Report on the SARC Review of SAW 60 Stock Assessments for Scup and Bluefish, June 2015

N. G. Hall

Unit 2
2 Wexford Street
Subiaco
Western Australia 6008
Australia
Phone: +61 8 9401 6891
Email: nghall@iinet.net.au

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1. Executive Summary

The SARC for the 60th Stock Assessment Workshop (SAW 60) met at Woods Hole in June 2015 to examine the stock assessments developed for Scup (*Stenotomus chrysops*) and Bluefish (*Pomatomus saltatrix*). Overall, the SARC Review Panel found the assessments to be of a high quality and accepted the conclusions that neither stock is overfished or experiencing overfishing. Decisions relating to stock definition, data to be employed, model structure, assessment models (after, in the case of Bluefish, correction of a mis-specified parameter), and Biological Reference Points (BRPs), and findings on stock status, short term projections, and vulnerabilities by each Working Group (WG) appeared sound and were accepted and endorsed by the Panel. Specific areas of concern in the assessments, which were explored during the review, are discussed below.

The key issue in the Scup assessment was the fact that, although estimates produced by the assessment model indicated that fishing mortality (F) had declined by about 95% and SSB had increased over 40-fold since 1994, there was little evidence of a marked reduction in fishing effort or other change in the fishery that might have been expected to accompany such a change in fishing mortality. This, coupled with the unexpected stability of estimates despite considerable variation in model configuration and the fact that, due to the dome shaped selectivity of the landings, much of the estimated increase in spawning stock biomass (SSB) is cryptic, led to concern by the Panel that the decline in fishing mortality and increase in SSB is not as great as estimated by the assessment model. The analyses undertaken during SARC 60 suggested that the stability of the model's estimates may be due partly to the extension of the time series of data used in the model back to 1963, and, because of the lack of age data prior to 1984, the resulting restriction on recruitment variability in the early part of the time series. Based on the results of the model configurations explored by the Scup WG, both before and during the review, the Panel agreed that it was unlikely that conclusions regarding the status of the Scup stock or its level of exploitation would be altered by the use of models that allowed greater recruitment variability in the early years. The Panel accepted that, despite its concern regarding the accuracy of SSB and F estimates in recent years, the results of the assessment indicated that the Scup stock was not overfished and overfishing was not occurring. The Panel also concluded that, in the short term, the values of OFL, which had been calculated for Scup, were acceptable.

It was recognised during SARC 60 that, inadvertently, a parameter of the logistic selectivity curve for the MRIP index in the final assessment model for Bluefish had been mis-specified. The Panel and the WG agreed that it was appropriate that this error should be corrected, such that assessments of the status of the stock and its level of exploitation, and estimates of OFLs, are based on correct rather than erroneous results. The WG updated the estimates of biological reference points, and ran MCMC analyses and projections during the meeting to produce revised estimates. The Panel accepted that the various model configurations that had been explored and the sensitivity analyses that had been undertaken using the final configuration of the assessment model prior to discovery of the mis-specification were sufficient to assess the likely uncertainty of the results produced by the final assessment model (after correction of the selectivity curve). In the case of the assessment for Bluefish, the major concern identified by the Panel was the fact that the key index influencing the

results was the MRIP catch per unit of effort (CPUE), which was derived from the fishery-dependent MRFSS/MRIP data and was not independent of the recreational catch data. While the Panel agreed with conclusions regarding the status of the Bluefish stock and its level of exploitation, and accepted the results of the projections, it recognised that the assessment would be more robust if a fishery-independent index representative of older Bluefish was available.

The review meeting was well organised, and documents were available on time. If it is possible, consideration should be given to using voice-activated microphones, as this would overcome the need to remind individuals to push the button to activate their microphone prior to speaking. There would be value in asking the WGs to provide copies of the input data used with the assessment model to the Panel, such that it is possible for the Panel to confirm that these data match the content of tables presented in the assessment reports.

Finally, returning to the assessments for Scup and Bluefish, I conclude that these are of a high quality, and provide the best scientific advice regarding the status of these two stocks that is currently available. The WGs are commended for their efforts.

2. Background

2.1. Overview

A Stock Assessment Review Committee (SARC) meeting to review the 2015 benchmark stock assessments for Scup (*Stenotomus chrysops*) and Bluefish (*Pomatomus saltatrix*) was held at the Northeast Fisheries Science Center, Woods Hole, Massachusetts, from 2-5 June 2015. The SARC Review Panel for the 60th Stock Assessment Workshop (SAW 60) comprised, as SARC Chair, Dr Cynthia Jones (Old Dominion University, Virginia), and, as panel members appointed by the Center for Independent Experts (CIE), Kevin Stokes (New Zealand), Sven Kupschus (CEFAS, UK), and Norman Hall (Murdoch University, Australia) (Appendix 3). The agenda for the Review Workshop is presented in Annex 3 of Appendix 2.

The Statement of Work provided to Dr Norm Hall by the CIE is attached as Appendix 2. This required that, in addition to satisfying the requirement for SARC Panel members to participate in the review and conduct an independent peer review of each assessment, Review Panel members should assist the Review Chairman in preparing a SARC Summary Report of the review, and each should also prepare an independent CIE report of the assessments and the review process. This CIE report, which is prepared in accordance with the last of these requirements, describes my evaluation of the assessments and the review process.

Prior to the SARC Review Meeting, the stock assessment documents and other background documentation had been made available to Panel members. A list of these documents is presented in Appendix 1.

2.2. Terms of Reference

The terms of reference for the stock assessments of the Scup and Bluefish are presented in the Statement of Work (Appendix 2), together with the terms of reference for the SARC review of these assessments.

2.3. Panel membership

Details of the Panel Membership and of other key participants for the SARC review of the SAW 60 stock assessments for Scup and Bluefish are presented in Appendix 3. In particular, the SARC Review Panel members comprised:

- Cynthia Jones, SARC Chair, MAFMC SSC
- Kevin Stokes, CIE
- Sven Kupschus, CIE
- Norman Hall, CIE

2.4. Date and place

The SARC met on 2–5 June, 2015, at the Northeast Fisheries Science Center, Woods Hole, Massachusetts, to review the benchmark stock assessments for Scup and Bluefish that had been produced for SAW 60.

2.5. Acknowledgments

Thanks are expressed to the various individuals who participated in the review meeting, and who contributed to the stock assessments, for making the review such an interesting and positive experience. The WGs and, in particular, the presenters, M. Terceiro, Tony Wood, and Katie Drew, are to be commended for the quality of their stock assessments, and their very competent and professional responses to the Panel's queries and requests. Thanks are also extended to the NEFSC SAW Chairman, J. Weinberg, Sheena Steiner, and Chris Legault (NEFSC) for their assistance in ensuring the smooth running of the review meeting, and to the rapporteurs, who greatly assisted the Panel by recording the Scup and Bluefish discussions. The valuable insights, comments, and recommendations offered during the review meeting by C. Jones, K. Stokes, and S. Kupschus are gratefully acknowledged.

3. Description of Reviewer's role in review activities

Prior to the review meeting, I familiarised myself with the background documentation, and the assessment and draft assessment summary reports for the two species that were the subject of the review (Appendix 1). Subsequently I attended and actively participated as a Review Panel member in the SARC meeting that was held at Woods Hole. At this meeting, the lead assessment scientists presented details of the data and the assessments, which I and the other Panel members reviewed and assessed. Together with other Panel members, I requested further details regarding specific aspects of the assessment that were of concern and considered and discussed the results of additional analyses that were requested during the meeting. I also participated in the Review Panel's discussions regarding the adequacy and soundness of the WG's responses to their various terms of reference, and whether the results of the assessments were of an appropriate scientific standard and thus acceptable as the basis for scientific advice for use in management. With other Panel Members, I contributed my suggestions of points to be considered when preparing the SARC Summary Report. During the Review Meeting, I drafted those sections of the SARC Summary Report, for which I had been assigned responsibility, and offered comment on the resulting draft report. I then focused on preparing this document, *i.e.*, the CIE report describing my evaluation of the two stock assessments and the SARC review.

4. Summary of findings relevant to SARC review of the Terms of Reference of the stock assessments for SAW 60

In this section of the document, I have attempted to present my own assessment of each of the Terms of Reference for the assessments produced for SAW 60. Note, however, that although the Statement of Work calls for an independent assessment by each CIE Panel Member, the review process itself and the process of preparing a SARC Summary Report that encompasses the different perspectives of the members of the Review Panel encourages convergence of views by Panel members and a focus on common issues. Note also that, in the text below, 'WG' refers to the working Group relevant to the particular ToR that is the subject of the discussion, i.e., the Scup or Bluefish Working Group.

*4.1 Scup (*Stenotomus chrysops*).*

Scup ToR 1. Estimate catch from all sources including landings and discards. Include recreational discards, as appropriate. Describe the spatial and temporal distribution of landings, discards, and fishing effort. Characterize the uncertainty in these sources of data.

Was the ToR completed successfully?

Yes.

Reason for acceptance/rejection

Following collation of available data, the WG reported time series of (a) commercial landings by state by major gear type, (b) GMDL and SBRM estimates of commercial discards (with PSE), (c) MRFSS and MRIP estimates of recreational landings, and (d) MRFSS and MRIP estimates of live discards by recreational fishers and details of sampling intensity (from 1995 to 2014). Recreational landings and releases between 2004 and 2011 were also reported by state, together with PSEs of the totals. Although no tables of commercial effort were reported, a plot of the spatial distribution of total commercial fishing effort (days fished) for Scup (based on port agent interviews prior to 1994, and VTRs subsequently) was presented.

Strength of analysis

Fishery-dependent, SBRM based estimates of commercial discards by fishers supplement the observer-based GDML estimates of those discards and, to some extent, address issues relating to observer sampling intensity. The detailed exploration of the precision of estimates of commercial discards derived from SBRM data using three alternative stratifications demonstrated clearly the merits of the decision to employ the MESH240 estimates of discards.

The NMFS Marine Recreational Fishery Statistics Survey (MRFSS; 1981–2011), and subsequently the NMFS Marine Recreational Information Program (MRIP; 2004–2014) have provided time series of estimates of recreational

landings of Scup that extend back to 1981. Estimates of reported recreational landings by party and charter boats are available not only from MRFSS but also from Vessel Trip Reports, although the former estimates were ~57% higher than the latter over the 1995–2014 period.

Use of MRIP rather than MRFSS data improved estimates of recreational landings, and, as a result of this modification, overall recreational harvest numbers, weights, and live discards for 1963–2003 were increased by 19%, 18%, and 11%.

Weakness of analysis

Annual TACs, commercial quotas and recreational harvest limits were not reported in the Scup Assessment Report.

The Scup Assessment Report advises that "not all states routinely reported all landings and effort data to the federal Dealer reporting system until the late 1980s". No information is provided in the Assessment Report as to whether this resulted in underestimation of commercial catches or whether the missing data were obtained from sources other than the Dealer reporting system.

The final model (S60_BASE_18) proposed by the Scup WG represented the fishery from 1963 to 2014, but, as noted in the Assessment Report, catches prior to 1981 are less reliable than those from 1982. Commercial landings by the distant water fleet, discards by commercial fishers, and the assumptions used to estimate removals by the recreational sector are uncertain. Commercial discards for 1963-1988 were estimated from landings using the discard to landings ratio for 1989-1991, i.e. 0.46. Recreational catch for 1963-1980 was estimated to be 50% of the values estimated by Mayo (1982).

Ageing data from commercial port sampling only became available in 1984, and, according to the Scup Assessment Report, "the time series is limited by the availability of sampled fishery ages".

Approximately 17% of commercial landings since 1989 have been taken using fishing gears other than trawling, and it is stated in the Assessment Report that, presumably despite the adoption of the SBRM for estimation of landings, "data are still sufficient to estimate discards for trawl gear only". The need to correct this deficiency is assessed as low, however, as it is assumed that either the gears other than trawling have low discard rates and/or low discard mortality rates. This assumption should ultimately be tested.

