Report on the 2008 SARC 47 --- Summer Flounder Benchmark Stock Assessment

Yan Jiao

Prepared for
Center for Independent Experts

Department of Fisheries and Wildlife Sciences
Virginia Polytechnic Institute & State University
Blacksburg, VA
24061
Phone: 540 2312749
Email: yjiao@vt.edu
http://www.fishwild.vt.edu/faculty/jiao.htm

Contents

Executive Summary

The 2008 assessments of summer flounder (*Paralichthys dentatus*) stock along the Atlantic coast (Maine to North Carolina) waters were reviewed as the SARC 47 (Stock Assessment Review Committee No. 47) process. The Assessment Review Panel met at Woods Hole, Massachusetts from June 15 - June 20 2008. The assessments of the stocks were presented to the Panel and the validity of the data, assessment procedures and results were discussed. A proposed new age-structured stock assessment method (implemented in ASAP toolbox software) for summer flounder, as well as new investigations on the survey data and a revised natural mortality (M changed from 0.2 to 0.25) in the newly proposed age-structured model for summer flounder has been suggested. In addition, a revised proxy of fishing mortality at maximum sustainable yield (F_{msy}) was presented and discussed. The Panel Members then prepared their individual reviews.

Stock assessments were executed by the Southern Demersal Working Group (SDWG) using the ASAP toolbox software (NFT, NEFSC website) instead of the previously used ADAPT-VPA toolbox software, which implied that a previously used VPA type of model was changed to a statistical catch-at-age model. Reasons for this model choice include: 1) more flexibility of the ASAP software, which can extend the previously used age-structured model to incorporate uncertainty in the catch data, and 2) less retrospective error, though ASAP cannot eliminate the retrospective pattern itself. The stock assessment results from the ADAPT-VPA and ASAP were very close based on the documents provided by SDWG. The working group investigated several new methods and studies on stock structure, sex-specific, fishery-specific selectivities through differing catch-at-age matrices, which are most valuable, though many of them were not used in the final selected benchmark model. Future further study on model selection and uncertainty evaluation is suggested. In general, there was limited reference to uncertainty for both the input and output of the models. Evaluation of the uncertainty of the output was inefficient or inappropriate. Compilations of reports on data uncertainty and estimation uncertainty in the future are suggested.

The summer flounder assessment is considered adequate for evaluating stock status, but the estimated reference points changed dramatically, which resulted in concern by different stakeholders. The current approaches used to estimate biological reference points SSB_{msy} and F_{msy} tend to be appropriate. The F_{msy} proxy changed from F_{max} to $F_{35\%}$, which bridges the influence of changing models and reference points. Uncertainty estimation of the parameters, population size, and biological reference points based on fully developed Bayesian analysis is encouraged. A risk estimate corresponding to different TACs is suggested; it would provide more information for managers.

Some key recommendations are summarised below:

- Investigate spatial structure of summer flounder including sex specific spatial structure.
- Investigate methods for understanding spatial and temporal dynamics of summer founder based on the survey data.
- Build methods of uncertainty estimation of the fishery status.
- Conduct a simulation study to evaluate the possible management risk of switching natural mortality values.

1. BACKGROUND

This report reviews the 2008 benchmark stock assessments of summer flounder along Atlantic coastal waters at the request of the Center for Independent Experts of the University of Miami. I was provided with draft stock assessment reports and web access to relevant files and documents, and participated in the 47th Northeast regional Stock Assessment Review Committee (SARC47) Meeting.

2. REVIEW ACTIVITIES

The SARC 47 meeting was held at the Stephen H. Clarke Conference Room - Northeast Fisheries Science Center, Woods Hole, Massachusetts from June 15-June 20, 2004.

The meeting followed the "draft agenda" for the SARC 47 review (Attachment 2). The meeting was open, and was attended by observers including members of the fishing industry. The draft assessment of summer flounder was presented to the Panel and other attendees, and the input data, models, parameter estimates and biological reference points were evaluated through open discussion. A conclusion was then drawn on whether to accept the assessment as a basis for management of this fishery. The Terms of Reference for this stock were reviewed to ensure they had been fully addressed, and recommendations from the previous SARC report and the 2006 "Methot" review were reviewed to determine the extent to which they too had been addressed.

