Center for Independent Experts (CIE) Peer Review Report of:

57th Northeast Regional Stock Assessment Review Committee (SARC 57) on striped bass and summer flounder

Woods Hole
Massachusetts
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1. Executive summary

The meeting to review the assessments of summer flounder and striped bass was held in Woods Hole, Massachusetts, from July 23-26, 2013.

The reports and presentations provided an excellent basis to evaluate the performance of the assessments. It is agreed that the assessments are effective in delineating stock status, determining Biological Reference Points (BRPs) and proxies, and in projecting probable short-term trends in stock biomass, fishing mortality, and catches. The science reviewed was of a high standard and for summer flounder could be classed as 'of the best scientific information available'. Some minor aspects of the striped bass evaluation of BRPs and projections needed some additional work, which was carried out in during the review. Comments given throughout this report should not be read as direct criticism of what has been done, but rather as ideas of areas for development. In retrospect one can always find room for improvement, and as such minor suggestions have been made throughout this report, which should not be considered prescriptive or limiting but rather as aspects for careful consideration. The main conclusions are given separately by species.

For summer flounder

All ToR were addressed fully.

Extensive catch data from both commercial and recreational fleets were prepared for the assessment as landings and discard fleets. An extensive range data from of surveys were prepared and used in the assessment. A manual iterative reweighting procedure was employed to fit the best model. The main change from previous assessments was the use of multinomial error functions for surveys with proportions at age to replace the independent lognormal approach used previously. The assessment and projection were accepted as suitable for advice.

The Southern Demersal Working Group's (SDWG) conclusion that the summer flounder stock from the southern border of North Carolina to the US-Canada border is not overfished and overfishing is not occurring in 2012 is endorsed. Fishing mortality has decreased since 1997, and is estimated to be below the new FMSY proxy of F35%= 0.309. SSB in 2012 was estimated to be at 82% of the new proxy reference point of SSB35%.

Studies undertaken by National Marine Fisheries Service (NMFS) Northeast Fisheries Science Center (NEFSC) and Partnership for mid-Atlantic Fisheries Science (PMAFS) have shown that there are sex-specific differences in mortality and growth, with females living longer and growing larger at age. Recent NEFSC surveys have shown a trend of overall slower growth in length and weight and the increased proportion of older males. Sexually dimorphic growth and survival would argue for developing sex-specific components of the model; the value of such an approach relies upon the availability of obtaining sex ratios of the landings, which is not currently feasible for the recreational landings. Some work has already been done to develop a sex specific assessment. Work to develop the model and partition the recreational catch should be continued.

For striped bass

All ToR were addressed however, some additional work was requested on BRPs and projections.

Extensive catch data from both commercial and recreational fleets was prepared for the assessment as landings and discard fleets. An extensive range of data from surveys was prepared and used in the assessment. A manual iterative reweighting procedure was employed to fit the best model. The main changes from previous assessments were: the use of multinomial error functions for surveys with proportions at age to replace the independent lognormal approach used previously and changes to natural mortality at age. The assessment and projection were accepted as suitable for advice.

The Striped Bass Technical Committee's (SBTC) conclusion that the striped bass stock is not overfished and overfishing is not occurring in 2012 is endorsed. Fishing mortality, is estimated to be above the new FMSY proxy of Ftarget= 0.175, and below the new proxy of Fthreshold=0.213. Female SSB in 2012 was estimated to be 85% of the new proxy target reference point of 125%SSB1995 and above the new proxy SSBthreshold=SSB1995.

New BRPs were proposed by the Working Group. There was some inconsistency between options proposed due to the mean recruitment from the parametric stock recruitment models. Following discussions coherent F and SSB reference points were calculated based on non-parametric S-R assumptions.

Annual catch projections were provided for 3 years. Several modeling approaches were used for both nonparametric and parametric estimates of the stock recruitment distributions. Sensitivity analyses were provided. Additional simulations based on the empirical simulations compatible with the assumptions used to define the new BRPs were requested.

The Instantaneous Rates Tag Return Model Incorporating Catch-Release Data (IRCR) provided estimates of total mortality (Z) consistent with the assessment, though detailed short-term trends can be different. Bringing the estimates of tag mortality into the assessment (with appropriate weight) would appear to be a useful addition.

There is considerable evidence for sexual dimorphism in growth and habitat use, with largely males caught by the Bay fleet and females by the Coast fleet. The aggregation of commercial and recreational landings makes the results difficult to attribute Fs to the separate fisheries and thus to separate sexes. Development of a fully sex-disaggregated model that accounts for differences in survivorship and growth is encouraged. Such a model should improve estimates of female biomass and enable less biased estimates of Biological Reference Points.

2. 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 (Appendix 2) 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 to Appendix 2. Further information on the CIE process can be obtained from www.ciereviews.org.

The 57th SARC (Stock Assessment Review Committee) met in the Northeast Fisheries Science Center in Woods Hole, MA from 23-26 July 2013 to review stock assessments for summer flounder (*Paralichthys dentatus*) and striped bass (*Morone saxtilis*). The review committee was composed of Dr. Cynthia M. Jones (MAFMC SSC and Old Dominion University Center for Quantitative Fisheries Ecology, Chair) and three scientists appointed by the Center for Independent Experts: Dr. Robin Cook (Strathclyde University Glasgow UK), Dr. Henrik Sparholt (ICES Secretariat, Copenhagen, Denmark), and Mr. John Simmonds (ICES Advisory Committee, Copenhagen, Denmark).

The review was assisted by the NEFSC Stock Assessment Workshop Chair, Dr. James Weinberg, Ms. Anne O'Brian, and staff, particularly Dr. Paul Rago (NEFSC). Supporting documentation for the summer flounder assessment was prepared by the Southern Demersal Working Group (SDWG), and presentations on summer flounder were made on the first day of the meeting by Dr. Mark Terceiro (NEFSC). Materials for the striped bass assessment were prepared by the striped bass Technical, Stock Assessment, and Tagging Committee and presentations were made on the second day by Gay Nelson (MA DNR), Heather Corbett (NJ DFW) and Dr. Alexi Sharov (MD DNR). Rapporteurs were provided for each session of the SARC meeting by the NEFSC. A total of 36 people (see Annex 3) participated in the SARC 57 meeting.

3. Description of the reviewer's role in the review activities.

I participated in all aspects of the review, paying particular attention to the stock assessment and the sensitivity analyses, estimation of management reference points for striped bass and spatial distribution of summer flounder.