Data relating to releases by recreational fishers are self-reported, and thus, are fishery dependent and a source of uncertainty. The basis for the discrepancy between the MRFSS and VTR estimates of party/charter boat landings is not known.

Were conclusions and recommendations acceptable?

The decision of the WG to employ the time series of commercial and recreational catches and discards from 1963 to 2014 was acceptable.

Reason for acceptance/rejection

While the earlier data were recognized as having greater uncertainty than the latter, it was appropriate to carry data for 1963–2014 into the 2015 assessment to provide continuity between the existing model and the new 2015 assessment model. Sensitivity runs using time series starting in 1977, 1984, and 1989 were explored by the WG and are discussed in ToR4.

Does work provide a scientifically credible basis for fishery management advice?

Yes.

Scup ToR 2. Present the survey data 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.

Was the ToR completed successfully?

Yes.

Reason for acceptance/rejection

The Scup Assessment Report reports time series (including CVs) of indices of abundance/biomass, which include the NEFSC winter (NECWIN), spring (NECSPR) and fall (NECFAL) bottom trawl surveys, the Connecticut Department of Energy and Environmental Protection (DEEP) spring (CTSPR) and fall (CTFAL) trawl surveys, the New York Department of Environmental Conservation (DEC) small mesh survey (NYDEC), the Massachusetts Division of Marine Fisheries spring (MASPRKG) and fall (MAFALKG) bottom trawl surveys, the Rhode Island Division of Fish and Wildlife (DFW) spring (RISPRKG) and fall (RIFALKG) bottom trawl surveys, the New Jersey Department of Fish and Wildlife (DFW) bottom trawl biomass survey (NJKG), the University of Rhode Island Graduate School of Oceanography trawl survey (URIGSO), the Virginia Institute of Marine Science (VIMS) Chesapeake Bay Multispecies Monitoring and Assessment Program trawl survey (ChesMMAP), the VIMS Juvenile Fish Trawl Survey (VIMSYOY), the VIMS Northeast Area Monitoring and Assessment Program (NEAMAP) spring (NEAMAP SPR) and fall (NEAMAP FAL) trawl surveys, and the Rhode Island DFW cooperative ventless trap survey (RI Coop Trap). It also describes and presents tables of age compositions for the four fishing fleets, i.e., the commercial and recreational landings and live releases, and for survey age compositions, i.e. NEFSC ('FSV Albatross equivalent') spring, NEFSC ('FSV Albatross equivalent') fall, NEFSC winter, RI DFW spring, RI DFW fall, RI DFW Coop Trap, CT DEEP spring, CT DEEP fall, NY DEC, VIMS ChesMMAP, VIMS NEAMAP spring, VIMS NEAMAP fall.

To explore uncertainty of the indices of abundance, alternative indices were calculated for subsets of NEFSC spring and fall bottom survey data based on different strata. No significant reduction in inter-annual variation resulted. Trends in numeric abundance and in Scup recruitment at age 0 present within the different indices were also compared subjectively. Generalized linear models relating spring and fall survey indices to year of sampling and survey identity were "constructed using lognormal, Poisson, negative binomial and gamma distributions with log-links where necessary". Similar models were also used to construct integrated annual indices at age. The hierarchical analysis method described by Conn (2010) was also applied to the spring and fall survey indices.

Strength of analysis

While many of the surveys are of limited geographic scope, collectively the various NEFSC, state and academic surveys cover much of the area occupied by the Scup stock.

Weakness of analysis

Ages are determined from scales rather than otoliths, which may be a potential source of error. Age compositions are assumed to be known without error.

The Panel noted that use in the 2015 assessment report of both true ages and model ages, where model age = true age + 1, is a potential source of error. It is recommended that only true ages be used in future assessments.

The replacement of the FSV Albatross IV in spring 2009 by the FSV Henry Bigelow resulted in an unavoidable break in the NEFSC spring and fall bottom surveys. A calibration study was undertaken in 2008, however, and the results were used by the WG to explore the implications of employing estimates of 'Albatross equivalent' survey indices calculated from the FSV Bigelow data using either annual aggregate or length equivalent results of the calibration.

The abundance indices that are calculated using data from surveys that predominantly catch age 0 Scup are sensitive to inter-annual variation in the abundance of recruits. The abundance indices of surveys, particularly of those where samples are collected from a small geographic region, are also sensitive to inter-annual variation in the spatio-temporal distribution, and thus availability of Scup, and to the length and age composition of the stock and the selectivity of fish of different lengths and ages to the fishing gear.

The abundance indices, and particularly those for spring surveys, exhibit high inter-annual variability, and appear to reflect the availability of Scup to the different surveys.

The aggregate indices constructed outside the assessment model are based on the set of assumptions used in the external analysis, where these assumptions may be inconsistent with those of the assessment model itself, thus potentially

introducing bias. The uncertainty associated with the external analysis must be carried through into the assessment model, but is often ignored. It is better to use the model itself to construct aggregate indices, as this ensures that a consistent set of assumptions is applied throughout the analysis.

Were conclusions and recommendations acceptable?

The survey indices and age compositions provide a sound basis for the 2015 assessment. The decision of the WG to base the assessment model on the use of the set of individual indices of abundance rather than on the GLM integrated and/or hierarchical indices of aggregate abundance, and to restrict the use of the latter to sensitivity analyses, is endorsed.

Reason for acceptance/rejection

The abundance indices and age compositions provide data of the type that are used in most age-structured assessment models and appear to have sufficient contrast during the latter portion of the time series to allow parameters to be estimated.

Does work provide a scientifically credible basis for fishery management advice?

Yes.

Scup ToR 3. Describe the thermal habitat and its influence on the distribution and abundance of scup, and attempt to integrate the results into the stock assessment.

Was the ToR completed successfully?

Yes.

Reason for acceptance/rejection

With the exception of fall 2008, surface air temperature, surface air and bottom temperatures, and bottom salinity measurements were available for the strata surveyed in the NEFSC bottom trawl survey in spring and fall. The relationships between Scup catches and these variables were explored.

Strength of analysis

The findings were interesting. Ignoring the areas of the strata, Scup were typically caught in the spring survey at tow sites with higher surface and bottom water temperatures, higher bottom salinity and warmer air temperature than the median values of those variables for the strata. In the fall survey, Scup were generally caught at sites with warmer surface and bottom temperatures, lower bottom salinity and slightly warmer air temperature than the median values of those variables.

Trends over time of the mean values of these environmental variables for strata with positive Scup catch tows were compared with mean values over all strata. For the spring survey, the mean surface temperature of survey tows with positive Scup catches were higher than the mean surface temperature over all tows, whereas in the fall there was little difference between the mean surface temperature for positive Scup tows and the mean over all tows. A similar pattern emerged for air temperature, but the difference between the mean air temperature for tows with positive Scup catches and that for all tows was less than in the case for surface water temperature. The mean surface temperature had increased between 1968 and 2013. The mean bottom temperature of tows with positive Scup catches is generally warmer than the mean bottom temperature for both spring and fall surveys. While mean salinity of tows with positive Scup catches was greater than the mean salinity for all tows for the spring survey, the converse was true for the fall survey.

Generalized linear and additive models were unable to adequately fit the Scup survey catches to the environmental variables.

Maps showing the distribution of Scup in spring survey catches overlaid on estimated distributions of bottom temperatures suggest the possibility of 'availability events' that might influence the distribution of Scup. A thermal niche model of habitat suitability was developed, and was applied to estimate the annual proportions of Scup habitat that were available but these proportions failed to show any systematic trends.

Weakness of analysis

While not a weakness of the analysis, but rather a characteristic of the data, the relationships between the distribution of Scup and those of temperature, salinity, and depth are poorly defined and vary temporally with both the migration of the fish and their availability to the NEFSC bottom trawl surveys. Such variation makes it difficult to adequately relate the distribution of Scup to these environmental variables using generalized linear and additive models.

Were conclusions and recommendations acceptable?

The conclusion that generalized linear and additive models failed to describe adequately the relationship of NEFSC spring and fall bottom trawl survey indices of abundance with the spatial distributions of temperature and salinity was sound. The WG is also correct, however, in recognizing that an understanding of the relationship between Scup abundance and environmental variables would possibly allow some of the effects of those factors on survey indices to be taken into account thereby improving the accuracy of estimates of abundance.

Reason for acceptance/rejection

The analyses undertaken and described by the WG are sound.

Does work provide a scientifically credible basis for fishery management advice?

The results of this research are not yet sufficiently developed to inform the Scup stock assessment. There would be value in continuing this research, however, as, if successful, the results could be used to adjust indices of abundance to take variation in availability into account. The relationship of Scup distributions to those of predator and prey species might be worth investigating.

Scup ToR 4. Estimate annual fishing mortality, recruitment and stock biomass (both total and spawning stock) for the time series, and estimate their uncertainty. Include a historical retrospective analysis to allow a comparison with previous assessment results and previous projections.

Was the ToR completed successfully?

Yes.

Reason for acceptance/rejection

The WG updated the data for the existing assessment model, then undertook a phased development of a new assessment model. The model structure was reconfigured to use abundance indices, to model age compositions using a multinomial distribution, to include data from new surveys, and to revise the maturity and discard estimates. It was then explored to determine the most appropriate configuration, reducing the influence of priors associated with initial parameter estimates, and finally tuned by adjusting CVs and effective sample sizes. The sensitivity to the ways in which the Albatross and Bigelow NEFSC survey data were used to develop indices was investigated, as was the effect on assessment outputs of starting the model run at different years and thus using data for time series of different lengths. Retrospective and MCMC analyses were undertaken using the final assessment model (S60_BASE_18). Likelihood profiles were produced for natural mortality (M) and values of unexploited SSB. The final model was used to produce estimates of annual fishing mortality, recruitment, and SSB (but apparently not total biomass), which were compared with the estimates produced by previous assessments and projections.

Strength of analysis

ASAP, a well-developed and extensively-tested age-structured model was employed by the WG to assess the state of the Scup fishery. This model is well suited to the types of data available for Scup, and uses estimates of selectivity at age or of the parameters of selectivity curves to account for the age compositions of the catches by the different fleets and of the different surveys. Differences in those age compositions result from the migratory behaviour and changing spatial distribution of Scup in conjunction with the location and timing of surveys and the fishing activities and discarding practices of the different fleets.

A logical and thorough step-wise approach appears to have been taken in developing the new assessment model, allowing the effects of each successive change to be examined before making a decision as to whether to accept or discard the change.

It was pleasing to note that attempts were made to set Ls of priors associated with initial estimates to zero, thereby reducing the influence of these estimates.

Weakness of analysis

Because of the lack of age composition data from 1963 to 1980, there is little information in those earlier data to inform estimates of recruitment deviations and, as a consequence, recruitment estimates for that period are estimated to be at the average level of recruitment. Recruitment varied considerably in later years, however, and similar variation would have been expected in the earlier years. Failing to capture adequately the variation in recruitment in the earlier period may result in unreliable parameter estimates and model predictions in the later period. The analysis by the WG of the sensitivity of the model, which used data extending back to 1963, to time series of data commencing in 1977, 1984, and 1989, and the results and diagnostic plots produced during SARC 60 for the last two time periods, were useful. In particular, with the shortest time series, results suggested that the estimate of SSB in 2014 would be reduced by ~25% from the value predicted using the data from 1963, the estimate of age 0 recruits in 2014 would be reduced by ~20%, and the estimate of fishing mortality in 2014 would be increased by ~20-25%. As the length of time series was reduced, retrospective error increased, although not to a great extent.

It would have been useful if the effect on parameter estimates and on the objective function of "turning off", i.e., excluding, the different survey indices and age compositions had been calculated and reported, thereby allowing exploration of possible 'tension' among these datasets.

The WG decided to 'turn off' the 'likelihood constants' when calculating the objective function for the model, thereby changing this objective function from a negative log-likelihood to a penalty. Such a change would affect the MCMC analysis, which is based on likelihood. It appears that the decision to drop these constants was based on concern that the term representing the sum of the natural logarithms of the recruitment deviations in the equation for the log-likelihood of these log-normally distributed recruitment deviations is dependent on the degree of variation in recruitment. In the technical description for ASAP, however, log_recruit_devs is defined in the ADMB code as an init_bounded_dev_vector, and hence their sum should be zero and independent of the magnitude of such variation.