3. TERMS OF REFERENCE

1. Characterize the commercial and recreational catch, effort and CPUE, including descriptions of landings, discards and discard mortality.

   This TOR was completed successfully. The data collection schemes are appropriate for estimating the quantity and size/age composition of all significant removals due to commercial and recreational fishing. Sampling intensity has improved over time and summer flounder is considered one of the best sampled stocks off the Atlantic coast. The fishery data can provide a suitable basis for exploring a range of catch-at-age models to provide credible fishery management advice.

   Compared with the previous stock assessment, the current one adopted a new recreational discarding mortality rate as 10%, which was previously set at 25%. Though 10% is based on field studies and lab experimental analysis, a simulation study is suggested to evaluate the influence of this change on both the absolute biomass and fishing mortality estimation, but also the relative values, such as fishery status and retrospective errors. Because the SARC stock assessment report also mentioned reported

differences in the recreational fishery landings between VTR and MRFSS, a simulation study is also suggested to investigate the influence of inappropriately reported recreational landings. A comprehensive simulation is also suggested to investigate the influence of extreme situations, such as the combinations that can result high biases in biomass and fishing mortality estimation, and/or larger retrospective pattern.

2. Review methods for using fishery-independent surveys as abundance indices in assessment models.

   This TOR is addressed adequately in general though further work on this TOR is still suggested. A lot of work has been done on this issue, including an extra working paper evaluating the application of an integrated index in the assessment, rather than utilizing many indices. Some work has been done to evaluate using a Generalized Linear Model approach to standardize the survey catch rate. Though simulation and investigations have been done, the current stock assessment took a step back and used the non-standardized survey indices to tune the age-structured model.

   An abundance indices selection algorithm is used based on the correlations between indices and the model tuned population size, and the variance of the indices themselves. However, no clearly stated standard was followed. Given the fact that using 51 (all) indices resulted similar results as using 39 indices as used in the benchmark assessment, It is appropriate in this benchmark stock assessment for management purposes. A clear standard is needed for future stock assessment.

   a. Evaluate whether to combine several of the surveys into a composite survey index. If appropriate, implement this approach.

      This is a large research question as to how to combine inconsistent surveys. For this assessment, the intent of the TOR was addressed and SDWG felt that there was no clear benefit to combining the individual sources in a simplistic manner based on a simulation study. Given reasonable time and resources, the method used was appropriate. Methods of combining several of the surveys into a composite survey index, or a clearly stated index selection and weighting standard, need to be considered. Work done on combining surveys or indices by other stock assessment committees may be investigated, such as the methods used in the menhaden stock assessment (SAFMC 2006).

      The survey data, even for these surveys not used in the SARC 47 stock assessment “base” model, may be valuable sources of information to provide coherent signals for spatial dynamics and to support further exploration of spatially explicit modelling that may be carried out in the future. They also provide basis for spatial structure assumptions of the assessment.

Though the current SDWG investigated the approach of abundance index standardization using GLM, spatial factors were not included in that analysis. Spatial heterogeneity seems an important characteristic of summer flounder, which may influence the survey catch rate standardization. Other factors such as survey month and water temperature could be important factors and need to be further investigated. Clearly, statistically reasonable justification is needed in future assessments if non-standardized indices are used. Simulation studies or strategies to combine indices should consider the above factors.

b. Develop and implement an appropriate statistical method to account for the probability of observing zeros in NEFSC survey tows.

SDWG thoroughly evaluated the suggestions and alternatives. Among other suggestions, such as using different small values, SDWG believes treating zeros as missing values is a more appropriate application. The evidence and analyses presented are appropriate support for treating zeros in the survey indices as missing values.

However, the TOR addresses zero's in tows, which to the panel is different than what the SDWG ultimately addressed. The panel notes that the SAW 47 TOR referring to 'tows' is different than the 2006 S&T assessment, which refers to zero's in 'survey input values'. The panel suggests the SDWG considering actual zero observations in the tows that contribute to the overall CPUE would be a considerable undertaking and also likely to contribute to bias as some zero catch tow observations are likely legitimate. Delta-distribution and Ada-Boost are techniques currently used in fisheries (Smith 1988, Bishop et al 2004, Kawakita et al 2005).

3. Evaluate the feasibility of implementing alternative approaches to assess status of summer flounder stock and comment on any potential effects on estimates of F, SSB, and BRPs.

