Summary Report of the 64th Northeast Regional Stock Assessment Review Committee (SARC 64)

Stock Assessment Review Committee (SARC) Meeting
November 28 – 30, 2017
Northeast Fisheries Science Center
Woods Hole, Massachusetts

Prepared by the Stock Assessment Review Committee
Benchmark Assessment for Atlantic Mackerel
(SAW/SARC 64)

December 8, 2017

SARC 64 Panel Members

John Boreman (Chair)
Robin Cook
Joseph Powers
Kevin Stokes

1. Introduction

1.1 Background

The 64th SARC (Stock Assessment Review Committee) met in the Clark Conference Room of the Northeast Fisheries Science Center's Woods Hole Laboratory during 28-30 November 2017. The purpose of the meeting was to review the most recent benchmark assessment of the Northwest Atlantic stock of Atlantic Mackerel (see Attachment 1). The review committee comprised three external scientists appointed by the Committee for Independent Experts (Robin Cook, Joseph Powers, and Kevin Stokes), and was chaired by John Boreman, current chair of the Mid-Atlantic Fishery Management Council Scientific and Statistical Committee.

The SARC was assisted by the NEFSC Stock Assessment Workshop (SAW) Chairman, James Weinberg and Sheena Steiner. Supporting documentation was prepared by the Atlantic Mackerel SAW 64 Working Group (WG), chaired by Gary Shepherd, and the presentation at the meeting was made by the lead assessment scientist Kiersten Curti (NEFSC). Toni Chute, Mark Terceiro, Katherine Sosebee, and Chris Legault, all from the NEFSC, served as rapporteurs. Approximately 20 people participated in the SARC 64 meeting, representing NMFS/NEFSC, the NMFS/Greater Atlantic Regional Office, Fisheries and Ocean Canada, non-governmental organizations, and the fishing industry (see Attachment 2).

1.2 Review of Activities and SARC Process

Several weeks prior to the meeting, assessment documents and supporting materials were made available to the SARC Panel via a server on the NEFSC website. On the morning of 28 November 2017, before the meeting, the SARC panel met with Jim Weinberg and Russell Brown (NEFSC) to review and discuss the meeting agenda, reporting requirements, and meeting logistics. During the SARC meeting, background and working documents were available electronically and in print. The meeting opened on the morning of Tuesday November 28, with welcoming remarks and comments on the agenda by Jim Weinberg and John Boreman. Participants and audience members introduced themselves. Following introductions, sessions on November 28 were devoted to presentation and discussion of the Atlantic Mackerel assessment, followed by SARC discussion with the presenter and chair of the WG; the discussion carried over into the afternoon of 29 November. The remainder of the afternoon on 29 November was devoted to walking through the Assessment Summary prepared by the WG and editing the text based on the preceding discussions; Kiersten Curti, Gary Shepherd, and Chris Legault were particularly helpful with the editing of the Assessment Summary. The SARC spent the final day, 30 November, drafting the responses to the TORs that would be incorporated into this report.

The SARC panel worked with the other participants throughout the meeting to gain a better understanding of the assessment, including requests for additional model runs and sensitivity analyses. The meeting was collegial and informative. The stock assessment was well presented and contained thorough documentation. Both the presenter and WG Chair were extremely responsive to the SARC. The SARC appreciated the level of audience participation, which added to the value of the discussion. The terms of reference (TORs) used to guide development of the benchmark assessment were, for the most part, clearly worded and progressed in a logical

order. The organization of the assessment text, tables, and figures, which cross-referenced to TORs they were supporting, greatly facilitated the assessment review and discussion. Only one stock was addressed in SARC 64 as opposed to the norm of two. Though the meeting was shorter than is typical, this enabled the SARC to do a more in-depth and thorough review.

The SARC Panel completed drafting this Summary Report by correspondence, evaluating each TOR that had been addressed by the WG. The SARC Chair compiled and edited the draft Panel Summary Report, which was distributed to the Panel for final review before being submitted to the NEFSC. Additionally, each of the CIE Panelists drafted and submitted an independent reviewer's report to the Center for Independent Experts.

The SARC Panel agreed that scientific and statistical analyses conducted by the WG were thorough and of high quality. The assessment was effective in helping to determine the current status of the Atlantic Mackerel stock. Discussed below in responses to the TORs are what the Panel viewed as the strengths and concerns of the assessment. The SARC considered the process effective in structuring a critical review of the work of the WG and in identifying areas that need additional work for future assessments.

2. Review of the Atlantic Mackerel Benchmark Assessment

2.1 Synopsis of the Panel Review

The stock of Atlantic Mackerel (*Scomber scombrus*) in the Northwest Atlantic is currently overfished and overfishing is occurring. An assessment model (ASAP) containing a northern and a southern contingent of the single stock is accepted by the SARC as the best scientific information available for determining stock status. $F_{40\%}$, as proposed by the WG, is considered by the SARC to be an acceptable proxy for F_{MSY}, the overfishing threshold.

