Independent Peer Review Report on the 52nd Stock Assessment Workshop/Stock Assessment Review Committee (SAW/SARC): Winter flounder (Southern New England Stock), Winter flounder (Georges Bank Stock), Winter flounder (Gulf of Maine Stock).

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Prepared for

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1. Executive Summary

The 52nd Stock Assessment Review Committee (SARC 52) meeting was held from 1 pm on 6 June 2011 through 5.30 pm on 10 June 2011 at the Northeast Fisheries Science Centre, Wood's Hole, Massachusetts, USA. I was contracted by the Center for Independent Experts (CIE) to act as a member of the SARC. The purpose of the meeting was to provide an external peer review of stock assessments for three stocks of Winter flounder (*Pseudopleuronectes americanus*): Southern New England, Georges Bank, and Gulf of Maine, in accordance with the requirements for CIE reviewers contained in the Statement of Work (Appendix 2).

Review activities

A comprehensive set of assessment reports and supporting documentation was made available to the review panel via a *.ftp site in advance of the meeting and in accordance with the agreed timescale (Appendix 1). Prior to the review meeting I familiarized myself with the assessment reports and supporting documentation. The review was carried out through a series of presentations on each stock, each of which was structured to address the terms of reference given to the Stock Assessment Workshop (SAW). The SAW adequately addressed its terms of reference and the additional work requested by the Panel.

Main findings

Winter flounder (Southern New England stock)

In general, the data used appeared adequate and appropriately assembled. The assessment was carried out using a statistical catch-at-age model (ASAP) which was also appropriate given the available data and information. Previous assessments were undertaken using ADAPT VPA. While there were a number of unresolved issues that would benefit from further investigation for future assessments, the model configuration preferred by the SAW gave an acceptable fit to the available fishery and survey indices. Alternative model configurations also appeared to provide equally acceptable or in some cases better fits to the data, but were rejected on the grounds that the changes required to the model specifications were *ad hoc* and required assumptions that seemed rather implausible.

The methodology to fit the stock - recruit relationship initially presented by the SAW was not considered appropriate. However, after exploring an alternative novel method during the review meeting based on the bias-corrected Akaike Information Criterion (AIC) to derive a value for steepness (h; slope of the stock recruitment curve near the origin), a fitted Beverton and Holt stock recruit relationship was fitted and accepted as the basis for the estimation of MSY-based biological reference points (BRPs) and for short-term projections.

The 2011 assessment is based on a new model and includes a revised assumption for the instantaneous rate of natural mortality (M=0.3 on all age groups, compared to the previous assumption of M=0.2 on all age groups) and results in new biological reference points.

Assessment results

The results of the accepted assessment for the Southern New England stock of Winter flounder are as follows:

Fishing mortality: The 2010 estimate of fishing mortality (F, ages 4-5) is 0.051

Spawning stock biomass: The 2010 estimate of Spawning Stock Biomass (SSB) is 7,076 mt.

Biological reference points:

FMSY = Fthreshold	= 0.290
SSBMSY = Btarget	= 43,661 mt.
1/2 SSBMSY = Bthreshold	= 21,831 mt
MSY	= 11,728 mt.

Stock status: In 2010 the SNE/MA Winter flounder stock was overfished but overfishing was not occurring.

Based on the data, information and analyses presented in the review meeting and in the SAW Assessment Report, I conclude that the data were adequate and were used properly. Furthermore, the analyses and models were appropriate and were carried out correctly. I also conclude that the results and conclusions presented in the assessment summary report for the Southern New England stock of Winter flounder provide a scientifically credible basis for developing fishery management advice.

Stochastic projections of future stock status were carried out based on the assessment results using mean weights, maturity, and fishery selectivity patterns at age estimated for the most recent 5 years (2006-2010). Recruitment was estimated using the fitted Beverton-Holt stock-recruitment model with steepness (h) fixed at 0.61. The projections also assumed the FMP Framework 44 fishing year (May 1) catch of 2,118 mt would be landed as a calendar year (Jan 1) catch in 2011.

Projections indicate that a catch of 842 mt in 2011 will result in a median fishing mortality rate of F=0.1 and median SSB in 2011 of 9,177 mt. Even with no catch of winter flounder (F=0.00) in 2012-2014, the projection results indicate that the probability that the stock will rebuild to SSBMSY by 2014 or 2015 is less than 1%.

Winter flounder (Georges Bank stock)

In general, the data used appeared adequate and appropriately assembled. The assessment was carried out using an ADAPT-VPA model with catch-at-age data (ages 1-7+) for 1982-2010 calibrated with swept-area stock abundance from the NEFSC spring and fall surveys (1982-2010) and the Canadian spring surveys (1987-2010. For the U.S. surveys, length-based, stock-specific calibration coefficients were used to convert catches by the SRV H.B. Bigelow to SRV Albatross IV catches. Major model changes included: the addition of discards from the Canadian scallop dredge fleet, a new maturity schedule, a new assumption for the instantaneous natural mortality rate (M = 0.3 instead of 0.2).

The model configuration preferred and presented by the SAW gave an acceptable fit to the available fishery and survey indices.

The methodology to fit the stock - recruit relationship initially presented by the SAW was not considered appropriate and the same methodology adopted for Southern New England Winter flounder based on the bias-corrected Akaike Information Criterion (AIC) to derive a value for steepness (h; slope of the stock recruitment curve near the origin) was employed to fit a Beverton and Holt stock recruit relationship. The resulting relationship was accepted as the basis for the estimation of MSY-based biological reference points and for short-term projections.

Assessment results

The results of the accepted assessment for the Georges Bank stock of Winter flounder are as follows:

Fishing mortality: The 2010 estimate of fishing mortality (F, ages 4-5) is 0.15

Spawning stock biomass: The 2010 estimate of Spawning Stock Biomass (SSB) is 9,703 mt.

Biological reference points:

FMSY = Fthreshold	= 0.42
SSBMSY = Btarget	= 10,100 mt.
1/2 SSBMSY = Bthreshold	= 5,050 mt
MSY	= 3,700 mt.

Stock status: In 2010, the GBK winter flounder stock was not overfished and overfishing was not occurring.

Note that it is not appropriate to derive stock status by comparing the estimates of fishing mortality and spawning stock biomass derived from the 2011 assessment of Georges Bank Winter flounder with biological reference points derived from previous assessments.

Projections
Stochastic projections of future stock status were carried out based on the assessment results using mean weights, maturity, and fishery selectivity patterns at age estimated for the most recent 5 years (2006-2010). Recruitment was estimated using the fitted Beverton-Holt stock-recruitment model with steepness (h) fixed at 0.78. The projections also assumed the FMP Framework 44 fishing year (May 1) catch of 2,118 mt would be landed as a calendar year (Jan 1) catch in 2011.

Projection results indicate that rebuilding to SSBMSY is expected to be achieved with 76% probability during 2011 assuming a 2011 catch of 2,118 mt.

Based on the data, information and analyses presented in the review meeting and in the SAW Assessment Report, I conclude that the data were adequate and were used properly. Furthermore, the analyses and models were appropriate and were carried out correctly. I also conclude that the results and conclusions presented in the assessment summary report for the Georges stock of Winter flounder provide a scientifically credible basis for developing fishery management advice.

Winter flounder (Gulf of Maine stock)

In many respects the assessment for Gulf of Maine Winter flounder proved to be the most problematic. The SAW presented assessment models formulated using ADAPT-VPA, SCALE and ASAP. However, none of these approaches resulted in a model that provided adequate fits to the input data. A major source of conflict in the input data was due to the large decreases in the estimated catch over the time period used for the assessment combined with little trend in the survey indices or in the age compositions of both the catch and the surveys. Both the SAW and the SARC were unable to adequately explain the likely reasons underlying these major conflicts but there is a suspicion that the recreational catch estimates for the early part of the time-series may be erroneous. In particular, the estimated catch and the catch rates for 1982 were high and variable.

During the SARC, several re-runs of the ASAP model were made to remove the effect of the conflicting signals in the time series by down-weighting or removing data from earlier years from the assessment time series. However, despite obtaining relatively better fits to the data, the Panel concluded that in the absence of any *a priori* rationale to remove conflicting data, such an approach was not appropriate, and was rejected.

Having rejected the analytical modeling approaches presented by the SAW, the Panel and the SAW agreed that the most appropriate way forward would be to conduct an assessment using survey data to provide a combined swept area estimate using the NEFSC, MADMF and the Maine-New Hampshire surveys. Crucial to the resulting swept area biomass estimate is the assumed efficiency of the trawl gear used in the surveys. Taking into account the results of calibration experiments between the FSV Bigelow and RV Albatross, the SARC agreed that an efficiency (catchability) coefficient (q) of 0.6 would be appropriate for 2010 Bigelow survey estimate. Given the available data, such an approach is appropriate but does not permit the estimation of MSY – based reference points or an assessment of whether the stock is overfished.

In the absence of reliable estimates of a time series of stock and recruitment, F40% was derived from a length-based yield per recruit analysis as the appropriate proxy for FMSY. The analysis incorporated the reasonable assumption that that all fish above 30 cm are fully recruited to the fishery and in keeping with the Southern New

England and Georges Bank stock assessments natural mortality was assumed to be M = 0.3.

Overfishing status was based on the ratio of the 2010 catch (195 mt) to survey based swept area estimate of biomass for winter flounder exceeding 30 cm in length (6,341 mt).

Assessment results

The results of the swept area assessment for the Georges Bank stock of Winter flounder are as follows:

Fishing mortality: The 2010 estimate of exploitation rate (proxy for fishing mortality) based on the ratio of the 2010 catch to survey based swept area estimate of biomass for winter flounder exceeding 30 cm in length) is 0.03

Spawning stock biomass: The 2010 swept area estimate of Spawning Stock Biomass (SSB) for winter flounder exceeding 30cm in length is 6,341 mt.