The Panel noted that a rather striking characteristic of S60_BASE_18 and various other model runs was the apparent stability of the estimates of stock status that were produced despite often marked changes in model configuration. It was not possible during the review to determine the basis for

such stability, although the Panel considered that the use of historical data back to 1963, with limited age data until ~1980 may have been partly implicated.

A very noticeable characteristic of the trend in SSB and fishing mortality estimated by S60_BASE_18 was the very rapid and marked increase in SSB and the very rapid and marked decrease in fishing mortality since 1994. A possible contributor to the predicted increase in SSB may be the dome shaped selectivity patterns estimated for the fleets, which suggest that much of the predicted biomass would have been cryptic. Because of the dome shaped selectivity, an increase in the cryptic biomass of older fish would have resulted in a decline in fishing mortality even without any associated marked change in fishing effort. Thus, lack of a signal that fishing effort had decreased would not preclude the possibility that fishing mortality had decreased markedly. The WG undertook a run with flat-topped selectivity for the landings in all periods, i.e. S60_BASE_18_FLATL. The resulting trends in the estimates of SSB and fishing mortality over the time series appeared more "realistic". Thus, although SSB still showed a marked increase and fishing mortality a marked decrease, the extent of these changes relative to values earlier in the time series were not as extreme as those estimated using S60_BASE_18. The estimates of these variables for 2014 were such that current stock status and short term projections would be unlikely to change.

Were conclusions and recommendations acceptable?

The Panel was not convinced that SSB had increased to the extent indicated by the final assessment model, nor that fishing mortality had declined to the extent that this model had estimated. The Panel was satisfied, however, that estimates of stock status and short term projections determined using the final assessment model were likely to be robust to this uncertainty given the recent trends in SSB and F predicted by the various models that had been explored by the WG.

Reason for acceptance/rejection

Despite the unusual stability of estimates of stock status, even with quite marked differences in model configuration, assessment outputs appeared robust to model uncertainty. Since 2000, SSB had increased markedly and estimates of fishing mortality had remained low under all scenarios considered by the WG, i.e. runs S60_BASE_1 through S60_BASE_20.

Does work provide a scientifically credible basis for fishery management advice?

The Panel accepted the final assessment model, i.e. S60_BASE_18, as suitable for determination of stock status and for use, in the short term, in preparing management advice.

Scup ToR 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.

Was the ToR completed successfully?

The WG satisfied the key elements of the ToR.

Reason for acceptance/rejection

The WG stated the existing stock status definitions for "overfished" and "overfishing", and reported the existing reference points that had been determined. It accepted the same proxies for F_{MSY}, SSB_{MSY}, and $SSB_{THRESHOLD}$ as had previously been used, and calculated values for these proxy reference points using the results from the new assessment model.

Strength of analysis

When developing the assessment model, it was found that the data contained little information on the steepness of the stock-recruitment relationship, and the decision was made to turn off the estimation of this relationship and only estimate recruitment deviations. Because of the lack of a clearly defined stock-recruitment relationship, it was not possible to calculate analytic model-based estimates. The decision to use $F_{40\%}$ as the proxy for F_{MSY}, $SSB_{40\%}$ as the proxy for the SSB_{MSY} target, and 0.5 $SSB_{40\%}$ as the proxy for the SSB threshold 0.5 SSB_{MSY} is appropriate.

Weakness of analysis

The WG did not discuss the adequacy of the existing or new reference points, nor did it provide estimates of the uncertainty of the reference points that it reported.

Greater clarity is required when specifying the fishing mortality measure used when calculating the values of the reference points. Thus, in the case of the new reference points, F is measured as 'apical' F at true age 3.

Were conclusions and recommendations acceptable?

The decisions of the WG regarding the reference points to be used were acceptable.

Reason for acceptance/rejection

The proxies for the reference points that were selected by the WG are consistent with those often used when managing other fish stocks with similar productivity and natural mortality, growth, and reproductive characteristics.

Does work provide a scientifically credible basis for fishery management advice?

The reference points selected by the WG provide a scientifically credible basis for management.

Scup ToR 6. Evaluate stock status with respect to the existing model (from previous peer reviewed accepted assessment) and with respect to a new model developed for this peer review.

a. When working with the existing model, update it with new data and evaluate stock status (overfished and overfishing) with respect to the existing BRP estimates.

b. Then use the newly proposed model and evaluate stock status with respect to "new" BRPs and their estimates (from TOR-5).

Was the ToR completed successfully?

Yes.

Reason for acceptance/rejection

The WG updated the data to 2014 then ran the existing model to produce estimates of fishing mortality and SSB for 2014. These were compared against the existing fishing mortality threshold and spawning biomass target reference points and, on the basis of this comparison, it was concluded that the stock was not overfished and overfishing was not occurring.

The WG then applied the final accepted 2015 assessment model to produce estimates of fishing mortality and SSB for 2014, and compared these against the reference points that had been determined using this assessment model (in ToR 5). Again, it was concluded that the stock was not overfished and overfishing was not occurring.

Were conclusions and recommendations acceptable?

The conclusions drawn by the WG regarding the status of the stock and its level of exploitation in 2014 were sound.

Does work provide a scientifically credible basis for fishery management advice?

The conclusions regarding stock status and level of exploitation in 2014 provide a scientifically-credible basis for fishery management.

Scup ToR 7. Develop approaches and apply them to conduct stock projections and to compute the statistical distribution (e.g., probability density function) of the OFL (overfishing level) (see Appendix to SAW TORs for definitions).

a. Provide numerical annual projections (3 years). 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.

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

Was the ToR completed successfully?

The key elements of the ToR were successfully completed.

Reason for acceptance/rejection

The WG developed projections based on two options, i.e. (A) 75% of the 2015 ACL being caught, and (B) 100% of the 2015 ACL being caught, where option A was considered by the WG to be the most realistic scenario. For each of 1000 MCMC estimates of 2014 stock sizes, 100 stochastic projections were made with future recruitments being drawn randomly from the cumulative density function of the recruitment series from 1984–2014. Estimates of SSB, and of the overfishing level (OFL) catches (and its CV), in 2016–2018 were reported for projections that assumed that, from 2016, the stock was fished at the fishing mortality threshold level of 0.220.

While the approach used in exploring model projections would have provided information on the statistical distribution of the OFL, this was not reported by the WG.

As F was fixed at the fishing mortality threshold level, the annual probability of exceeding the threshold BRPs for F was zero.

Annual probabilities of falling below threshold BRPs for SSB were not reported.

While a range of model configurations were explored when developing the model and sensitivity analyses were conducted (ToR4), the results of projections based on these various analyses were not explored. All projections were undertaken using the final accepted 2015 assessment model. Uncertainty in terminal year abundance was considered, however, through basing projections on each of the 1000 MCMC estimates of abundance in 2014 for this model. Uncertainty in recruitment was also considered, by conducting 100 stochastic projections for each of the 1000 estimates of abundance in 2014, and drawing annual recruitments randomly from the cumulative distribution of

recruitment estimates from 1984 to 2014 for this final assessment model. Uncertainty associated with the catch taken in 2015 was taken into account by running projections for two alternative scenarios regarding this catch, i.e. options A and B.

Based on its consideration of the range of estimates of SSB in 2014 during its exploration of alternative model configurations and sensitivity analyses, i.e. +/- 40% of the average estimate of SSB in 2014, and the estimates of retrospective error and analytically derived estimates of the CVs for 2014 SSB (11%), F(15%), and total number of Scup with ages of 1+ in 2014 (15%), the WG concluded that by approximately doubling the analytically derived CVs of the 2016–2018 OFLs, sufficient allowance would be made for additional uncertainty.

Based on the projections, the WG concluded that, in the short term, the stock has a low probability of becoming overfished if fishing is at the OFL. Explicit comment was not made on other sources of vulnerability.

Strength of analysis

By using AGEPRO, the WG ensured that projections were produced using well-tested software that is linked directly to ASAP, the model structure used to produce the final accepted assessment model for Scup.

Uncertainty in model estimates of terminal SSB and future recruitment streams was taken into account by running 100 stochastic projections with each of 1000 MCMC estimates of 2014 SSB.

Weakness of analysis

It would have been informative to have produced projections using model configurations that explored the key uncertainties, and in particular the alternative 1984 starting year and alternative estimates of M.

Were conclusions and recommendations acceptable?

The Panel accepted the estimates of OFLs and the proposed adjustment to the annual CVs of those OFLs. It accepted the advice of the WG that the 2015 catch assumed in Option A was the more likely of the two scenarios considered by the WG.

Reason for acceptance/rejection

Given the range of estimates of SSBs produced by the various model configurations and sensitivity analyses that had been undertaken by the WG, doubling of the CVs of the annual OFLs provides adequate allowance for the likely range of additional uncertainty.

Does work provide a scientifically credible basis for fishery management advice?

Estimates of OFLs derived from the projections provide a scientifically credible basis for fishery management advice.

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

Was the ToR completed successfully?

Yes.

Reason for acceptance/rejection

Research recommendations that had been made by the Data Poor Working Group (DPWG 2008) and by the MAFMC SSC in July 2012 were listed in the 2015 Assessment Report, and comment was made on the research that had been undertaken or was still to be undertaken. The WG also listed a set of new research recommendations.

Strength of analysis

The requirement of the ToR that research recommendations be explicitly listed, and that a comment is made on the extent to which each research item had been addressed, is useful as it ensures that, at intervals, research recommendations are critically examined.

Weakness of analysis

It would have been useful if, for each research recommendation, an assessment was made by the WG of how the results of the research would benefit the assessment and the extent to which uncertainties in the assessment model were likely to be reduced by successful completion of the proposed research item. It would also have been useful for the WG to have ranked the research in order of priority.

A number of the research recommendations fail to identify the precise research tasks to be undertaken, or relate to non-research activities. For example, the recommendation to continue current levels of at-sea and port sampling of the commercial and recreational fisheries simply addresses the need for continuation of an ongoing data collection activity rather than identifying a particular research task. There would be value in framing each research recommendation as a specific and well-defined research task, such that the scope of the research and the outputs that it will produce are more clearly identified.

Were conclusions and recommendations acceptable?

The recommendations for research tasks yet to be completed were endorsed. It is also recommended that (1) further exploration of the configuration of the assessment model is undertaken to understand why trends in estimates of SSB and F are relatively insensitive to changes in configuration, and (2) to assess what information might need to be collected to provide more reliable estimates of current SSB and F. This second task may be aided by undertaking the development of a management strategy evaluation tool, as identified in one of the existing research recommendations, and which would probably be of value also for fisheries other than Scup.

Reason for acceptance/rejection

The descriptions of the various research recommendations in the 2015 assessment report are not accompanied by details of the specific issues that led to those research recommendations, and the specific assessment needs that would be addressed. Such additional information is required before it is possible to evaluate the feasibility and value of the various items of proposed research.

Does work provide a scientifically credible basis for fishery management advice?

Without further information on the contribution that each research item is likely to make to improving the assessment, and, in a number of cases, a clearer specification of the precise research task that is proposed, it is difficult to assess the relative benefits of the different research tasks.

*4.2 Bluefish (*Pomatomus saltatrix*)*

Bluefish ToR 1. Estimate catch from all sources including landings and discards. Evaluate and if necessary update the discard mortality estimate. Describe the spatial and temporal distribution of landings, discards, and fishing effort. Characterize the uncertainty in these sources of data.

Was the ToR completed successfully?

Yes.

Reason for acceptance/rejection

The WG collated and reported the time series of annual commercial catches by both state and gear category from 1982 to 2014. Commercial discards were considered sufficiently small to be ignored. The WG also reported time series of estimates of recreational harvest and releases by state from 1982 to 2014, and presented a time series of the estimated number of recreational trips where Bluefish was the target or was caught in each year between 1991 and 2013.

Following a review of available metadata, the WG accepted a mortality estimate of 15% for discards from the recreational fishery.

