

Summary Report by the Chair on the 40th North East Regional Stock Assessment Review Committee (SARC)

Robin Cook

Prepared for

University of Miami

Independent System for Peer Review

44 North Deeside Road
Bieldside
Aberdeen
AB15 9DR
UK

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Executive Summary

- (i) A full review of the assessments of goosfish was conducted. The SARC concluded that the NEFSC surveys provided a basis for determining the status of the stocks relative to the over-fished definition. It was not possible to determine the status with regard to overfishing. For both the Northern and Southern stocks the biomass was considered to be above $B_{\text{threshold}}$.
- (ii) The industry collaborative survey for 2004 had not been fully analysed. However, preliminary results indicated that it was consistent with trends observed in the NEFSC surveys.
- (iii) A Bayesian surplus production model had been attempted but the SARC agreed with the Southern Demersal Working Group that the results of the model were not sufficiently reliable for the purposes of providing advice. It appeared that there was relatively little information in the data and that the results from the model were driven by the choice of prior probabilities for the parameters.
- (iv) Reviewers felt that more use could be made of age disaggregated information both from the surveys and catch at age data. This might be done using an integrated model.
- (v) There may be implications for the Northern stock assessment if the Canadian component of Georges Bank forms part of the same stock. This should be investigated.
- (vi) Changes in the sex ratio at older ages suggest that assumptions about homogenous mortality rates may need to be carefully considered.
- (vii) Concerns were expressed about the industry chosen fixed stations in the cooperative survey. These may introduce bias into the estimation of biomass. Alternative methods for biomass calculation need to be considered.
- (viii) Material relating to the incomplete weakfish assessment was reviewed. No attempt was made to evaluate the status of the stock and the panel confined itself to making constructive observations on work undertaken and suggestions for further analysis.
- (ix) The ADAPT assessment of weakfish that used both fishery dependent and fishery independent data showed a strong retrospective pattern. The terminal values tended to over-estimate biomass and underestimate fishing mortality relative to the converged VPA. This is the result of conflicting signals in the data. A surplus production model analysis revealed the same problem.
- (x) Fishery independent surveys all indicate increasing biomass in recent years as the result of good recruitment. However, commercial and recreational data do not

reflect this trend and imply that fish are harder to find. This fundamental problem needs to be addressed by a detailed examination of the basic data. It will not be resolved by re-configuring standard models that assume that all the data reflect the same trends.

- (xi) The SARC cautioned against selecting sub-sets of data in order to obtain an assessment that conformed to a prior hypothesis. Data should not be omitted until a proper understanding of its properties has been gained and sound reasons for exclusion obtained.

1. Background

The meeting of the 40th SARC took place at Wood's Hole on the 29th November to the 2nd December. Initially the committee had been asked to review goosefish, weakfish and scup assessments. However, the scup assessment was not ready for review and was withdrawn. The weakfish assessment was also incomplete but it was agreed that work done so far would be reviewed.

The Panel comprised Robin Cook (chair), John Casey, Peter Shelton and Norm Hall, all representing CIE. They were assisted by the SAW chair, Terry Smith, and the acting head of the NEFSC Population Dynamics Branch, Mark Terceiro. The meeting was attended by a small number of scientists from the NEFSC and staff from the New England Fishery Management Council and the Atlantic States Marine Fisheries Commission.

This report summarises the main points made in the individual reports prepared by the three independent reviewers.

2. Review of Activities

The first day of the meeting was devoted to reviewing the goosefish assessment report. A presentation was made by the lead assessment scientist, Anne Richards. This described the input data, research vessel survey analyses, a Bayesian surplus production model and the preliminary results of the industry goosefish co-operative survey. The SARC discussion covered all four themes and is reported in the Summary document.

On the second day the weakfish assessment was considered. A detailed presentation of the work completed to date was made by Jim Uphoff of the Maryland Department of Natural Resources. This included a detailed description of the fisheries, outputs from ADAPT runs, results from a biomass dynamic model and results of studies examining trophic interactions between weakfish and their prey and predator species. Unfortunately, the lead ADAPT scientist, Des Kahn, was unable to attend the meeting. However, additional contributions to the weakfish assessment were made by Victor Crecco of the Connecticut Marine Fisheries Division.