This TOR was completed and different alternatives were addressed in different degrees of success. The evaluation was sufficient to provide the basis for a final assessment model and the benchmark model is sufficient to provide a credible basis for management advice.

The ASAP (based on a statistical catch-at-age model framework) allows flexibility of considering catch uncertainty. The selected benchmark model, a two-fleet ASAP model, bridges with the ASAP one fleet model and then bridges with the previously used ADAPT model, and no large differences in the results were observed.

a. Separate catch-at-age matrices for commercial and recreational fisheries and resulting partial recruitment vectors for each fishery.

This was not explored by the SDWG. The SDWG suggested that there is

not enough beneficial evidence of doing this from the 6-fleet version of ASAP and the SS2 analyses. Not enough information was provided to allow us to comment on this.

b. Regional differences (north, south) in catch-at-age matrices.

This was not explored by the SDWG. The SDWG suggested that there is not enough beneficial evidence of doing this from the 6-fleet version of ASAP and the SS2 analyses. Not enough information was provided to allow us to comment on it.

Further comparison of catch-at-age composition changes over time in north and south from the survey is suggested.

c. Potential gender differences in lifespan, growth rate, natural mortality and implications of these factors for observed age- and length-specific sex ratios.

A lot of basic sex-specific data analysis has been done, which led to the discussion of natural mortality. The SDWG suggested that there is not enough beneficial evidence of doing this from the 6-fleet version of ASAP and the SS2 analyses. This was not explored by the SDWG. A sex explicit model will require sex characteristics sampling, but the current sex-ratio information only comes from the NEFSC offshore survey. Further biological sampling on sex related information is needed to have an efficient sex-specific catch-at-age model.

d. Strength of evidence for natural mortality rate used in the assessment; Update the estimate if appropriate.

Studies based on experience with equations for natural mortality in males and females were evaluated, with the results provided in working paper 8. The SDWG recommended an increase in the combined-sex natural mortality value from 0.20 to 0.25 on the basis of their evaluations. The change in M resulted in a significant change in the perception of stock status, and the decision to change M requires careful justification. Arguments from SDWG for increasing M included: 1) M on males is likely to be higher than on females. This is based on observed maximum ages in male and female summer flounder, declines in proportion male with increasing age in surveys. 2) Exploratory modelling using these age-structured models generally resulted in better fits with natural mortality rates in excess of 0.2.

The SDWG arrived at a weighted average M estimate of 0.25 based on the assumption of 0.3 in males and 0.2 in females, and the observed sex-composition from the NEFSC fall survey. M=0.25 is considered acceptable after comparative scenarios of different ADAPT and ASAP runs at M=0.2, and 0.25, which all lead to similar current spawning stock biomass and

fishery status after the F_{msy} proxy changed from F_{max} to $F_{35\%}$. Considering the fact that the fishing mortality is slowly decreasing, the population size increased in the early 2000s and is stabilizing over the recent three years, the relatively consistent estimates of the fishery status after a switch from M=0.2 to 0.25, experimental management is worthwhile to try.

Some aspects of the methods applied by SDWG to arrive at appropriate values of natural mortality require further consideration. Sex ratio and maturity sampling in multiple inshore and offshore sites along the Atlantic coast are suggested, which should provide more and consistent evidence of M variations.

4. Compare results from alternative modelling approaches with those from the VPA model to evaluate the robustness of VPA model results. Perform retrospective analyses of F, SSB, and recruitment for the models, and describe potential effects of retrospective patterns on assessment and rebuilding.

   This TOR is addressed adequately in general. Several different models and several sensitivity runs for each model were provided by the SDWG, but the model structures were not adequately addressed. I suggest that SDWG includes equations and objective functions for each model in the future.

   The SDWG evaluated not only the VPA, but also statistical catch-at-age implemented in the toolbox models ASAP and SS2. Results showed that all these age-structured models are robust to catch-at-age and abundance indices uncertainty. The driving factor of the variations of the population size evaluation is natural mortality, which is more important than model structure changes in this species stock assessment.

   Justification of model selection can be hard. A statistically sound algorithm and/or criteria may be considered in the future assessment. Including the composition of the objective functions in the output should help reviewers and readers to understand goodness-of-fit and how improvement of fit is related to the different data sources.