Strength of analysis

Details of commercial fisheries landings are collected from dealer reports and trip ticket systems. To ensure consistency and reproducibility of data collection for future Bluefish assessments, the WG decided that commercial landings data would be drawn from the Atlantic Coastal Cooperative Statistics Program (ACCSP) Warehouse. These data were compared with landings from the NEFSC database and local state records, and differences were resolved.

Biological data characterizing the commercial landings have been collected by the NEFSC data collection program, the Virginia Marine Resources Commission's (VMRC) Stock Assessment Program (SAP), the North Carolina Division of Marine Fisheries sampling program, and by the Florida Fish and Wildlife Conservation Commission (FWC).

The time series of recreational landings and releases of Bluefish used in the 2015 assessment were obtained from the MRFSS and MRIP programs. MRIP, which was implemented in 2005, improved on methods used to estimate catches by better accounting for the sampling design of the dockside intercept survey component of the program. The estimates of CPUE, which are produced from the intercept data, are combined with estimates of effort, which are obtained from the other component, i.e., the Coastal Household Telephone Survey (CHTS), to produce estimates of recreational catch. On examination, however, it was found that for-hire modes of recreational fishing were underrepresented in the CHTS, and thus, from 2005, effort data for charter boats and head boats have been sampled through the For-Hire Survey (FHS) and several overlapping sampling programs. Details of landings by party/for-hire boats were obtained from MRFSS, MRIP, the Southeast Head Boat Logbook Program North Carolina to Florida), the FHS, the Vessel Trip Report Program (Maine through Virginia), and state census logbook programs in South Carolina, Florida and Maryland. The fact that estimates of quantities of released fish are based on self-reporting by recreational fishers is a source of uncertainty.

Weakness of analysis

Differences between commercial landings extracted from the ACCSP Warehouse and those from the NEFSC and state sources arose from duplicate state and federal reporting, and failure to synchronize data updated to different databases. It was noted that the NEFSC Commercial Fisheries Database (CFDBS), from which landings data from Maine to Maryland had been extracted for previous assessments, does not capture commercial Bluefish landings from those dealers who do not need to satisfy federal reporting requirements. Such differences between data sets are a source of uncertainty.

Relatively few length samples were collected from commercial landings from Maine to Virginia between 1989 and 1995, and sampling of commercial landings from Florida to North Carolina has been inadequate.

Discards of Bluefish from the commercial fishery are reported to be minimal, but no details of the source of information regarding quantities discarded are presented in the assessment report. The WG supported the statement that these discards were minimal by noting that the total commercial quota has not been landed in any year between 2000 and 2014. The assessment report advises that, because of the small quantities of commercial discards relative to landings, use of commercial discard data in the assessment would introduce more error than would be resolved, suggesting that these discard estimates are very imprecise.

While the WG described how inconsistencies in commercial and recreational data collected by different programs were reconciled and how data from different sources had been collated for use in the assessment, it would have been useful to have presented estimates of the CVs of estimates of recreational harvest and releases, and, in the case of censuses of commercial catches, the ranges of values obtained when using data from different sources.

Data on the length compositions of recreational landings were obtained from the MRIP Access Point Angler Intercept Survey (APAIS), the voluntary on-line angler logbook (eLOGBOOK), which was implemented in 2010 by the Rhode Island Department of Environmental Management Division of Fish and Wildlife, and from the Volunteer Angler Survey (VAS), which has been conducted since 1979 by the Connecticut DEEP Marine Fisheries Division. The sources of length composition for fish released by recreational fishers were the recorded data for Bluefish tagged and released in the American Littoral Society tagging program and various volunteer angler programs in RI, CT, and NJ. It would have been useful if the number of fish landed by recreational fishers that had been sampled for length measurements each year from each state, relative to the total number of fish landed from that state in that year by recreational fishers, had been reported, such that the adequacy of sampling might be assessed.

The WG noted that a bimodal pattern, which was present in many of the length compositions of commercial and recreational landings, and, to a lesser extent, recreational discards, could not yet be explained.

Were conclusions and recommendations acceptable?

The decision by the WG to accept the catch and recreational release as appropriate for use in the 2015 assessment is sound.

Reason for acceptance/rejection

Although failing to capture removals resulting from commercial discards, the data relating to other removals appears to be complete and of an accuracy and

precision suitable for use in assessing the state of the Bluefish stock and its level of exploitation in 2014.

Does work provide a scientifically credible basis for fishery management advice?

Yes.

Bluefish ToR 2. Present and evaluate data and trends on life history information including, age, growth, natural mortality, food habits, and maturity.

Was the ToR completed successfully?

Yes.

Reason for acceptance/rejection

The WG provided a detailed description in the 2015 assessment report of the age data that had been collated, the sources from which these data had been drawn, the difficulties that are encountered when using scales to age Bluefish, the move to the use of otoliths rather than scales to age individuals of this species, the differences the ages determined from scales and otoliths, the use of these data to construct age-length keys, and the improvements to sampling intensity that had followed acceptance of Addendum 1 to Amendment 1 of the Bluefish Fishery Management Plan. The WG had compared the parameters of growth curves fitted to different groups of data, estimates of natural mortality calculated using a wide range of different estimators, and the parameters of maturity ogives fitted to both length and age for different groups of fish. It had also reviewed data relating to the timing of spawning and, since 1977, the compositions of the diets of Bluefish during different decades.

Strength of analysis

The WG is commended for the considerable effort expended in tracking down the original and new sources of age data, and their use of these data to construct age-length keys.

Weakness of analysis

Although unavoidable due to the paucity of data from earlier years, the need to construct age-length keys by pooling data across years is unfortunate, as use of such keys to assign ages to fish on the basis of their lengths introduces bias when relative year-class strength varies among years and among locations.

Parameters of von Bertalanffy growth curves fitted to data from different regions, from different periods, and grouped on the basis of whether scales or otoliths were employed when ageing, differed markedly. The switch from the use of scales to the use of otoliths as the basis for ageing fish made it difficult, however, for the WG to determine if growth had changed over the years for which data were available.

Were conclusions and recommendations acceptable?

The decision that fish classified as age 0 in spring samples from NC from 1985 –2000 should be re-classified as age 1 is endorsed as it appears that an inappropriate birthdate had been used when these fish were initially assigned ages.

Based on the range of estimates of natural mortality derived using a wide range of different estimators, the WG decided to continue using the assumption that M = 0.2. This decision is sound.

Following a review of data relating to the diets of Bluefish, the WG concluded that, as had been found in earlier studies, the diet of this species is dominated by fish.

The WG adopted an updated maturity curve fitted to the proportion mature at age for all fish as the input data for the 2015 assessment model. This decision is endorsed.

Reason for acceptance/rejection

The decision by the WG to combine fish of age 6 and greater into a 6+ group was based on the fact that, from age 6, there is increasing divergence between the ages attributed to fish as a result of ageing using scales and those determined using otoliths. Through this decision, the WG avoided the potential for bias that would have been introduced through use of scale-based ages for data collected in earlier years.

Does work provide a scientifically credible basis for fishery management advice?

Yes.

Bluefish ToR 3. Present the survey data available for use in the assessment (e.g., indices of relative or absolute abundance, recruitment, state surveys, age-length data, etc.), evaluate the utility of the age-length key for use in stock assessment, and explore standardization of fishery-independent indices. Investigate the utility of recreational LPUE as a measure of relative abundance. Characterize the uncertainty and any bias in these sources of data, including exploring environmentally driven changes in availability and related changes in size structure. Explore the spatial distribution of the stock over time, and whether there are consistent distributional shifts.

Was the ToR completed successfully?

Yes.

Reason for acceptance/rejection

Time series of young-of-year survey data (several of which were standardized) from the New Hampshire Fish and Game Department's Marine Division Juvenile Finfish Seine Survey (1997–2014), the Rhode Island Department of Environmental Management (DEM) Division of Fish and Wildlife Narrangansett Bay Juvenile Finfish Beach Seine Survey (1988–2014), the New York Department of Environmental Conservation's (NYSDEC) Western Long Island Beach Seine Survey (WLIS)(1987–1996, 2998–3014), the NJDFW Delaware River striped bass young-of-year (YOY) Seine Survey (2002–2014), the Maryland Department of Natural Resources' (MD DNR) Juvenile Striped Bass Seine Survey (1985–2014), the Virginia Institute of Marine Science (VIMS) Juvenile Striped Bass Seine Survey (1985–2014), and the Southeast Area Monitoring and Assessment Program (SEAMAP) fishery-independent trawl survey (1989–2014) were presented in the 2015 Bluefish stock assessment report. Using Bayesian hierarchical modelling, these YOY surveys were combined into a composite index (1981–2014), which was subsequently used in the assessment model (ToR 4) instead of the original YOY indices. The WG also reported time series of survey data (including age compositions) for the Connecticut Department of Energy and Environmental Protection's (CTDEEP) Marine Fisheries Division Long Island Sound Trawl Survey (LISTS) (1985–2014), the New Jersey Division of Fish and Wildlife (NJDFW) Bureau of Marine Fisheries Ocean Trawl Survey (1990–2014), the Northeast Area Monitoring and Assessment Program (NEAMAP) Mid-Atlantic/Southern New England Nearshore Trawl Survey (2007–2014), the North Carolina Division of Marine Fisheries (DMF) Pamlico Sound Independent Gill Net Survey (PSIGNS) (2001-2014), and the Northeast Fisheries Science Center (NEFSC) Fall Inshore Trawl Survey (Albatross: 1985–2008; Bigalow: 2009–2014).

The WG reported that age data prior to 1985 were too sparse to be reliable, and thus concluded that the model should start in 1985. Based on a quantitative analysis, the WG determined that sharing age data across time should be avoided. It advised that the age-length keys used for the 2015 assessment had been greatly improved by the additions made to the coast wide biological collection program since 2005, and particularly since 2012.

A time series of Generalized Linear Model (GLM) standardized estimates of catch per unit of effort (CPUE) (1981–2014) was produced from MRIP intercept data for trips that targeted or caught Bluefish. The factors considered in the GLM were year, mode, avidity, state, wave, and area.

An investigation of Bluefish distributions and their relationship to ocean temperature, abundance, and body size was undertaken, but no systematic shifts in distribution were identified. A parametric thermal niche model was developed and used to explore thermal habitat suitability, but yearly proportions of thermal habitat suitability surveyed by NEFSC did not exhibit consistent trends.

Strength of analysis

Summaries of the various surveys considered by the WG included details of survey design and methods used to analyse the collected data. Maps were provided that identified the areas surveyed.

CVs of abundance indices were reported for the RI YOY, NY YOY, MD YOY, NEAMAP, and NEFSC surveys, the composite YOY index, and standardized MRIP CPUE.

Weakness of analysis

While the collection of biological data has improved considerably since 2012, and the WG has attempted to track down the original sources of age data for earlier years and identify any new sources, limited sampling was undertaken in many regions in the earlier years of the fishery.

Were conclusions and recommendations acceptable?

Reported survey indices (and associated age compositions) and MRIP CPUE data for 1985 – 2014 were considered appropriate for use in the 2015 assessment. Recognizing the limitations of the age data for 1997–2004, the WG decided that effective sample sizes for this period should be set to a low value. Both decisions are acceptable.

Reason for acceptance/rejection

While the areas over which a number of the surveys were conducted were relatively small compared with the area over which the Bluefish stock is distributed, and thus the associated indices are susceptible to inter-annual variation in availability of Bluefish to the surveyed regions, there is potential that they may contribute information concerning trends in abundance and about changes in the age composition of the population. Because of its wide coverage and specific focus on Bluefish, the MRIP CPUE index is likely to be particularly informative, despite the fact that it is a fishery-dependent index.

Does work provide a scientifically credible basis for fishery management advice?

Yes.

Bluefish ToR 4. Estimate relative fishing mortality, annual fishing mortality, recruitment, total abundance, and stock biomass (both total and spawning stock) for the time series, and estimate their uncertainty. Explore inclusion of multiple fleets in the model. Include both internal and historical retrospective analyses to allow a comparison with previous assessment results and previous projections. Explore alternative modeling approaches if feasible.