2.2 Evaluation of the Terms of Reference for Atlantic Mackerel

1. *Spatial and ecosystem influences on stock dynamics:*
   a. *Evaluate possible spatial influences on the stock dynamics. Recommend any need to modify the current stock definition for future stock assessments.*

      - This TOR was fully met.

      - The WG considered a wide range of working papers (Secor, *et al.*; Friedland, *et al.*; Adams) that influenced the WG's and Panel's interpretation of the assessment output.

      - The analyses contained in these papers demonstrate a change in distribution of the stock, as well as the relative contributions of the northern and southern contingents to the fisheries.

      - While recognizing the contingent structure, conclusions drawn from the analyses justified use of a single stock in the assessment.

      - The Panel agreed with the WG decision not to modify the current stock definition.

b. *Describe data (e.g., oceanographic, habitat, or species interactions) that might pertain to Atlantic mackerel distribution and availability. If possible, integrate the results into the stock assessment (TOR-4).*

- This TOR was fully met.

- Available evidence of predation was not sufficient to draw conclusions about the extent of predation on mackerel. It was not possible, for example by modifying assumptions about natural mortality, to integrate the results into the stock assessment.

- Manderson, *et al.* working papers provide useful information on the relationship between stock distribution and habitat parameters (temperature), but not to the point where this information can be analytically incorporated into the assessment.

- While not leading to direct changes in the stock assessment, the relevant working papers did influence interpretation of the assessment and of the stock status results.

2. *Estimate catch from all sources including landings and discards. Describe the spatial and temporal distribution of landings, discards, and fishing effort. Characterize the uncertainty in these sources of data.*

- This TOR was largely met.

- The assessment report includes maps showing the distributions of catch and discards, temporally and spatially.

- The assessment also provides age and length compositions for all the major components of the catch.

- Collaboration with the Canadian scientists enabled accounting for the major sources of catch from the entire stock.

- No spatial or temporal information on effort was provided, partially due to absence of records of effort distribution in one of the major US fleets.

- The ASAP model used in the assessment accounted for most sources of catch, but did not include unreported catch from the recreational and bait fisheries and commercial discards in Canada. The CCAM model used in the sensitivity analysis did, however, consider the missing catch issues. Also, the WG did an ASAP sensitivity run that included the estimated unreported catch from the CCAM model.

- Even though the ASAP did not capture all the possible sources of catch, the Panel was comfortable with the robustness of the assessment.

- Characterization of the uncertainty in the sources of data was not explicitly described though many of the pertinent issues are mentioned in the WG report.

3. *Evaluate fishery independent and fishery dependent indices being used in the assessment (e.g., indices of relative or absolute abundance, recruitment, state surveys, age-length*

data, etc.). Characterize the uncertainty and any bias in these sources of data.

- This TOR was largely met.

- The WG considered a range of state and federal surveys, and reasonably retained the NEFSC bottom trawl survey. The NEFSC survey provided age composition and abundance information.

- The WG integrated US and Canadian egg surveys into a combined index that provided critical new information relative to spawning stock biomass (Carter and Richardson working paper).

- The new, combined egg survey index is much more crucial for the assessment, which emphasizes the importance of maintaining the US and Canadian egg surveys for future assessments.

- Explicit characterization of uncertainty and bias in the data sources was not fully addressed under this TOR. Although CVs are given in the text, it would have helped if those WG members close to the data provided some insight into the significance of the CVs. A number of factors which might have affected survey indices were considered and further addressed in the assessment modeling.

4. *Estimate annual fishing mortality, recruitment and stock biomass (both total and spawning stock) for the time series, and estimate their uncertainty. Develop alternative approaches which might also be able to estimate population parameters. Include a comparison of new assessment results with those from previous assessment(s).*

- This TOR was fully met.

- The response to this TOR was well presented and further explained during the review process, including thorough, well-considered responses to requests for further information and model runs.

- The Panel accepted the WG's choice of the base model, which provided estimates of fishing mortality, recruitment, and stock biomass, having also considered in more detail alternative configurations using the ASAP.

- Uncertainty in the estimates of fishing mortality, recruitment, and stock biomass was characterized by using model estimates of precision. In addition, an extensive sensitivity analysis, which included alternative model approaches (SAM and CCAM), demonstrated the robustness of the results.

- MCMC was used to characterize the distributions of critical model outputs, which fed into reference point calculations and projections.

- The current assessment was compared to previous assessments (note that the 2009 assessment was not accepted by the TRAC). The current assessment is considered a sound basis for management advice and stock status determination, largely due to the incorporation of a combined egg index for the stock.

5. *State the existing stock status definitions for "overfished" and "overfishing". Then update or redefine biological reference points (BRPs; point estimates or proxies for B_{MSY}, $B_{THRESHOLD}$, F_{MSY} and MSY) and provide estimates of their uncertainty. If analytic model-based estimates are unavailable, consider recommending alternative measurable proxies for BRPs. Comment on the scientific adequacy of existing BRPs and the "new" (i.e., updated, redefined, or alternative) BRPs.*

- This TOR was fully met.
- Due to the lack of an existing accepted stock assessment, there were no existing BRPs or definitions of stock status.
- The stock assessment does not lead to analytic, model-based estimates of MSY BRPs as no parametric stock recruitment model was available; therefore, the WG proposed $F_{40\%}$ as a proxy for F_{msy}. The proxy for B_{msy} was based on $F_{40\%}$. A range was provided for the estimate of B_{msy} and MSY. An estimate of $B_{THRESHOLD}$ was provided.
- Uncertainty in the proposed BRPs was examined through the use of sensitivity analysis.