Biological reference points:

F40% (FMSY proxy) = Fthreshold	=	0.42
SSBMSY = Btarget	=	not defined
1/2 SSBMSY = Bthreshold	=	not defined
MSY	=	not defined.

Stock status: In 2010 overfishing was not occurring. This conclusion is robust to the range of uncertainty in the biomass estimate. The status of the stock with respect to whether it is overfished is not defined.

The most recent estimates for biological reference points for this stock derived prior to this review were FMSY=0.43 and BMSY=4,100 mt. These estimates arose from the assessment at SARC 36 in 2003 and should now be considered redundant . It is not appropriate to compare the F estimates from the present assessment with those values.

Projections: Projections could not be performed.

Acknowledgement

The expertise, diligence and sheer hard work by the assessment team for all three stocks both in the SAW and during the review meeting is deserving of special mention. While it is inevitable that during a review, there will be aspects of the data and analysis that require additional clarification, elaboration or investigation, I was once again thoroughly impressed by the sheer volume and complexity of work undertaken by the SAW in preparing and documenting the data, analyses and findings for all three stocks. Their patience and cooperation in the review process and their willingness to respond to requests for additional analyses to be undertaken was remarkable. Furthermore, the organization of the meeting by the Chair of the

SARC was exemplary as was the welcome and hospitality extended by the staff of the population dynamics team in the NEFSC.

I would also like to thank the other members of the Panel for their assistance and support during the review. All three of them were a pleasure to work with.

I also wish to thank Manoj Shivlani from the CIE for doing an excellent job in taking care of the logistical arrangements relating to my participation in this review.

Finally, I wish to acknowledge the efforts of everyone involved in the assessment and review process for these three stocks.

2. Background

Winter flounder is distributed in the Northwest Atlantic from Labrador to Georgia. U.S. and commercial and recreational fisheries exist from the Gulf of Maine to the Mid-Atlantic Bight. The stocks are managed in Federal waters under the New England Fishery Management Council's Northeast Multispecies Fishery Management Plan (FMP), and in state waters under Atlantic States Marine Fisheries Commission's Fishery Management Plan for Inshore Stocks of Winter Flounder. The last assessment of these three winter flounder stocks was carried out at the Groundfish Assessment Review Meeting (GARM-III) in 2008.

Assessments of the three separate stock units (Southern New England, Georges Bank and Gulf of Maine) were performed in Spring 2011. It is the results of those assessments that form the subject of this SARC. The results of the SARC are to form the scientific basis for fishery management in the northeast region.

The 52nd Stock Assessment Review Committee (SARC 52) meeting was held from 1pm on 6 June 2011 through 5.30 pm on 10 June 2011 at the Northeast Fisheries Science Centre, Wood's Hole, Massachusetts, USA. I was contracted by the Centre for Independent Experts (CIE) to act as a member of the SARC. The purpose of the meeting was to provide an external peer review of stock assessments for three stocks of Winter flounder (*Pseudopleuronectes americanus*): Southern New England, Georges Bank, and Gulf of Maine in accordance with the requirements for CIE reviewers contained in the Statement of Work (Appendix 2).

3. Review Activities

A comprehensive set of assessment reports and supporting documentation was made available to the review panel via an *.ftp site in advance of the meeting and in accordance with the agreed timescale (Appendix 1). Prior to the review meeting I familiarized myself with the assessment reports and supporting documentation in order to gain a thorough understanding of the data and methods used, the results of the assessments and to identify any issues requiring clarification or explanation. The review was carried out through a series of presentations on each stock, each of which was structured to address the terms of reference given to the Stock Assessment Workshop (SAW). The review Panel questioned the presenters and other members of the SAW on any points requiring elaboration and/or clarification and made several requests for additional analyses to be undertaken. The additional requests were all adequately addressed by the members of the SAW.

Comments on the SARC the review process

In general the process works very well but it is obviously expensive. The data and assessment documentation is extremely impressive and the logistical organization and preparations for the review by the SARC chair were excellent.

While the charge to the SARC is well specified in the Statement of Work and in general terms the SARC is requested to undertake a review and prepare a report including a list of recommendations, in practice the SARC does more than this and in some cases may even change a whole assessment to achieve consensus. While I personally think this is appropriate, my understanding is that this is not what is really intended.

I think it would be worth considering whether in the SARC summary report it would be worth documenting any additional requests to the SAW arising in the course of the SARC as is done in the STAR process. This would mean that any requests for additional work to be undertaken by the SAW during the SARC would be in writing and would be included in the SARC summary report. The rationale for the requests should also be in writing and would also be included together with the responses and conclusions. I find such an approach extremely useful and it provided a logical commentary on the discussions that took place.

Also it may be worth considering the value and cost of the requirement for each CIE reviewer to provide an independent report in addition to contributing to the SARC summary report. I can see the value of three independent reviewers, but would have thought that in most cases a Panel report would suffice as a credible peer-review document. Even if the reviewers cannot reach consensus on all points, any disagreements could be documented in the Panel report. This would avoid repetition and would reduce the workload of the reviewers and the cost to the review process.

4. Introduction to review of stock assessments

The following sections provide stock specific comments for each of the three winter flounder stocks under review. They are structured so that I provide a commentary and response to each of the terms of reference provided to the SAW for each stock separately. Some of the points raised under each term of reference are repeated separately in each of the stock sections. This is deliberate and I have adopted this approach so that my comments relating to each stock can be read in isolation and stand alone.

5. Winter flounder (Southern New England Stock)

1. Estimate catch from all sources including landings and discards. Characterize the uncertainty in these sources of data.

As far as is possible to judge, the sources of data and the methodology adopted to produce input catch data for the assessment of SNE winter flounder was appropriate and acceptable. I consider that this term of reference was completed adequately and the data form a credible basis for the assessment approach used.

There are a number of points which were identified during the course of the SARC, that deserve consideration for future assessments:

There is an explicit assumption that the mortality rate of flounder caught and discarded is 50%. It would be extremely useful to have an examination of the precision associated with this estimate to inform the precision associated with the estimates of catch used for the assessment.

Estimates of spawning stock biomass may be positively biased although the extent and variation of the potential bias is not known. This observation arises from the fact that the mean weights at age used to raise numbers at age to spawning stock biomass are based on mean weight s at age in the sampled landings from the fishery. Size selectivity of the gears used to catch flounder is likely to result in an inflated mean length and weight at age in the catch for those size groups only partially recruited to the gear. Furthermore, high grading will also bias the mean weights at age from the fishery but I am unsure whether this practice is common in the fisheries for Winter flounder.

For SNE winter flounder, the time trends of mean weight at age look odd. There are instances where fish from a single cohort seem to have reduced in mean weight from one year to the next. While this is not biologically impossible, it would be unusual and is probably due to sampling error.

It was unclear how much and what component of the overall variation is represented in the proportional standard error (PSE) or how this statistic might most usefully be used in a statistical catch at age assessment. For the commercial catch, this typically represented error in the allocation process, whereas the PSE determined in the calculation of the discard information from the observer data reflected variation in sampling.

2. Present survey data being considered and/or used in the assessment (e.g., regional indices of abundance, recruitment, state and other surveys, age-length data, etc.). Characterize uncertainty in these sources of data.

The following comments apply to survey data used for all three stocks and are repeated in each of the stock sections.

Survey data were generally well documented and I consider that the way the data were treated was appropriate and form a credible scientific basis for use in the assessment.

There is scope to provide even clearer documentation. It would be useful to consider the value of the information in each of the survey time series so that in the assessment they can be weighted accordingly. For example, information on what area of the stock distribution each survey covers and whether surveys can be combined to produce a standardized index for use in assessment. I recognize that this is a general issue and is under investigation in various fora.

To facilitate ease of reviewing, it would be helpful if all indices used in the assessment would be tabulated and provided graphically as time series. A certain degree of standardization for the assessment would also be useful to facilitate easy comparison between tables. Particularly useful would be presentation of standardized tables and plots of the indices by age with row and column totals.

A degree of standardization of the presentation of distributional data from surveys would be useful. Personally I find maps with relative densities depicted as bubble plots by age group over time are extremely informative.

Estimates of precision of survey indices are also extremely useful to inform on the quality of data being used for the assessment. Such estimates can also be used to provide weighting to the data when fitting the assessment model.

Personally I find basic indicators extremely useful. For example simple catch curve analyses can be used to inform on the general level of overall mortality being experienced by the stock and if provided as a time series can indicate any major changes in overall mortality on the population over time.

Because the vessel conducting the NMFS surveys changed from SRV Albatross IV to SRV H.B. Bigelow length-based catch rate calibrations between vessels were undertaken. As far as is possible to judge this was undertaken appropriately but the methods used probably should be subject to further scrutiny though independent peer review. Because of the apparent differing efficiencies, particularly at either end of the size compositions, the conversion is not straightforward and the methodology should be fully evaluated.

3. Estimate annual fishing mortality, recruitment and stock biomass (both total and spawning stock) for the time series (integrating results from TOR-5), and estimate their uncertainty. Include area-swept biomass estimates. Investigate if implied survey gear or catchability estimates are reasonable. Include a historical retrospective analysis to allow a comparison with previous assessment results.

I interpreted this term of reference to extend to a review of the appropriateness of the assessment model and the quality of the assessment and the credibility of the results as a basis for fishery management decisions.

The statistical catch at age assessment model (ASAP) used for SNE winter flounder was appropriate given the available data and information. While there were a number of issues that could not be fully reconciled, I consider that the approach and assessment results constitute a scientifically credible basis for developing fishery management advice.

The assessments for all three winter flounder stocks now assume a constant M of 0.3 instead of M=0.2 as previously assumed. This is based on good evidence and there are some indications from the analyses presented that an assumption of a constant M greater than 0.3 may not be wholly inappropriate. Nevertheless the Panel agreed that the use of a constant M set at M=0.3 is appropriate.