   None of the models were able to eliminate the retrospective pattern. The work group explored sensitivity analyses of different models, but no reasons were found to explain the retrospective pattern. Based on the fact that the underlying cause of retrospective patterns is hard to find and/or model, the retrospective error has become smaller in the recent two years and the pattern/ direction is changing, it is appropriate to use the benchmark assessment for management purposes without explanation of the retrospective pattern.

5. Based on the “best” model or models, estimate fishing mortality rate, recruitment, spawning stock biomass, and total stock biomass for the

current year and characterize the uncertainty of those estimates. If possible, also include estimates for earlier years with uncertainty estimates.

This TOR is addressed adequately in general. The SDWG adopted ASAP model as the "best" stock assessment model for summer flounder of the reviewed alternatives, and used the model results for population projection. Uncertainty of the historical and current SSB and fishing mortality were estimated in different ways. The explanation from the report is inadequate for us to understand the exact approaches and the reasons of using different approaches in estimating uncertainty of parameters/variables in the same model. Some possible correlations among parameters need to be explored, such as correlations between F and F_{BRP}, N and N_{BRP}.

6. Examine and evaluate the role of the environment on past and present summer flounder recruitment success.

   This TOR is addressed adequately in general although further examination on this TOR is suggested. A lot of work has have been done to address this TOR. Relationships between recruitment, recruitment/spawner ~NAO, PNO, and bottom temperature were evaluated. A working paper using the wavelet method to explore the relationship between recruitment and NAO time series was provided. Some other factors may be involved in a future analysis, such as spawner stock size, salinity, and predators. SDWG did not perceive any value of using environmental factors as predictors of R built into the age-structured model. This is considered to be appropriate. However, further evaluation and modelling effort to better understand the summer flounder recruitment is still valuable.

7. Biological Reference Points

   a. Update or redefine biological reference points (BRPs; proxies for B_{MSY} and F_{MSY}), taking into account conclusions from earlier assessments and findings from TOR 6 (i.e., recruitment and the environment). Estimate uncertainty in BRPs. Comment on the scientific adequacy of existing and redefined BRPs.

   This TOR is adequately addressed. The FMP Amendment 12 (MAFMC 1999) Biological Reference Points were estimated as yield at F_{max}, used as a proxy for MSY, at 21,444 mt (47.3 million lbs), and the corresponding total stock biomass (TSB) as 97,430 mt (214.8 million lbs). The 2006 NMFS S&T Peer Review recommended that spawning stock biomass (SSB) be used as the biomass reference point. The 2006 S&T assessment reference points, which are the existing BRPs, are F_{max} = F_{MSY} = 0.280 and SSB_{MSY} = 89,411 mt = 197.1 million lbs (Terceiro 2006). The newly recommended proxy for F_{MSY} by SDWG changed from F_{max} to $F_{35\%}$, while $F_{40\%}$ is recommended as an F_{target} (see Special Comments). The proposed fishing mortality reference point is $F_{35\%}$ = 0.310 as a proxy

for $F_{MSY} = F_{threshold}$. The proposed SSB target reference point is estimated as the projection of Jan 1, 2008 stock sizes at $F_{35\%} = 0.310$ and mean recruitment of 41.6 million fish per year (1982-2007). The proposed SSB_{MSY} target is estimated to be 60,074 mt (132.4 million lbs), and the biomass threshold of one-half SSB_{MSY} is estimated to be 30,037 mt (66.2 million lbs). $F_{40\%} = 0.255$ is proposed as an F_{target} for management.

The previously and currently used BRPs are from per-recruitment models. A stock-recruitment model, including recruitment modelling with environmental factors, was not used in developing the BRPs. The recruitment estimated by SDWG varied over time and showed a very weak relationship with spawning stock size. Adding environmental variables in the sub-model of the recruitment in the model of SCAA did not improve the model goodness of fit according to the work done by SDWG.