6. *Make a recommended stock status determination (overfishing and overfished) based on new results developed for this peer review. Include qualitative written statements about the condition of the stock that will help to inform NOAA Fisheries about stock status.*

- This TOR was fully met.
- Based on the accepted stock assessment, the stock is defined as overfished and experiencing overfishing.
- The status determination is robust across all sensitivity tests and alternative modeling approaches.

7. *Develop approaches and apply them to conduct stock projections.*

   a. *Provide numerical annual projections (3 years) and the statistical distribution (e.g., probability density function) of the catch at F_{MSY} or an F_{MSY} proxy (i.e. the overfishing level, OFL) (see Appendix to the SAW TORs). Each projection should estimate and report annual probabilities of exceeding threshold BRPs for F, and probabilities of falling below threshold BRPs for biomass. Use a sensitivity analysis approach in which a range of assumptions about the most important uncertainties in the assessment are considered (e.g., terminal year abundance, variability in recruitment).*

   - This TOR was largely met.
   - Projections are provided under the assumptions of F_0, $F_{40\%}$, and $F_{status\ quo}$.
   - Interval estimates of the projected SSB are provided for only the base model, but not the probability of exceeding the BRPs.

- Uncertainty was characterized by using estimates of precision from the base model runs, but this precision excludes the results from alternative models. Hence, the range of uncertainty is likely underestimated.

b. *Comment on which projections seem most realistic. Consider the major uncertainties in the assessment as well as sensitivity of the projections to various assumptions. Identify reasonable projection parameters (recruitment, weight-at-age, retrospective adjustments, etc.) to use when setting specifications.*

- This TOR was met.

- The projections are influenced by the 2015 year class being estimated at a relatively high level but with higher uncertainty than other recruitment estimates, as is typical for the terminal year recruitment estimate.

- The Panel found the wording of this TOR ambiguous, specifically regarding use of the term "realistic." All projections depend on knowledge of expected fishery performance in the future, coupled with the current state of the stock.

c. *Describe this stock's vulnerability (see "Appendix to the SAW TORs") to becoming overfished, and how this could affect the choice of ABC.*

- TOR was not explicitly addressed in the assessment because the stock is considered currently overfished, which is direct evidence that the stock is vulnerable to becoming overfished due to its susceptibility to fishing. Projections have shown the potential for recovery based on the productivity potential of the stock. However, it would have been useful to see more discussion of how the biological characteristics of the species affects its vulnerability to the existing fisheries.

8. *Review, evaluate and report on the status of the SARC and Working Group research recommendations listed in most recent peer reviewed assessment and review panel reports. Identify new research recommendations.*

- This TOR was fully met.
- An update was reported on the TRAC research recommendations.
- The WG proposed a new set of recommendations which were reviewed and discussed with the Panel.
- The Panel concurs with the general areas of investigation recommended in the assessment.

3. Bibliography

3.1 Background Papers

Berg, C.W., and A. Nielsen. 2016. Accounting for correlated observations in an age-based state-space stock assessment model. ICES Journal of Marine Science 73: 1788-1797.

Berrien, P. 1988. Atlantic mackerel, *Scomber scombrus*, total annual egg production and spawner biomass estimates for the Gulf of St. Lawrence and northeastern United States waters, 1987. NMFS

Northeast Fisheries Science Center. Sandy Hook Laboratory Report No. 88-02. 18p.

Department of Fisheries and Oceans. 2014. Assessment of the Atlantic Mackerel stock for the Northwest Atlantic (Subareas 3 and 4) in 2013. Department of Fisheries and Oceans Canada. Science Advisory Report 2014/030. 16p.

Department of Fisheries and Oceans. 2017. Assessment of the Atlantic Mackerel stock for the Northwest Atlantic (Subareas 3 and 4) in 2016. Department of Fisheries and Oceans Canada. Science Advisory Report 2017/034. 15p.

Deroba, J. J., G. Shepherd, F. Grégoire, J. Nieland, and J. Link. 2010. Stock assessment of Atlantic Mackerel in the Northwest Atlantic – 2009. Fisheries and Oceans Canada Transboundary Resource Assessment Committee. Reference Document 2010-01. 64p.

Grégoire, F., M.-H. Gendron, J.-L. Beaulieu, and I. Lévesque. 2013.   Results of the Atlantic mackerel (*Scomber scombrus* L.) egg surveys conducted in the southern Gulf of St. Lawrence from 2008 to 2011. Department of Fisheries and Oceans Canada. Science Advisory Secretariat. Research Document 2013/035. v + 57 p.