The main area of interest and debate regarding the SNE winter flounder assessment was the discrepancy between the age-aggregated survey indices and the stock numbers predicted by the model. This was discussed at length and investigations found that the discrepancy could be much reduced by varying the input value of natural mortality (M). However permutations investigated included a) increasing M from 0.3 to 0.6 for a number of years and then reducing M back to 0.2 for the remainder of the time series and b) inputting an annual increase in M over a series of years from M=0.3 to M=0.6 using increments of 0.01. Both seemed to give reasonable adequate fits to the catch data, but neither configuration was accepted on the grounds that there was *no a priori* evidence available to support such increases on biological grounds.

4. Perform a sensitivity analysis which examines the impact of allocation of catch to stock areas on model performance (in TOR-3).

The sensitivity of the assessment results to choices in the allocation of catch appeared to be thoroughly examined. Results did not seem to be overly sensitive to alternative reasonable allocation choices.

5. Examine the effects of incorporating environmental factors in models of population dynamics (e.g., spring water temperatures in an environmentally-explicit stock recruitment function).

This term of reference was addressed successfully through an analysis of the effects of temperature on departures from mean recruitment levels. The work was presented in the review meeting and as a working document by Jon Hare of the NEFSC. The assessment models accepted as the basis for management decisions did not explicitly include any environmental effects.

The analysis was conducted in a scientifically sound manner and is beginning to inform on the physical drivers that might be affecting recruitment for this species. The study indicated that higher recruitment rates tend to be associated with lower sea water temperatures at spawning time. However the mechanism is not yet understood and furthermore, the ability to predict recruitment for a given temperature and our ability to predict how temperature might change is not straightforward and it is clear that further work is needed.

6. 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}, $B_{THRESHOLD}$, and F_{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 term of reference was satisfactorily addressed. Previously adopted stock status definitions for “overfished” and “overfishing” were provided for all stocks. These were updated and redefined for the SNE stock based on the results of the accepted ASAP model and the method developed during the SARC to derive an appropriate stock-recruit model for determining MSY-based biological reference points and for projections

Much time was devoted to discussing MSY-based reference points and the appropriate stock recruit model to be used to derive them. The SAW had adopted the approach of Myers at al. (1999)[2] to derive an input value for steepness (the slope of the stock recruitment curve near the origin) on the grounds that the three stocks may have a similar slope at the origin since they are the same species and are in close proximity to each other. Fecundities at size are similar, although larval survivorship and recruitment to the fishery may vary between areas.

However, Myers et al.’s study was based on stocks of pleuronectids that are more distantly related than the winter flounder stocks in the northwest Atlantic and while for a variety of reasons, it was agreed that steepness may not be identical between stocks, because of their similarities, some means of deriving a steepness value that would be similar would be appropriate.

Values of steepness were chosen to be as similar as possible between stocks within the constraints of model fit. A strategy was outlined that allowed the steepness parameters to be chosen among a range of reasonable values that provided good fits to the stock-recruit data for each individual stock, but were also reasonably close in the parameter space to each other.

This was based on an approach that took into account the profile of the change in the Akaike information criterion in the Beverton and Holt stock recruit fit to fixed input values for steepness. Values of steepness that are within 2 units of the minimum AIC for each stock are considered to be realistic values (Burnham and Anderson, 2002)[1].

For the SNE stock this means steepness was set at the largest value such that ΔAIC = 2. For the GBK stock this means steepness was set at the smallest value such that ΔAIC = 2. The model estimates were shrunk towards each other, thus making steepness as similar as possible without losing the stock specific characteristics of the recruitment process.

This method was developed during the SARC52 review meeting for the three winter flounder stocks. Given the information available to the SARC, the review panel believes this method is the most appropriate means available at the meeting for determining the spawner-recruit relationship and for specifying the biological reference points.

The BRP estimates derived for the three winter flounder stocks in this way are direct MSY-based estimates and given the input data and knowledge of the winter flounder stocks in the north-west Atlantic, the approach seem intuitive and reasonable and the BRPs derived from the resulting stock recruit fit provide a scientifically credible basis for management decision-making.

The recommended BRPs for SNE winter flounder are as follows

FMSY = Fthreshold	= 0.290
SSBMSY = Btarget	= 43,661 mt.
1/2 SSBMSY = Bthreshold	= 21,831 mt
MSY	= 11,728 mt.

[1.] Burnham, K. P., and Anderson, D.R. 2002. Model Selection and Multimodel Inference: A Practical Information-Theoretic Approach, 2nd ed. Springer-Verlag.

[2.] Myers, R. A., Bowen, K. G., Barrowman, N. J. 1999. Maximum reproductive rate of fish at low population sizes. Can. J. Fish. Aquat. Sci. 56: 2404-2419.

7. Evaluate stock status (overfished and overfishing) with respect to the "new" BRPs (from TOR 6), and with respect to the existing BRPs (from a previous accepted peer review) whose values have been updated.

The stock status values derived from the accepted assessment model and the associated BRPs were reviewed and I conclude that they form a credible scientific basis for management decisions. As is always the case, these estimates are subject to some uncertainty and may be subject to change in the future if revised or new data and / or assessment models become available,

Stock status of SNE winter flounder is as follows:

In 2010 the SNE/MA winter flounder stock was overfished but overfishing was not occurring.
In 2010, the GBK winter flounder stock was not overfished and overfishing was not occurring.

It would be informative if future Terms of Reference to the SAW included an evaluation of the probability of being overfished or of overfishing taking place, rather than simply using a point estimate based on the model output.

8. Develop and apply analytical approaches and data that can be used for conducting single and multi-year stock projections and for computing candidate ABCs (Acceptable Biological Catch; see Appendix to the TORs)

under a set of alternative harvest scenarios. If the stock needs to be rebuilt, take that into account in these projections.

a. Provide numerical short-term projections (3-5 yrs, or through the end of the rebuilding period, as appropriate). Each projection should estimate and report annual probabilities of exceeding threshold BRPs for F, and probabilities of falling below threshold BRPs for biomass. In carrying out projections, consider a range of assumptions about the most important uncertainties in the assessment (e.g., terminal year abundance, variability in recruitment).
b. Take into consideration uncertainties in the assessment and the species biology to describe this stock's vulnerability (see "Appendix to the SAW TORs") to becoming or remaining overfished, and how this could affect the choice of ABC.
c. Develop plausible hypotheses (e.g., mixing among the three stocks) which might explain any conflicting trends in the data and undertake scenario analyses to evaluate the consequences of these alternate hypotheses on ABC determination.

The methods used to undertake projection were largely standard and appropriate and appear to have been carried out in the correct manner. I conclude that they form a scientifically credible basis for management decisions.

The SNE assessment used an MCMC approach to generate initial values for the projections although it remains unclear how the uncertainty associated with the recruitment estimates was dealt with in the assessments. This was not discussed in the SARC and I could not find it in the assessment documents or working papers. This may of course be an oversight. Uncertainty in M is not included in the projections.

Information on stock vulnerability (as may be characterized through indices of productivity and/or susceptibility) was presented in the assessment document. The text in these sections was largely restricted to a commentary on sensitivity analyses, residual plots and retrospectives in this regard. The concept of vulnerability from a more holistic biological /ecological or environmental perspective were largely overlooked.

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

The SAW has made good progress in addressing previous research recommendations and the proposed list of new recommendations is relevant and attainable given appropriate resources.

In addition I would like to suggest the following which include those suggested in the SARC summary report.

Recommendations for future investigations in relation to Southern New England winter flounder.

Consider investigating uncertainty associated with the assumed 50% mortality rate for discards and whether this is size- or gear- dependent and the relationship with other factors, e.g., towing speed or tow duration.

Examine commercial fishery and survey weight at age data to see whether a more unbiased estimate of SSB would be obtainable through the use of survey mean weights at age.

Re-examine weights at age data to examine apparent inconsistencies in the estimates. If such inconsistencies do not have a plausible explanation and a rational reason why they should remain in the datasets, consider a modeling approach to smooth the variation in the data.

Examine whether the PSE on the catch (retained and discarded) data can be constructed in such a way to better reflect overall uncertainty and their use in weighting the data in the statistical catch at age assessment model.

Evaluate the methodology used to convert survey length-based indices from SRV Albatross IV to those from SRV H.B. Bigelow. An appropriate and reliable methodology needs to be developed to derive Albatross equivalent indices for length groups that are not represented in catches from SRV Albatross but are represented in catches from SRV Bigelow.

6. Winter flounder (Georges Bank Stock)

1. Estimate catch from all sources including landings and discards. Characterize the uncertainty in these sources of data.

As far as is possible to judge, the sources of data and the methodology adopted to produce input catch data for the assessment of GBK winter flounder was appropriate and acceptable. I consider that this term of reference was completed adequately and the data form a credible basis for the assessment approach used.

There are a number of points which were identified during the course of the SARC, that deserve consideration for future assessments.

In the absence of any reliable estimates derived from sampling, it was assumed that prior to 1982, all fish below the minimum landing size were discarded. It would be worthwhile to investigate whether this assumption is reasonable by investigating size selectivity of gears used at that time.

Potential inconsistencies in the identification of stage of maturity at age at sea were raised during the meeting. It would be worthwhile considering whether post-landing association to appropriate maturity categories can be conducted using some kind of ratio estimator based on histological staging in the laboratory.

2. Present survey data being considered and/or used in the assessment (e.g., regional indices of abundance, recruitment, state and other surveys, age-length data, etc.). Characterize uncertainty in these sources of data.

The following comments apply to survey data used for all three stocks and are repeated in each of the stock sections.

Survey data were generally well documented and I consider that the way the data were treated was appropriate and form a credible scientific basis for use in the assessment.

There is scope to provide even clearer documentation. It would be useful to consider the value of the information in each of the survey time series so that in the assessment they can be weighted accordingly. For example, information on what area of the stock distribution each survey covers and whether surveys can be combined to produce a standardized index for use in assessment. I recognize that this is a general issue and is under investigation in various fora.