Was the ToR completed successfully?

Yes.

Reason for acceptance/rejection

The WG updated the previous (SAW 2005) assessment model, then progressively modified its structure such that the first modelled year was 1985, new catches and weights at age, and new indices were introduced, age compositions were modelled as samples from multinomial distributions rather than indices of abundance at age, a commercial and a recreational fleet were modelled, the new maturity ogive was employed, selectivities were estimated rather than fixed, and two selectivity blocks were considered. Various changes to effective sample sizes, lambdas, penalties, and CVs were explored, the likelihood constant in the objective function was turned off, various modifications were made to the forms of the selectivities of different surveys and the MRIP CPUE, and the model was 'tuned' by adjusting CVs and effective sample sizes. At each stage of this process, i.e. for each modification of the assessment model, plots of the time series of estimates of fishing mortality, recruitment, total abundance, total biomass, and spawning stock biomass were produced and compared with the time series of the estimates of these variables produced by a previous version of the 2015 model. Other diagnostic plots, e.g. plots of selectivities at age and age compositions, were also produced. For selected versions of the 2015 model, e.g. the continuity run (B001), the retrospective biases of estimates of F, SSB, recruitment, and other variables were assessed, and an MCMC analysis was run to produce distributions of the estimates of variables such as SSB and F at 2014. Various sensitivity analyses were conducted to explore uncertainty. Historical retrospective plots were produced to compare the time series of estimates of fishing mortality, recruitment, total abundance, total biomass, and spawning stock biomass produced by the previous benchmark model, the continuity run with updated data, and the final preferred model. The DCAC and DBSRA models were also applied to the Bluefish data.

Strength of analysis

As in the case of the Scup assessment, ASAP, a well-developed and extensively tested age-structured model, was employed by the WG to assess the state of the Bluefish fishery. This model is well suited to the types of data available for Bluefish, and uses estimates of selectivity at age or of the parameters of selectivity curves to account for the age compositions of the catches by the different fleets and of the different surveys. Differences in those age compositions result from the migratory behaviour and changing spatial distribution of Bluefish in conjunction with the location and timing of surveys and the fishing activities and discarding practices of the different fleets.

The WG added new data and indices to the continuity run from the previous assessment model, thereby constructing a base model for the 2015 assessment. A bridge was then built from this base model by thorough exploration of alternative configurations, settings and, weights and progressive extension of the model to the final model presented in the 2015 stock assessment report. In this process, approximately 75 models were explored, of which a subset

representing the most important changes were described in the assessment report.

Weakness of analysis

The use (in the stock assessment report) of both 'true' age and 'model' age, where model age = true age + 1, is a potential source of error. It is recommended that only 'true' age is used.

The WG decided to drop the variable $\Sigma\ln(R_{y,v})$ and constant terms from likelihood functions when calculating the objective function for the model, thereby changing this objective function from a negative log-likelihood to a penalty. Such a change would affect the MCMC analysis, which is based on likelihood. It appears from the technical description for ASAP, however, that log_recruit_devs is defined in the ADMB code as an init_bounded_dev_vector, and thus $\Sigma\ln(R_{y,v})$ sums to zero, and hence does not depend on model parameters.

In discussion regarding the diagnostics of the final assessment model (B043) brought to SARC 60 for review, it was recognised that the value of A50 for the selectivity of the MRIP index had inadvertently been set at true age 0 (i.e., model age 1) rather than, as had been intended, at true age 1. The model was re-run (B044), estimating A50 rather than fixing it, and thereby improving the residual pattern of the age compositions for this index. Terminal fishing mortality for the revised model increased from that estimated by B043, while estimated SSB decreased. Retrospective bias also increased, but further investigation indicated that this was not of a magnitude that would cause estimates of F and SSB to fall outside the confidence limits estimated for these variables by the MCMC analysis. As it represented a correction for a mis-specification in B043, and was not a new model proposed by the Panel, B044 was accepted by the Panel and the WG as the final model to be used for the Bluefish stock assessment. In relative terms, projections for B044 were considered likely to differ only slightly from those of B043, and results of sensitivity analyses were likely to be similar. Accordingly, the WG used the results from B044 to determine new reference points for Bluefish, and to assess the state of its stock.

Because it provides information on the relative abundance of the older age classes, the MRIP index influences strongly the trends in SSB and F that are estimated by the assessment model for Bluefish. It is, however, a fishery-dependent index, which is calculated from the data for the recreational fishery collected through the MRFSS/MRIP programs. The Panel also noted that, although including data on all released fish, the index and associated age composition were not entirely independent of the time series of recreational catches and their age compositions.

Were conclusions and recommendations acceptable?

The corrected model (B044) was accepted by the Panel as the final assessment model.

Reason for acceptance/rejection

The extensive exploration of model configurations, settings, and sensitivities of B043 was accepted by the Panel as providing sufficient understanding of the likely response of B044 to similar changes in configurations, settings and assumptions, such that values of terminal F and SSB, and estimates of new reference points calculated using B044 would provide a reliable basis for determination of stock status and estimation of OFLs.

Does work provide a scientifically credible basis for fishery management advice?

Yes.

Bluefish ToR 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.

Was the ToR completed successfully?

Yes.

Reason for acceptance/rejection

The existing stock status definitions, as determined in SARC 41, were stated. Due to the lack of data regarding recruitment levels at low stock sizes, it was not possible to determine a reliable stock-recruitment relationship for Bluefish using the 2015 assessment model. In the absence of such a relationship, analytic model-based estimates of MSY-based reference points could not be determined. MSY proxies were therefore used to redefine the reference points, and their values were calculated from the results of projections from the accepted assessment model (B044). The adequacy of the new reference points was discussed.

Strength of analysis

In the absence of a reliable stock-recruitment relationship, the decisions to use $F_{40\%SPR}$ as a proxy for F_{MSY}, and to set $SSB_{MSYproxy} = SSB_{40\%SPR}$, $SSB_{THRESHOLDproxy} = 0.5\ SSB_{40\%SPR}$, and MSY_{proxy} to the equilibrium yield under $F_{40\%SPR}$ were sound.

Following correction of a mis-specification in model B043, new biological reference points were calculated using the accepted assessment model, B044. The resulting values were:

$F_{MSYproxy} = F_{40\%SPR} = 0.17$
$SSB_{MSYproxy} = SSB_{40\%SPR} = 111, 228$ mt
$SSB_{THRESHOLDproxy} = 0.5\ SSB_{40\%SPR} = 55{,}614$ mt

MSY_{proxy} was estimated to be 13,967 mt.

Weakness of analysis

Although new biomass reference points were specified in terms of SSB rather than total biomass, this fact was not conveyed in the description of ToR 5 presented in the 2015 stock assessment report.

Were conclusions and recommendations acceptable?

The reference points recommended by the WG are acceptable.

Reason for acceptance/rejection

Biological reference points based on $F_{40\%SPR}$ and $B_{40\%SPR}$ proxies have been employed for many other fisheries. The Panel noted that Bluefish is probably more productive than the species for which reference points based on 40%SPR were assessed as being appropriate. Consideration might be given to exploring whether a proxy based on a lower percentage of SPR might be appropriate for Bluefish, given its biological characteristics and the nature of its fishery.

Does work provide a scientifically credible basis for fishery management advice?

Yes.

Bluefish ToR 6. Evaluate stock status with respect to the existing model (from previous peer review accepted assessment) and with respect to a new model developed for this peer review.
a. When working with the existing model, update it with new data and evaluate stock status (overfished and overfishing) with respect to the existing BRP estimates.
b. Then use the newly proposed model and evaluate stock status with respect to "new" BRPs and their estimates (from TOR-5).

Was the ToR completed successfully?

Yes.

Reason for acceptance/rejection

Following the update of data, estimates of F and B in 2014 were determined using the existing assessment model. Based on comparison of these estimates with existing reference points, it was concluded that overfishing is not occurring and the Bluefish stock is not overfished. The estimates of F and SSB in 2014 produced using the accepted 2015 assessment model (B044) were then compared with the values of the new BRPs, and it was again concluded that overfishing is not occurring and the Bluefish stock is not overfished.

Strength of analysis

Based on the 2015 assessment model that was accepted by SARC 60, i.e. B044, $F_{2014} = 0.157$ and $SSB_{2014} = 86{,}534$ mt. As $F_{2014} < F_{THRESHOLD}$ ($=F_{MSYproxy} = F_{40\%SPR}=0.17$) and $SSB_{2014} > SSB_{THRESHOLDproxy}$ ($= 0.5\ SSB_{40\%SPR} = 55{,}614$ mt), overfishing is not occurring and the Bluefish stock is not overfished.

Weakness of analysis

None were identified.

Were conclusions and recommendations acceptable?

The decisions regarding stock status and level of fishing were sound.

Does work provide a scientifically credible basis for fishery management advice?

Yes.

Bluefish ToR 7. Develop approaches and apply them to conduct stock projections and to compute the statistical distribution (e.g., probability density function) of the OFL (overfishing level; see Appendix to the SAW TORs).
a. Provide annual projections (3 years). For given catches, 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.
c. Describe this stock's vulnerability (see "Appendix to the SAW TORs") to becoming overfished, and how this could affect the choice of ABC.

Was the ToR completed successfully?

Yes.

Reason for acceptance/rejection

The stock was projected through 2016 to 2018 under the assumption that the 2015 quota was removed in 2015, and applying a constant level of fishing mortality, where the latter was set to one of five values, i.e. F_{low}=0.1, $F_{status\ quo}$=0.157, $F_{0.1}$=0.187, F_{TARGET}=90%$F_{MSYproxy}$=0.153, and $F_{MSYproxy}$=$F_{40\%SPR}$=0.17, and where these fishing mortalities had been determined using the accepted assessment model, B044. A single fleet was assumed, with a composite selectivity curve determined from the estimates of fishing mortality at age for the commercial and recreational fleets for the last three years. The ranges of projected values of annual yield and biomass likely to result from uncertainty associated with estimates of recruitment and initial abundance at age were determined. Estimates of recruitment were randomly drawn from the distribution of the recruitment estimates from the accepted model (B044) and the distribution of estimates of terminal abundance determined from the MCMC analysis for that model. The sensitivities of the projected values to drawing recruitment estimates from the cumulative distribution of recruitments for only 2006 to 2014 (the years with the best age data), a higher value of M, and increased uncertainty in selectivity-at-age, weight-at-age, and maturity-at-age (CV increased from 0.01 to 0.1) were explored, and a comment was made by the WG on the projection it considered most realistic. The WG also discussed the stock's vulnerability to overexploitation and how this might affect the choice of ABC.

Strength of analysis

The range of projected values of biomass remained above the threshold level in all years, despite uncertainty associated with future recruitments and terminal abundance, and under all sensitivity scenarios.

Weakness of analysis

In the assessment report, the projected values of biomass are incorrectly reported as total biomass rather than SSB.

Were conclusions and recommendations acceptable?

The Panel agreed with the conclusion by the WG that Bluefish has a low degree of vulnerability to overfishing if, over the next three years, an ABC based on $F_{MSYproxy}$ is set.

Reason for acceptance/rejection

The stock is assessed as being near its target SSB, and, although F is close to its threshold, the projections that were undertaken indicate a very low probability that, in the short term, the stock will become overfished. Biological characteristics such as rapid growth, early maturity, and protracted spawning over a wide geographic area reduce risk to the effects of fishing. Reduced demand for older fish, which are considered unpalatable, also affords a measure of protection.

Does work provide a scientifically credible basis for fishery management advice?

Yes.

Bluefish ToR 8. Review, evaluate and report on the status of the SARC and Working Group research recommendations listed in most recent SARC reviewed assessment and review panel reports, as well as MAFMC SSC model recommendations from 2005 and the research recommendations contained in its 23 September 2013 report to the MAFMC. Identify new research recommendations..

Was the ToR completed successfully?

Yes.