Kelly, C., M. Ortiz, and D. Robert. 2010. Transboundary Resources Assessment Committee (TRAC) Atlantic Mackerel benchmark and assessment. External review. Fisheries and Oceans Canada Transboundary Resource Assessment Committee. Reference Document 2010-03-12. 6p.

Legault, C. M., and V. R. Restrepo. 1998. A flexible forward age-structured assessment program. ICCAT Working Document SCRS/98/58. 15p.

Nielsen, A., and C. Berg. 2014. Estimation of time-varying selectivity in stock assessments using state-space models. Fisheries Research 158: 96-101.

Northeast Fisheries Science Center. 2006. 42nd Northeast Regional Stock Assessment Workshop (42nd SAW) Stock Assessment Report. Part A: Silver Hake, Atlantic Mackerel, and Northern Shortfin Squid. Northeast Fisheries Science Center Reference Document 06-09a. 290p.

Northeast Fisheries Science Center. 2006. 42nd Northeast Regional Stock Assessment Workshop (42nd SAW) 42nd SAW Assessment Summary Report. Northeast Fisheries Science Center Reference Document 06-09. 70p.

Payne, A. I. L. 2005. Summary Report on the 42nd Northeast Regional Stock Assessment Workshop (SAW-42) Stock Assessment Review Committee Meeting. NMFS Northeast Fisheries Science Center. 91p.

Sette, O. E. 1943. Biology of the Atlantic Mackerel (*Scomber scombrus*) of North America. Part I: Early life history, including the growth, drift, and mortality of the egg and larval populations. Fishery Bulletin 50. 91p.

Sette, O. E. 1943. Biology of the Atlantic Mackerel (*Scomber scombrus*) of North America. Part II: Migrations and Habits. Fishery Bulletin 51. 110p.

Transboundary Resource Assessment Committee. 2010. Atlantic Mackerel in the Northwest Atlantic [NAFO Subareas 2 - 6]. Transboundary Resource Assessment Committee Status Report 2010/01. 12p.

Van Beveren, E., Castonguay, M., Doniol-Valcroze, T., and Duplisea, D.   2017. Results of an informal survey of Canadian Atlantic mackerel commercial, recreational and bait fishers. Department of Fisheries and Oceans Canada. Science Advisory Secretariat. Research Document 2017/029. v + 26 p.

Van Beveren, E., D. Duplisea, M. Castonguay, T. Doniol-Valcroze, S. Plourde, and N. Cadigan. 2017. How catch underreporting can bias stock assessment of and advice for northwest Atlantic Mackerel and a possible resolution using censored catch. Fisheries Research 194: 146-154.

3.2 Working Papers

Adams, C. F. 2017. Appendix 4: Spatial patterns in the spring NEFSC survey for Atlantic Mackerel. Stock Assessment Workshop 64. NMFS Northeast Fisheries Science Center. 78p.

Axelson, L., W. K. Bright, L. Bright, G. DiDomenico, G. Goodwin, J. Hoey, J. Kaelin, J. Knight, M. Lapp, J. P. Manderson, G. McCallig, B. P. Mitchell, P. Moore, R. Mullen, G. O'Neill, P. Quinn, W. Reichle, J. Ruhle, and C. Sarro. 2017. Appendix 9: Fishing industry perspectives on the socioecological factors driving catchability and landings of Atlantic Mackerel in US waters. Stock Assessment Workshop 64. NMFS Northeast Fisheries Science Center. 33p.

Carter, L., and D. Richardson. 2017. Appendix 2: Development of an egg index for Atlantic Mackerel (*Scomber scombrus*) on the northeast U.S. Continental Shelf. Stock Assessment Workshop 64. NMFS Northeast Fisheries Science Center. 17p.

Deroba, J. J. 2017. Appendix 11: A State-Space Stock Assessment Model (SAM) for Northwest Atlantic Mackerel. Stock Assessment Workshop 64. NMFS Northeast Fisheries Science Center. 30p.

Friedland, K., J. Manning, J. Manderson, and R. Morse. 2017. Appendix 7: Change in the spatial distribution of mackerel habitat during spring. Stock Assessment Workshop 64. NMFS Northeast Fisheries Science Center. 8p.

Friedland, K., C. McManus, R. Morse, and M. Castonguay. 2017. Appendix 8: Physical conditions and lower trophic level ecology in the Atlantic Mackerel spawning areas in US and Canadian waters. Stock Assessment Workshop 64. NMFS Northeast Fisheries Science Center. 18p.

Manderson, J. P., J. Kohut, J. Pessutti, D. Politikos, W. K Bright, P. Moore, M. Roffer, L. Nazarro, E. Curchister, and G. Didomenico. 2017. Appendix 5: Changes in the spatial structure of Atlantic Mackerel and thermal habitat during the spring NEFSC bottom trawl survey and a winter habitat model accounting for movement constraints. Part I. changes in spatial structure. Stock Assessment Workshop 64. NMFS Northeast Fisheries Science Center. 32p.

Manderson, J., J. Pessutti, L. Nazarro, W. K. Bright, J. Kohut, D. Politikos, P. Moore, M. Roffer, E. Curchister, and G. Didomenico. 2017. Appendix 6: Winter habitat for juvenile and adult North West Atlantic Mackerel and its value for estimating availability to the spring NEFSC bottom trawl survey. Stock Assessment Workshop 64. NMFS Northeast Fisheries Science Center. 18p.