To facilitate ease of reviewing, it would be helpful if all indices used in the assessment would be tabulated and provided graphically as time series. A certain degree of standardization for the assessment would also be useful to facilitate easy comparison between tables. Particularly useful would be presentation of standardized tables and plots of the indices by age with row and column totals.

A degree of standardization of the presentation of distributional data from surveys would be useful. Personally I find maps with relative densities depicted as bubble plots by age group over time are extremely informative.

Estimates of precision of survey indices are also extremely useful to inform on the quality of data being used for the assessment. Such estimates can also be used to provide weighting to the data when fitting the assessment model.

Personally I find basic indicators extremely useful. For example simple catch curve analyses can be used to inform on the general level of overall mortality being experienced by the stock and if provided as a time series can indicate any major changes in overall mortality on the population over time.

Because the vessel conducting the NMFS surveys changed from SRV Albatross IV to SRV H.B. Bigelow length-based catch rate calibrations between vessels were undertaken. As far as is possible to judge this was undertaken appropriately but the methods used probably should be subject to further scrutiny though independent peer review. Because of the apparent differing efficiencies, particularly at either end of the size compositions, the conversion is not straightforward and the methodology should be fully evaluated.

3. Estimate annual fishing mortality, recruitment and stock biomass (both total and spawning stock) for the time series (integrating results from TOR-5), and estimate their uncertainty. Include area-swept biomass estimates. Investigate if implied survey gear or catchability estimates are reasonable. Include a historical retrospective analysis to allow a comparison with previous assessment results.

I interpreted this term of reference to extend to a review of the appropriateness of the assessment model and the quality of the assessment and the credibility of the results as a basis for fishery management decisions.

The ADAPT VPA model used for GBK winter flounder was appropriate given the available data and information. While there were a number of issues that could not be fully reconciled, I consider that the approach and assessment results constitute a scientifically credible basis for developing fishery management advice.

The assessments for all three winter flounder stocks now assume a constant M of 0.3 instead of M=0.2 as previously assumed. This is based on good evidence and there are some indications from the analyses presented that an assumption of a constant M greater than 0.3 may not be wholly inappropriate. Nevertheless the Panel agreed that the use of a constant M set at M=0.3 is appropriate.

While the ADAPT VPA approach used for GBK winter flounder is appropriate, the drawback from such an approach is that the catch data are treated as exact. There are concerns that the estimated catch at age from the GBK stock may be less certain than is desirable for such an approach. It would have been appropriate to investigate a statistical catch at age (SCA) model for the GBK assessment which in principle could be configured to take account of uncertainty in the input catch at age data. The potential problem with such an approach is likely to be in tracking changes in selectivity that have probably occurred as a result of management measures that have been implemented during the assessment time series. It would be useful if a SCA could be explored. However, there are no reasons so far highlighted that would indicate that a SCA would give different results to the VPA used in this assessment.

4. Perform a sensitivity analysis which examines the impact of allocation of catch to stock areas on model performance (in TOR-3).

The sensitivity of the assessment results to choices in the allocation of catch appeared to have been thoroughly examined. Results did not seem to be overly sensitive to alternative reasonable allocation choices.

5. Examine the effects of incorporating environmental factors in models of population dynamics (e.g., spring water temperatures in an environmentally-explicit stock recruitment function).

This term of reference was addressed successfully through an analysis of the effects of temperature on departures from mean recruitment levels. The work was presented in the review meeting and as a working document by Jon Hare of the NEFSC. The assessment models accepted as the basis for management decisions did not explicitly include any environmental effects.

The analysis was conducted in a scientifically sound manner and is beginning to inform on the physical drivers that might be affecting recruitment for this species. The study indicated that higher recruitment rates tend to be associated with lower sea water temperatures at spawning time. However the mechanism is not yet understood and furthermore, the ability to predict recruitment for a given temperature and our ability to predict how temperature might change is not straightforward and it is clear that further work is needed.

6. 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}, $B_{THRESHOLD}$, and F_{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 term of reference was satisfactorily addressed. Previously adopted stock status definitions for “overfished” and “overfishing” were provided for all stocks. These were updated and redefined for the GBK stock based on the results of the accepted ASAP model and the method developed during the SARC to derive an appropriate stock-recruit model for determining MSY-based biological reference points and for projections.

Much time was devoted to discussing MSY-based reference points and the appropriate stock recruit model to be used to derive them. The SAW had adopted the approach of Myers at al (1999)[2] to derive an input value for steepness (the slope of the stock recruitment curve near the origin) on the grounds that the three stocks may have a similar slope at the origin since they are the same species and are in close proximity to each other. Fecundities at size are similar, although larval survivorship and recruitment to the fishery may vary between areas.

However Myers et al.'s study was based on stocks of pleuronectids that are more distantly related than the winter flounder stocks in the northwest Atlantic and while for a variety of reasons, it was agreed that steepness may not be identical between stocks, because of their similarities, some means of deriving a steepness value that would be similar would be appropriate.

Values of steepness were chosen to be as similar as possible between stocks within the constraints of model fit. A strategy was outlined that allowed the steepness parameters to be chosen among a range of reasonable values that provided good fits to the stock-recruit data for each individual stock, but were also reasonably close in the parameter space to each other.

This was based on an approach that took into account the profile of the change in the Akaike information criterion in the Beverton and Holt stock recruit fit to fixed input values for steepness. Values of steepness that are with 2 units of the minimum AIC for each stock are considered to be realistic values (Burnham and Anderson, 2002)[1].

For the SNE stock this means steepness was set at the largest value such that ΔAIC = 2. For the GBK stock this means steepness was set at the smallest value such that ΔAIC = 2. The model estimates were shrunk towards each other, thus making steepness as similar as possible without losing the stock specific characteristics of the recruitment process.

This method was developed during the SARC-52 review meeting for the three winter flounder stocks. Given the information available to the SARC, the review panel believes this method is the most appropriate means available at the meeting for determining the spawner-recruit relationship and for specifying the biological reference points.

The BRP estimates derived for the three winter flounder stocks in this way are direct MSY-based estimates and given the input data and knowledge of the winter flounder stocks in the north-west Atlantic, the approach seem intuitive and reasonable and the BRPs derived from the resulting stock recruit fit provide a scientifically credible basis for management decision-making.

The recommended BRPs for GBK winter flounder are as follows

FMSY = Fthreshold	= 0.42
SSBMSY = Btarget	= 10,100 mt.
1/2 SSBMSY = Bthreshold	= 5,050 mt
MSY	= 3,700 mt.

[1.] Burnham, K. P., and Anderson, D.R. 2002. Model Selection and Multimodel Inference: A Practical Information-Theoretic Approach, 2nd ed. Springer-Verlag.

[2.] Myers, R. A., Bowen, K. G., Barrowman, N. J. 1999. Maximum reproductive rate of fish at low population sizes. Can. J. Fish. Aquat. Sci. 56: 2404-2419.

7. Evaluate stock status (overfished and overfishing) with respect to the "new" BRPs (from TOR 6), and with respect to the existing BRPs (from a previous accepted peer review) whose values have been updated.

The stock status values derived from the accepted assessment model and the associated BRPs were reviewed and I conclude that they form a credible scientific basis for management decisions. As is always the case, these estimates are subject to some uncertainty and may be subject to change in the future if revised or new data and / or assessment models become available,

Stock status of SNE winter flounder is as follows:

In 2010, the GBK winter flounder stock was not overfished and overfishing was not occurring.

It would be informative if future Terms of Reference to the SAW included an evaluation of the probability of being overfished or of overfishing taking place, rather than simply using a point estimate based on the model output.

8. Develop and apply analytical approaches and data that can be used for conducting single and multi-year stock projections and for computing candidate ABCs (Acceptable Biological Catch; see Appendix to the TORs) under a set of alternative harvest scenarios. If the stock needs to be rebuilt, take that into account in these projections.
    a. Provide numerical short-term projections (3-5 yrs, or through the end of the rebuilding period, as appropriate). Each projection should estimate and report annual probabilities of exceeding threshold BRPs for F, and probabilities of falling below threshold BRPs for biomass. In carrying out projections, consider a range of assumptions about the most important uncertainties in the assessment (e.g., terminal year abundance, variability in recruitment).
    b. Take into consideration uncertainties in the assessment and the species biology to describe this stock's vulnerability (see "Appendix to the SAW TORs") to becoming or remaining overfished, and how this could affect the choice of ABC.
    c. Develop plausible hypotheses (e.g., mixing among the three stocks) which might explain any conflicting trends in the data and undertake scenario analyses to evaluate the consequences of these alternate hypotheses on ABC determination.

The methods used to undertake projections were largely standard and appropriate and appear to have been carried out in the correct manner. I conclude that they form a scientifically credible basis for management decisions.

The GBK assessment used a bootstrap approach to incorporate the assessment uncertainty into the initial values the projections. Variability in recruitment was included based on the spawner-recruit relationship and a re-sampling of the associated residuals. Uncertainty in M is not included in the projections.

Information on stock vulnerability (as may be characterized through indices of productivity and/or susceptibility) was presented in the assessment document. The text in these sections was largely restricted to a commentary on sensitivity analyses, residual plots and retrospectives in this regard. The concept of vulnerability from a more holistic biological /ecological or environmental perspective were largely overlooked.

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

The SAW has made good progress in addressing previous research recommendations and the proposed list of new recommendations is relevant and attainable given appropriate resources.

In addition I would like to suggest the following which include those suggested in the SARC summary report.

Recommendations for future investigations in relation to Georges Bank winter flounder.

Consideration should be given to evaluating whether the assumption that prior to 1982, all fish below the minimum landing size were discarded is reasonable.

Consideration should be given to whether post-landing association of at-sea maturity staging can be conducted using some kind of ratio estimator based on histological staging in the laboratory.

Evaluate the methodology used to convert survey length-based indices from SRV Albatross IV to those from SRV H.B. Bigelow. An appropriate and reliable methodology needs to be developed to derive Albatross equivalent indices for length groups that are not represented in catches from SRV Albatross but are represented in catches from SRV Bigelow.