The weakfish assessment was not complete at the time of the SARC meeting and it had been agreed with the SAW chair that the main purpose of this element of the meeting would be to provide advice to the assessment team on how to resolve certain difficulties with the assessment. Detailed discussions took place about the presentations and the core difficulty of the assessment that revolved around the conflicting signals between the commercial catch data and the research vessel survey data. The weakfish assessment team had posed four questions to the SARC relating to problems with interpreting the data and the application of assessment models (document B13). These were discussed and advice offered.

In order to provide additional advice to the assessment team the SARC panel devoted the morning of the 1st December to individual explorations of the weakfish data. Results of

these panel analyses were discussed with the weakfish assessment team as suggestions for possible ways forward. The public proceedings of the SARC ended on the evening of the 1st December. On December 2nd, the Panel met in private to consider their findings.

Prior to the meeting the assessment of scup was withdrawn and this stock was not reviewed.

3. Findings

3.1. Goosefish

3.1.1. Input Data

It was noted that catch data derived from official statistics are subject to various uncertainties such as the derivation of live weights, assumptions about the way data are expanded and poor information on foreign landings. One reviewer queried the absence of Canadian data given the likely continuation of the Northern US stock into Canadian waters. There were also some questions about the potential bias of discard data. None of the reviewers suggested that these problems significantly undermined use of the catch data in the assessment.

All three reviewers considered that the NEFSC spring and autumn surveys were satisfactory for the purposes of monitoring stock trends as the survey covers a large part of the known stock distribution. However, attention was drawn to the possible disruption of this valuable time series when the new NMFS survey vessel enters service. As the management of the stocks are dependent on these surveys this could have serious implications.

The reviewers noted that the co-operative survey for 2004 had not been fully analysed at the time of the assessment. However, the preliminary biomass estimate from the survey compared to 2001 is consistent with the NEFSC survey. Two reviewers queried the use of the industry-selected fixed stations in the estimates of abundance as these may lead to bias if they were chosen on prior assumptions about goosefish density. Alternate analytic approaches were suggested including removal of these stations from the biomass calculations or the use of geostatistical methods. There had also been changes to the survey design that need to be considered.

The absence of older males in the goosefish cooperative survey data raises interesting questions regarding the adequacy of the assumption of a common instantaneous rate of natural mortality for males and females and/or the accuracy and adequacy of survey estimates of abundance and biomass.

3.1.2. Methods of Assessment

The status of the goosefish stocks is evaluated from the NEFSC surveys by comparing three year moving averages of biomass per tow and exploitation rates

from Heinke's method, with agreed threshold values. One reviewer noted that the use of aggregated values for exploitation rates does not make good use of the age disaggregated data and suggested using a GLM approach of the log index ratios as a potentially useful way forward. He also drew attention to the fact that the method is somewhat *ad hoc* and its performance needs to be evaluated. This could be done with simulated data derived from an operating model.

It was noted that a Bayesian surplus production model had been attempted. The reviewers agreed with the Southern Demersal Working Group that while the method has potential, it is still not ready for use in providing management advice.

3.1.3. Results of the Assessment

On the basis of the NEFSC surveys the reviewers agreed that the Northern and Southern stocks were not over-fished. However, they also concluded that the estimates of exploitation rate were too uncertain to be used to make a judgement about over-fishing.

All of the reviewers expressed doubts about the Bayesian surplus production model results. This had much to do with the fact there appeared to be little information in the data and that the results were effectively determined by the chosen prior probabilities for critical parameters. Concerns were also expressed at the use of the co-operative survey biomass estimate for 2001 to 'anchor' the model. This suggested that the model is heavily dependent on a single observation and the need to anchor the model is related to the fact that there is little contrast in the catch data. One reviewer felt that the review by the SARC of the model was limited and questioned where development of the model was going. He suggested that an integrated analysis might be considered which used age dis-aggregated data as well as biomass aggregate data.

3.1.4. Recommendations for Future Assessments

The following lists the recommendations made by the reviewers.

- An examination of the influence of fixed stations on the estimate of biomass from the cooperative research survey should be undertaken.
- An exploration of a geostatistical approach to estimate biomass from the cooperative survey would also be of value.
- There are some concerns with the ageing results. An ageing validation study should be undertaken to confirm the accuracy of catch at age estimates.
- The changes in the distribution in the fishery over time may be influencing the results of the assessment. This should be examined more thoroughly.

