an existing analysis and if the information can be produced rather quickly.

(3) After the Open meeting

(SARC CIE reviewers)

Each reviewer shall prepare an Independent CIE Report (see Annex 2). This report should explain whether each Term of Reference of the SAW was or was not completed successfully during the SARC meeting, using the criteria specified above in the "Charge to SARC panel" statement.

If any existing Biological Reference Point (BRP) proxies are considered inappropriate, the Independent CIE Report should include recommendations and justification for suitable alternatives. If such alternatives cannot be identified, then the report should indicate that the existing BRPs are the best available at this time.

During the meeting, additional questions that were not in the Terms of Reference but that are directly related to the assessments may be raised. Comments on these questions should be included in a separate section at the end of the Independent CIE Report produced by each reviewer.

If a reviewer feels that his/her comments are adequately expressed in the SARC Summary Report, it will not be necessary to repeat the same comments in the Independent CIE Report. In that case, the Independent CIE Report can be used to provide greater detail on specific Terms of Reference or on additional questions raised during the meeting.

(SARC chair)
The SARC chair shall prepare a document summarizing the background of the work to be conducted as part of the SARC process and summarizing whether the process was adequate to complete the Terms of Reference of the SAW. If appropriate, the chair will include suggestions on how to improve the process. This document will constitute the introduction to the SARC Summary Report.

(SARC chair and CIE reviewers)
The SARC Chair and CIE reviewers will prepare the SARC Summary Report. Each CIE reviewer and the chair will discuss whether they hold similar views on each Term of Reference and whether their opinions can be summarized into a single conclusion for all or only for some of the Terms of Reference of the SAW. For terms where a similar or a consensual view can be reached, the SARC Summary Report will contain a summary of such opinions. In cases where multiple and/or differing views exist on a given Term of Reference, the SARC Summary Report will note that there is no agreement and will specify - in a summary manner – what the different opinions are and the reason(s) for the difference in opinions.

The chair's objective during this Summary Report development process will be to identify or facilitate the finding of an agreement rather than forcing the panel to reach an agreement if it cannot reach one. The chair will take the lead in editing and completing this report. The chair may express the chair's opinion on each Term of Reference of the SAW, either as part of the group opinion, or as a separate minority opinion.

The SARC Summary Report (please see Annex 3 for information on contents) should address whether each Term of Reference of the SAW was completed successfully. For each Term of Reference, this report should state why that Term of Reference was or was not completed successfully. The Report should also include recommendations that might improve future assessments.

If any existing Biological Reference Point (BRP) proxies are considered inappropriate, the SARC Summary Report should include recommendations and justification for suitable alternatives. If such alternatives cannot be identified, then the report should indicate that the existing BRP proxies are the best available at this time.

The contents of the draft SARC Summary Report will be approved by the CIE reviewers by the end of the SARC Summary Report development process. The SARC chair will complete all final editorial and formatting changes prior to approval of the contents of the draft SARC Summary Report by the CIE

reviewers. The SARC chair will then submit the approved SARC Summary Report to the NEFSC contact (i.e., SAW Chairman).

Schedule

The milestones and schedule are summarized in the table below. No later than December 17, 2007, the CIE reviewers shall submit their Independent CIE Reports to the CIE Program manager Dr. Manoj Shivlani via e-mail to mshivlani@rsmas.miami.edu

Milestone	Date
Open workshop at Northeast Fisheries Science Center (NEFSC) (begin writing reports, as soon as open Workshop ends)	November 26-28, 2007
SARC Chair and CIE reviewers work at the NEFSC drafting reports	November 28-30
Draft of SARC Summary Report, reviewed by all CIE reviewers, due to the SARC Chair **	December 17
CIE reviewers submit Independent CIE Reports to CIE for approval	December 17
SARC Chair sends Final SARC Summary Report, approved by CIE reviewers, to NEFSC contact (i.e., SAW Chairman)	December 24
CIE provides reviewed Independent CIE Reports to NMFS COTR for approval	December 31
COTR notifies CIE of approval of reviewed Independent CIE Reports	January 7, 2008 [*]
COTR provides final Independent CIE Reports to NEFSC contact	January 7, 2008

[*] Assuming no revisions are required of the reports.
** The SARC Summary Report will not be submitted, reviewed, or approved by the CIE.

The SAW Chairman will assist the SARC chair prior to, during, and after the meeting in ensuring that documents are distributed in a timely fashion.

NEFSC staff and the SAW Chairman will make the final SARC Summary Report available to the public. Staff and the SAW Chairman will also be responsible for production and publication of the collective Working Group papers, which will serve as a SAW Assessment Report.