Reason for acceptance/rejection

In its 2015 assessment report, the WG reviewed and reported on the status of previously specified research recommendations and identified new research recommendations. The Panel expressed concern, however, that insufficient detail accompanied each research recommendation, i.e., justification for each research item, which clearly identifies how the assessment would be improved by the results of the research, and details of the original intent and need when the research was proposed. In a number of cases, research items were open ended and needed to be more clearly specified. Without such detail, the Panel concluded that it would be difficult to comment on the research items that had been listed. To address these concerns, the WG revised the text relating to ToR 8 during SARC 60. The Panel then reviewed the new research recommendations and commented on these in its report of the meeting.

Strength of analysis

The revised descriptions of the various research recommendations were far more informative than those in the original text. The assessments made by the WG regarding the value of as yet uncompleted research recommendations appear sound.

Research recommendations to improve fishery-independent sampling over the full age range of Bluefish and thereby supplement the information provided by the MRIP survey would benefit future assessments.

Weakness of analysis

The Panel recommended that the priority of several proposed new research items should be modified. Thus, the study relating to NC scale data from 1985–1995 was relegated to medium priority, and that which proposed the investigation of species associations with recreational angler trips targeting Bluefish to potentially modify the MRIP index was classified as being of high

priority. The research item relating to the thermal niche model was considered of low priority for Bluefish.

The Panel recommended that, before undertaking research to take advantage of length-based assessment frameworks, further consideration should be given to the extent that such research would improve the Bluefish assessment, noting that the predominant gear is not very size selective, growth is rapid, and differences in migration patterns appear to be age-dependent rather than length dependent. The Panel did not share the WG's concern regarding the bimodality of length composition data, and suggested that, should it be decided to investigate this issue, sufficient data are probably already available.

Does work provide a scientifically credible basis for fishery management advice?

Yes.

5. Conclusions and recommendations

The SARC 60 Review Panel examined the 2015 stock assessments developed for Scup (*Stenotomus chrysops*) and Bluefish (*Pomatomus saltatrix*). After considering the information relating to the biology of each species, the data that were available, and the details of the assessment for each species, discussing areas of concern, and, in the case of Bluefish, correcting a mis-specification of a selectivity parameter, the Panel accepted the assessment models that had been proposed by the WG.

The Panel was concerned that, although the Scup assessment model predicted very marked changes in fishing mortality and SSB since 1994, there was little evidence that the estimates were as great as had been estimated. Because selectivity of landings had been estimated to be dome-shaped, much of the increased SSB was cryptic. There did not appear to have been any marked change in the behaviour of fishers or reductions in fishing effort, as might have been expected if the decline in fishing mortality was real. The Panel concluded that it was likely that the increase in SSB and reduction in fishing mortality were less than predicted. The model explorations undertaken by the WG did suggest, however, that SSB had increased and fishing mortality had declined, but not to the extent predicted by the final assessment model. A factor that appeared to influence the model results was the starting year of the time series of data used in the model, i.e. 1963. With no age compositions for Scup prior to 1984, variation in recruitment in the early part of the time series could not be estimated. By starting the time series later, and reducing the number of years of data considered in the model, more conservative estimates of increase in SSB and decline in F were produced. After considering the results of the explorations of different model configurations by the WG, the Panel concluded that it was unlikely that conclusions regarding the status of the stock and its level of exploitation would be modified by use of a model with a shorter time series, such as those explored, and that, in the short term, the OFL estimates produced using the final assessment model were acceptable. There would be value in developing a survey that would provide a reliable index of abundance of older scup, such that more reliable estimates of SSB could be obtained.

While exploring the work undertaken by the Bluefish Working Group in developing an assessment model for this species, it was recognised that, in the final assessment model, a parameter of the logistic selectivity curve for the MRIP index had been mis-specified. After considerable discussion, it was agreed that this error should be corrected, such that corrected results would be available, thereby providing a sound basis for determination of the status of the stock and its level of exploitation, and producing reliable estimates of OFLs. The biological reference points were re-estimated using the corrected model, and MCMC analysis and projections were re-run to produce revised estimates. The Panel considered the results of the explorations of the various model configurations that had been conducted during model development and the sensitivity analyses that had been undertaken using the final configuration of the assessment model prior to discovery of the mis-specification and concluded that these were sufficient to assess the likely uncertainty of the results produced by the final assessment model (after correction of the selectivity curve). The major concern identified by the Panel was the fact that model results were driven by the MRIP CPUE, a fishery-dependent index calculated from MRFSS/MRIP data that was not entirely independent of the recreational catch data. The Panel accepted the conclusions regarding the status of the Bluefish stock and its level of exploitation, and the results of the projections, but advised that a fishery-independent index representative of older Bluefish should be developed.

The SARC meeting facilities and logistical support for the meeting were excellent. Information Technology support during the meeting ensured that access was available to the file server. The assistance provided by the rapporteurs, who recorded details of the discussions during the review, was greatly appreciated. It was pleasing to find that access to the meeting was available through WebEx, allowing a broader audience to participate.

Appendix 1: Bibliography of materials provided

Scup

Conn, Paul B. 2010. Hierarchical Analysis of Multiple Noisy Abundance Indices. Canadian Journal of Fisheries and Aquatic Sciences: 67. 108-120. 13p.

Love, J.W. and Chase, P.D. 2009. Geometric Morphological Differences Distinguish Populations of Scup in the Northwestern Atlantic Ocean. Marine and Coastal Fisheries: Dynamics, Management and Ecosystem Science 1:1. 22-28. 7p.

Mayo, R.K. 1983. An Assessment of the Scup *Stenotomus chrysops* Population in the Southern New England and Middle Atlantic Regions. Woods Hole Laboratory Reference Doc 82-46. 68p.

Miller, T. et al. January 2009. Report by the Peer Review Panel for the Northeast Data Poor Stocks Working Group. 38p.

Northeast Fisheries Science Center (NEFSC). 2008. Northeast Data Poor Stocks Working Group Report. NEFSC Reference Document 09-02A & B. 886p.

Northeast Fisheries Science Center (NEFSC). 2012. Stock Assessment of Scup (*Stenotomus chrysops*) for 2012. NEFSC Reference Document 12-25. 112p.

NOAA Fisheries Toolbox (NFT). April 2014. A Stroll Through the Automated Plots for ASAP3. Technical Documentation for ASAP Toolbox Version 3. 6p.

NOAA Fisheries Toolbox (NFT). September 2012. Technical Documentation for ASAP Version 3.0. 71p.

NOAA Fisheries Toolbox (NFT). September 2012. User Manual for ASAP 3. 22p.

Working Papers

Scup Working Group. SAW-SARC 60 Stock Assessment of Scup for 2015. 303p.

Bell, R. J., Gervelis, B. and Hoey, J. Northeast Fisheries Science Center (NEFSC), National Marine Fisheries Service. April 2015. Study Fleet Scup CPUE. SAW-SARC Background Paper A12. 10p.

Lapp, M., Almeida, K., Cadrin, S. 2015. Commercial Fishermen's Perspective on the Scup Fishery and Resource. SAW-SARC 60 Background Paper A18. 6p.

Manderson, J. et al. Northeast Fisheries Science Center (NEFSC) Cooperative Research Program and Virginia Institute of Marine Science (VIMS). 2015. Description of the Thermal Habitat and its Influence on the Distribution and Abundance of Scup, and Attempt to Integrate the Results Into the Stock Assessment (TOR 3). SAW-SARC 60 Background Paper A11. 52p.

Terceiro, M. 2015. Biological Data for Scup (TOR 2 and 3). SAW-SARC 60 Background Paper A2. Northeast Fisheries Science Center (NEFSC). 47p.

Terceiro, M. 2015. Consideration of Alternative Strata Sets and Model-Based Indices from NEFSC Spring and Fall Trawl Surveys for Scup (TOR 2). SAW-SARC 60 Background Paper A4. 48p.

Terceiro, M. 2015. Description of Commercial Fishery Dealer Report Trawl Gear Landings and Effort and Modeling Landings Rate (LPUE) Data for Scup (TOR 1). SAW-SARC 60 Background Paper A5. 34p.

Terceiro, M. 2015. Description of MRFSS/MRIP Intercept Catch and Effort and Modeling of Total Catch Rate (CPUE) Data for Scup (TOR 1). SAW-SARC 60 Background Paper A9. 13p.

Terceiro, M. 2015. An Approach to the Integration of Survey Abundance Indices Used for Scup Population Model Calibration (TOR 2 and 8). SAW-SARC 60 Background Paper A10. 48p.

Terceiro, M. and Miller, A. 2015. Estimates of Commercial Fishery Scup Discards: 1989-2013 (TOR1). SAW-SARC 60 Background Paper A3. 37p.

Terceiro, M. and Miller, A. 2015. Description of Vessel Trip Report Trawl Gear Catch and Effort Data and Modeling Catch Rates (CPUE) for Scup (TOR 1). SAW-SARC 60 Background Paper A6. 27p.

Terceiro, M. and Miller, A. 2015. Description of Vessel Trip Report Party/Charter Boat Catch and Effort Data and Modeling Catch Rates (CPUE) for Scup (TOR 1). SAW-SARC 60 Background Paper A7. 29p.

Terceiro, M. and Miller, A. 2015. Description and Modeling of NEFOP (Observer) Fish Trawl Gear Catch Rate (CPUE) Data for Scup (TOR 1). SAW-SARC 60 Background Paper A8. 23p.

Presentations

Conn, P. Integrated Indices for Scup. SAW-SARC Background Paper A13. PowerPoint presentation. 15 slides.

NEFSC Trawl Surveys: Spatial and Temporal Distribution of Catch, Bottom Temperature and Salinity. SAW-SARC Background Paper A14. PowerPoint presentation. 83 slides.

NEFSC Trawl Surveys: Spatial and Temporal Distribution of Catch and Bottom Temperature V2: Revised Catch Intervals, 'Bubble' Size, and to Include Strata Boundaries. SAW-SARC Background Paper A15. PowerPoint presentation. 48 slides.

Spatial and Temporal Distribution of Fishery Catch and Effort. SAW-SARC 60 Background Paper A16. PowerPoint presentation. 22 slides.

Bluefish

ASMFC Technical Committee/Assessment Subcommittee. 2005. 41st SAW Assessment Report of Bluefish. 85p.

Conn, Paul B. 2010. Hierarchical Analysis of Multiple Noisy Abundance Indices. Canadian Journal of Fisheries and Aquatic Sciences: 67: 108-120. 13p.

Dick, E.J. and MacCall, A.D. 2011. Depletion-Based Stock Reduction Analysis: A Catch-Based Method for Determining Sustainable Yields for Data-Poor Fish Stocks. Journal of Fisheries Research: 110: 331-341. 11p.

Jones, C.M. 2005. 41st Northeast Regional Stock Assessment Workshop (SAW-41) Chair's Report for Peer Review. 89p.

MacCall, A.D. 2009. Depletion-Corrected Average Catch: A Simple Formula for Estimating Sustainable Yields in Data-Poor Situations. ICES Journal of Marine Sciences, 66: 2267-2271. 5p.

NOAA. 2006. Bluefish, *Pomatomus saltatrix*, Life History and Habitat Characteristics. NOAA Technical Memorandum NMFS-NE-198. 100 p.

Robillard, E., Reiss, C.S. and Jones, C.M. 2008. Reproductive Biology of Bluefish (*Pomatomus saltatrix*) Along the East Coast of the United States. Journal of Fisheries Research: 90: 198-208. 11p.

Robillard, E., Reiss, C.S. and Jones, C.M. 2009. Age-Validation and Growth of Bluefish (*Pomatomus saltatrix*) Along the East Coast of the United States. Journal of Fisheries Research: 95: 65-75. 11p.

Salerno, D.J., Burnett, J. and Ibara, R.M. 2001. Age, Growth, Maturity and Spatial Distribution of Bluefish, *Pomatomus saltatrix* (Linnaeus), off the Northeast Coast of the United States, 1985-96. Journal of Northwest Atlantic Fisheries Science: 29: 31-39. 9p.

Shepherd, G.R. et al. 2006. The Migration Patterns of Bluefish (*Pomatomus saltatrix*) Along the Atlantic Coast, Determined from Tag Recoveries. Fishery Bulletin 104: 559-570. 12p.