No uncertainty was provided on these BRPs. Per-recruitment based reference points seem very sensitive to biological and fisheries (selectivity from the model --- ADAPT) input. Some justification of input based on long-term or short term data with uncertainty needs to be addressed. For information regarding BRP, long-term biological and fisheries data seem to be more reasonable, while short-term biological and fisheries data may serve as more reasonable indicators of fisheries status. In this stock assessment, short-term biological and fisheries information was used based on the fact of the sex ratio changes observed in recent years. Continuous monitoring of sex ratios is needed to further justify the information needed for developing BRPs.

b. Evaluate current stock status with respect to the existing BRPs, as well as with respect to updated or redefined BRPs (from TOR 7a).

This TOR is adequately addressed. The previously accepted, peer-reviewed 2006 NMFS S&T ADAPT VPA assessment model (Terceiro 2006) has been updated through 2007. Using the ADAPT VPA model assuming constant M = 0.20, the stock would be considered overfished and overfishing would be occurring when compared to existing BRPs (as defined in 2006). Although this specific comparison was requested, comparison of current assessment results with those biological reference points is not advised due to the changes in assessment model and input of biological and fisheries data in the per recruit models in this benchmark assessment this year.

It is recommended that the proxy for F_{MSY} be changed from a threshold and a target at F_{max} to a threshold at $F_{35\%}$ and a target at $F_{40\%}$. This is appropriate because F_{max} is poorly defined when M is high and, when compared to the use of $F_{35\%}$, provides only a marginal increase in yield (<5%) while requiring much higher fishing mortality (80%) and resulting in 37% lower SSB per recruit.

The change in the assessment model used is not the reason for the perceived change in stock status. An important assumption that affects stock status perception is the value of natural mortality, M, used in the assessment and reference point calculations. The expert opinion of the SDWG, supported by the SARC, is that M=0.25 is more appropriate for the summer flounder stock. The change in status is also due to the two new years of data added to the assessment for 2006 and 2007, indicating a continuing decline in fishing mortality, which is now estimated to be below the proposed F_{msy} and above F_{target}. SSB is estimated to have stabilized but is expected to reach the biomass target by the end of 2012 if F is reduced to the $F_{rebuild}$ level.

A simulation study is suggested in the future to address the possible loss/risk of switching M.

8. Stock Projections

This TOR is adequately addressed. Projections of stock SSB were provided under $F_{rebuild}$ and $F_{msy}=F_{35\%}$ scenarios. Only a one year landing projection was provided.

a. Recommend what modelling approaches and data should be used for conducting single and multi-year stock projections, computing TACs or TALs, and measures of uncertainty.

Choices of parameters for projections and BRP estimation must be consistent. The AGEPRO program approach is not fully appropriate though variation in terminal year abundance and recruitment were considered in the projection. The coherent relationship among parameters is lost using this approach. The uncertainty expressed in SSB_{msy} over time is inappropriate using this approach.

An integrated approach, taking advantage of the ASAP model characteristics/outputs, is recommended. To better account for overall uncertainty in the assessment, I recommend using the MCMC output of parameters/variables that are needed in the projection as consistent matrices and using each of these vector combinations to project the population into the future. This method is suggested as an appropriate approach for estimating uncertainty about parameters/values of management importance. Uncertainties related to individual parameters and their associations can thus be distilled into their combined influence on population projections and provide clear implications for our understanding of risk and sustainability of the fishery.

b. If possible,

i. Provide numerical examples of short term projections (2-3 years) of biomass and fishing mortality rate, and characterize their uncertainty

under various TAC/F strategies.

Minimal projections were reported in the SARC review report. Additional projections evaluating alternative management scenarios are suggested in response to recommendations by the SSC and the Council. The SARC only evaluated the two runs provided.

ii. Compare projected stock status to existing rebuilding or recovery schedules, as appropriate.

For $F_{rebuild}$ and F_{target} strategies, short term projections of SSB are provided and TALs for one year in the future are shown (2009). No catch projections for further years are provided. Based on the figures presented, the stock should rebuild at the proposed $F_{rebuild}$ (and F_{target}) by the end of 2012.

The future assessments should include a fuller set of constant catch and constant/varied exploitation options and the probability of rebuilding within the required timeframe (and/or expected year to achieve rebuild) for each option.

9. Review, evaluate and report on the status of the Research Recommendations offered in recent SARC reviewed assessments and in the 2006 “Methot” Review.

