

Independent Peer Review Report on the
Stock Assessment Review Committee (SARC)
Evaluation of Monkfish, Sea Scallop, and Pollock

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by

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Table of Contents

Executive Summary	3
Background.....	4
Description of Individual Reviewer’s Role	5
Summary Findings for Each Term of Reference	5
A. Monkfish	5
B. Sea Scallop	8
C. Pollock.....	10
Conclusions and Recommendations	12
Appendix 1: Bibliography of Materials Provided for Review.....	13
Appendix 2: Copy of CIE Statement of Work.....	16
Appendix 3: Panel Membership.....	33

Executive Summary

This report presents an independent scientific peer review of the assessments of monkfish, sea scallop and pollock as presented by the various stock assessment working groups at the SARC 50 conducted in June 2010. This reviewer appreciates the time and effort that went into developing these assessments and believes that the quality of the assessments reflects that effort. The meeting proceeded forward in a timely manner with clear presentations provided for each assessment and a constructive dialogue between reviewers and assessment scientists.

The Terms of Reference were clearly defined and to the point. Overall, it appeared that all the Terms of Reference for each of the assessments were met. Nevertheless, critical uncertainties still remain for several of the assessments, but managers should consider that the best available science was used to advance the estimates, projections, and reference points for these populations.

A general observation for all the assessments is that little time was spent by the Review Panel in evaluating the progress made on previous research recommendations the public session. It also appeared that the Working Groups did not spend much time on these either. It seems to me that it is useful to keep track of research recommendations and important to update the priorities and evaluate those research recommendations that have been pursued. This adds continuity not only to the assessments, but to the review process as well. In addition to keeping track of the uncertainties historically encountered throughout the evolution of the assessment, one can examine the track record of whether the recommendations have proven fruitful or not. The review of the monkfish assessment, in particular, would have benefited greatly from an extended discussion of what had been accomplished (or not) in terms of research and model development for this species.

In the following paragraphs I summarize my main points of concern for each assessment reviewed.

Monkfish

- There exists a strong retrospective pattern in the monkfish assessment for the northern management area that is not evident in the south, presumably caused by the appearance of a strong recruitment pulse in the north that didn't result in an accumulation of adults in later years.
- When a contrast in signals or questionable assumptions exist causing an anomaly (such as a retrospective pattern) significant effort should go into diagnosis of the problem and if it cannot be fixed, then a presentation should be given of what the consequences are for the assessment under alternative hypotheses, assumptions or model structures that frame the problem. This would have greatly aided the review.
- SCALE seems like a useful model and it facilitates the integration all the information available for this stock. The age-length-mortality relationship needs quite a bit of attention however. Data, as might come from developing a valid age-length relationship,

would help. So would some flexibility in the model itself to allow exploration of alternatives. These issues must be addressed before the next benchmark assessment.

- The greater catchability of this species by the new survey vessel (the *Bigelow*) should help improve the population index.

Sea Scallop

- The sea scallop assessment was clearly presented, well documented, and appeared to be scientifically sound.
- The population seems to be in good status, but the population and catch projections and associated reference points are strongly dependent upon the assumption that the unprecedented high level of productivity (as reflected in the strong recruitment in recent years) will continue.
- There are several innovative approaches developed here. NMFS scientists should be encouraged (and given time) to publish these results and share them with and get feedback from the rest of the scientific community.

Pollock

- The pollock assessment has greatly improved. Questions still remain regarding stock structure and the existence of older, larger fish (assumed to be present in the model).
- The effect on the assessment of the choices made regarding allocation of historical catch appeared to be minimal, but it would be useful to make these allocations consistent and scientifically sound over the time series of catches.
- When dome-shaped selectivity is assumed, the model estimates that there should be older, larger fish in the population. When the alternative assumption of asymptotic selectivity is made the estimates drop. The projections and reference points under the dome-shaped selectivity assumption also presume that the fish are out there (when perhaps they are not). This induces some risk for the fishery and the population. It would be useful to gather some information to help reduce this risk.

Background

The Stock Assessment Review Committee (SARC) of the 50th Stock Assessment Workshop (SAW 50) met at the Northeast Fisheries Science Center (NEFSC), Woods Hole, MA during 1st – 5th June 2010 to review Northeast regional benchmark stock assessments of monkfish (*Lophius americanus*), sea scallop (*Placopecten magellanicus*), and pollock (*Pollachius virens*) guided by the SAW 50 Terms of Reference.