NEFSC Contact person and SAW Chairman:
Dr. James R. Weinberg, NEFSC, Woods Hole, MA. 508-495-2352,
James.Weinberg@noaa.gov

a. Submission and Acceptance of CIE Reports

No later than December 31, 2007, the CIE shall provide via e-mail the final independent CIE reports and the CIE chair's summary report to the COTR William Michaels (William.Michaels@noaa.gov) at NOAA Fisheries. The COTR and alternate COTR Dr. Stephen K. Brown (Stephen.K.Brown@noaa.gov) will review the CIE reports to determine that the Term of Reference was met, notify the CIE program manager via e-mail regarding acceptance of the reports by January 7, 2008, and then distribute the reports to the NEFSC contact person.

ANNEX 1:

Terms of Reference

for the 46th Northeast Regional Stock Assessment Workshop on

ATLANTIC STRIPED BASS, *Morone saxatilis*
2007 Stock Assessment & Peer Review

Terms of Reference

1. Characterize the commercial and recreational catch including landings and discards.

2. Characterize the fisheries independent and dependent indices of abundance.

3. Evaluate the Statistical Catch at Age (SCA) model and its estimates of F, spawning stock biomass, and total abundance of Atlantic striped bass, along with the uncertainty of those estimates.

4. Evaluate the Baranov's catch equation method and associated model components applied to the Atlantic striped bass tagging data. Evaluate estimates of F and abundance from coastwide and Chesapeake Bay specific programs along with the uncertainty of those estimates.

5. Review the Instantaneous Rates Tag Return Model Incorporating Catch-Release Data (IRCR) and estimates of F on Atlantic striped bass. Provide suggestions for further development of this model for future use in striped bass stock assessments.

6. Review the Forward-Projecting Statistical Catch-At-Age Model Incorporating the Age-Independent Instantaneous Rates Tag Return Model (SCATAG) and estimates of F, spawning stock biomass, and total abundance of striped bass. Provide suggestions for further development of this model for future use in striped bass stock assessments.

7. Evaluate the current biological reference points for Atlantic striped bass from Amendment 6 and determine stock status based on those reference points.

ANNEX 2: Contents of SARC CIE Independent Reports

1.

For each assessment reviewed, the report should address whether each Term of
Reference of the SAW was completed successfully. For each Term of Reference,
state why that Term of Reference was or was not completed successfully. To make
this determination, CIE reviewers should consider whether the work provides a
scientifically credible basis for developing fishery management advice. Scientific
criteria to consider include: whether the data were adequate and used properly, the
analyses and models were carried out correctly, and the conclusions are
correct/reasonable.

The report may include recommendations on how to improve future assessments.

 If a reviewer feels that his/her comments are adequately expressed in the SARC
Summary Report, it will not be necessary to repeat the same comments in the
Independent CIE Report. In that case, the Independent CIE Report can be used to
provide greater detail on specific Terms of Reference or additional questions raised
during the meeting.

2.

If any existing Biological Reference Point (BRPs) proxies are considered
inappropriate, include recommendations and justification for alternative proxies. If
such alternatives cannot be identified, then indicate that the existing BRPs are the best
available at this time.

3.

Any independent analyses conducted by the CIE reviewers as part of their
responsibilities under this agreement should be incorporated into their Independent
CIE Reports. It would also be helpful if the details of those analyses (e.g, computer
programs, spreadsheets etc.) were made available to the respective assessment
scientists.

4.

Additional questions that were not in the Terms of Reference but that are directly
related to the assessments. This section should only be included if additional
questions were raised during the SARC meeting.

ANNEX 3: Contents of SARC Summary Report

1.

The main body of the report shall consist of an introduction prepared by the SARC chair that will include the background, a review of activities and comments on the appropriateness of the process in reaching the goals of the SARC. Following the introduction, for each assessment reviewed, the report should address whether each Term of Reference of the SAW was completed successfully. For each Term of Reference, the SARC Summary Report should state why that Term of Reference was or was not completed successfully.

To make this determination, the SARC chair and CIE reviewers should consider whether the work provides a scientifically credible basis for developing fishery management advice. Scientific criteria to consider include: whether the data were adequate and used properly, the analyses and models were carried out correctly, and the conclusions are correct/reasonable. If the CIE reviewers and SARC chair do not reach an agreement on a Term of Reference, the report should explain why. It is permissible to express majority as well as minority opinions.

The report may include recommendations on how to improve future assessments.

2.

If any existing Biological Reference Point (BRP) proxies are considered inappropriate, include recommendations and justification for alternative proxies. If such alternatives cannot be identified, then indicate that the existing BRPs are the best available at this time.

3.

The report shall also include the bibliography of all materials provided during SAW 46, and any papers cited in the SARC Summary Report, along with a copy of the CIE Statement of Work.

The report shall also include as a separate appendix the Terms of Reference used for SAW 46, including any changes to the Terms of Reference or specific topics/issues directly related to the assessments and requiring Panel advice.