Northeast Fisheries Science Center. 2017. Appendix 10: Sequence of ASAP model configurations. Stock Assessment Workshop 64. NMFS Northeast Fisheries Science Center. 11p.

Northeast Fisheries Science Center. 2017. Appendix 12: Censored Catch Assessment Model (CCAM) figures. Stock Assessment Workshop 64. NMFS Northeast Fisheries Science Center. 14p.

Northeast Fisheries Science Center. 2017. File = Run118.dat ASAP3 run on Monday, 30 Oct 2017 at 12:40:30. Stock Assessment Workshop 64. NMFS Northeast Fisheries Science Center. 75p.

Secor, D., G. Redding, and M. Castonguay. 2017. Appendix 1: Contingent Mixing by Atlantic mackerel sampled in the Spring NEFSC Trawl Survey: inferences from otolith stable isotope analysis. Stock Assessment Workshop 64. NMFS Northeast Fisheries Science Center. 16p.

Smith, B., and S. Gaichas. 2017. Appendix 3: Mackerel predation estimates from predators sampled in the NEFSC bottom trawl surveys. Stock Assessment Workshop 64. NMFS Northeast Fisheries Science Center. 10p.

Statement of Work
National Oceanic and Atmospheric Administration (NOAA)
National Marine Fisheries Service (NMFS)
Center for Independent Experts (CIE) Program
External Independent Peer Review

64th Stock Assessment Workshop/Stock Assessment Review Committee (SAW/SARC)
Benchmark stock assessment for Atlantic mackerel

Background
The National Marine Fisheries Service (NMFS) is mandated by the Magnuson-Stevens Fishery Conservation and Management Act, Endangered Species Act, and Marine Mamma! Protection Act to conserve, protect, and manage our nation's marine living resources based upon the best scientific information available (BSIA). NMFS science products, including scientific advice, are often controversial and may require timely scientific peer reviews that are strictly independent of all outside influences. A formal external process for independent expert reviews of the agency's scientific products and programs ensures their credibility. Therefore, external
scientific peer reviews have been and continue to be essential to strengthening scientific quality assurance for fishery conservation and management actions.

Scientific peer review is defined as the organized review process where one or more qualified experts review scientific information to ensure quality and credibility. These expert(s) must conduct their peer review impartially, objectively, and without conflicts of interest. Each reviewer must also be independent from the development of the science, without influence from any position that the agency or constituent groups may have. Furthermore, the Office of Management and Budget (OMB), authorized by the Information Quality Act, requires all federal agencies to conduct peer reviews of highly influential and controversial science before dissemination, and that peer reviewers must be deemed qualified based on the OMB Peer Review Bulletin standards. (http://www.cio.noaa.gov/services programs/pdfs/OMB Peer Review Bulletin m05-03.pdf). Further information may be obtained from www.ciereviews.org.

Scope
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 peer review is the cornerstone of the Northeast Stock Assessment Workshop (SAW) process, which includes assessment development, and report preparation (which is done by SAW Working Groups or ASMFC technical committees), assessment peer review (by the SARC), public presentations, and document publication. This review determines whether or not the scientific assessments are adequate to serve as a basis for developing fishery management advice. Results provide the scientific basis for fisheries within the jurisdiction of NOAA's Greater Atlantic Regional Fisheries Office (GARFO).

The purpose of this meeting will be to provide an external peer review of a benchmark stock assessment for **Atlantic mackerel.** The requirements for the peer review follow. This Statement of Work (SOW) also includes Appendix 1: TORs for the stock assessment, which are the responsibility of the analysts; Appendix 2: a draft meeting agenda; Appendix 3: Individual Independent Review Report Requirements; and Appendix 4: SARC Summary Report Requirements.

Requirements

NMFS requires three reviewers under this contract (i.e. subject to CIE standards for reviewers) to participate in the panel review. The SARC chair, who is in addition to the three reviewers, will be provided by either the New England or Mid-Atlantic Fishery Management Council's Science and Statistical Committee; although the SARC chair will be participating in this review, the chair's participation (i.e. labor and travel) is not covered by this contract.

Each reviewer will write an individual review report in accordance with the SOW, OMB Guidelines, and the TORs below. All TORs must be addressed in each reviewer's report. No more than one of the reviewers selected for this review is permitted to have served on a SARC panel that reviewed this same species in the past. The reviewers shall have working knowledge and recent experience in the application of modern fishery stock assessment models. Expertise should include forward projecting statistical catch-at-age models. Reviewers should also have experience in evaluating measures of model fit, identification, uncertainty, and forecasting. Reviewers should have experience in development of Biological Reference Points (BRPs) that includes an appreciation for the varying quality and quantity of data available to support estimation of BRPs. For mackerel, knowledge of migratory pelagics, spatial elements in a stock assessment, and data-limited assessment methods would be useful.