Working Papers

Bluefish Working Group. SAW-SARC 60 Stock Assessment of Bluefish for 2015. 399p.

Bluefish Working Group. 2015. Life History of Bluefish (TOR 2). SAW-SARC 60 Background Paper B2. 32p.

Bluefish Working Group. 2015. Improvements to Ageing Data for the Atlantic Coast Bluefish Stock. SAW-SARC 60 Background Paper B5. 92p.

Bluefish Working Group. 2015. Age Data Decisions Made at Assessment Workshop. SAW-SARC 60 Background Paper B6. 15p.

Celestino, M. and Brust, J. 2015. Implications of Expanded Age Sampling on Bluefish *Pomatomus saltatrix* Catch Estimates. SAW-SARC 60 Background Paper B7. 33p.

Gottschall, K. 2015. Review and Evaluation of Catch-and-Release Angling Mortality Estimates for Bluefish. SAW-SARC 60 Background Paper B1. 15p.

Manderson, J. et al. 2015. Exploring Temperature Effects on the Distribution of Bluefish and Availability to Surveys. SAW-SARC 60 Background Paper B4. 45p.

Spanik, K., Gartland, J., Gaichas, S. 2015. Food Habitats of Bluefish (TOR 2). SAW-SARC 60 Background Paper B3. 21p.

Appendix 2: Copy of the CIE Statement of Work

Attachment A: Statement of Work for Dr. Norm Hall

External Independent Peer Review by the Center for Independent Experts

T08-01 FINAL Version:Dec. 4, 2014

Statement of Work

60th Stock Assessment Workshop/Stock Assessment Review Committee (SAW/SARC): Benchmark stock assessments for scup and bluefish

Statement of Work (SOW) for CIE Panelists
(including a description of SARC Chairman's duties)

BACKGROUND

The National Marine Fisheries Service's (NMFS) Office of Science and Technology coordinates and manages a contract providing external expertise through the Center for Independent Experts (CIE) to conduct independent peer reviews of NMFS scientific projects. The Statement of Work (SoW) described herein was established by the NMFS Project Contact and Contracting Officer's Representative (COR), and reviewed by CIE for compliance with their policy for providing independent expertise that can provide impartial and independent peer review without conflicts of interest. CIE reviewers are independently selected by the CIE Steering Committee and CIE Coordination Team to conduct the independent peer review of NMFS science in compliance the predetermined Terms of Reference (ToRs) of the peer review. Each CIE reviewer is contracted to deliver an independent peer review report to be approved by the CIE Steering Committee and the report is to be formatted with content requirements as specified in Annex 1. This SoW describes the work tasks and deliverables of the CIE reviewer for conducting an independent peer review of the following NMFS project. Further information on the CIE process can be obtained from www.ciereviews.org.

SCOPE

Project Description: 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 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 benchmark stock assessments for **scup** and **bluefish**.

OBJECTIVES

The SARC review panel will be composed of three appointed reviewers from the Center of Independent Experts (CIE), and an independent chair from the SSC of the New England or Mid-Atlantic Fishery Management Council. The SARC panel will write the SARC Summary Report and each CIE reviewer will write an individual independent review report.

Duties of reviewers are explained below in the "**Requirements for CIE Reviewers**", in the "**Charge to the SARC Panel**" and in the "**Statement of Tasks**". The draft stock assessment Terms of Reference (ToRs) which are carried out by the SAW WGs are attached in **Annex 2**. The draft agenda of the panel review meeting is attached in **Annex 3**. The SARC Summary Report format is described in **Annex 4**.

Requirements for the reviewers: Three reviewers shall conduct an impartial and independent peer review of the **scup** and **bluefish** stock assessments, and this review should be in accordance with this SoW and stock assessment ToRs herein. The reviewers shall have working knowledge and recent experience in the application of modern fishery stock assessment models. Expertise should include statistical catch-at-age, state-space and index 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 that includes an appreciation for the varying quality and quantity of data available to support estimation of Biological Reference Points. SARC 59 will address fishery stock assessments of **scup** and **bluefish**. For both species, experience in assessing pelagic stocks and in incorporating environmental factors into assessments would be desirable. For bluefish, experience in the use of recreational fisheries data would also be desirable.

PERIOD OF PERFORMANCE

The contractor shall complete the tasks and deliverables as specified in the schedule of milestones within this statement of work. Each reviewer's duties shall not exceed a maximum of 16 days to complete all work tasks of the peer review described herein.

Not covered by the CIE, the SARC chair's duties should not exceed a maximum of 16 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).

PLACE OF PERFORMANCE AND TRAVEL

Each reviewer shall conduct an independent peer review during the panel review meeting scheduled in **Woods Hole, Massachusetts** during **June 2-5, 2015**.

STATEMENT OF TASKS

Charge to SARC panel: During the SARC meeting, the panel is to determine and write down whether each stock assessment Term of Reference (ToR) of the SAW (see **Annex 2**) 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 Term of Reference 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 following tasks in accordance with the SoW and Schedule of Milestones and Deliverables herein.

Tasks prior to the meeting: The contractor shall independently select qualified reviewers that do not have conflicts of interest to conduct an independent scientific peer review of stock assessments prepared by SAW WGs or ASMFC Technical Committees in accordance with the tasks and ToRs within the SoW. Upon completion of the independent reviewer selection by the contractor's technical team, the contractor shall provide the reviewer information (full name, title, affiliation, country, address, email, FAX number, and CV suitable for public distribution) to the COR, who will forward this information to the NMFS Project Contact no later than the date specified in the Schedule of Milestones and Deliverables. The contractor shall be responsible for providing the SoW and stock assessment ToRs to each reviewer. The NMFS Project Contact will be responsible for providing the reviewers with the background documents, reports for review, foreign national security clearance, and other information concerning pertinent meeting arrangements. The NMFS Project Contact will also be responsible for providing the Chair a copy of the SoW in advance of the panel review meeting. Any changes to the SoW or ToRs must be made through the COR prior to the commencement of the peer review.

Foreign National Security Clearance: The reviewers shall participate during a panel review meeting at a government facility, and the NMFS Project Contact will be responsible for obtaining the Foreign National Security Clearance approval for the reviewers who are non-US citizens. For this reason, the reviewers shall provide by FAX or by email the following requested information (e.g., 1.name [first, middle, and last], 2.contact information, 3.gender, 4.country of birth, 5.country of citizenship, 6.country of permanent residence, 7.whether there is dual citizenship, 8.country of current residence, 9.birth date [mo, day, year], 10.passport number, 11.country of passport) to the NMFS Project Contact for the purpose of their security clearance, and this information shall be submitted at 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/.

Pre-review Background Documents and Working Papers: Approximately two weeks before the peer review, the NMFS Project Contact will send (by electronic mail or make available at an FTP site) to the SARC chair and CIE reviewers the necessary background information and reports (i.e., working papers) for the peer review. In the case where the documents need to be mailed, the NMFS Project Contact will consult with the COR on where to send documents. The reviewers are responsible only for the pre-review documents that are delivered to the contractor in accordance to the SoW scheduled deadlines specified herein. The reviewers shall read all documents deemed as necessary in preparation for the peer review.

Tasks during the panel review meeting: Each reviewer shall conduct the independent peer review of the stock assessments in accordance with the SoW and stock assessment ToRs, and shall not serve in any other role unless specified herein. **Modifications to the SoW and ToRs shall not be made during the peer review, and any SoW or ToRs modifications prior to the peer review shall be approved by the COR and contractor.** Each CIE reviewer shall actively participate in a professional and respectful manner as a member of the meeting review panel, and their peer review tasks shall be focused on the stock assessment ToRs as specified herein. The NMFS Project Contact is responsible for any facility arrangements (e.g., conference room for panel review meetings or teleconference arrangements). The NMFS Project Contact is responsible for ensuring that the Chair understands the contractual role of the CIE reviewers as specified herein. The CIE Lead Coordinator can contact the Project Contact to confirm any peer review arrangements, including the meeting facility arrangements.

(SARC chair)

Act as chairperson, where duties include control of the meeting, coordination of presentations and discussions, making sure all stock assessment Terms of Reference of the SAW are reviewed, control of document flow, and facilitation of discussion. For each assessment, review both the Assessment Report and the 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 that address stock status and assessment uncertainty.

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 stock assessment 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 or BRP proxy to be inappropriate, the reviewer should try to recommend an alternative, should one exist. 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 that address stock status and assessment uncertainty.

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.

Tasks after the panel review meeting:

SARC CIE reviewers:

Each CIE reviewer shall prepare an Independent CIE Report (see Annex 1). 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 above in the "Charge to SARC panel" statement.

If any existing Biological Reference Points (BRP) or their 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 stock assessment 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 stock assessment 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 (see Annex 4).

SARC chair and CIE reviewers:

The SARC Chair, with the assistance from the CIE reviewers, will prepare the SARC Summary Report. Each CIE 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 (please see **Annex 4** for information on contents) should address whether each stock assessment 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 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.

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).

DELIVERY

Each reviewer shall complete an independent peer review report in accordance with the SoW. Each reviewer shall complete the independent peer review according to required format and content as described in **Annex 1**. Each reviewer shall complete the independent peer review addressing each stock assessment ToR listed in **Annex 2**.

Specific Tasks for CIE Reviewers: The following chronological list of tasks shall be completed by each CIE reviewer in a timely manner as specified in the **Schedule of Milestones and Deliverables**.

1) Conduct necessary pre-review preparations, including the review of background material and reports provided by the NMFS Project Contact in advance of the peer review.

2) Participate during the panel review meeting at the Woods Hole, Massachusetts scheduled during the tentative dates of June 2-5, 2015.

3) Conduct an independent peer review in accordance with this SoW and the assessment ToRs (listed in **Annex 2**).

4) No later than June 19, 2015, each CIE reviewer shall submit an independent peer review report addressed to the "Center for Independent Experts," and sent to Dr. Manoj Shivlani, CIE Lead Coordinator, via email to mshivlani@ntvifederal.com, and to Dr. David Sampson, CIE Regional Coordinator, via email to david.sampson@oregonstate.edu. Each CIE report shall be written using the format and content requirements specified in **Annex 1**, and address each assessment ToR in **Annex 2**.

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

April 24, 2015	Contractor sends reviewer contact information to the COR, who then sends this to the NMFS Project Contact
May 19, 2015	NMFS Project Contact will attempt to provide reviewers the pre-review documents
June 2-5, 2015	Each reviewer participates and conducts an independent peer review during the panel review meeting in Woods Hole, MA
June 5, 2015	SARC Chair and CIE reviewers work at drafting reports during meeting at Woods Hole, MA, USA
June 19, 2015	Reviewers submit draft independent peer review reports to the contractor's technical team for independent review
June 19, 2015	Draft of SARC Summary Report, reviewed by all CIE reviewers, due to the SARC Chair *
June 26, 2015	SARC Chair sends Final SARC Summary Report, approved by CIE reviewers, to NEFSC contact (i.e., SAW Chairman)
July 2, 2015	Contractor submits independent peer review reports to the COR who reviews for compliance with the contract requirements
July 10, 2015	The COR distributes the final reports to the NMFS Project Contact and regional Center Director

* 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.

Modifications to the Statement of Work: Requests to modify this SoW must be approved by the Contracting Officer at least 15 working days prior to making any permanent substitutions. The Contracting Officer will notify the COR within 10 working days after receipt of all required information of the decision on substitutions. The COR can approve changes to the milestone dates, list of pre-review documents, and ToRs within the SoW as long as the role and ability of the reviewers to complete the deliverable in accordance with the SoW is not adversely impacted. The SoW and ToRs shall not be changed once the peer review has begun.

Acceptance of Deliverables: The deliverables shall be the final peer review report from each reviewer that satisfies the requirements and terms of reference of this SoW. The contract shall be successfully completed upon the acceptance of the contract deliverables by the COR based on three performance standards:

(1) each report shall be completed with the format and content in accordance with **Annex 1**,

(2) each report shall address each stock assessment ToR listed in **Annex 2**,

(3) each report shall be delivered in a timely manner as specified in the schedule of milestones and deliverables.