4. Findings by ToR.

The report is organized as two separate sections that relate to the assessments of the two stocks; summer flounder (*Paralichthys dentatus*) Section 4.1 and striped bass (*Morone saxtilis*) Section 4.2. A brief discussion of the review of meeting process is given in Section 5. The statement of work is given in Appendix 3. The detailed Terms of Reference (ToR) that provided the structure for section 4.1 and 4.2 are provided in Annex 2 to Appendix 2. The list of participants who attended the review and the initial agenda are given in Appendix 3.

4.1. Summer Flounder

4.1.1. Estimates of summer flounder catch.

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

This ToR was fully met.

Data were presented from the two main types of fishery, recreational and commercial. The commercial landings are the larger component and data are sourced from official landings records at both state and federal level. These data are used in the assessment assuming minimal error. Recreational catch data are estimated from the MRFSS/MRIP survey. The MRIP survey, available since 2004, is considered an improvement on the MRFSS survey in terms of its statistical design. The estimates of this component of the catch are not regarded as particularly precise. Comparison of the MFRSS estimates with values estimated from the Vessel Trip Report (VTR) system differed by a factor of 2-3. The reason for this disparity has not been established; as such the catch estimates may be considered a minimum. The differences between MRIP and VTR estimates may give some insight into the uncertainty in the estimates of recreational fishery landings.

Discard estimates for the commercial fishery were obtained from an observer program. A number of different methods were investigated to raise observer samples to the fleet level. Raising factors that are based on the catch of all species by trip were considered to be the most robust approach. Such an approach is suited for situations where the stock in question is caught as a part of a greater catch of other species and discard components are related to the overall catch rather than the catch of summer flounder specifically.

Estimates of the recreational fishery discards were made from the MRFSS/MRIP surveys and combined with experimentally derived estimates of release mortality to derive estimates of dead discards. The release mortality is thought to be low but uncertain, and small changes in the value used for this mortality can have a large effect on the estimate of dead discards. Nevertheless, as the recreational fishery is the minority fishery, compared to the commercial fishery, the overall level of dead discards in the recreational fishery is considered small although uncertain.

The spatial and temporal distribution of catch and effort was presented based on vessel trip records. The mean along coast or latitudinal location was computed but no other spatial metrics were presented. It is concluded that a northerly shift in the abundance has been observed, however, the cause of this is unclear. A number of explanations are possible: It could be the result of lower exploitation rates that results in the older larger individuals, which are found further north, becoming more abundant; or there may be a northward shift in distribution. In order to determine if temperature could be the cause, the sea surface temperature was compared to the location but no significant covariance was observed. The spatial analysis presented is not especially informative. It is possible to evaluate age based distributional data to separate changing abundance at a location from changing location. This is discussed in more detail in Section 4.1.2

No formal estimates of the variances of the catch components are given in the report but the sources of uncertainty are discussed and carefully considered in the report, and uncertainty in the estimates of dead discards are included in the modeling. It might be interesting to further follow up on the differences in estimates from VTR and MRIP, though this is not regarded as a major issue for the advice.

4.1.2. Survey data available for the assessment.

ToR 2. 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.), and explore standardization of fishery-independent indices. Investigate the utility of commercial or recreational LPUE as a measure of relative abundance. Characterize the uncertainty and any bias in these sources of data. Describe the spatial distribution of the stock over time.

This ToR was fully met.

The available surveys are listed and described. They comprise surveys of the whole stock area performed by the NEFSC and a number of state surveys that typically cover the individual state's waters, or a part of these. Some of the abundance indices are aggregate measures of abundance over several ages with the ages not specified, whilst others are age structured. Some of the age structured indices are for catch of the young of the year (YOY) only. For the NEFSC surveys the most recent indices were corrected for a change in vessel (change from Albatross to Bigalow) and sampling protocol (including change in trawl), which occurred in 2009. The resulting potential change in catch rate is an additional source of uncertainty. However, once the Bigalow series become long enough, probably by the next benchmark, the conversion factors will no longer be necessary and the two series can be fitted separately. Generally the calibration conversion factors used are stable over length but not at the extremes. The calibration conversion factors at length are seen to increase from a standard factor of about 1.8 over the range 26-60cm to a factor exceeding 15 times by 17 or 75cm. These higher value factors are apparently based on few fish and not significantly different from the factor at 26-60cm. Table A41 of the Assessment WG report indicates that these high values do have some influence and elevate the factor at youngest and oldest ages from around 1.8 to 3.6 and 3.0 for ages 0 and 7+ respectively. Given the very rapid increase in the factor with length just at extreme lengths, the apparent scarcity of fish recorded to estimate the factors, and the lack of significance in the difference, it might be preferable to use factors from the better estimated ages, unless there is other experimental evidence for such factors.

An agreed and reviewed protocol for the inclusion/exclusion of surveys in the assessment exists and this was applied to the datasets to select those to be included in the modeling.

Dropping the pre-2003 Delaware survey time-series seemed an appropriate response to the observed survey time series compared to the utility of the other survey data.

A number of fishery dependent LPUE/CPUE indices were investigated for their suitability for use in the assessment. Attempts were made to derive standardized indices by fitting GLMs to vessel trip records. Overall the working group concluded that the indices that were generated were not adequate for inclusion in the assessment. Given the availability of fishery independent surveys and the well-known problems with abundance indices based on commercial fishery data, this appears to be an appropriate conclusion.

In the longer run there would be clear advantages in assembling a composite survey that could be expected to represent the whole inshore area, rather than the current collection of small state-wide surveys that are currently brought into the assessment as individual indices. Such local surveys may indeed accurately measure local abundance but include movement between areas. The movements are then resolved in the main assessment model. This process variability (stock movement) is then treated as observation error, rather than process variability that is its cause, which is acceptable but not ideal. While a GLM approach has been used to try to draw out the major signal, this approach does not take account of the negative correlation associated with abundance shift along with the positive correlation from the overall abundance change. Rather it mimics the assessment, drawing out the coherent signals and treating the different local variability as observation error. While the assessment is at the 'stock' level these tuning indices reflect only a varying subset of the abundance. One way to determine the maximum potential from the totality of the survey data would be to run the assessment without the localized survey data using for example the NEFSC surveys, and then evaluate what weighted combination of the localized surveys would be the most informative. Such an approach could potentially over fit the data, but it would at least put some kind of upper bound on the utility of the combined data sets. Using such an exploratory investigation may give guidance on how best to formulate a model to fit this diverse set of partial indices. In the longer term it would of course be better to unify these surveys by changing operating practice. However, it is recognized that while this might be desirable it may not be practically achievable. Thus the approach of trying to use the existing surveys might be preferable and in any case it is the only solution in the short term.