Requirements for Reviewers
- Review the background materials and reports prior to the review meeting
- Attend and participate in the panel review meeting
    - The meeting will consist of presentations by NOAA and other scientists, stock assessment authors and others to facilitate the review, to provide any additional information required by the reviewers, and to answer any questions from reviewers
- Reviewers shall conduct an independent peer review in accordance with the requirements specified in this SOW and TORs, in adherence with the required formatting and content guidelines; reviewers are not required to reach a consensus.
- Each reviewer shall assist the SARC Chair with contributions to the SARC Summary Report
- Deliver individual Independent Review Reports to the Government according to the specified milestone dates

- This report should explain whether each stock assessment Term of Reference of the SAW was or was not completed successfully during the SARC meeting, using the criteria specified below in the "Requirements for SARC panel."
- If any existing Biological Reference Points (BRP) or their proxies are considered inappropriate, the Independent 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 Report produced by each reviewer.
- The Independent Report can also be used to provide greater detail than the SARC Summary Report on specific stock assessment Terms of Reference or on additional questions raised during the meeting.

Requirements for SARC panel

- During the SARC meeting, the panel is to determine whether each stock assessment Term of Reference (TOR) of the SAW was or was not completed successfully. 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. If alternative assessment models and model assumptions are presented, evaluate their strengths and weaknesses and then recommend which, if any, scientific approach should be adopted. Where possible, the SARC chair shall identify or facilitate agreement among the reviewers for each stock assessment TOR of the SAW.
- If the panel rejects any of the current BRP or BRP proxies (for Bmsy and Fmsy and MSY), the panel should explain why those particular BRPs or proxies are not suitable, and the panel should recommend suitable alternatives. If such alternatives cannot be identified, then the panel should indicate that the existing BRPs or BRP proxies are the best available at this time.
- Each reviewer shall complete the tasks in accordance with the SOW and Schedule of Milestones and Deliverables below.

Requirements for SARC chair and reviewers combined:
Review both the Assessment Report and the draft Assessment Summary Report. The draft Assessment Summary Report is reviewed and edited to assure that it is consistent with the outcome of the peer review, particularly statements about stock status recommendations and descriptions of assessment uncertainty.

The SARC Chair, with the assistance from the reviewers, will write the SARC Summary Report. Each reviewer and the chair will discuss whether they hold similar views on each stock assessment 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 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 SARC 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 will not be submitted, reviewed, or approved by the Contractor.

If any existing Biological Reference Points (BRP) or 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.

Foreign National Security Clearance
When reviewers participate during a panel review meeting at a government facility, the NMFS Project Contact is responsible for obtaining the Foreign National Security Clearance approval for reviewers who are non-US citizens. For this reason, the reviewers shall provide requested information (e.g., first and last name, contact Information, gender, birth date, country of birth, country of citizenship, country of permanent residence, country of current residence, dual citizenship (yes, no), passport number, country of passport, travel dates.) to the NEFSC SAW Chair for the purpose of their security clearance, and this Information shall be submitted of least 30 days before the peer review in accordance with the NOAA Deemed Export Technology Control Program NAO 207-12 regulations available at the Deemed Exports NAO website: http://deemedexports.noaa.gov/ and
http://deemedexports.noaa.gov/compliance access control procedures/noaa-foreign-national-registration-system.html. The contractor is required to use all appropriate methods to safeguard Personally Identifiable Information (PII).

Place of Performance
The place of performance shall be at the contractor's facilities, and at the Northeast Fisheries Science Center in Woods Hole, Massachusetts.

Period of Performance
The period of performance shall be from the time of award through January 22, 2018. Each reviewer's duties shall not exceed 14 days to complete all required tasks.

Attachment 1

Schedule of Milestones and Deliverables: The contractor shall complete the tasks and deliverables in accordance with the following schedule.

No later than October 24, 2017	Contractor sends reviewer contact information to the COR, who then sends this to the NMFS Project Contact
No later than November 14, 2017	NMFS Project Contact will provide reviewers the pre-review documents
Nov. 28-30, 2017	Each reviewer participates and conducts an independent peer review during the panel review meeting in Woods Hole, MA
Nov. 30, 2017	SARC Chair and reviewers work at drafting reports during meeting at Woods Hole, MA, USA
Dec. 14, 2017	Reviewers submit draft independent peer review reports to the contractor's technical team for review
Dec. 14, 2017	Draft of SARC Summary Report, reviewed by all reviewers, due to the SARC Chair *
Dec. 21, 2017	SARC Chair sends Final SARC Summary Report, approved by reviewers, to NMFS Project contact (i.e., SAW Chairman)
Jan. 4, 2018	Contractor submits independent peer review reports to the COR and technical point of contact (POC)
Jan. 11, 2018	The COR and/or technical POC distributes the final reports to the NMFS Project Contact and regional Center Director

* The SARC Summary Report will not be submitted to, reviewed, or approved by the Contractor.

Applicable Performance Standards

The acceptance of the contract deliverables shall be based on three performance standards: (1) The reports shall be completed in accordance with the required formatting and content; (2) The reports shall address each TOR as specified; (3) The reports shall be delivered as specified in the schedule of milestones and deliverables.