   This TOR is adequately addressed. SDWG presented their comments and efforts on the many previous research recommendations. The stock assessment report combines all research recommendations in a single section. Major data and analytical needs for future assessments have been identified in the SAW 35 review of the 2002 assessment (NEFSC 2002a), the SDWG assessment updates for 2003 and 2004 (Terceiro 2003; SDWG 2004), the SAW 41 assessment update (NEFSC 2005), the 2006 assessment and S&T peer review (Terceiro 2006a, 2006b; Methot et al. 2006), the SDWG 2007 assessment update, and by the SDWG for this current benchmark assessment (SDWG 2008). The remaining recommendations have been subset into those that have been completed (between the last benchmark and the current assessment), those in progress at present or to be addressed (previously identified), and new recommendations (identified by the SDWG for this benchmark assessment (SDWG 2008)).

4. References

ASMFC (Atlantic States Marine Fisheries Commission). 2006. Atlantic menhaden stock assessment report for peer review. ASMFC, 1444 Eye St., NW, Washington, DC 20005.

Bishop, J., Venables, W.N., and Wang, Y.G. 2004. Analysing commercial catch and effort data from a Penaeid trawl fishery: a comparison of linear models, mixed models, and generalized estimating equations approaches. Fish. Res. 70:179-193.

Kawakita, M., Minami, M., Eguchi, S., and Lennert-Cody, C.E. 2005. An introduction to the predictive technique AdaBoost with a comparison to generalized additive models. Fish. Res. 76: 328-343.

Smith, J.S. 1988. Evaluating the efficiency of the delat-distribution mean estimator. Biometrics. 44: 485-493.

Attachment 1: Statement of Work for Dr. Yan Jiao

External Independent Peer Review by the Center for Independent Experts

SARC 47: Summer Flounder Benchmark Stock Assessment

Meeting Date: June 16 – 20, 2008

Statement of Work (SOW) for CIE Panelists

(including a description of SARC Chairman's duties)

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 SARC47 review panel will be composed of three appointed reviewers from the Center of Independent Experts (CIE), and an independent chair from the South Atlantic Fishery Management Council. The panel will convene at the Woods Hole Laboratory of the Northeast Fisheries Science Center (NEFSC) in Woods Hole, Massachusetts during June 16-20, 2007 to review one assessment (Summer flounder, *Paralichthys dentatus*). In the days following the review of the assessment, the panel will write the SARC Summary Report and each CIE reviewer will write an individual independent review report.

Overview of CIE Peer Review Process

The Office of Science and Technology implements measures to strengthen the National Marine Fisheries Service's (NMFS) Science Quality Assurance Program (SQAP) to ensure the best available high quality science for fisheries management. For this reason, the NMFS Office of Science and Technology coordinates and manages a contract for obtaining external expertise through the Center for Independent Experts (CIE) to conduct independent peer reviews of stock assessments and various scientific research projects. The primary objective of the CIE peer review is to provide an impartial review, evaluation, and recommendations in accordance to the Statement of Work (SoW), including the Terms of Reference (ToR) herein, to ensure the best available science is utilized for the National Marine Fisheries Service management decisions.

The NMFS Office of Science and Technology serves as the liaison with the NMFS Project Contact to establish the SoW which includes the expertise requirements, ToR, statement of tasks for the CIE reviewers, and description of deliverable milestones with dates. The CIE, comprised of a Coordination Team and Steering Committee, reviews the SoW to ensure it meets the CIE standards and selects the most qualified CIE reviewers according to the expertise requirements in the SoW. The CIE selection process also requires that CIE

reviewers can conduct an impartial and unbiased peer review without the influence from government managers, the fishing industry, or any other interest group resulting in conflict of interest concerns. Each CIE reviewer is required by the CIE selection process to complete a Lack of Conflict of Interest Statement ensuring no advocacy or funding concerns exist that may adversely affect the perception of impartiality of the CIE peer review. The CIE reviewers conduct the peer review, often participating as a member in a panel review or as a desk review, in accordance with the ToR producing a CIE independent peer review report as a deliverable. The Office of Science and Technology serves as the COTR for the CIE contract with the responsibilities to review and approve the deliverables for compliance with the SoW and ToR. When the deliverables are approved by the COTR, the Office of Science and Technology has the responsibility for the distribution of the CIE reports to the Project Contact.