The spatial distribution of the stock was investigated using data from the NEFSC surveys that cover the stock distribution. This shows that the center of distribution of the stock is now more northerly than in earlier years. Larger fish are generally found further north. The analysis provided illustrates some of the major differences but does not allow a quantitative evaluation of spatial attributes or test the statistical significance of the movement. For the analysis presented the cause may be due either to more older fish located in the same more northerly location or a shift in the overall population. Although numerical, the current method is considered more qualitative, rather than a quantitative, approach.   There are some methods that have been used to evaluate data sets and similar questions statistically. Based on work carried out by the Ecole de Mines de Paris in Fontainebleau and IFREMER in Brest, France, a coherent set of spatial metrics have been developed to evaluate spatial changes by age or size over time. The methodological development was carried out within the framework of the European project FISBOAT (Fisheries Independent Survey Based Operational Assessment Tools, DG–Fish, 6th Framework STREP, Contract 502572). Selected statistics (Table 4.1) were chosen to capture spatial patterns of fish populations using fish density data collected during research surveys. The methodology was specifically developed to handle diffuse population limits, and to describe these populations with variables that are designed specifically so they are not dependent on arbitrary delineation of the domain (Bez 2001). They can be calculated from sets of data with a variety of sampling strategies and used to characterize the location, occupation of space (inertia, isotropy, positive area, spreading area and equivalent area) and internal structure (microstructure). These spatial indices have the potential to be used in a monitoring system to detect changes in spatial distribution (Woillez et al., 2007). A multivariate analysis can be used to determine if overall a combination of parameters infer that the population has changed its distribution (Petigas 2009).

Table 4.1 List of the spatial indices and the population characteristics to which they are thought to be related.

Index	Abbrev.	Units or range	Population characteristics
Centre of gravity	*CG*	geographical coordinates	Mean geographic location of the population
Inertia	*I*	square nautical miles	Dispersion of the population around its centre of gravity
Isotropy	*Iso*	[0, 1]	Elongation of the spatial distribution of the population
Positive area	*PA*	square nautical miles	Area of presence occupied by the stock, even with a low density
Spreading area	*SA*	square nautical miles	A measure of the area occupied by the stock that takes into account variations in fish density.
Equivalent area	*EA*	square nautical miles	An individual-based measure of the area occupied by the stock
Microstructure	*Mi*	[0, 1]	The fine-scale variability of the fish density surface

An example of this type of evaluation is for North Sea plaice and sole stocks, and shows how the population moves by age and over time, and it illustrates which parameters show significant change (STECF 2010). The STECF report contains an annex with the full definitions of the parameters given above. Routines have been developed in R and are available through the Ecole de Mines de Paris Fontainebleau, France. Use of these types of analyses may be helpful in establishing if the summer flounder stock is moving north or the apparent change in location is more related to abundance at age.

4.1.3. **Sex specific data available for the assessment.**

ToR 3. Review recent information on sex-specific growth and on sex ratios at age. If possible, determine if fish sex, size and age should be used in the assessment.

This ToR was fully met.

Analyses of both NEFSC, commercial and recreational fishery data were performed. These show that growth differs by sex with females typically larger at age than males. There are long-term trends in weight at age with lower mean weights in more recent years for the older fish. This trend coincides with a greater proportion of males at older ages in recent years and may relate to higher survival of fish resulting from lower fishing mortality. Several studies have pointed out the potential error in sex combined assessments (Maunder WP 2012, Maunder and Wong 2011 and public comment at this review from Martell).

Sex-specific composition data from the NMFS-NEFSC ocean trawl survey is available. Usually when fish are sampled from the fishery no sex determination is made, which means the only source of data to split the catch data by sex is to use survey data. In 2010, both the commercial and recreational fisheries were sampled for sex ratio of summer flounder. Although, sex-at-length of summer flounder landed in the commercial fishery is well described by data collected on the NMFS-NEFSC ocean trawl survey, Morison et al. (SARC 57) concluded that the sex-at-length and sex-at-age keys developed from NMFS were not appropriate for describing the sex ratio of recreational landings. So unfortunately, sex-specific composition data cannot currently be constructed for the recreational landings, though a split of the commercial catch is available. This lack of split for historic catch data has prevented a full sex disaggregated assessment. I would encourage further evaluation of methods to estimate sex ratio in the recreational fishery. If this could be accomplished even approximately, this should allow a sex specific assessment model to be used straightforwardly. Alternatively if it was possible to construct a survey that corresponds to the population as a whole given the availability of sex specific natural mortality and sex specific weights at age, it would allow a combined assessment to be separated into a sex specific assessment even if sex specific catch data was not available.

4.1.4. Estimate annual fishing mortality, recruitment and SSB.

ToR 4. Estimate annual fishing mortality, recruitment and stock biomass (both total and spawning stock) for the time series (integrating results from TOR-3), 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.

This ToR was fully met.

Overall it is agreed that the assessment provided a satisfactory estimates of fishing mortality, historical recruitment and spawning stock biomass for management advice.

An age structured statistical catch at age model (ASAP) was used to estimate population parameters. The catch data were assigned to two separate “fleets”. Landings from the commercial and recreational fishery were combined into a single “fleet” and the same approach was used to create a discard “fleet”. This classification is thought to be somewhat artificial since it does not describe the operation of true fleets and the estimated selectivity values are not directly useful for management purposes. However, it is considered that this issue is probably not important for the estimation of total fishing mortality. Modeling the commercial fleet and recreational fleets as separate fishery based fleets would be a more natural way of partitioning the catch and would give meaningful values of fleet selectivity. In this way partial Fs by fleet can be related to both landings and discards simultaneously, which may be more meaningful than the current landings and discard Fs. It is recognized that the method chosen has utility in terms of error factors, because the error in the landings estimates are much smaller than the error in the discard estimates. However, the added utility of partial Fs by fishery should be an advantage when considering management measures. Currently it is difficult to determine the correct management measures to be applied for the catch limits for the two fisheries. It might be helpful for managers to have the information on both historic and forward projection under different scenarios for commercial and recreational fisheries that are, I understand, managed under different approaches. This would provide management options to be presented that do not assume both fisheries change in the same way.