Travel

All travel expenses shall be reimbursable in accordance with Federal Travel Regulations (http://www.gsa.gov/portal/content/104790).

Restricted or Limited Use of Data

The contractors may be required to sign and adhere to a non-disclosure agreement.

NMFS Project Contact

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Attachment 1

Appendix 1. *Stock Assessment Terms of Reference for SAW/SARC-64*

The SARC Review Panel shall assess whether or not the SAW Working Group has reasonably and satisfactorily completed the following actions.

A. Atlantic mackerel (NAFO Subareas 3-6)

1. Spatial and ecosystem influences on stock dynamics:
    a. Evaluate possible spatial influences on the stock dynamics. Recommend any need to modify the current stock definition for future stock assessments.
    b. Describe data (e.g., oceanographic, habitat, or species interactions) that might pertain to Atlantic mackerel distribution and availability. If possible, integrate the results into the stock assessment (TOR-4).

2. Estimate catch from all sources including landings and discards. Describe the spatial and temporal distribution of landings, discards, and fishing effort. Characterize the uncertainty in these sources of data.

3. Evaluate fishery independent and fishery dependent indices being used in the assessment (e.g., indices of relative or absolute abundance, recruitment, state surveys, age-length data, etc.). Characterize the uncertainty and any bias in these sources of data.

4. Estimate annual fishing mortality, recruitment and stock biomass (both total and spawning stock) for the time series, and estimate their uncertainty. Develop alternative approaches which might also be able to estimate population parameters. Include a comparison of new assessment results with those from previous assessment(s).

5. State the existing stock status definitions for "overfished" and "overfishing". Then update or redefine biological reference points (BRPs; point estimates or proxies for BMSY, BTHRESHOLD, Fmsy, and MSY) and provide estimates of their uncertainty. If analytic model-based estimates are unavailable, consider recommending alternative measurable proxies for BRPs. Comment on the scientific adequacy of existing BRPs and the "new" (i.e., updated, redefined, or alternative) BRPs.

6. Make a recommended stock status determination (overfishing and overfished) based on new results developed for this peer review. Include qualitative written statements about the condition of the stock that will help to inform NOAA Fisheries about stock status.

7. Develop approaches and apply them to conduct stock projections.
    a. Provide numerical annual projections (3 years) and the statistical distribution (e.g., probability density function) of the catch at Fmsy or an Fmsy proxy (i.e. the overfishing level, OFL) (see Appendix to the SAW TORs). Each projection should estimate and report annual probabilities of exceeding threshold BRPs for F, and probabilities of falling below threshold BRPs for biomass. Use a sensitivity analysis approach in which a range of assumptions about the most important uncertainties in the assessment are considered (e.g., terminal year abundance, variability in recruitment).

b. Comment on which projections seem most realistic. Consider the major uncertainties in the assessment as well as sensitivity of the projections to various assumptions. Identify reasonable projection parameters (recruitment, weight-at-age, retrospective adjustments, etc.) to use when setting specifications.

c. Describe this stock's vulnerability (see "Appendix to the SAW TORs") to becoming overfished, and how this could affect the choice of ABC.

8. Review, evaluate and report on the status of the SARC and Working Group research recommendations listed in most recent peer reviewed assessment and review panel reports. Identify new research recommendations.

NOAA Fisheries has final responsibility for making the stock status determination based on best available scientific information.

Clarification of Terms
used in the Stock Assessment Terms of Reference

Guidance to SAW WG about "Number of Models to include in the Assessment Report': In general, for any TOR in which one or more models are explored by the WG, give a detailed presentation of the "best" model, including inputs, outputs, diagnostics of model adequacy, and sensitivity analyses that evaluate robustness of model results to the assumptions. In less detail, describe other models that were evaluated by the WG and explain their strengths, weaknesses and results in relation to the "best" model. If selection of a "best" model is not possible, present alternative models in detail, and summarize the relative utility each model, including a comparison of results. It should be highlighted whether any models represent a minority opinion.

On "Acceptable Biological Catch" (DOC Nat. Stand. Guidelines. Fed. Reg., v. 74, no. 11, 1-162009):

Acceptable biological catch (ABC) is a level of a stock or stock complex's annual catch that accounts for the scientific uncertainty in the estimate of Overfishing Limit (OFL) and any other scientific uncertainty..." *(p. 3208) [In other words, OFL ABC.]*

ABC for overfished stocks. For overfished stocks and stock complexes, a rebuilding ABC must be set to reflect the annual catch that is consistent with the schedule of fishing mortality rates in the rebuilding plan. *(p. 3209)*

NMFS expects that in most cases ABC will be reduced from OFL to reduce the probability that overfishing might occur in a year. (p. 3180)

ABC refers to a level of "catch" that is "acceptable" given the "biological" characteristics of the stock or stock complex. As such, Optimal Yield (OY) does not equate with ABC. The

specification of OY is required to consider a variety of factors, including social and economic factors, and the protection of marine ecosystems, which are not part of the ABC concept. (p. 3189)

On "Vulnerability" (DOC Natl. Stand. Guidelines. Fed. Reg., v. 74, no. 11, 1-16-2009):