Because of potential uncertainty in the estimates catch at age for Georges Bank winter flounder, it would be useful if a statistical catch at age model SCA could be explored as an appropriate assessment tool. Particular attention will need to be give to tracking any potential changes in selectivity that have arisen as a result of management measures.

Consider whether assessments carried out separately by sex are likely to provide results that will be more informative for management decision making.

Georges Bank is a unique area hydrographically. Investigate the possibility of deriving a retention index to show the influence on larval drift in order to take this into account with regard to recruitment estimation.

7. Winter flounder (Gulf of Maine Stock)

1. Estimate catch from all sources including landings and discards. Characterize the uncertainty in these sources of data.

As far as is possible to judge, the sources of data and the methodology adopted to produce input catch data for the assessment of GBK winter flounder was appropriate and acceptable. I consider that this term of reference was completed adequately and the data form a credible basis for the assessment approach used.

There are a number of points which were identified during the course of the SARC, that deserve consideration for future assessments.

The estimated recreational catch and CPUE for the early part of the time series were high and variable, particularly for the year 1982. It proved impossible to reconcile the differences in signals from the catch data and the survey indices in the assessment model, and on account of such inconsistency, the assessment models presented by the SAW were rejected. A re-examination of the recreational catch data in the early part of the time series is likely to prove a worthwhile exercise.

The SAW should give consideration to an investigation on the appropriateness of using a length-based yield per recruit analysis to help determine biological reference points. The growth information used in the present assessment is derived from a growth model based on historic size at age information. The SAW should consider whether more recent information on growth would be more appropriate when using this approach.

2. Present survey data being considered and/or used in the assessment (e.g., regional indices of abundance, recruitment, state and other surveys, age-length data, etc.). Characterize uncertainty in these sources of data.

The following comments apply to survey data used for all three stocks and are repeated in each of the stock sections.

Survey data were generally well documented and I consider that the way the data were treated was appropriate and form a credible scientific basis for use in the assessment.

There is scope to provide even clearer documentation. It would be useful to consider the value of the information in each of the survey time series so that in the assessment they can be weighted accordingly. For example, information on what area of the stock distribution each survey covers and whether surveys can be combined to produce a standardized index for use in assessment. I recognize that this is a general issue and is under investigation in various fora.

To facilitate ease of reviewing, it would be helpful if all indices used in the assessment would be tabulated and provided graphically as time series. A certain degree of standardization for the assessment would also be useful to facilitate easy comparison between tables. Particularly useful would be presentation of standardized tables and plots of the indices by age with row and column totals.

A degree of standardization of the presentation of distributional data from surveys would be useful. Personally I find maps with relative densities depicted as bubble plots by age group over time are extremely informative.

Estimates of precision of survey indices are also extremely useful to inform on the quality of data being used for the assessment. Such estimates can also be used to provide weighting to the data when fitting the assessment model.

Personally I find basic indicators extremely useful. For example simple catch curve analyses can be used to inform on the general level of overall mortality being experienced by the stock and if provided as a time series can indicate any major changes in overall mortality on the population over time.

Because the vessel conducting the NMFS surveys changed from SRV Albatross IV to SRV H.B. Bigelow length-based catch rate calibrations between vessels were undertaken. As far as is possible to judge this was undertaken appropriately but the methods used probably should be subject to further scrutiny though independent peer review. Because of the apparent differing efficiencies, particularly at either end of the size compositions, the conversion is not straightforward and the methodology should be fully evaluated.

3. Estimate annual fishing mortality, recruitment and stock biomass (both total and spawning stock) for the time series (integrating results from TOR-5), and estimate their uncertainty. Include area-swept biomass estimates. Investigate if implied survey gear or catchability estimates are reasonable. Include a historical retrospective analysis to allow a comparison with previous assessment results.

I interpreted this term of reference to extend to a review of the appropriateness of the assessment model and the quality of the assessment and the credibility of the results as a basis for fishery management decisions.

The models presented by the SAW to the SARC (ASAP, SCALE, VPA) proved to be inadequate to provide a scientifically credible basis for developing fishery management advice. Each of these models highlighted a number of issues relating to conflicting signals between the catch at age data and survey indices that were irreconcilable. The models were therefore rejected as a credible representation of stock status.

An alternative swept-area method was used. The method provides a reliable gauge of overfishing status, but is unable to provide any indication of whether the stock is overfished. In the absence of any alternative reliable assessment, I consider that the method provides a reliable measure of overfishing status that is robust to the estimated catchability coefficient used to convert SFV Bigelow catch rates to swept-area biomass and provides a scientifically credible basis for developing fishery management advice.

4. Perform a sensitivity analysis which examines the impact of allocation of catch to stock areas on model performance (in TOR-3).

The sensitivity of the assessment results to choices in the allocation of catch appeared to be thoroughly examined. Results did not seem to be overly sensitive to alternative reasonable allocation choices.

5. Examine the effects of incorporating environmental factors in models of population dynamics (e.g., spring water temperatures in an environmentally-explicit stock recruitment function).

This term of reference was addressed successfully through an analysis of the effects of temperature on departures from mean recruitment levels. The work was presented in the review meeting and as a working document by Jon Hare of the NEFSC. The assessment models accepted as the basis for management decisions did not explicitly include any environmental effects.

The analysis was conducted in a scientifically sound manner and is beginning to inform on the physical drivers that might be affecting recruitment for this species. The study indicated that higher recruitment rates tend to be associated with lower sea water temperatures at spawning time. However the mechanism is not yet understood and furthermore, the ability to predict recruitment for a given temperature and our ability to predict how temperature might change is not straightforward and it is clear that further work is needed.

6. 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}, $B_{THRESHOLD}$, and F_{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.

The GOM assessment, using a swept area method, was able to provide a proxy estimate of the "overfishing" level, but could not provide an estimate of "overfished" status.

The recommended BRP for GOM winter flounder are as follows:

F40% (FMSY proxy) = Fthreshold	=	0.42
SSBMSY = Btarget	=	not defined
1/2 SSBMSY = Bthreshold	=	not defined
MSY	=	not defined.

7. Evaluate stock status (overfished and overfishing) with respect to the "new" BRPs (from TOR 6), and with respect to the existing BRPs (from a previous accepted peer review) whose values have been updated.

Stock status of GOM winter flounder is as follows:

In 2010 overfishing on GOM winter flounder was not occurring. This conclusion is robust to the range of uncertainty in the biomass estimate. The status of the stock with respect to whether it is overfished is not defined.

8. Develop and apply analytical approaches and data that can be used for conducting single and multi-year stock projections and for computing candidate ABCs (Acceptable Biological Catch; see Appendix to the TORs) under a set of alternative harvest scenarios. If the stock needs to be rebuilt, take that into account in these projections.
    a. Provide numerical short-term projections (3-5 yrs, or through the end of the rebuilding period, as appropriate). Each projection should estimate and report annual probabilities of exceeding threshold BRPs for F, and probabilities of falling below threshold BRPs for biomass. In carrying out projections, consider a range of assumptions about the most important uncertainties in the assessment (e.g., terminal year abundance, variability in recruitment).
    b. Take into consideration uncertainties in the assessment and the species biology to describe this stock's vulnerability (see "Appendix to the SAW TORs") to becoming or remaining overfished, and how this could affect the choice of ABC.
    c. Develop plausible hypotheses (e.g., mixing among the three stocks) which might explain any conflicting trends in the data and undertake scenario analyses to evaluate the consequences of these alternate hypotheses on ABC determination.

The SAW addressed all of the above terms of reference but none of the modeling approaches presented was accepted. The assessment was changed to a survey swept area estimate and the results from such an assessment means that projections are not possible.

Hence the GOM assessment provided no projections.

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

The SAW has made good progress in addressing previous research recommendations and the proposed list of new recommendations is relevant and attainable given appropriate resources.

In addition I would like to suggest the following which include those suggested in the SARC summary report.

Recommendations for future investigations in relation to Gulf of Maine winter flounder.

In an attempt to reconcile inconsistencies in signals from the catch data and survey indices in the early part of the time series, especially 1982, the recreational catch estimates for this period should be re-examined for accuracy and precision.

Growth information in more recent years should be re-examined and the SAW should consider whether more recent information on growth would be more appropriate than historic data when using a length-based yield per recruit analysis to determine biological reference points.

Evaluate the methodology used to convert survey length-based indices from SRV Albatross IV to those from SRV H.B. Bigelow. An appropriate and reliable methodology needs to be developed to derive Albatross equivalent indices for length groups that are not represented in catches from SRV Albatross but are represented in catches from SRV Bigelow.

8. Appendix 1: Bibliography of materials provided for review

Working Papers for Review

SDWG. 2011. Southern New England/Mid-Atlantic (SNE/MA) Winter Flounder: Stock Assessment for 2011

SDWG. 2011. Southern New England / Mid-Atlantic (SNE/MA) Winter Flounder Assessment Summary

SDWG. 2011. Georges Bank Winter Flounder Stock Assessment for 2011

SDWG. 2011. Georges Bank Winter Flounder Assessment Summary For 2011

SDWG. 2011. Gulf of Maine (GOM) Winter Flounder Stock Assessment for 2011

SDWG. 2011. Gulf of Maine (GOM) Winter Flounder Assessment Summary for 2011

Background Papers

Southern Demersal Working Group Papers

1. DeCelles, G, Cadrin, SX. ICES CM 2007/L:18, An Interdisciplinary Assessment of Winter Flounder (Pseudopleuronectes americanus) Stock Structure

2. Terceiro, M. Impacts of reduced inshore strata sampling on NEFSC trawl survey indices for SNE/MA winter flounder

3. Southern Demersal Working Group. 2011. Maturity

4. Southern Demersal Working Group. 2011. Response to 2008 GARM3 Research Recommendations for winter flounder

5. Southern Demersal Working Group. 2011. SNE/MA Winter Flounder TOR 4

6. Southern Demersal Working Group. 2011. Management Regulations

7.
   7a. Miller, T. 2011. Winter Flounder Length-based Survey Calibration

   7b. Southern Demersal Working Group. 2011. Winter Flounder Calibration: WP 7

8. McBride, R, Wuenschel, M, McElroy, D, Rowinski, Y, Thornton, G., Nitschke, P. 2011. Classifying female winter flounder maturity during NEFSC resource surveys: comparing at-sea, macroscopic maturity classifications with results from a gonad histology method. A Working Paper for SARC 52

9.