Requirements for CIE Reviewers

CIE reviewers shall have working knowledge and recent experience in the application of modern fishery stock assessment models and Biological Reference Points. Expertise should include both the use of statistical catch-at-age and traditional VPA approaches. Experience with comparative studies of these approaches is especially valuable. Reviewers should also have experience in evaluating measures of model fit, identifiability, uncertainty, and forecasting. Experience with flatfish population dynamics would be useful.

Specific Activities and Responsibilities

The CIE's deliverables shall be provided according to the schedule of milestones listed on Page 6**.** The CIE reviewers, along with input and leadership 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 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 CIE reviewers shall conduct an impartial and independent peer review in accordance with the Terms of Reference (ToR) herein. 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 the 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.

The Independent CIE Report can also be used to provide greater detail than the SARC Summary Report 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. 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 July 7, 2008, the CIE reviewers shall submit their Independent CIE Reports to the CIE lead coordinator Mr. Manoj Shivlani via e-mail to shivlanim@bellsouth.net and CIE regional coordinator Dr. David Sampson via e-mail to David.Sampson@oregonstate.edu.

Milestone	Date
CIE reviewers attend the SARC workshop to conduct peer review at Northeast Fisheries Science Center (NEFSC) in Woods Hole, MA, USA	June 16-19
SARC Chair and CIE reviewers work at the NEFSC drafting reports	June 19-20
Draft of SARC Summary Report, reviewed by all CIE reviewers, due to the SARC Chair **	July 7
CIE reviewers submit Independent CIE Reports to CIE for approval	July 7
SARC Chair sends Final SARC Summary Report, approved by CIE reviewers, to NEFSC contact (i.e., SAW Chairman)	July 14
CIE provides reviewed Independent CIE Reports to NMFS COTR for approval	July 21
COTR notifies CIE of approval of reviewed Independent CIE Reports	July 28, 2008 *
COTR provides final Independent CIE Reports to NEFSC contact	July 28, 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

Submission and Acceptance of CIE Reports

No later than July 21, 2008, 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 July 28, 2008, and then distribute the reports to the NEFSC contact person.

ANNEX 1:

DRAFT Assessment Terms of Reference for SAW/SARC-47 in June, 2008

(Last Revised: Sept. 27, 2007)

Summer flounder

1. Characterize the commercial and recreational catch, effort and CPUE, including descriptions of landings, discards and discard mortality.

2. Review methods for using fishery-independent surveys as abundance indices in assessment models.

    a. Evaluate whether to combine several of the surveys into a composite survey index. If appropriate, implement this approach.

    b. Develop and implement an appropriate statistical method to account for the probability of observing zeros in NEFSC survey tows.

3. Evaluate the feasibility of implementing alternative approaches to assess status of summer flounder stock and comment on any potential effects on estimates of F, SSB, and BRPs. Alternative approaches could consider:

    a. Separate Catch at age matrices for commercial and recreational fisheries, and resulting partial recruitment vectors for each fishery.

    b. Regional differences (north, south) in catch at age matrices.

    c. Potential gender differences in life span, growth rate, and natural mortality and implications of these factors for observed age- and length-specific sex ratios.

    d. Strength of evidence for natural mortality rate used in the assessment; Update the estimate if appropriate.

4. Compare results from alternative modeling approaches with those from the VPA model, to evaluate the robustness of VPA model results. Perform retrospective analyses of F, SSB, and recruitment for the models, and describe potential effects of retrospective patterns on assessment and rebuilding.

5. Based on the "best" model or models, estimate fishing mortality rate, recruitment, spawning stock biomass, and total stock biomass for the current year and characterize the uncertainty of those estimates. If possible, also include estimates

for earlier years with uncertainty estimates.

6. Examine and evaluate the role of the environment on past and present summer flounder recruitment success.

7. Biological Reference Points

    a. Update or redefine biological reference points (BRPs; proxies for B_{MSY} and F_{MSY}), taking into account conclusions from earlier assessments and findings from TOR 6 (i.e., recruitment and the environment). Estimate uncertainty in BRPs. Comment on the scientific adequacy of existing and redefined BRPs.

    b. Evaluate current stock status with respect to the existing BRPs, as well as with respect to updated or redefined BRPs (from TOR 7a).