The SARC review panel consisted of R. O’Boyle (Beta Scientific Consulting Inc.), M. Bell (ICIT, UK), P. Sullivan (Cornell U.), K. Trzcinski (Fisheries and Oceans Canada) and J. Wheeler (Fisheries and Oceans Canada). R. O’Boyle and P. Sullivan are also members of the New England Fisheries Management Council’s Scientific and Statistical Committee (SSC).

Description of Individual Reviewer's Role

This reviewer was appointed to the SARC by the New England Fisheries Management Council and is a member of the Council's Scientific and Statistical Committee. The reviewer's tasks were to provide an independent review of the science behind the three population assessments covered by the SARC and provide an additional review report beyond that provided by the Chair and three reviewers appointed by the Center for Independent Experts.

Prior to the meeting background papers, working documents, and the Statement of Work were provided to SARC panel members via a secured network. A list of these documents is provided in Appendix 1 below. The documents were reviewed prior to the meeting. During the meeting the reviewer attended all presentations and actively participated in the inquiry and discussion that followed. Subsequent to the meeting the reviewer participated in the development of the SARC 50 Consensus Summary Report and wrote this reviewer's Independent Peer Review Report.

Summary Findings for Each Term of Reference

A. Monkfish

1. *Characterize the commercial catch including landings, effort, LPUE and discards. Describe the uncertainty in these sources of data.*

I agree with the Panel that this Term of Reference was met to the extent possible. It is noted that the age samples from at-sea observers have not been processed because the aging method has not yet been validated. One might think that because a "length-based" method is being used that developing an aging method is of low priority, but the SCALE model uses an age-length relationship and the relationship is suspect, so coming up with a method for obtaining at least some good ages from the commercial catch is strongly recommended. Also, not seeing an accumulation of larger fish in the landings as one might expect given reductions in catch in recent years is an inconsistency that should be investigated, especially with the high weight (belief) given to the catch observations in the model. The uncertainty is high.

2. *Report results of 2009 cooperative monkfish survey and describe sources of uncertainty in the data and results.*

I agree with the Panel that this Term of Reference was met. The cooperative survey seemed like a useful opportunity that was lost. I recognize that it is sometimes difficult to make use of *ad hoc* data sources and that there is a cost in dealing with such data and that such data don't always follow specified designs or standardized protocols, but there are many questions left glaringly open by the assessment and one would think that such cooperative efforts might be useful in

providing a bit of information here and there that can contribute to solving the puzzle that is the assessment. I wouldn't give up so quickly on this potential source of information, but I recognize that some effort will be needed to construct a successful cooperative effort (by both parties).

3. *Characterize other survey data that are being used in the assessment (e.g., regional indices of abundance, recruitment, length data, state surveys). Describe the uncertainty in these sources of data.*

I agree that this Term of Reference was met. So the larger fish are not showing up here in the survey or in the catch. Why is that? The higher catch-rates of this species on the *Bigelow* should help better inform future assessments. However, an assessment, even one that is working properly, cannot stand on simply the catch alone. An index is needed. If the standardized survey is insufficient then other sources (state surveys, coop surveys, commercial CPUE, or perhaps other innovative approaches) need to be developed. The uncertainty is high.

4. *Estimate annual fishing mortality, recruitment and stock biomass (both total and spawning stock) for the time series, and characterize the uncertainty of those estimates.*

Although highly uncertain, estimates for these elements of the assessment were derived and so this Term of Reference was met. In such circumstances, when the input is highly uncertain and the validity of the model structure is questionable in places, it would be better to capture and communicate the uncertainty in the estimates through a decision table listing alternative models or model assumptions and associated estimates so that the range of uncertainty can be reasonably represented.

5. *Update or redefine biological reference points (BRPs; estimates or proxies for B_{MSY} , $B_{THRESHOLD}$, and F_{MSY} ; and estimates of their uncertainty). Comment on the scientific adequacy of existing and redefined BRPs.*

I agree that this Term of Reference was met, but as indicated above the results are highly uncertain. The SCALE model is a better way of assimilating and integrating the available data than previous analytical approaches, however inconsistencies in the signals must be followed up and the consequences clearly communicated in order for the BRPs to be sufficiently well understood and appropriately interpreted.

There was some discussion about whether the assessment estimates and BRPs should be adjusted for the retrospective pattern. While I applaud the effort at trying to anticipate how far off the model estimates are likely to be in the future, I would prefer that more time be spent on determining why it occurs in the first place. While solutions to the problem might not be readily available, the consequences and risks associated with actions taken under alternative scenarios would be fruitful to develop. If such adjustments are to be used, then they should be given in the context of the unadjusted estimates and the consequences and risks of choosing one set of estimates when the other might be true should be fleshed out to assist decision makers.