9a. SDWG52 WP 9: Validating the stock apportionment of commercial fisheries landings using positional data from Vessel Monitoring Systems (VMS): Impacts on the winter flounder stock allocations. (Update of Palmer, MC Wigley, SE 2007. Validating the stock apportionment of commercial fisheries landings using positional data from Positional Monitoring Systems (VMS). US Dept Commer, Northeast Fisheries Sci Cent Ref Doc. 07-22.

9b. Palmer MC, Wigley SE Using positional data from vessel monitoring systems (VMS) to validate the logbook-reported area fished and the stock allocation of commercial fisheries landings, 2004-2008. (Update of Northeast Fisheries Science Center Reference Document 07-22)

10. DeCelles, G, Roman S, Martins, D, Wood, A, Cadrin S. Results of an Industry-Based Survey for Winter Flounder in the Great South Channel. (Presentation in December 2010 Distribution and Abundance of Winter Flounder in the Great South Channel included in NEFSC CRD 1021.)

11. Wigley SE, Palmer, M., Legault, C. A 2011. Comparison of Discard Rates Derived from At-Sea Monitoring and Observer Trips. A Working Paper in support of SARC 52 Winter Flounder TOR 1:"Estimate catch from all sources including landings and discards. Characterize the uncertainty in these sources of data."

12. McElroy, WD, Rowinski, YK, Towle, McBride RS, Wuenschel MJ. Reproductive potential of female winter flounder, *Pseudopleuronectes americanus*: Comparison of fecundity and skipped spawning among three stocks

13. Hare, J. ToR 5. Examine the effects of incorporating environmental factors in models of population dynamics (e.g., spring water temperatures in an environmentally-explicit stock recruitment function). Development of environmentally-explicit stock-recruitment models for three stocks of winter flounder (*Pseudopleuronectes americanus*) along the northeast coast of the United States

14. Wigley, SE, Blaylock, J, Palmer, M. 2011. Measures of Uncertainty in the Trip-based Allocated Landings. A Working Paper in support of SARC 52 Winter Flounder TOR 4 "Perform a sensitivity analysis which examines the impact of allocation of catch to stock areas on model performance (in TOR 5)."

15. Southern Demersal Working Group. Anthony Woods. 2011. Winter flounder natural mortality derived from data in Howe and Coates (1975) using instantaneous rates tagging models. Working Paper: Re-analysis of Howe and Coates (1975)

16. Southern Demersal Working Group. 2011. Consensus Statement on Biological Reference Points (Term of Reference 6) and Vulnerability (Term of Reference 8b) for Winter Flounder Stocks (also called "16_D")

Garm III Background Papers

1. GARM III. Summary NEFSC 2008
2. Terceiro, M. GARM III Report. NEFSC 2008. J. Southern New England/Mid-Atlantic winter flounder
3. Hendrickson, L. GARM III Report. NEFSC 2008. K. George's Bank winter flounder
4. Nitschke, P. GARM III Report. NEFSC 2008. I. Gulf of Maine winter flounder

5. O'Boyle R, Bell, Crecco V, Van-Eeckhaute L, Kahn D, Needle C, Rothschild, B, Smith S, Helge Volstad, J . GARM III Report. NEFSC 2008. Report of the Groundfish Review Assessment Meeting (GARM III). Part I. Data Methods.
6. O'Boyle R., De Oliveira J, Gavaris S, Ianelli J, Jiao Y, Jones C, Medley P. GARM III Report. NEFSC 2008. Panel Summary Report of the Groundfish Review Assessment Meeting (GARM III). Part II Assessment Methodology (Models)
7. O'Boyle R, Bell M, Gavaris S, Haist V, Reeves S, Thompson G.GARM III Report. NEFSC 2008. Panel Summary Report of the Groundfish Review Assessment Meeting (GARM III). Part 3. Biological Reference Points.

Misc. Background Papers

1. Nies TA. 2011. Use of Reference Points in the Northeast Multispecies Fishery Management Plan (Applicable to New England Groundfish, Including Winter Flounder)
2. Nies TA. 2011. Management of the Northeast Multispecies Fishery 1977-2010
3. Rademeyer RA, Butterworth DS. April 2010. Initial Applications of Statistical Catch-at-Age Assessment Methodology to the Gulf of Maine Winter Flounder Resource
4. Rademeyer RA, Butterworth DS. April 2010. Initial Applications of Statistical Catch-at-Age Assessment Methodology to the Southern New England/Mid-Atlantic Winter Flounder Resource
5. Rademeyer R, Butterworth D. SNE Winter Flounder: Application of SCAA. Marine Resource Assessment and Management Group, University of Cape Town
6. Rademeyer RA, Butterworth DS. April 2010. Update of the Southern New England/Mid-Atlantic Winter Flounder Resource New Base Case SCAA using updated data
7. Rothschild Brian J. and Jiao Yue, May 2011 'Characterizing Uncertainty in Fish Stock Assessments: the Case of the Southern New England-Mid-Atlantic Winter Flounder', Transactions of the American Fisheries Society, 140: 3, 557 — 569, First published on: 18 May 2011 (iFirst)

8. Brooks, E. N., Powers, J. E., and Corte´s, E. 2010. Analytical reference points for age-structured models: application to data-poor fisheries. – ICES Journal of Marine Science, 67: 165–175.

9. Brooks, E. N., and Powers, J. E. 2007. Generalized compensation in stock-recruit functions: properties and implications for management. – ICES Journal of Marine Science, 64: 413–424.

10. Gedamke T, Hoenig JM, Dupaul WD, and Musick JA. Stock–Recruitment Dynamics and the Maximum Population Growth Rate of the Barndoor Skate on Georges Bank. North American Journal of Fisheries Management. 29:512–526, 2009

11. Iles, TC. A Review of Stock-Recruitment Relationships with Reference to Flatfish Populations. Netherlands Journal of Sea Research 32 (3/4): 399-420 (1994)

9. Appendix 2: CIE Statement of Work

Statement of Work for Dr. John Casey (CEFAS)

External Independent Peer Review by the Center for Independent Experts

52st Stock Assessment Workshop/Stock Assessment Review Committee (SAW/SARC): Winter flounder (Southern New England Stock), Winter flounder (Georges Bank Stock), Winter flounder (Gulf of Maine Stock).

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

Scope of Work and CIE Process: 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 Technical Representative (COTR), 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 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.

Project Description: The purpose of this meeting will be to provide an external peer review of stock assessments for three stocks of winter flounder (*Pseudopleuronectes americanus*): Southern New England, Georges Bank, and Gulf of Maine. Winter flounder, also known as blackback or lemon sole, is a demersal flatfish distributed in the Northwest Atlantic from Labrador to Georgia. U.S. commercial and recreational fisheries exist from the Gulf of Maine to the Mid-Atlantic Bight. Winter flounder stocks are managed in federal waters under the New England Fishery Management Council's Northeast Multispecies Fishery Management Plan (FMP), and in state waters under Atlantic States Marine Fisheries Commission's Fishery Management Plan for Inshore Stocks of Winter Flounder. The last assessment of these three winter flounder stocks was carried out at the Groundfish Assessment Review Meeting (GARM-III) in 2008. Results of the 2011 review will form the scientific basis for fishery management in the northeast region. 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 Terms of Reference (ToRs) for the assessment scientists are attached in **Annex 2**. The tentative agenda of the panel review meeting is attached in **Annex 3**. The SARC Summary Report format is attached as **Annex 4.**

The SARC 52 review panel will be composed of three appointed reviewers from the Center of Independent Experts (CIE), and an independent chair from the SSC of the New England or Mid-Atlantic Fishery Management Council. The SARC panel will write the SARC Summary Report and each CIE reviewer will write an individual independent review report.

Requirements for CIE Reviewers: Three CIE reviewers shall conduct an impartial and independent peer review in accordance with the SoW and ToRs herein. CIE reviewers shall have working knowledge and recent experience in fish stock assessments. Reviewers should be familiar with winter flounder (or comparable species) life history and population dynamics.

In general, CIE reviewers for SARCs 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.

Each CIE 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).

Location of Peer Review: Each CIE reviewer shall conduct an independent peer review during the panel review meeting scheduled in Woods Hole, Massachusetts during 6-10 June, 2011.

Charge to SARC panel: The panel is to determine and write down whether each Term of Reference of the SAW (see **Annex 2**) was or was not completed successfully during the SARC meeting. To make this determination, panelists should consider whether the work provides a scientifically credible basis for developing fishery management advice. Criteria to consider include: whether the data were adequate and used properly, the analyses and models were carried out correctly, and the conclusions are correct/reasonable. Where possible, the chair shall identify or facilitate agreement among the reviewers for each Term of Reference of the SAW.

If the panel rejects any of the current Biological Reference Point (BRP) proxies for B_{MSY} and F_{MSY}, the panel should explain why those particular proxies are not suitable and the panel should recommend suitable alternatives. If such alternatives cannot be identified, then the panel should indicate that the existing BRPs are the best available at this time.

Statement of Tasks:

1. Prior to the meeting

(SARC chair and CIE reviewers)

Review the reports produced by the Working Groups and read background reports.