- The assessment lacks a reliable forecast. Since commercial catch-at-age data and survey catch-at-age data exist and assuming that ageing can be validated, alternative forward-projecting age structured models should be investigated.
- An examination of transect survey data for changes in the distribution of the population by depth would be informative.
- Further, consideration should be given to a more complete treatment of the Canadian portion of this stock, with possibly some interaction with the team doing the assessment of monkfish in NAFO Divisions 4VWX5Zc, possibly through the TRAC process.
- Ways of estimating of fishing mortality at age should be investigated. This could take the form of a general linear modelling approach with survey age and year effects in an analysis of Z where $Z_{y,a} = \ln\left(\frac{I_{y+a,a+1}}{I_{y,a}}\right)$. Alternatively a more fully specified population model based on survey-at-age data such as the RCRV1A model of Cook (1997) and recent developments described under SURBA may be applicable.
- The co-operative survey should be continued as it is informative and can be used in the Bayesian surplus production model and may provide a means of calibrating the NEFSC survey data when the survey vessel is replaced.

3.2. Weakfish

3.2.1. Introduction

At the time of the SARC the weakfish assessment was not completed. The Panel agreed to review the work available at the time and offered suggestions to address some of the issues emerging.

3.2.2. Input Data

Input data consisted of catch-at age information, research vessel surveys and commercial abundance indices. Catch at age data had been derived from scale readings in early years and otoliths in more recent years. This change was considered by one reviewer to be a possible source of bias. An analysis by another reviewer suggested that the age disaggregated data did not show any discernible cohort effects and suggested that the data might be better used in aggregate form.

3.2.3. Methods of Assessment

The working group had attempted to use ADAPT as the main assessment tool. This had shown, as in previous assessments, a strong retrospective pattern. The reviewers concluded that the reason for the pattern was an inconsistency between the data from the commercial fishery and the surveys. All the surveys showed an increase in biomass in recent years while the commercial catch at age data indicated the reverse. Other methods such as ICA and a surplus production model had also been attempted but essentially the same problem existed. It was noted that no standard assessment model would resolve the difficulties encountered since the underlying problem lay in the data.

3.2.4. Results of the Assessment

As indicated above the assessments available at the time of the review were incomplete and the results were only presented for discussion. The reviewers agreed that the current status of the assessments was insufficient as a basis for providing advice.

The fishery-dependent data were more consistent with the catch-at-age data but inconsistent with the survey indices. The catch-at-age data showed a declining trend in abundance over recent years and reflected continued levels of relatively high fishing mortality. By contrast, the survey indices, which were more influenced by younger age classes, suggested an increase in biomass over more recent years, implying that reduced catches were a result of considerably reduced fishing mortality.

The SARC advised that the inconsistency should not be resolved by arbitrarily selecting sets of indices that matched a chosen hypothesis. It was essential that the cause of the inconsistency should first be identified in order that an appropriate assessment of stock status might be undertaken. The solution to the problem concerning the inconsistency among indices of abundance and catch at age would not necessarily be resolved by a more complex model, such as an ecosystem or multispecies model, unless that model addressed the fundamental cause of the inconsistency.

Resolution of the inconsistency will require investigations into the basic data. Reviewers suggested using simple ANOVA type approaches or tuning the ADAPT using single data series at a time to identify the signal in each series. However, a more fundamental investigation is likely to be required to understand why the commercial and fishery independent data apparently perceive different signals from the stock.