6. *Evaluate stock status with respect to the existing BRPs, as well as with respect to updated or redefined BRPs (from TOR 5).*

This Term of Reference appeared to be met, with the caveats stated above. I would guess that the stock estimates, the BRPs and the status are likely to change in revised assessments.

7. *Evaluate monkfish diet composition data and its implications for population level consumption by monkfish.*

This Term of Reference was met. The information will prove useful as ecosystem-based approaches develop. Perhaps not on this species so much, but I would be curious if any of this information could be used directly in the assessment as a proxy or rationale for changing mortality with size or time. Can it be used to provide an independent determination of the health of this resource?

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).*
 - a. *Provide numerical short-term projections (through 2016). 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 to examine important sources of uncertainty in the assessment.*
 - b. *Comment on which projections seem most realistic, taking into consideration uncertainties in the assessment.*
 - c. *Describe this stock's vulnerability to becoming overfished, and how this could affect the choice of ABC.*

I agree that this Term of Reference was met. The method appears to me to be fine. It is just that the starting point and the underlying processes governing the dynamics are poorly known.

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.*

I agree that this Term of Reference was met in the sense that a status report was given. The report was basically that most of the previous research recommendations had not been dealt with. A clear understanding of the age-growth-mortality relationship would seem to me to represent the highest research priority. Advancing the model to the point where it can incorporate alternative hypotheses about age, growth and mortality would seem to be fairly important as well. This ToR would have benefited from greater discussion at the SARC. Some rationale should be provided as to why the various recommendations were not pursued. If they are no longer a priority, that should be noted. If funding or time does not permit the recommendation to be developed then that should be noted too.

B. Sea Scallop

1. *Characterize the commercial catch including landings, effort, LPUE and discards. Describe the uncertainty in these sources of data.*

I agree with the Panel that this Term of Reference was met. The data appear to be in good shape. It would be nice to have more information about the number and size of discards and the discard mortality rate, but this seems to be an active area of research and some adjustment is already being made in the model to account for discard losses.

2. *Characterize the survey data that are being used in the assessment (e.g., regional indices of abundance, recruitment, state surveys, length data, etc.). Describe the uncertainty in these sources of data. Document the transition between the survey vessels and their calibration. If other survey data are used in the assessment, describe those data as they relate to the current assessment (Exclude consideration of future survey designs and methods).*

This Term of Reference appears to be well met. The survey data and relationships between different survey methods appear adequate and well documented. Some further exploration is needed to understand the apparent contrast in signals between the several survey sources (specifically the NMFS dredge survey and the SMAST video surveys in recent years).

3. *Estimate annual fishing mortality, recruitment and stock biomass (both total and spawning stock) for the time series, and characterize the uncertainty of those estimates.*

This Term of Reference appears to be very well met. The approach presented here was clear, scientifically sound, and well documented. There was some concern expressed by the Working Group as to whether the standard errors should be reported, given that they likely under represent the true uncertainty in the assessment estimates. My recommendation is to report them as they will serve as reference points themselves for future assessments and provide a guide to how uncertainty shifts in the model with additional data or changes in model assumptions. If one wishes to provide caveats regarding these standard errors, I think that would be fine, but having them in the report is valuable none-the-less.

4. *Update or redefine biological reference points (BRPs; estimates or proxies for B_{MSY} , $B_{THRESHOLD}$, and F_{MSY} ; and estimates of their uncertainty). Comment on the scientific adequacy of existing and redefined BRPs.*

I agree fully with the Panel's conclusion that this Term of Reference was met. The various conditions and endorsements outlined in the SARC summary report should be fully considered. In particular, managers should be made fully aware that the BRPs and projected catch levels are conditioned upon productivity (as measured through recent recruitment) remaining at unprecedented high levels.

5. *Evaluate stock status with respect to the existing BRPs, as well as with respect to updated or redefined BRPs (from TOR 4).*

This Term of Reference was met. Presently the stock appears to be in good shape.

6. *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).*
 - a. *Provide numerical short-term projections (through 2014). 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 to examine important sources of uncertainty in the assessment.*
 - b. *Comment on which projections seem most realistic, taking into consideration uncertainties in the assessment.*
 - c. *Describe this stock's vulnerability to becoming overfished, and how this could affect the choice of ABC.*

This Term of Reference appears to be met. The SAMS method is constructed to allow examination of alternative area management strategies and is innovative and well formulated to adequately characterize what consequences are likely to occur under alternative management scenarios. It is the approach that we approved, the projections will have to depend on what scenarios are explored.