Each CIE reviewer shall complete the following tasks in accordance with the SoW and Schedule of Milestones and Deliverables herein:

Upon completion of the CIE reviewer selection by the CIE Steering Committee, the CIE shall provide the CIE reviewer information (full name, title, affiliation, country, address, email, and FAX number) to the COTR, who forwards this information to the NMFS Project Contact no later the date specified in the Schedule of Milestones and Deliverables. The CIE is responsible for providing the SoW and ToRs to the CIE reviewers. The NMFS Project Contact is responsible for providing the CIE reviewers with the background documents, reports, foreign national security clearance, and other information concerning pertinent meeting arrangements. The NMFS Project Contact is also 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 COTR prior to the commencement of the peer review.

Foreign National Security Clearance: When CIE reviewers participate during a panel review meeting at a government facility, the NMFS Project Contact is responsible for obtaining the Foreign National Security Clearance approval for CIE reviewers who are non-US citizens. For this reason, the CIE reviewers shall provide by FAX the requested information (e.g., first and last name, contact information, gender, birth date, passport number, country of passport, travel dates, country of citizenship, country of current residence, and home country) 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/sponsor.html).

Pre-review Background Documents: 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 CIE reviewers the necessary background information and reports for the peer review. In the case where the documents need to be mailed, the NMFS Project Contact will consult with the CIE Lead Coordinator on where to send documents. CIE reviewers are responsible only for the pre-review documents that are delivered to the reviewer in accordance to the SoW scheduled deadlines specified herein. The CIE reviewers shall read all documents in preparation for the peer review.

2. During the Open meeting

Panel Review Meeting: Each CIE reviewer shall conduct the independent peer review in accordance with the SoW and 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 COTR and CIE Lead Coordinator.** 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 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 discussion, making sure all Terms of Reference of the SAW are reviewed, control of document flow, and facilitation of discussion. For the assessment, review both the Assessment Report and the draft Assessment Summary Report.

During the question and answer periods, provide appropriate feedback to the assessment scientists on the sufficiency of their analyses. It is permissible to discuss the stock assessment and to request additional information if it is needed to clarify or correct an existing analysis and if the information can be produced rather quickly.

(SARC CIE reviewers)
For each stock assessment, participate as a peer reviewer in panel discussions on assessment validity, results, recommendations, and conclusions. From a reviewer's point of view, determine whether each Term of Reference of the SAW was completed successfully. Terms of Reference that are completed successfully are likely to serve as a basis for providing scientific advice to management. If a reviewer considers any existing Biological Reference Point proxy to be inappropriate, the reviewer should try to recommend an alternative, should one exist.

During the question and answer periods, provide appropriate feedback to the assessment scientists on the sufficiency of their analyses. It is permissible to request additional information if it is needed to clarify or correct an existing analysis and if the information can be produced rather quickly.

3. After the Open meeting

(SARC CIE reviewers)
Each CIE reviewer shall prepare an Independent CIE Report (see **Annex 1**). This report should explain whether each Term of Reference of the SAW was or was not completed successfully during the SARC meeting, using the criteria specified above in the "Charge to SARC panel" statement.

If any existing Biological Reference 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 Terms of Reference or on additional questions raised during the meeting.

(SARC chair)
The SARC chair shall prepare a document summarizing the background of the work to be conducted as part of the SARC process and summarizing whether the process was adequate to complete the Terms of Reference of the SAW. If appropriate, the

chair will include suggestions on how to improve the process. This document will constitute the introduction to the SARC Summary Report (see **Annex 4**).

(SARC chair and CIE reviewers)
The SARC Chair and CIE reviewers will prepare the SARC Summary Report. Each CIE reviewer and the chair will discuss whether they hold similar views on each Term of Reference and whether their opinions can be summarized into a single conclusion for all or only for some of the Terms of Reference of the SAW. For terms where a similar 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 Term of Reference of the SAW was completed successfully. For each Term of Reference, this report should state why that Term of Reference was or was not completed successfully. The Report should also include recommendations that might improve future assessments.

If any existing Biological Reference Point (BRP) proxies are considered inappropriate, the SARC Summary Report should include recommendations and justification for suitable alternatives. If such alternatives cannot be identified, then the report should indicate that the existing BRP proxies are the best available at this time.

The contents of the draft SARC Summary Report will be approved by the CIE reviewers by the end of the SARC Summary Report development process. The SARC chair will complete all final editorial and formatting changes prior to approval of the contents of the draft SARC Summary Report by the CIE reviewers. The SARC chair will then submit the approved SARC Summary Report to the NEFSC contact (i.e., SAW Chairman).

Contract Deliverables - Independent CIE Peer Review Reports: Each CIE reviewer shall complete an independent peer review report in accordance with the SoW. Each CIE reviewer shall complete the independent peer review according to required format and content as described in **Annex 1**. Each CIE reviewer shall complete the independent peer review addressing each ToR as described 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 during June 6-10, 2011.
3) Conduct an independent peer review in accordance with the ToRs (**Annex 2**).
4) No later than June 24, 2011, 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 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 ToR in **Annex 2**.

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

25 April 2011	CIE sends reviewer contact information to the COTR, who then sends this to the NMFS Project Contact
23 May 2011	NMFS Project Contact will attempt to provide CIE Reviewers the pre-review documents by this date
6-10 June 2011	Each reviewer participates and conducts an independent peer review during the panel review meeting in Woods Hole, MA
9-10 June 2011	SARC Chair and CIE reviewers work at drafting reports during meeting at Woods Hole, MA, USA
24 June 2011	CIE reviewers submit draft CIE independent peer review reports to the CIE Lead Coordinator and CIE Regional Coordinator
27 June 2011	Draft of SARC Summary Report, reviewed by all CIE reviewers, due to the SARC Chair *
1 July 2011	SARC Chair sends Final SARC Summary Report, approved by CIE reviewers, to NEFSC contact (i.e., SAW Chairman)
8 July 2011	CIE submits CIE independent peer review reports to the COTR
15 July 2011	The COTR distributes the final CIE 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 COTR within 10 working days after receipt of all required information of the decision on substitutions. The COTR 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 CIE 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: Upon review and acceptance of the CIE independent peer review reports by the CIE Lead Coordinator, Regional Coordinator, and Steering Committee, these reports shall be sent to the COTR for final approval as contract deliverables based on compliance with the SoW and ToRs. As specified in the Schedule of Milestones and Deliverables, the CIE shall send via e-mail the contract deliverables (CIE independent peer review reports) to the COTR (William Michaels, via William.Michaels@noaa.gov).

Applicable Performance Standards: The contract is successfully completed when the COTR provides final approval of the contract deliverables. The acceptance of the contract deliverables shall be based on three performance standards:
(1) each CIE report shall be completed with the format and content in accordance with **Annex 1**,
(2) each CIE report shall address each ToR as specified in **Annex 2**,
(3) the CIE reports shall be delivered in a timely manner as specified in the schedule of milestones and deliverables.

Distribution of Approved Deliverables: Upon acceptance by the COTR, the CIE Lead Coordinator shall send via e-mail the final CIE reports in *.PDF format to the COTR. The COTR will distribute the CIE reports to the NMFS Project Contact and Center Director.

Support Personnel:

William Michaels, Program Manager, COTR
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1315 East West Hwy, SSMC3, F/ST4, Silver Spring, MD 20910
William.Michaels@noaa.gov Phone: 301-713-2363 ext 136

Manoj Shivlani, CIE Lead Coordinator
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Roger W. Peretti, Executive Vice President
Northern Taiga Ventures, Inc. (NTVI)
22375 Broderick Drive, Suite 215, Sterling, VA 20166
RPerretti@ntvifederal.com Phone: 571-223-7717

Key Personnel:

NMFS Project Contact:

Dr. James Weinberg, NEFSC SAW Chairman
Northeast Fisheries Science Center
166 Water Street, Woods Hole, MA 02543
James.Weinberg@noaa.gov (Phone: 508-495-2352) (FAX: 508-495-2230)

Mr. Frank Almeida, Acting NEFSC Science Director
National Marine Fisheries Service, NOAA
Northeast Fisheries Science Center
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frank.almeida@noaa.gov
phone: 508-495-2233

Annex 1: Format and Contents of CIE Independent Peer Review Report

1. The CIE independent 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 reviewer 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 Term of Reference of the SAW was completed successfully. For each Term of Reference, the Independent Review Report should state why that Term of Reference was or was not completed successfully. To make this determination, the SARC chair and CIE reviewers should consider whether the work provides a scientifically credible basis for developing fishery management advice.

   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 CIE 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 CIE independent report shall be an independent peer review of each ToRs, 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 the CIE Statement of Work
   Appendix 3: Panel Membership or other pertinent information from the panel review meeting.

Annex 2: Assessment Terms of Reference for SAW/SARC52

A. Winter flounder (Southern New England Stock)

1. Estimate catch from all sources including landings and discards. Characterize the uncertainty in these sources of data.

2. Present survey data being considered and/or used in the assessment (e.g., regional indices of abundance, recruitment, state and other surveys, age-length data, etc.). Characterize uncertainty in these sources of data.

3. Estimate annual fishing mortality, recruitment and stock biomass (both total and spawning stock) for the time series (integrating results from TOR-5), and estimate their uncertainty. Include area-swept biomass estimates. Investigate if implied survey gear or catchability estimates are reasonable. Include a historical retrospective analysis to allow a comparison with previous assessment results.

4. Perform a sensitivity analysis which examines the impact of allocation of catch to stock areas on model performance (in TOR-3).

5. Examine the effects of incorporating environmental factors in models of population dynamics (e.g., spring water temperatures in an environmentally-explicit stock recruitment function).

6. 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}, $B_{THRESHOLD}$, and F_{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.

7. Evaluate stock status (overfished and overfishing) with respect to the "new" BRPs (from TOR 6), and with respect to the existing BRPs (from a previous accepted peer review) whose values have been updated.