Upon the acceptance of each independent peer review report by the COR, the reports will be distributed to the NMFS Project Contact and pertinent NMFS science director, at which time the reports will be made publicly available through the government's website.

The contractor shall send the final reports in PDF format to the COR, designated to be Allen Shimada, via email allen.shimada@noaa.gov

Support Personnel:

Allen Shimada, COR

NMFS Office of Science and Technology

1315 East West Hwy, SSMC3, F/ST4, Silver Spring, MD 20910

allen.shimada@noaa.gov Phone: 301-427-8174

Manoj Shivlani, CIE Lead Coordinator

NTVI Communications, Inc.

10600 SW 131st Court, Miami, FL 33186

mshivlani@ntvifederal.com Phone: 305-968-7136

Key Personnel:

Dr. James Weinberg, NEFSC SAW Chairman, NMFS Project Contact

Northeast Fisheries Science Center

166 Water Street, Woods Hole, MA 02543

James.Weinberg@noaa.gov (Phone: 508-495-2352) (FAX: 508-495-2230)

Dr. William Karp, NEFSC Science Director

Northeast Fisheries Science Center

166 Water St., Woods Hole, MA 02543

william.karp@noaa.gov Phone: 508-495-2233

Annex 1: Format and Contents of Independent Peer Review Report

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 main body of the report shall consist of a Background, Description of the Individual Reviewer's Role in the Review Activities, Findings of whether they accept or reject the work that they reviewed, and an explanation of their decisions (strengths, weaknesses of the analyses, etc.) for each ToR, and Conclusions and Recommendations in accordance with the ToRs. For each assessment reviewed, the report should address whether each ToR of the SAW was completed successfully. For each ToR, the Independent Review Report should state why that ToR was or was not completed successfully. To make this determination, the SARC chair and reviewers should consider whether the work provides a scientifically credible basis for developing fishery management advice.

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, and especially where there were divergent views.

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

d. Reviewers shall provide a critique of the NMFS review process, including suggestions for improvements of both process and products.

e. The independent report shall be a stand-alone document for others to understand the proceedings and findings of the meeting, regardless of whether or not others read the SARC Summary Report. The independent report shall be an independent peer review of each ToR, and shall not simply repeat the contents of the summary report.

3. The reviewer 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.

Annex 2: 60th SAW/SARC Stock Assessment Terms of Reference (file vers.: 10/162014)

A. Scup

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

2. Present the survey data 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.

3. Describe the thermal habitat and its influence on the distribution and abundance of scup, and attempt to integrate the results into the stock assessment.

4. Estimate annual fishing mortality, recruitment and stock biomass (both total and spawning stock) for the time series, and estimate their uncertainty. Include a historical retrospective analysis to allow a comparison with previous assessment results and previous projections.

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. Evaluate stock status with respect to the existing model (from previous peer reviewed accepted assessment) and with respect to a new model developed for this peer review.

a. When working with the existing model, update it with new data and evaluate stock status (overfished and overfishing) with respect to the existing BRP estimates.

b. Then use the newly proposed model and evaluate stock status with respect to "new" BRPs and their estimates (from TOR-5).

7. Develop approaches and apply them to conduct stock projections and to compute the statistical distribution (e.g., probability density function) of the OFL (overfishing level) (see Appendix to SAW TORs for definitions).

a. Provide numerical annual projections (3 years). 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.

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, SSC, and Working Group research recommendations listed in most recent SARC reviewed assessment and review panel reports. Identify new research recommendations.

Annex 2: (cont)

B. Bluefish

1. Estimate catch from all sources including landings and discards. Evaluate and if necessary update the discard mortality estimate. Describe the spatial and temporal distribution of landings, discards, and fishing effort. Characterize the uncertainty in these sources of data.

2. Present and evaluate data and trends on life history information including, age, growth, natural mortality, food habits, and maturity.

3. Present the survey data available for use in the assessment (e.g., indices of relative or absolute abundance, recruitment, state surveys, age-length data, etc.), evaluate the utility of the age-length key for use in stock assessment, and explore standardization of fishery-independent indices. Investigate the utility of recreational LPUE as a measure of relative abundance. Characterize the uncertainty and any bias in these sources of data, including exploring environmentally driven changes in availability and related changes in size structure. Explore the spatial distribution of the stock over time, and whether there are consistent distributional shifts.

4. Estimate relative fishing mortality, annual fishing mortality, recruitment, total abundance, and stock biomass (both total and spawning stock) for the time series, and estimate their uncertainty. Explore inclusion of multiple fleets in the model. Include both internal and historical retrospective analyses to allow a comparison with previous assessment results and previous projections. Explore alternative modeling approaches if feasible.

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. Evaluate stock status with respect to the existing model (from previous peer review accepted assessment) and with respect to a new model developed for this peer review.
a. When working with the existing model, update it with new data and evaluate stock status (overfished and overfishing) with respect to the existing BRP estimates.
b. Then use the newly proposed model and evaluate stock status with respect to "new" BRPs and their estimates (from TOR-5).

7. Develop approaches and apply them to conduct stock projections and to compute the statistical distribution (e.g., probability density function) of the OFL (overfishing level; see Appendix to the SAW TORs).
a. Provide annual projections (3 years). For given catches, 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.
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 SARC reviewed assessment and review panel reports, as well as MAFMC SSC model recommendations from 2005 and the research recommendations contained in its 23 September 2013 report to the MAFMC. Identify new research recommendations.

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Annex 2: (cont)

Appendix to the SAW Assessment TORs:
Clarification of Terms used in the SAW/SARC Terms of Reference

On "Overfishing Limit" and Acceptable Biological Catch" (DOC Nat. Stand. Guidel. Fed. Reg., v. 74, no. 11, 1-16-2009):

- 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 annual catch that is consistent with 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 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)

Interactions among members of a SAW Assessment Working Group:

- Anyone participating in SAW assessment working group 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.

One model or alternative models:

- The preferred outcome of the SAW/SARC is to identify a single "best" model and an accompanying set of assessment results and a stock status determination. 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.

Annex 3: Draft Agenda

60th Stock Assessment Workshop/Stock Assessment Review Committee (SAW/SARC): Benchmark stock assessments for A. scup and B. bluefish

June 2-5, 2015

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

AGENDA* (version: May 29, 2015)

TOPIC	PRESENTER(S)	SARC LEADER	RAPPORTEUR

Tuesday, June 2

10 – 10:30 AM
Welcome — **James Weinberg**, SAW Chair
Introduction — **Cynthia Jones,** SARC Chair
Agenda
Conduct of Meeting

10:30 – 12:30 PM Assessment Presentation (A. Scup)
Mark Terceiro TBD — **Larry Alade**

12:30 – 1:30 PM Lunch

1:30 – 3:30 PM Assesssment Presentation (A. Scup)
Mark Terceiro TBD — **Chuck Adams**

3:30 – 3:45 PM Break

3:45 – 5:45 PM SARC Discussion w/ Presenters (A. Scup)
Cynthia Jones, SARC Chair — **Chuck Adams**

5:45 – 6 PM Public Comments

TOPIC	PRESENTER(S)	SARC LEADER	RAPPORTEUR

Wednesday, June 3

8:30 – 10:30 AM	Assessment Presentation (B. Bluefish)		
	Tony Wood	TBD	**Jon Deroba**
10:30 – 10:45 AM	Break		
10:45 – 12:30 PM	(cont.) Assessment Presentation (B. Bluefish)		
	Tony Wood	TBD	**Jon Deroba**
12:30 – 1:30 PM	Lunch		
1:30 – 3:30 PM	SARC Discussion w/presenters (B. Bluefish)		
	Cynthia Jones, SARC Chair		**Brian Linton**
3:30 – 3:45 PM	Public Comments		
3:45 -4 PM	Break		
4 – 6 PM	Revisit with presenters (A. Scup)		
	Cynthia Jones, SARC Chair		**Toni Chute**
7 PM	**(**Social Gathering **)**		

TOPIC	PRESENTER(S)	SARC LEADER	RAPPORTEUR

Thursday, June 4

8:30 – 10:30	Revisit with presenters (B. Bluefish)	**Cynthia Jones,** SARC Chair	**Anne Richards**
10:30 – 10:45	Break		
10:45 – 12:15	Review/edit Assessment Summary Report (A. Scup)	**Cynthia Jones,** SARC Chair	**Alicia Miller**
12:15 – 1:15 PM	Lunch		
1:15 – 2:45 PM	(cont.) edit Assessment Summary Report (A. Scup)	**Cynthia Jones,** SARC Chair	**Mike Palmer**
2:45 – 3 PM	Break		
3 – 6 PM	Review/edit Assessment Summary Report (B. Bluefish)	**Cynthia Jones,** SARC Chair	**TBD**

Friday, June 5

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. During the SARC report writing stage on June 5, the public should not engage in discussion with the SARC.

Annex 4: 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 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 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 Points (BRP) 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.

Appendix 3: Panel membership and Participants

SARC Meeting for SAW 60
Scup and Bluefish

Appointee	Function	Affiliation
Independent Review Panel		
Cynthia Jones	SARC Chair	MAFMC SSC, Old Dominion University
Kevin Stokes	Independent Reviewer	CIE
Sven Kupschus	Independent Reviewer	CIE
Norman Hall	Independent Reviewer	CIE
Presenters		
Mark Terceiro	Lead Analyst, scup	
Tony Wood	Lead Analyst, bluefish	
Katie Drew	Analyst, bluefish	
Coordination		
Jim Weinberg	SAW 60 Chairman	NEFSC
Sheena Steiner	Administrative Support	NEFSC
Chris Legault	Population Dynamics Branch	NEFSC

SAW-SARC 60 PARTICIPANT LIST

NAME	AFFILIATION	CONTACT INFO
Jim Weinberg	NEFSC	james.weinberg@noaa.gov
Paul Rago	NEFSC	paul.rago@noaa.gov
Mike Simpkins	NEFSC	michael.simpkins@noaa.gov
Sheena Steiner	NEFSC	sheena.steiner@noaa.gov
Chris Legault	NEFSC	chris.legault@noaa.gov
Gary Shepherd	NEFSC	gary.shepherd@noaa.gov
Mark Terceiro	NEFSC	mark.terceiro@noaa.gov
Tony Wood	NEFSC	anthony.wood@noaa.gov
Kirby Rootes-Murdy	ASMFC	krootes-murdy@asmfc.org
Katie Drew	ASMFC	kdrew@asmfc.org
Mike Celestino	NJ DFW	mike.celestino@dep.nj.us
Joey Ballenger	SCDNR	ballengerj@dnr.sc.gov
Julia Beaty	MAFMC	jbeaty@mafmc.org
Jocelyn Runnebaum	Univ. of Maine	Jocelyn.runnebaum@maine.edu
Nicole Lengyel	RI DEM DFW	nicole.lengyel@dem.ri.gov
Jason McNamee	RIDFW/ASMFC	jason.mcnamee@dem.ri.gov
Steve Cadrin	SMAST	scadrin@umassd.edu
Wendy Gabriel	NEFSC/MAFMC	wendy.gabriel@noaa.gov
Chuck Adams	NEFSC	charles.adams@noaa.gov
David McElroy	NEFSC	dave.mcelroy@noaa.gov
John Manderson	NEFSC	john.manderson@noaa.gov
Brian Linton	NEFSC	brian.linton@noaa.gov
Mike Palmer	NEFSC	michael.palmer@noaa.gov
Susan Wigley	NEFSC	susan.wigley@noaa.gov
Alicia Miller	NEFSC	alicia.miller@noaa.gov

Kiersten Curti	NEFSC	kiersten.curti@noaa.gov
Larry Alade	NEFSC	larry.alade@noaa.gov
Jon Deroba	NEFSC	jon.deroba@noaa.gov
Loretta O'Brien	NEFSC	loretta.o'brien@noaa.gov
Paul Nitschke	NEFSC	paul.nitschke@noaa.gov

Numerous other individuals, who, at various times, were present or monitoring the proceedings via WebEx, participated and offered valuable comment during the review meeting.