7. *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.*

I agree that this Term of Reference was met. We did not have much time to review the previous research recommendations during the open session at the meeting. It was apparent that some of the previous recommendations had been dealt with and some had not. For those that were not there was often a reasonable rationale provided for why they were ignored or put off. But, for those that were listed as "Not done" it would have been useful to document why these ideas might now appear to be a dead end or an unfruitful path to pursue or why they should continue to be pursued and at what priority level. Sometimes these recommendations accumulate but are not likely to bear fruit. I suppose one might continue tracking them for posterity, but at some point they might be put on the shelf. The new research recommendations formulated by the working group seemed to be clear and well thought out.

C. Pollock

1. *Characterize the commercial and recreational catch including landings, effort, LPUE and discards. Describe the uncertainty in these sources of data, including consideration of stock definition.*

I agree with the Panel that this Term of Reference was met. The data seem to be in good order, and although work should continue on how to properly allocate the historical landings in order to best represent the U.S. portion of the population, the model seems relatively insensitive to the effect of these changes.

2. *Characterize the survey data that are being used in the assessment (e.g., regional indices of abundance, recruitment, state surveys, age-length data, etc.). Describe the uncertainty in these sources of data, including consideration of stock definition.*

This Term of Reference was met. As stated in the Consensus Summary Report there are several points of concern regarding the NMFS survey. 1) Both the old and the new survey vessels are not great at catching pollock. Thus, the survey index will likely not improve as an indicator of pollock abundance. Alternative indicators should be explored. 2) Having a dome-shaped selectivity curve for the survey may seem appropriate, but it results in a cryptic biomass that, at present, can neither be confirmed nor denied. Many of the rationales provided for its existence seem reasonable, but are in many ways circumstantial. It would be less risky to have some concrete evidence that this biomass of older individuals exists, perhaps based on data collected through a tagging study. Until such evidence is provided, then I would recommend providing estimates with and without the dome-shaped selectivity assumption and the consequences and risks of assuming one assumption is correct when the other is being used. 3) I don't know that we had enough time to evaluate the usefulness of the ME/NH survey as a recruitment index, but if that survey adequately represents likely recruitment levels, then one would assume that it would be helpful to have it in the model.

3. *Estimate annual fishing mortality, recruitment and stock biomass (both total and spawning stock) for the time series, and characterize the uncertainty of those estimates.*

This Term of Reference appeared to be met. The shift to the ASAP model and the reworking of the choices of which data to include seems to have given this assessment some stability. Recognize, however, that some contrast in the signals from the various data sources still exists and an alternative set of assumptions or data weightings could change our perspective on this population.

4. *Update or redefine biological reference points (BRPs; estimates or proxies for B_{MSY} , $B_{THRESHOLD}$, and F_{MSY} ; and estimates of their uncertainty). Comment on the scientific adequacy of existing and redefined BRPs.*

I agree with the Panel that this Term of Reference was met. The model was redone and so the BRPs also needed to be recalculated. The approach taken by the Working Group seems

reasonable. Uncertainty in the reference points is most likely to result from the uncertainty in the assessment, particularly with regard to assumptions associated with the cryptic biomass.

5. *Evaluate stock status with respect to the existing BRPs, as well as with respect to updated or redefined BRPs (from TOR 4).*

This Term of Reference was met. However, I think it would be much more informative if in the Assessment and Summary Reports a decision table along the lines of the one given in the Panel's Consensus Summary Report were provided to highlight the consequences of model assumptions on model outputs and projections.

6. *Evaluate pollock diet composition data and its implications for population level consumption by pollock.*

This Term of Reference was met. As mentioned in the Consensus Summary Report such analyses could not only help with understanding ecosystem level processes, but also help better understand and perhaps improve or better validate the assessment. If there are in fact a lot of large pollock out there, how would that impact the ecosystem? Is there sufficient energy in terms of prey to support such a biomass?

7. *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).*
 - a. *Provide numerical short-term projections (through 2017). 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 to examine important sources of uncertainty in the assessment.*
 - b. *Comment on which projections seem most realistic, taking into consideration uncertainties in the assessment.*
 - c. *For a range of candidate ABC scenarios, compute probabilities of rebuilding the stock by 2017.*
 - d. *Describe this stock's vulnerability to becoming overfished, and how this could affect the choice of ABC.*

I agree with the Panel that this Term of Reference was met and I wish to reiterate here what was said in the Panel's report that some communication of the consequences and risks of assuming alternative selectivity patterns should be communicated to facilitate appropriately defining ABCs.

7. *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.*

As with the other two assessments, we did not have time to evaluate the status of research recommendations. It wasn't even clear if we had them all listed from previous reviews and working groups. Nevertheless, it is clear that some future effort should be put into "finding" the cryptic biomass and into better understanding stock structure.