A new statistical assumption was made in the model, which is that the proportions at age are described by a multinomial distribution, whereas in the previous assessment model the numbers at age were assumed to be independent and drawn from lognormal distributions. This approach appears legitimate and the differences in modeled F and SSB appear small. However, it is unclear how uncertainty in the proportions at age is spread amongst the age terms with this approach. Typically age proportion error will follow a ‘bath tub’ curve with low variability associated with the fully selected ages where the probability of sampling a fish is highest. Variability often increases both at older ages due to relatively less frequent occurrence of fish at these ages and the youngest age due to lower occurrence due to low selection. Currently it is not clear if the multinomial method with a single effective sample size for all ages will provide this variability profile.

A structured approach was used to investigate the new model configuration and the updated data. This shows the effect of the new configuration when analyzing the same data as the previous assessment and the incremental changes arising by introducing the updated data. Qualitatively the new assessment shows the same historical trends in F and SSB as the old model but there are differences in scale.

Comprehensive diagnostics of model fit are given for all the surveys and the catch at age data. In addition, a retrospective analysis was performed and a likelihood profile produced over a range of values for natural mortality. Fits to the total catch and catch age compositions are generally good. Some state surveys are poorly fit but receive low weight in the likelihood. The retrospective pattern for recent years shows no strong pattern. The profile over M indicates that a value between 0.2 and 0.3 receives the greatest likelihood, which is supportive of the current choice of M in the model.

The modeling approach utilized a manual reweighting iterative process. The weight given to each survey was modified in two ways, for the indices fitted with log residuals the weighting assigned through the CVs was altered by modifying the value of the CV in the fit. For the multinomial parameters the weight was influenced by varying the effective sample size. This process appears to work effectively. It could however, be relatively easily be automated. An automated process would formalize the approach. As the fitting modifies the CV and effective sample size to standardize the error in each survey there is no concern over the arbitrary setting of effective sample size.

4.1.5. Biological Reference points.

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.

This ToR was fully met.

Current BRPs are based on the F35% MSY proxy. The Working Group considered a number of analyses that have addressed the basis for BRPs for this stock and which have suggested a less conservative approach, such as F30%. Applying a non-parametric approach where mean recruitment is applied to the yield/SSB per recruit calculation suggests that moving from F35% to F30% would result in a very small increase in yield but a moderate reduction in equilibrium SSB. For this reason the Working Group proposed that the F35% BRPs should be retained. The panel discussed this issue at some length and noted that simulations run with a Beverton-Holt stock recruitment model gave sustainable SSBs and higher yields when run at F30%. However, the Working Group felt that the fit of stock recruitment curve did not reliably estimate steepness and thus undermined the utility of the analysis. As a result there was no consensus that F30% should be preferred over F35% as a basis for the BRPs. The yield at F30% was computed to be around 2% greater and implied a 14% reduction in mean population size. The added risk to the stock, under a regime with higher exploitation rates associated with F30%, for such a modest gain in yield appears too big a risk for such a small gain. However, if a fishery is catching summer flounder only as an incidental bycatch and the current exploitation rate is resulting in discards with an important mortality rate the benefits of a higher exploitation rate could be investigated. Such an evaluation might possibly be through the use of an MSE (Rademeyer, 2007).

4.1.6. Stock Status.

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).

This TOR was met.

The old model used the BRP established by the 2008 SAW 47 review, based on a model wherein age-dependent indices were independent and lognormally distributed. When updated with new data the model results showed that the stock was not overfished and overfishing was not occurring.

The 2013 Working group established a new model, based on multinominally distributed proportions at age, which gave slightly different perception of the stock and new BRPs. Graphs and tables were presented that showed consistent results with the old and new models and similar values for stock status.

Overall the Working Group evaluation of stock status is endorsed. According to the old and new reference points, and with both old and new assessment models, the stock is not overfished and overfishing is not occurring.

4.1.7. **Stock Projections.**

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) and candidate ABCs (Acceptable Biological Catch; 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.

The ToR7 was met.

The working group provided a three-year projection, 2014-2016, using the program AGEPRO and no retrospective adjustment and a CV=100 for the OFL. They provided a sensitivity analysis by including stochastic recruitment by resampling from the 1982-2012 recruitment distribution. They did not partition the catch into commercial and recreational fishery sectors, but into landings and discards. The partition into commercial and recreational components is provided by the MAFMC subsequently. They projected that there was zero chance that F > FMSY and SSB < ½*SSBMSY. No important retrospective problems were noted.

There are some concerns that the effect of differential survival and spatial mixing adds uncertainty to the projections. Summer flounder show sexually dimorphic growth (females are larger) that varies in time and space. This has been confirmed by NEFSC research surveys and the fishery sampling. The stock assessment does not fully account for these dynamics and does not partition the model by sex based on the difficulty in evaluating the landings by sex. It is difficult to discern whether there will be significant effects on the projections of R, F, and SSB due to the uncertainty due to dimorphic growth and survival.

Landings are assumed reported without error and this implies a lower-bound estimate (see Section 4.1.1). However, assessment and advice would be consistent with any systematic constant under (or over) reporting.

The sensitivity to natural mortality was investigated by profiling the fit in the assessment using M in the range 0.1 to 0.4. The presence of a minimum in the likelihood, between 0.2 and 0.3, is supportive of the use of the current value.

The AGEPRO 2014-2016 projection results showed that at the MSY proxy of F35 there was no chance of F > FMSY or SSB < ½*SSBMSY and less than13% chance for the ABC. It is agreed that currently the stock does not appear to be vulnerable to overfishing based on the projections, and it is noted that the projections included a sensitivity analysis where release mortality was halved and doubled to show that F was not sensitive to changes in the recreational discard mortality.

A minor aspect of the short-term projection is the direct use of the most recent recruitment value. The CV on the terminal year recruit estimate is high, almost as high as the CV for the stock recruit model; such a similar CV suggests that the assessment is only slightly more informative than a random draw from the underlying distribution of recruitment. Currently on average the incoming recruitment provides around 9%, 16% and 20% of any TAC in first, second and third catch years respectively. For this year's advice with estimated recruitment close to the recent mean there is no issue. However, the method chosen could be potentially problematic on some occasions. For example, the retrospective analysis shows that the first estimate of age 1 recruits for 2009 was rather high and subsequently revised downwards. In such circumstances one approach would be to draw recruitment as a weighted combination of the estimated value and the median of the S-R model (or if preferred a non-parametric recruitment model). One appropriate source of weighting factors would be based on the CV in the S-R and the CV in the assessment estimate. Such an approach would result in little difference this year because the estimated and simulated means are similar. However, it would modify more any extreme low or high values such as the first 2009 estimate. The general concept is described in Shepherd (1997). It is possible that assigning an appropriate weight to the S-R function in the assessment (rather than applying an arbitrary low weight) may provide the modification adequately; however, sensitivity of this approach to estimates of historic recruitment needs to be checked before choosing this approach. If the assessment was to be used for two or even three years catch advice, where the contribution of the incoming recruitment is on average 16% and 20%, this type of modification would be helpful, particularly when the terminal recruitment estimate is large or small.