"Vulnerability. A stock's vulnerability is a combination of its productivity, which depends upon its life history characteristics, and its susceptibility to the fishery. Productivity refers to the capacity of the stock to produce Maximum Sustainable Yield (MSY) and to recover if the population is depleted, and susceptibility is the potential for the stock to be impacted by the fishery, which includes direct captures, as well as indirect impacts to the fishery (e.g., loss of habitat quality)." (p. 3205)

Participation among members of a Stock Assessment Working Group:

Anyone participating in SAW meetings that will be running or presenting results from an assessment model is expected to supply the source code, a compiled executable, an Input file with the proposed configuration, and a detailed model description in advance of the model meeting. Source code for NOAA Toolbox programs is available on request. These measures allow transparency and a fair evaluation of differences that emerge between models.

Appendix 2. Draft Review Meeting Agenda

{Final Meeting agenda to be provided at time of award}

64th Stock Assessment Workshop/Stock Assessment Review Committee (SAW/SARC)
Benchmark stock assessment for A. Atlantic mackerel

Nov. 28-30, 2017

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

DRAFT AGENDA* (version: June 30, 2017)

TOPIC	PRESENTER(S)	SARC LEADER RAPPORTEUR

Tuesday, Nov. 28

10— 10:30 AM
Welcome   **James Weinberg,** SAW Chair
Introduction   **John Boreman,** SARC Chair
Agenda
  Conduct of Meeting

10:30 — 12:30 PM   Assessment Presentation (A. Mackerel)
                Kiersten Curti   TBD

12:30 — 1:30 PM   Lunch

1:30 — 3:30 PM   Assessment Presentation (A. Mackerel)
                Kiersten Curti   TBD

3:30 — 3:45 PM   Break

3:45 — 5:45 PM   SARC Discussion w/ Presenters (A. Mackerel)
                John Boreman, SARC Chair   TBD

5:45 —6 PM   Public Comments

7 PM   (Social Gathering)

Attachment 1

TOPIC	PRESENTER(S)	SARC LEADER	RAPPORTEUR

<u>**Wednesday, Nov. 29**</u>

9:00 — 10:45   Revisit with Presenters (A. Mackerel)
                John Boreman, SARC Chair   **TBD**

10:45 - 11   Break

11— 11:45   Revisit with Presenters (A. Mackerel)
                John Boreman, SARC Chair   **TBD**

11:45 — Noon   Public Comments

0— 1:15 PM   Lunch

1:15 — 4
                Review/Edit Assessment Summary Report (A. Mackerel)
                John Boreman, SARC Chair   **TBD**

4 — 4:15 PM   Break

4:15 — 5:00 PM   SARC Report writing

<u>**Thursday, Nov. 30**</u>

9:00 AM — 5:00 PM   SARC Report writing

*All times are approximate, and may be changed at the discretion of the SARC chair. The meeting is open to the public; however, during the Report Writing sessions on July 20 and 21, we ask that the public refrain from engaging in discussion with the SARC.

Appendix 3. Individual Independent Peer Review Report Requirements

1. The independent peer review report shall be prefaced with an Executive Summary providing a concise summary of whether they accept or reject the work that they reviewed, with an explanation of their decision (strengths, weaknesses of the analyses, etc.).

2. The report must contain a background section, description of the individual reviewers' roles in the review activities, summary of findings for each TOR in which the weaknesses and strengths are described, and conclusions and recommendations in accordance with the TORs. The independent report shall be an independent peer review, and shall not simply repeat the contents of the SARC Summary Report.

   a. Reviewers should describe in their own words the review activities completed during the panel review meeting, including a concise summary of whether they accept or reject the work that they reviewed, and explain their decisions (strengths, weaknesses of the analyses, etc.), conclusions, and recommendations.

   b. Reviewers should discuss their independent views on each TOR even if these were consistent with those of other panelists, but especially where there were divergent views.

   c. Reviewers should elaborate on any points raised in the SARC Summary Report that they believe might require further clarification.

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

3. The report shall include the following appendices:

   Appendix 1: Bibliography of materials provided for review
   Appendix 2: A copy of this Statement of Work
   Appendix 3: Panel membership or other pertinent information from the panel review
            meeting.

Appendix 4. SARC Summary Report Requirements

1. The main body of the report shall consist of an introduction prepared by the SARC chair that will include the background and 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 or not each Term of Reference of the SAW Working Group 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 reviewers should consider whether or not the work provides a scientifically credible basis for developing fishery management advice. If the 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 Points (BRPs) or BRP proxies are considered inappropriate, include recommendations and justification for alternatives. If such alternatives cannot be identified, then indicate that the existing BRPs or BRP proxies are the best available at this time.

3. The report shall also include the bibliography of all materials provided during the SAW, and relevant 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 assessment Terms of Reference used for the SAW, including any changes to the Terms of Reference or specific topics/issues directly related to the assessments and requiring Panel advice.

Attachment 2

SARC 64 ATTENDEE LIST (Mackerel Assessment Review, Nov. 28-30, 2017)

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