8. Stock Projections

    a. Recommend what modeling approaches and data should be used for conducting single and multi-year stock projections, computing TACs or TALs, and measures of uncertainty.

    b. If possible,

        I. Provide numerical examples of short term projections (2-3 years) of biomass and fishing mortality rate, and characterize their uncertainty, under various TAC/F strategies and

        II. Compare projected stock status to existing rebuilding or recovery schedules, as appropriate.

9. Review, evaluate and report on the status of the Research Recommendations offered in recent SARC reviewed assessments and in the 2006 “Methot” Review.

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.

   The Independent CIE Report might also be used to provide greater detail than the SARC Summary Report on specific Terms of Reference or on 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.

5. The report shall include a list of all background material provided, a copy of the Statement of Work with Terms of Reference, and meeting agenda attached as separate appendices.

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 47, 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 47, including any changes to the Terms of Reference or specific topics/issues directly related to the assessments and requiring Panel advice.

Attachment 2: DRAFT AGENDA (5-28-08)

47th Northeast Regional Stock Assessment Workshop (SAW 47)
Stock Assessment Review Committee (SARC) Meeting

Stephen H. Clark Conference Room – Northeast Fisheries Science Center Woods Hole, Massachusetts

June 16 - 20, 2008

Sessions are open to the public, except where indicated.

TOPIC PRESENTERS RAPPORTEUR

Monday, 16 June (1:00 – 5:00 PM)…….
Welcome **James Weinberg**, SAW Chairman Introduction **John Carmichael**, SARC Chairman Agenda Conduct of Meeting

Summer flounder (A) M. Terceiro, J. Coakley, M. Maunder Rich Wong

SARC Discussion John Carmichael

Tuesday, 17 June (9 AM – Noon)…….……
Summer flounder (A) – finish presentations.
M. Terceiro, J. Coakley, M. Maunder Rich Wong

SARC Discussion **John Carmichael**

Tuesday, 17 June (1:15 PM – 5 PM)……..…….

Q&A #1 between Reviewers and All Presenters, clarification of any issues. (Open Meeting)
Rich Wong
SARC Discussion **John Carmichael**

Wednesday, 18 June (9 AM – Noon) …….
SARC Panel deliberations/report writing (Closed Meeting).

Wednesday, 18 June (1:15 PM – 4 PM)…….
Q&A #2 between Reviewers and All Presenters, clarification of any issues. (Open Meeting)
Rich Wong
SARC Discussion **John Carmichael**

Wednesday, 18 June (4 PM – 5 PM) …….

SARC Report writing (Closed Meeting).

Thursday, 19 June (and possibly 20 June AM)…….
SARC Report writing (Closed Meeting).

Attachment 3: Background material

#	Title	Author	
1	Estimation of Commercial Fishery Discards of Summer Flounder: Update 2007 or Revise the 1989-2007 Time Series?	anon.	
2	Discard Mortality of Summer Flounder in the Inshore Trawl Fishery	Emerson Hasbrouck Tara Froehlich Kristin Gerbino John Scotti	
3	Some Approaches to the Integration of Survey Abundance Indices used in VPA Calibration	Mark Terceiro	
4	Simulation Studies of Issues Associated with Filling Zeros in VPA Tuning Indices	Chris Legault Al Seaver	
5	Some More Thoughts on Filling Zeros in Tuning Indices: A Simple Regression Example	Chris Legault	
6	The Treatment of "Zero" Observations in the Summer Flounder ADAPT VPA Calibration	Mark Terceiro	
7	Evaluation of summer flounder life history parameters from NEFSC trawl survey data, 1992 – 2006.	Jeffrey C. Brust	
8	A Review of Natural Mortality of Summer Flounder	Rich Wong	
9	Analysis of Trends in Sex Ratio, Implications for Natural Mortality, and Variation in Age-Length Keys in Summer Flounder	Eric N. Powell Jason Morson	
10	Re-evaluation of Summer Flounder (*Paralichthys dentatus*) Stock Status Following Adjustments for Retrospective Bias and Inclusion of Trophic Effects	Victor Crecco	
11	Modeling environmental factors and summer flounder recruitment success	Mark Terceiro	
12	Wavelet Analysis of Trends in Summer Flounder YOY and Spawner-Recruit Relationships	Eric Powell	
13	Specifying Initial Conditions for Forecasting When Retrospective Pattern Present	Chris Legault and Mark Terceiro	