4.1.8. Research Recommendations.

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 2012. Identify new research recommendations.

This TOR has been met. There were 15 old and 13 new research recommendations. The Working Group provided the status of progress on the old research recommendations. NMFS and PMAFS have made progress for example on otolith collections, confirmation of sexually dimorphic growth, reporting accuracy in the recreational fishery, sex ratios in the landings, and otolith chemistry to evaluate spatial structure.

The WG sees as a priority the development of sex-specific sampling of surveys and landings to provide improved model input, sampling of discards and changing the model to include sex-specific parameterization. It is agreed that these are priorities and should improve the utility of the assessment, the BRPs and management information.

4.2. Striped bass

4.2.1. Fishery dependent and independent indices.

ToR 1. Investigate all fisheries independent and dependent data sets, including life history, indices of abundance, and tagging data. Discuss strengths and weaknesses of the data sources. Evaluate evidence for changes in natural mortality in recent years.

This ToR was fully met.

The report provided an extensive set of indices of both aged and aggregate abundance. The very large quantity of data available implies that a very considerable amount of work was involved in preparing these data sets. The preparation of the indices was not included in this review, as this has been reviewed elsewhere. The available data were considered to be well assembled, though from the Working Group report there was some uncertainty initially concerning exactly which data sets were used in the model. This was fully clarified in the meeting. For the recreational catch estimates a change in the sampling program from MRFSS to MRIP was noted, though it was considered not to be a problem because only the raw intercept data were used in this assessment. Overall it is concluded that the data sets provided were suitable for the assessment.

In the longer run there would be clear advantages in assembling a composite survey that could be expected to represent the whole area, rather than the current collection of small state-wide surveys that are currently brought into the assessment as individual indices. Such local surveys may accurately measure movement between areas that are then confounded in the main assessment model. This process variability (stock movement) is effectively treated as observation error in the assessment model, which is an acceptable approach but not ideal.

The use of the age aggregated SDNSS index is based on flat selection from 3 year and older. This index fits particularly poorly in the assessment (see below). Given the non-uniform spatial distribution of the stock by age it may be useful to try to obtain a better model of selection for this index or to further truncate the age range used in the computation of comparable abundance.

The group presented the information on natural mortality derived from tag data and concluded that the value to be used in the assessment should be replaced with new values with higher M at younger ages. The review group agreed with this conclusion. There were some concerns that the value of M at ages 2-4 ages was rather high for the sizes of fish at these ages. The differences in longevity between males and females were thought to be important in explaining the higher Ms at these ages, which was discussed and the values of M were accepted. Overall it was concluded that the revised values represented the best available estimates at the moment. It was noted that it may be possible to analyze the tag data in the assessment model directly (see below), which would be helpful in providing a consistent compilation of the data. It is understood that care will be needed in weighting the tag data so that the model is flexible enough to reconcile the different short-term mortality signals between catch and tag data.

4.2.2. Commercial and recreational catch.

ToR 2. Estimate commercial and recreational landings and discards. Characterize the uncertainty in the data and spatial distribution of the fisheries.

This ToR was fully met.

The review concluded that the assembled catch data represented the best current estimates of catch (landings and dead discards) and they are suitable for the assessment. It was recognized that the estimate of both recreational and commercial dead discards is sensitive to the assumed values of post-release mortality, and, because a rather high proportion are considered to survive for most gears, this may result in a large error on these estimates.

Overall the catch is assembled into three fleets (bay landings, coastal landings and dead discards). By combining the data in this way it is not possible to use the assessment directly to evaluate the impact of different 'fisheries' as combined landings and discards. With this formulation estimated Fs on landing can change separately from F on discards in the same fishery, it is not clear if this model response is appropriate. Organizing the data by 'Fishing Fleet', e.g. bay fishery and coastal fishery, may give a more useful model for each fishery. Although it is suggested that this model formulation be examined, it is not considered that the current method has resulted in incorrect conclusions on the state of stock.

It is noted that the catches are not currently sampled for sex ratio. As there is clear evidence of sexual dimorphism, and sex dependence in the catch rates, there may be advantages in considering the splitting of the assessment into sex components. If this was to be done it implies estimating a sex split in the catch. Some very reasonable practical restrictions on this were noted. It was noted that there exists extensive traceability in the marketing and consumption of landed striped bass. Fish are individually tagged in the market and recreational catches are not generally sold. Current limitations on sampling for sex ratio appear to come partly from the loss in value associated with sampling of landings or the cost of purchasing samples. Fish obtained later in the supply chain may not suffer from the same limitations, but their origin may still be traceable through the tag system. Thus it is considered that it may be possible to determine sex ratios (at length) in a cooperative way from recreational landings and fish buyers, which could be explored if the assessment is to move to a full sex separated model.

4.2.3. Estimates of fishing mortality, recruitment and SSB

ToR 3. Use the statistical catch-at-age model to estimate annual fishing mortality, recruitment, total abundance and stock biomass (total and spawning stock) for the time series and estimate their uncertainty. Provide retrospective analysis of the model results and historical retrospective. Provide estimates of exploitation by stock component, where possible, and for total stock complex.

This ToR was fully completed and the current assessment is acceptable and suitable for estimating the state of the stock.

It is noted that the assessment was particularly sensitive to two surveys (MDSSN and MRFSS). The pattern of residuals for both these two surveys are of some concern and the sensitivity analysis shows that the assessed SSB and F would be different over at least the last 8 years if either of these surveys were omitted from the assessment data set. While including these in the assessment was considered acceptable (and removing both from the assessment would probably give only minor changes in results), it is of concern that data with such diverse signals are included and individually they can have substantial influence. Further detailed evaluation of these two data sources and their utility in the assessment would be helpful.

The assessment model is based on three 'fleets' that don't correspond to real fisheries (see above) reformulating the assessment into two or more fleets, each with landings and discard components, may give added value to the assessment results as it would allow the commercial and recreational fisheries to be considered separately in a more useful way.