3.2.5. Recommendations for Future Assessments

- There exists a considerable amount of information that in principle should permit an assessment using catch at age analysis. The basic information should be thoroughly evaluated as to its suitability for this approach.
- The commercial and recreational data should be examined with regard to its precision and accuracy, both in terms of the absolute estimates of catches and its age composition.
- The survey catch rates at age should be evaluated with respect to the spatial and temporal distribution of age groups over time to try to gain an understanding of why there are no consistent year-class signals within surveys.
- The survey distributions should be compared to observed changes in the pattern of the fisheries for weakfish to try to explain the inconsistencies in the trends observed in the different series.
- Work should be undertaken to validate the ageing methods employed.
- It is of primary importance to carefully evaluate the input data in terms of the information content regarding relative year-class strength. This evaluation could take the form of more statistically based GLM approach along the lines of the graphical analysis (i.e. Pope-Shepherd-Nicholson analysis of year-class, age and year effects). Alternatively the survey analysis approach suggested by Cook (1997) and subsequent developments under SURBA could have merit in this regard.
- It seems unlikely that statistical modelling will be able to reconcile the very different perspective on year-class strength between the fishery independent surveys and the index obtained from the NMFS Marine Recreational Fisheries Statistics Survey. This problem should be given urgent attention through a focused research project that considers alternative hypotheses for the divergence.
- The SARC was informed about a possible ecological explanation for the possible decline of the weakfish stock that requires review. Other explanations related to the survey indices and the recreational fishery statistics under the amended FMP also need to be given careful consideration.

4. Reference

Cook, R. M. 1997. Stock trends in six North Sea stocks as revealed by an analysis of research vessel surveys. *ICES Journal of Marine Science* 54, 924–933.

Appendix 1: Bibliography

Goosefish documents

Report of the 34th Northeast Regional Stock Assessment Workshop. Goosefish Advisory Report.

SAW 34. Consensus Summary of Assessments.

SARC 40: Goosefish (Monkfish) Assessment Summary

Goosefish stock assessment: Report of the Southern Demersal Working Group Meeting, October, 2004.

Weakfish documents and materials

Documents provided before the meeting:

30th Northeast Regional Stock Assessment Workshop (SAW). Weakfish Advisory Report.

B1: Weakfish stock assessment summary. Memo from Jim Uphoff

B2: Assessment of Atlantic Coast Weakfish (*Cynoscion regalis*), 1999 Report to the Stock Assessment Review Committee (SARC) February 2000. ASMFC Weakfish Stock Assessment Subcommittee

B3: Weakfish growth analysis, based on 2000 samples from pound net and long haul seine in the Chesapeake Bay and Pamlico Sound. A Report to the ASMFC Weakfish Technical Committee. Desmond Kahn

B4: Fishing mortality based reference points for weakfish in 2000 based on two growth models.

B5: Advisory Report. 2002 Weakfish Stock Assessment

B6: Stock Assessment Of Weakfish Through 2000, Including Estimates Of Stock Size On January 1, 2001. Desmond M. Kahn,

B7: Risk Assessment of Virtual Population Analysis Estimates of Atlantic Coast Weakfish Fishing Mortality and Spawner Biomass during 1982-2000. Jim Uphoff

B8: An evaluation of Separable Virtual Population Analysis as a tool for assessing the stock status of weakfish on the Atlantic Coast of the United States. Janaka A. de Silva

B9: Trends in Weakfish Fishing Mortality and Stock Biomass based on Relative Exploitation from Recreational CPUE and Abundance Indices from Fisheries Independent Trawl Surveys. Victor Crecco.

B10: Powerpoint presentation: Board presentation

B11: Powerpoint presentation: Biomass

B12: Powerpoint presentation: Weakfish proportional densities

B13: Report to the 40th Stock Assessment Review Committee on preliminary assessment results for weakfish, *Cynoscion regalis* (Sciaenidae). Desmond M. Kahn

B14: Weakfish ADAPT output data file

B15: Weakfish ADAPT output plots

B16: Weakfish ADAPT diagnostics

B17: Weakfish ADAPT run 8 output

B18: Weakfish ADAPT run 10 output

Additional documents provided:

Weakfish catch-at-age data

ADAPT run descriptions

Powerpoint presentations:

1. Data and ADAPT runs
2. Biomass dynamic modelling
3. Weakfish proportional densities
4. Trophic interactions

Appendix 2: Meeting Agenda

**40th Northeast Regional Stock Assessment Workshop (SAW 40)
Stock Assessment Review Committee (SARC) Meeting**

Aquarium Conference Room - Northeast Fisheries Science Center
Woods Hole, Massachusetts