8. Develop and apply analytical approaches and data that can be used for conducting single and multi-year stock projections and for computing candidate ABCs (Acceptable Biological Catch; see Appendix to the TORs) under a set of alternative harvest scenarios. If the stock needs to be rebuilt, take that into account in these projections.
    d. Provide numerical short-term projections (3-5 yrs, or through the end of the rebuilding period, as appropriate). Each projection should estimate and report annual probabilities of exceeding threshold BRPs for F, and probabilities of falling below threshold BRPs for biomass. In carrying out projections, consider a range of assumptions about the most important uncertainties in the assessment (e.g., terminal year abundance, variability in recruitment).
    e. Take into consideration uncertainties in the assessment and the species biology to describe this stock's vulnerability (see "Appendix to the SAW TORs") to becoming or remaining overfished, and how this could affect the choice of ABC.
    f. Develop plausible hypotheses (e.g., mixing among the three stocks) which might explain any conflicting trends in the data and undertake scenario analyses to evaluate the consequences of these alternate hypotheses on ABC determination.

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

B. Winter flounder (Georges Bank Stock)

1. Estimate catch from all sources including landings and discards. Characterize the uncertainty in these sources of data.

2. Present survey data being considered and/or used in the assessment (e.g., regional indices of abundance, recruitment, state and other surveys, age-length data, etc.). Characterize uncertainty in these sources of data.

3. Estimate annual fishing mortality, recruitment and stock biomass (both total and spawning stock) for the time series (integrating results from TOR-5), and estimate their uncertainty. Include area-swept biomass estimates. Investigate if implied survey gear or catchability estimates are reasonable. Include a historical retrospective analysis to allow a comparison with previous assessment results.

4. Perform a sensitivity analysis which examines the impact of allocation of catch to stock areas on model performance (in TOR-3).

5. Examine the effects of incorporating environmental factors in models of population dynamics (e.g., spring water temperatures in an environmentally-explicit stock recruitment function).

6. 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}, $B_{THRESHOLD}$, and F_{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.

7. Evaluate stock status (overfished and overfishing) with respect to the "new" BRPs (from TOR 6), and with respect to the existing BRPs (from a previous accepted peer review) whose values have been updated.

8. Develop and apply analytical approaches and data that can be used for conducting single and multi-year stock projections and for computing candidate ABCs (Acceptable Biological Catch; see Appendix to the TORs) under a set of alternative harvest scenarios. If the stock needs to be rebuilt, take that into account in these projections.
   d. Provide numerical short-term projections (3-5 yrs, or through the end of the rebuilding period, as appropriate). Each projection should estimate and report annual probabilities of exceeding threshold BRPs for F, and probabilities of falling below threshold BRPs for biomass. In carrying out projections, consider a range of assumptions about the most important uncertainties in the assessment (e.g., terminal year abundance, variability in recruitment).
   e. Take into consideration uncertainties in the assessment and the species biology to describe this stock's vulnerability (see "Appendix to the SAW TORs") to becoming or remaining overfished, and how this could affect the choice of ABC.
   f. Develop plausible hypotheses (e.g., mixing among the three stocks) which might explain any conflicting trends in the data and undertake scenario analyses to evaluate the consequences of these alternate hypotheses on ABC determination.

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

C. Winter flounder (Gulf of Maine Stock)

1. Estimate catch from all sources including landings and discards. Characterize the uncertainty in these sources of data.

2. Present survey data being considered and/or used in the assessment (e.g., regional indices of abundance, recruitment, state and other surveys, age-length data, etc.). Characterize uncertainty in these sources of data.

3. Estimate annual fishing mortality, recruitment and stock biomass (both total and spawning stock) for the time series (integrating results from TOR-5), and estimate their uncertainty. Include area-swept biomass estimates. Investigate if implied survey gear or catchability estimates are reasonable. Include a historical retrospective analysis to allow a comparison with previous assessment results.

4. Perform a sensitivity analysis which examines the impact of allocation of catch to stock areas on model performance (in TOR-3).

5. Examine the effects of incorporating environmental factors in models of population dynamics (e.g., spring water temperatures in an environmentally-explicit stock recruitment function).

6. 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}, $B_{THRESHOLD}$, and F_{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.

7. Evaluate stock status (overfished and overfishing) with respect to the "new" BRPs (from TOR 6), and with respect to the existing BRPs (from a previous accepted peer review) whose values have been updated.

8. Develop and apply analytical approaches and data that can be used for conducting single and multi-year stock projections and for computing candidate ABCs (Acceptable Biological Catch; see Appendix to the TORs) under a set of alternative harvest scenarios. If the stock needs to be rebuilt, take that into account in these projections.
    d. Provide numerical short-term projections (3-5 yrs, or through the end of the rebuilding period, as appropriate). Each projection should estimate and report annual probabilities of exceeding threshold BRPs for F, and probabilities of falling below threshold BRPs for biomass. In carrying out projections, consider a range of assumptions about the most important uncertainties in the assessment (e.g., terminal year abundance, variability in recruitment).
    e. Take into consideration uncertainties in the assessment and the species biology to describe this stock's vulnerability (see "Appendix to the SAW TORs") to becoming or remaining overfished, and how this could affect the choice of ABC.
    f. Develop plausible hypotheses (e.g., mixing among the three stocks) which might explain any conflicting trends in the data and undertake scenario analyses to evaluate the consequences of these alternate hypotheses on ABC determination.

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

Appendix to the SAW TORs:

Clarification of Terms
used in the SAW/SARC Terms of Reference

(The text below is from DOC National Standard Guidelines, Federal Register, vol. 74, no. 11, January 16, 2009)

On "Acceptable Biological Catch":

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

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

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

ABC refers to a level of ''catch'' that is ''acceptable'' given the ''biological'' characteristics of the stock or stock complex. As such, [optimal yield] OY does not equate with ABC. The specification of OY is required to consider a variety of factors, including social and economic factors, and the protection of marine ecosystems, which are not part of the ABC concept. (p. 3189)

On "Vulnerability":

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

Annex 3: Draft Agenda

52nd Northeast Regional Stock Assessment Workshop (SAW 52)
Stock Assessment Review Committee (SARC) Meeting

June 6-10, 2011

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

DRAFT AGENDA (version: 20 April 2011)

TOPIC	PRESENTER(S)	SARC LEADER	RAPPORTEUR

Monday, June 6

1 – 1:15 PM
Welcome — **James Weinberg**, SAW Chair
Introduction — **Patrick Sullivan**, SARC Chair
Agenda
Conduct of Meeting

1:15 – 3:15 Assessment Presentation (A. SNE Winter flounder)
Mark Terceiro **TBD** **TBD**

3:15 – 3:30 Break

3:30 – 5:30 SARC Discussion w/ presenters (A. SNE Winter flounder)
Pat Sullivan, SARC Chair **TBD**

Tuesday, June 7

8:30-10:30 AM Assessment Presentation (B. GBK Winter flounder)
Lisa Hendrikson **TBD** **TBD**

10:30-10-45 Break

10:45 – 12:30 SARC Discussion w/ presenters (B. GBK Winter flounder)
Pat Sullivan, SARC Chair **TBD**

12:30 - 1:45 Lunch

1:45 – 3:45 Assessment Presentation (C. GOM Winter flounder)
Paul Nitschke **TBD** **TBD**

3:45 – 4:00 Break

4:00 – 5:45 SARC Discussion w/ presenters (C. GOM Winter flounder)
Pat Sullivan, SARC Chair **TBD**

(Evening Social/Dinner at **TBD**, 7pm)

Wednesday, June 8

8:45 – 11 Revisit w/ presenters (A.)
Pat Sullivan, SARC Chair **TBD**

11 - 11:15 Break

11:15 – 12:30 Revisit w/ presenters (B.)
Pat Sullivan, SARC Chair **TBD**

12:30 – 1:45 Lunch

1:45 – 2:45 cont. Revisit w/ presenters (B.)
Pat Sullivan, SARC Chair **TBD**

2:45 - 3 Break

3 – 5:15 Revisit w/ presenters (C.)
Pat Sullivan, SARC Chair **TBD**

Thursday, June 9

8:45 – 11 Review/edit Assessment Summary Report (A.)
Pat Sullivan, SARC Chair **TBD**

11 - 11:15 Break

11:15 – 12:30 Review/edit Assessment Summary Report (B.)
Pat Sullivan, SARC Chair **TBD**

12:30 – 1:45 Lunch

1:45 – 2:45 cont. Review/edit Assessment Summary Report (B.)
Pat Sullivan, SARC Chair **TBD**

2:45 - 3 Break

3 – 5:15 Review/edit Assessment Summary Report (C.)
Pat Sullivan, SARC Chair **TBD**

Friday, June 10
9:00 - 5:30 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.

Annex 4: Contents of SARC Summary Report

1.

The main body of the report shall consist of an introduction prepared by the SARC chair that will include the background, a review of activities and comments on the appropriateness of the process in reaching the goals of the SARC. Following the introduction, for each assessment reviewed, the report should address whether each Term of Reference of the SAW was completed successfully. For each Term of Reference, the SARC Summary Report should state why that Term of Reference was or was not completed successfully.

To make this determination, the SARC chair and CIE reviewers should consider whether the work provides a scientifically credible basis for developing fishery management advice. Scientific criteria to consider include: whether the data were adequate and used properly, the analyses and models were carried out correctly, and the conclusions are correct/reasonable. If the CIE reviewers and SARC chair do not reach an agreement on a Term of Reference, the report should explain why. It is permissible to express majority as well as minority opinions.

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

2.

If any existing Biological Reference Point (BRP) proxies are considered inappropriate, include recommendations and justification for alternative proxies. If such alternatives cannot be identified, then indicate that the existing BRPs are the best available at this time.

3.

The report shall also include the bibliography of all materials provided during the SAW, and any papers cited in the SARC Summary Report, along with a copy of the CIE Statement of Work.

The report shall also include as a separate appendix the Terms of Reference used for the SAW, including any changes to the Terms of Reference or specific topics/issues directly related to the assessments and requiring Panel advice.

10. Appendix 3: Panel Membership or other pertinent information from the panel review meeting.

Panel Membership

Pat Sullivan, SARC Chair
Noel Cadigan, CIE reviewer
John Casey, CIE reviewer
Cynthia Jones, CIE reviewer