The assessment is carried out using data combined across sexes. The female biomass is then estimated using temporally invariant age dependent factors. There is some concern that this splitting factor should depend on F and thus the constant values may be biased in some periods. It is considered that splitting the assessment by sex may be possible and, given the implications on mortality and the estimation of reference points, it should be considered in the future. The current approach to estimation of female SSB based on a fixed proportion of the population may need only a minor reformulation inside the model to allow for proportions that vary with the male / female F ratios instead of fixed proportions in the population. In addition, if estimates of M by sex were also available, then even though information on catches is not split in the assessment, the fishing mortality results could be calculated with the implied sex dependent mortality.

The estimation of F in 1982 is considered to be particularly uncertain. This is illustrated by the poor fit to the selection for the catch data in that year. The review group endorsed the decision to delete this from the results.

The Working Group presented an extensive range of sensitivity tests that taken as a whole strongly support the conclusion that the assessment can be used for management. With the exception of the sensitivity of the two surveys mentioned above, the assessment was robust to a number of different formulations. The comparison with previous assessments confirmed the relative stability of the modeling approach.

The model formulation is complex in terms of the use of sample size for data treated with multinomial method and indices fitted with residuals and scaled CVs. The method to estimate effective sample size appears to be somewhat arbitrary based on initial values equal for each survey and then modified subsequently. The numerical value for effective sample sizes, using the Francis (2011) adjustment for catch and index age compositions, were implemented in the middle of the process, and if they are to be utilized, would better be entered before any other reweighting. Manual iterative reweighting has been used via amendment of CVs for each survey data set. If this approach is the preferred method for the assessment model, it should be implemented as an automated process to ensure correct and complete implementation. It is unclear how important the iterative reweighting is to the final results. The sensitivity to some aspects of this was explored, by, for example, changing all the CVs in the weighting by 20%. A 20% shift implies around a 40% shift in weighting factor. The 20% shift changes the overall weight of all the indices relative to catch or fractions at age but not the relative weight of the individual data sources.

It was noted that there was an aging bias caused by the use of fish scales rather than otoliths to age individuals. It was shown that this could affect the estimate of SSB and F. Although this results in different values for both assessment and reference points, the perception of the state of the stock is unaltered. However, the extent to which F is affected is not clear and the forecast may be sensitive to this bias. Further exploration of sensitivity to aging bias should be considered.

4.2.4. Tag return modeling.

ToR 4. Use the Instantaneous Rates Tag Return Model Incorporating Catch-Release Data (IRCR) and associated model components applied to the Atlantic striped bass tagging data to estimate F and abundance from coast wide and producer area tag programs along with the uncertainty of those estimates. Provide suggestions for further development of this model.

This ToR was full addressed.

A study was carried out and presented. This study concluded that tag based total mortality was similar to the total mortality in the assessment, though there are some differences in short term trends within the time-series. It is suggested that inclusion of tag estimated mortality in the assessment may be helpful. It may for example be possible to use this to estimate or confirm the discard survival rates that are important for estimating catch.

It was noted that there were a few thousand tags recovered from re-releases. These data had not been specifically analyzed. If it is possible it may be interesting to compare re-releases of tagged fish, as these may be more typical of fishery releases than those released by tagging program.

The current approach to computing Z from tagging does depend on accurate reporting. It is unclear how accurate the overall returns are, particularly from the recreational fishery, where bag limits exist as part of the regulation but the fishery is potentially open access and considered a right by some participants. If underreporting of catch was a potential problem, it is possible to use a regular tagging program to estimate mortality in the situation of uncertain total catch using a ratio estimation process based on the Jolly-Seber approach (see Ricker, 1975 and Antsalo, 2009). Using tag return data for fish belonging to year class y, the total mortality Z(i, j, y), between years i and j is obtained using the Jolly–Seber estimator:

$$Z(y_i,y_j,a) = log\{\Sigma r(y_i,y_k,a)/\Sigma r(y_j,y_k,a)*R(y_j,a)/R(y_i,a)\}$$

where R(i, y) is the number of tagged fish of year class y that were released in year i, R(j, y) the number of tagged fish of the same year class that were released in year j . Σr(i, k, y) the numbers of such tagged fish that were recaptured in the years k summed over all $k \geq j$. This approach is less sensitive to a number of survival assumptions and catch accounting assumptions, requiring stability between adjacent years rather than long term estimation of survival.

4.2.5. Biological Reference Points.

ToR 5. Update or redefine biological reference points (BRPs; point estimates or proxies for BMSY, SSBMSY, FMSY, MSY). Define stock status based on BRPs.

This aspect of the ToR was not fully developed in the Working Group report and required some extensive additional analysis during the review.

Attempts were made to estimate Fmsy from analyses using parametric approaches with a variety of stock recruit relationships. These analyses produced disparate results and were particularly sensitive to the recruitment relationships assumed. This was mostly because different functions implied different mean recruitment in the future and the basis for these differences was weak. It was particularly difficult to estimate good SSB parameters that rely explicitly on assumed recruitment. Following some additional analysis it was concluded that selecting a single model was not robust. It was decided that the use of the estimate of the 1995SSB as an SSB threshold would be compatible with current management objectives and not be inconsistent with an MSY approach. Once an SSB threshold is defined, a set of internally consistent F and SSB thresholds and targets were defined based on a non-parametric assumption that future recruitment will be similar to past recruitment (1990 to present). The distribution of SSB implied by the target and threshold F was examined and it was concluded that the proposed values would give high long-term yield and be consistent in terms of F and SSB. This coherent set is an improvement on the less coherent set used previously. Overall this approach does not estimate Fmsy or SSBmsy, but does give management proxies that, although they are not explicitly MSY based, do give high and stable long-term yield.

Some of the difficulty in determining MSY estimates for this stock relates to difficulties in selecting stock recruit models. Earlier approaches using model averaging methods (Brodziak and Legault 2005) could assist; however, these approaches still result in the use of a single composite function. As the estimate of BRPs can be done using a stochastic approach, no explicit Stock Recruit model decision is required and multiple models can be allowed simultaneously (Michelson and McAlister 2004, Simmonds *et al*, 2011). Such an approach, which explicitly includes the uncertainty in the form of the S-R function, may be helpful. The current approach and proxies are reasonable, and if there is no need to define an explicit MSY BRP, the current approach, though not strictly MSY, is thought to be quite adequate for general management purposes.