November 29 – December 2, 2004

AGENDA

TOPIC	PRESENTER	RAPPORTEUR
MONDAY, 29 November (1:00 - 5:00 PM)		
Opening	John Boreman , Science Director	
Welcome	Terry Smith , SAW Chairman	
Introduction	Robin Cook , SARC Chairman	
Agenda		
Conduct of meeting		
Goosefish/Monkfish (A)	Anne Richards	Kathy Sosebee
SARC Discussion	Robin Cook	
TUESDAY, 30 November (8:30 - 5:00 PM)		
Weakfish (B)	Des Kahn / Jim Uphoff	Des Kahn / Jim Uphoff
SARC Discussion	Robin Cook	
WEDNESDAY, 1 December (8:30 - 5:00 PM)		
Weakfish (B) (if necessary)	Des Kahn / Jim Uphoff	Des Kahn / Jim Uphoff
SARC Discussion	Robin Cook	
THURSDAY, 2 December (8:30 - 5:00 PM)		
SARC Report writing (closed)		

Appendix 3: Statement of Work

Consulting Agreement Between the University of Miami and Dr. Robin Cook

September 24, 2004

General

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

The Center for Independent Experts (CIE) shall provide a panel chair and three panelists for the 40th Stock Assessment Review Committee panel. The panel will convene at the Woods Hole Laboratory of the Northeast Fisheries Science Center in Woods Hole, Massachusetts, the week of 29 November 2004 (November 29 – December 2) to review assessments for monkfish (*Lophius americanus*), scup (*Stenotomus chrysops*), and weakfish (*Cynoscion regalis*).

Specific

The chair's duties shall occupy a maximum of 19 days- several days prior to the meeting for document review; the SARC meeting in Woods Hole; and several days following the meeting to review the individual panelist's Review Reports and produce the Summary Report. This report shall be a summary of the individual Review Reports, accurately and fairly representing all viewpoints. There shall be no attempt by the Chair to develop a consensus report.

Roles and responsibilities:

- (1) Prior to the meeting: review the reports produced by the Working Groups.
- (2) During the meeting: act as chairperson, where duties include control of the meeting, coordination of presentations and discussion, control of document flow and facilitation of discussion.
- (3) After the meeting: provide a Summary Report, which summarizes the findings of the individual panelist's Review Reports, which shall be provided to the chair. The Summary Report shall be organized like the Review Reports, with an executive summary, a review of activities and, for each stock assessment reviewed, a summary of findings and recommendations that collectively emerged from the meeting. The Chair shall not attempt to reach or describe consensus on

an assessment, but shall fairly summarize the individual Review Reports and draw attention to the collective conclusions and recommendations.

The milestones and schedule for the Chair are summarized in the table below. The Chair shall begin the summarization using the draft individual Review Reports provided by the Panelists on December 16, 2004. When these individual reports are finalized, following the CIE internal review and approval by the NMFS COTR, the CIE shall provide copies of the final versions to the Chair on December 27 for completion of the Summary Report. No later than January 7, 2005, the Chair shall submit the Summary Report¹ to the CIE. This shall be 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 Manoj Shivlani, via e-mail to mshivlani@rsmas.miami.edu. The CIE shall provide the final Summary Report to NOAA Fisheries for final approval on January 10, 2005.

Milestone	Date
Workshop at Northeast Fisheries Science Center (NEFSC)	November 29-December 2, 2004
Individual panelists provide their draft reports to CIE for review and to Chair for initiating development of the Summary Report	December 16
CIE provides reviewed individual panelist reports to COTR for approval	December 22
COTR notifies CIE of approval of individual panelist reports	December 28
CIE provides final individual panelist reports to COTR (with signed cover letter) and to Chair to complete Summary Report	December 30
COTR provides final individual panelist reports to NEFSC contact	January 3, 2005
Chair provides CIE with draft Summary Report for review	January 7
CIE provides reviewed Summary Report to COTR for approval	January 12
COTR notifies CIE of approval of Summary Report	January 13
CIE provides final Summary Report with signed cover letter to COTR	January 14
COTR provides final Summary Report to NEFSC contact	January 14

The SAW Chairman and SAW Coordinator 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 be responsible for the production of the final SARC report, which will include the Chair’s Summary Report and the individual panelist’s Review Reports. 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.

Contact person:

Dr. Terrence P. Smith, NEFSC, Woods Hole, SAW Chairman, 508-495-2230,
Terry.Smith@noaa.gov.