If managers would like a more comprehensive evaluation of management under these BRPs, an MSE (Rademeyer, 2007) could be used to evaluate the likely frequency of encountering threshold values of SSB and F, taking into account not just biological variability but also observation error.

4.2.6. Stock Projections.

ToR 6. Provide annual projections of catch and biomass under alternative harvest scenarios. Projections 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 covering a range of assumptions about the most important sources of uncertainty, including potential changes in natural mortality.

This ToR was completed and catch projections supplied.

The review group considered that these catch options can be used for management. However, the assumptions used by the Working Group for the projections applied different stock recruitment model/assumptions from those that were used for calculation of the BRPs, leading to potential inconsistency between projections and reference points. Following the discussion of the BRPs (see above) and the choice of recruitment model, in the future the projections should be carried out with the same recruitment basis as that chosen for the BRPs. In practice short term projections would not be expected to be sensitive to the choice of recruitment model unless the fishery is highly dependent on recruiting year classes. In the striped bass fishery fish are fully recruited by age 4-5 so recruitment should only have a very minor effect on projections.

The three fleet approach to splitting the catch data, which combines discards from both fisheries, makes it difficult to estimate mortality separately for the two main fisheries. As noted above reformulation of the model into recreational and commercial fleets, including dead discard components, may be of assistance in providing appropriate and much more useful separate fishery based catch options.

4.2.7. Research Recommendations.

ToR 7. Review and evaluate the status of the Technical Committee research recommendations listed in the most recent SARC report. Identify new research recommendations. Recommend timing and frequency of future assessment updates and benchmark assessments.

The Working Group provided an extensive list of research recommendations and they have clearly identified three levels: high, moderate and low. The Group also identified research priorities as being met or in progress. Section B11.2 identifies the need for a coastal population index as of moderate priority. If this could be linked to state surveys to obtain a population wide survey, this would be of high priority and be potentially of considerable utility in the assessment.

It is also considered that issues surrounding sexually differentiated migration be examined. Although some work in this area has been carried out, as yet this has not been integrated into the assessment used for management advice. The Working Group presented information on different migration patterns for males and females. There was a perception that females tend to migrate out of the rivers into the coastal region whilst males remain in the inshore areas. There were reports of catches being composed of 90% or 95% males within Chesapeake Bay and selection on females was high in the coastal fisheries. The separate exploitation of these different groups could potentially affect the exploitation and certainly influence the evaluation of Fmsy. Consideration has also been given to sex dependent natural mortality. Management targets based on only female SSB may need to be considered carefully if relatively heavy exploitation of males is occurring but not included in the management targets. It is suggested that simulation of the problem through a two area model could be used to further evaluate the issues relatively cheaply. In particular the evaluation the ignoring sex differences on the consequence for management, the influence on MSY targets and BRPs and the need for precautionary exploitation would be informative. A simulation might also be used to indicate the minimum data needed to manage the fishery and could be identified in such a simulation. In this context it may be useful to evaluate if a two area spatial assessment model with two sexes could be parameterized in order to better model the spatially diverse Chesapeake Bay and coastal fisheries.

5. Panel review proceedings

I was impressed overall with the quality of this review and all who participated in it, I would like to thank all involved for their efforts. In particular I would like to thank the presenters for their hard work in prepared presentations and the chair for her work guiding the review and for the work assembling and editing the review group report.

All the data and assessment reports were provided on time. The presentations covered most issues well. A small improvement would be to ask presenters to refocus the presentation of the assessment results. The current approach was a description of the approach and the stages along the way, which provides an insight to the process rather than the results. The important aspects are the differences between the new model and previously agreed assessments, the changes resulting from new data and then the sensitivity to critical assumptions.

6. Conclusion.

The reports and presentations provided an excellent basis to evaluate the performance of the assessment. It is agreed that the assessments are effective in delineating stock status, determining BRPs and proxies, and in projecting probable short-term trends in stock biomass, fishing mortality, and catches. The science reviewed was of a high standard and for summer flounder could be classed as 'of the best scientific information available'. Some minor aspects of the striped bass evaluation of BRPs and projections needed some additional work, which was carried out in during the review. Comments given throughout this report should not be read as direct criticism of what has been done, but rather as ideas of areas for development. In retrospect one can always find room for improvement, and as such minor suggestions have been made throughout this report, which should not be considered prescriptive or limiting but rather as aspects for careful consideration.

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Appendix 2 : Statement of Work

57th Stock Assessment Workshop/Stock Assessment Review Committee (SAW/SARC): Benchmark stock assessments for striped bass and summer flounder

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 is the cornerstone of the Northeast Stock Assessment Workshop (SAW) process, which includes assessment development (SAW Working Groups or ASMFC technical committees), assessment peer review, public presentations, and document publication. 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 fishery management in the northeast region.

The purpose of this panel review meeting will be to provide an external peer review of stock assessments for striped bass (*Morone saxatilis*) and summer flounder (*Paralichthys dentatus*). Striped bass and summer flounder are commercially and recreationally important species found along the US east coast. This review determines whether the scientific assessments are adequate to serve as a basis for developing fishery management advice.

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 MidAtlantic 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 stock assessment Terms of Reference (ToRs) 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 striped bass and summer flounder 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 methods. 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. For both striped bass and summer flounder, it is desirable to have knowledge of stock assessments involving spatially distributed populations, migratory behavior, and natural mortality rates that vary with time or sex.

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 July 23-26, 2013.

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 B_{MSY} and F_{MSY} 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 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, and FAX number) 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, 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 if necessary) the 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 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 July 23-26, 2013.
3) Conduct an independent peer review in accordance with this SoW and the assessment ToRs (listed in **Annex 2**).
4) No later than August 9, 2013, each CIE reviewer shall submit an independent peer review report addressed to the "Center for Independent Experts," and sent to Mr. Manoj Shivlani, CIE Lead Coordinator, via email to shivlanim@bellsouth.net, 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.

June 19, 2013	Contractor sends reviewer contact information to the COR, who then sends this to the NMFS Project Contact
July 9, 2013	NMFS Project Contact will attempt to provide reviewers the pre-review documents
July 23-26, 2013	Each reviewer participates and conducts an independent peer review during the panel review meeting in Woods Hole, MA
July 26, 2013	SARC Chair and CIE reviewers work at drafting reports during meeting at Woods Hole, MA, USA
August 9, 2013	Reviewers submit draft independent peer review reports to the contractor's technical team for independent review

August 9, 2013	Draft of SARC Summary Report, reviewed by all CIE reviewers, due to the SARC Chair *
August 16, 2013	SARC Chair sends Final SARC Summary Report, approved by CIE reviewers, to NEFSC contact (i.e., SAW Chairman)
August 23, 2013	Contractor submits independent peer review reports to the COR who reviews for compliance with the contract requirements
August 30, 2013	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 William Michaels, via email William.Michaels@noaa.gov

Support Personnel:

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NMFS Office of Science and Technology
1315 East West Hwy, SSMC3, F/ST4, Silver Spring, MD 20910
William.Michaels@noaa.gov Phone: 301-427-8155

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Roger W. Peretti, Executive Vice President
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Key Personnel:

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Dr. William Karp, NEFSC Science Director
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Northeast Fisheries Science Center
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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: 57th SAW/SARC Stock Assessment Terms of Reference

(file vers.: 12/18/2012)

A. Summer flounder

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

2. 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.), and explore standardization of fishery-independent indices*. Investigate the utility of commercial or recreational LPUE as a measure of relative abundance. Characterize the uncertainty and any bias in these sources of data. Describe the spatial distribution of the stock over time.

3. Review recent information on sex-specific growth and on sex ratios at age. If possible, determine if fish sex, size and age should be used in the assessment*.

4. Estimate annual fishing mortality, recruitment and stock biomass (both total and spawning stock) for the time series (integrating results from TOR-3), 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.

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

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) and candidate ABCs (Acceptable Biological Catch; see Appendix to the SAW TORs).
   d. 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).
   e. Comment on which projections seem most realistic. Consider the major uncertainties in the assessment as well as sensitivity of the projections to various assumptions.
   f. 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 2012. Identify new research recommendations.

(*: Completion of specific sub-task is contingent on analytical support from staff outside of the NEFSC.)

B. Striped bass**

1. Investigate all fisheries independent and dependent data sets, including life history, indices of abundance, and tagging data. Discuss strengths and weaknesses of the data sources. Evaluate evidence for changes in natural mortality in recent years.

2. Estimate commercial and recreational landings and discards. Characterize the uncertainty in the data and spatial distribution of the fisheries.

3. Use the statistical catch-at-age model to estimate annual fishing mortality, recruitment, total abundance and stock biomass (total and spawning stock) for the time series and estimate their uncertainty. Provide retrospective analysis of the model results and historical retrospective. Provide estimates of exploitation by stock component, where possible, and for total stock complex.

4. Use the Instantaneous Rates Tag Return Model Incorporating Catch-Release Data (IRCR) and associated model components applied to the Atlantic striped bass tagging data to estimate F and abundance from coast wide and producer area tag programs along with the uncertainty of those estimates. Provide suggestions for further development of this model.

5. Update or redefine biological reference points (BRPs; point estimates or proxies for B_{MSY}, SSB_{MSY}, F_{MSY}, MSY). Define stock status based on BRPs.

6. Provide annual projections of catch and biomass under alternative harvest scenarios. Projections 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 covering a range of assumptions about the most important sources of uncertainty, including potential changes in natural mortality.

7. Review and evaluate the status of the Technical Committee research recommendations listed in the most recent SARC report. Indentify new research recommendations. Recommend timing and frequency of future assessment updates and benchmark assessments.

(**: These TORs were developed by the ASMFC Striped Bass Stock Assessment Subcommittee and Tagging Subcommittee, with approval from the Technical Committee and Management Board.)

Appendix 3 Review Group Agenda and Participants

57th Northeast Regional Stock Assessment Workshop (SAW 57)
Stock Assessment Review Committee (SARC) Meeting

July 23-26, 2013

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

AGENDA (version: 16 July 2013)

TOPIC	PRESENTER(S)	SARC LEADER	RAPPORTEUR

Tuesday, July 23

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. Summer flounder)
Mark Terceiro TBD **Brian Linton**

12:30 – 1:30 PM Lunch

1:30 – 3:30 Assesssment Presentation (A. Summer flounder)
Mark Terceiro TBD **Brian Linton**

3:30 – 3:45 Break

3:45 – 5:45 SARC Discussion w/ Presenters (A. Summer flounder)
Cynthia Jones, SARC Chair **Charles Adams**

5:45 – 6 Public Comments (A. Summer flounder)

TOPIC	PRESENTER(S)	SARC LEADER	RAPPORTEUR

Wednesday, July 24

9 – 10:45 AM	Assessment Presentation (B. Striped bass)		
	Gary Nelson **Heather Corbett** **Alexei Sharov**	TBD	**Jessica Blaylock**
10:45 – 11 AM	Break		
11 – 12:30 PM	(cont.) Assessment Presentation (B. Striped bass)		
	Gary Nelson **Heather Corbett** **Alexei Sharov**	TBD	**Jessica Blaylock**
12:30 – 1:45 PM	Lunch		
1:45 – 3:30	SARC Discussion w/presenters (B. Striped bass)		
	Cynthia Jones, SARC Chair		**Toni Chute**
3:30 – 3:45	Public Comments (B. Striped bass)		
3:45 -4	Break		
4 – 6	Revisit with presenters (A. Summer flounder)		
	Cynthia Jones, SARC Chair		**Kiersten Curti**
7	**(**Social Gathering **)**		

TOPIC	PRESENTER(S)	SARC LEADER	RAPPORTEUR

Thursday, July 25

8:30 – 10:15 AM Revisit with presenters (B. Striped bass)
Cynthia Jones, SARC Chair **Anthony Wood**

10:15 – 10:30 Break

10:30 – 12:45 Review/edit Assessment Summary Report (B. Striped bass)
Cynthia Jones, SARC Chair **Anthony Wood**

12:45 – 2 PM Lunch

2 – 2:45 (cont.) edit Assessment Summary Report (B. Striped bass)
Cynthia Jones, SARC Chair **Toni Chute**

2:45 – 3 Break

3 – 6 Review/edit Assessment Summary Report (A. Summer flounder)
Cynthia Jones, SARC Chair **Julie Nieland**

Friday, July 26

9 AM – 5 PM SARC Report writing. (closed meeting)

*All times are approximate, and may be changed at the discretion of the SARC chair.
The meeting is open to the public, except where noted.

57th SAW/SARC, List of Attendees

Name	Affiliation	Email
Adams Charles	NEFSC	charles.adams@noaa.gov
Blaylock Jessica	NEFSC	Jessica.Blaylock@noaa.org
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