Conclusions and Recommendations

Each of these assessments appears to represent the best available science for determining population status. The assessments have all advanced technically and I would consider them much improved. But, uncertainties remain.

For monkfish a better defense of the assessment could have been organized by providing some rationale for the various choices made in terms of model structure, data selection, assumptions, and prioritization of research. In the end, the Working Group may not have had enough time or resources to fully explore model results and better ground the estimates provided. It would have been good to know the constraints that exist in moving forward.

Appendix 1: Bibliography of Materials Provided for Review

Monkfish background documents

- A1. Northeast Data Poor Stocks Working Group, 2007. *Monkfish Assessment Report for 2007*. Northeast Fisheries Science Center Reference Document 07-21.
- A2. Northeast Fisheries Science Center, 2010. *Cooperative Monkfish Surveys*. Unpublished background document.
- A3. Northeast Data Poor Stocks Working Group, 2007. *Monkfish Assessment Summary for 2007*. Northeast Fisheries Science Center Reference Document 07-13.
- A4. Northeast Fisheries Science Center, 2009. *Goosefish Bigelow-Albatross Calibration Factor Analyses*. Unpublished background document.
- A5. Haring, P. & Maguire, J-J., 2008. The monkfish fishery and its management in the northeastern USA. *ICES Journal of Marine Science*, **65**, 1370–1379.
- A6. Richards, A., Nitschke, P., Cadrin, S., Rago, P. & Maguire, J-J., 2007. Population assessment of monkfish (*Lophius americanus*) in the northeastern USA. *ICES CM 2007/K:15*.
- A7. Johnson, A., Richards, A., Place, A. & Nguluwe, B., 2010. *The use of DNA markers to evaluate US fishery management areas and effective population size of monkfish, Lophius Americanus*. Unpublished background document.
- A8. Richards, R.A., Nitschke, P.C. & Sosebee, K.A., 2008. Population biology of monkfish *Lophius americanus*. *ICES Journal of Marine Science*, **65**, 1291–1305.
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- A11. Rago, P.J., Weinberg, J.R. & Weidman, C., 2006. A spatial model to estimate gear efficiency and animal density from depletion experiments. *Canadian Journal of Fisheries and Aquatic Sciences*, **63**, 2377-2388.

Monkfish working papers

- WP1. Southern Demersal Working Group, 2010. *A. Monkfish (Goosefish) Stock Assessment for 2010*. 50th Northeast Stock Assessment Workshop, Assessment Report.
- WP1-Appendices. Southern Demersal Working Group, 2010. *Appendices to the Monkfish Assessment Report*. 50th Northeast Stock Assessment Workshop, Appendices to Assessment Report.
- WP2. Southern Demersal Working Group, 2010. *A. Monkfish Assessment Summary for 2010*. 50th Northeast Stock Assessment Workshop, Assessment Summary Report.

Sea Scallop background documents

- B1. Northeast Fisheries Science Center, 2007. *Sea Scallop Assessment Summary for 2007*. pp. 24-37 in: *45th Northeast Regional Stock Assessment Workshop (45th SAW): 45th SAW*

- Assessment Summary Report*. Northeast Fisheries Science Center Reference Document 07-11.
- B2. Northeast Fisheries Science Center, 2007. *Assessment of Atlantic Sea Scallops*. pp. 139-370 in: *45th Northeast Regional Stock Assessment Workshop (45th SAW): 45th SAW Assessment Report*. Northeast Fisheries Science Center Reference Document 07-16.
- B3. Northeast Fisheries Science Center, 2004. *Sea Scallop Assessment Summary for 2004*. pp. 14-16 in: *39th Northeast Regional Stock Assessment Workshop (39th SAW): Assessment Summary Report*. Northeast Fisheries Science Center Reference Document 04-10a.
- B4. Northeast Fisheries Science Center, 2004. *Sea Scallop Assessment Summary for 2004*. pp. 87-211 in: *39th Northeast Regional Stock Assessment Workshop (39th SAW): Assessment Report*. Northeast Fisheries Science Center Reference Document 04-10b.
- B5. Hart, D.R., 2001. Individual-based yield-per-recruit analysis, with an application to the Atlantic sea scallop, *Placopecten magellanicus*. *Canadian Journal of Fisheries and Aquatic Sciences*, **58**, 2351-2358.
- B6. Hart, D.R., 2001. Yield- and biomass-per-recruit analysis for rotational fisheries, with an application to the Atlantic sea scallop (*Placopecten magellanicus*). *Fishery Bulletin*, **101**, 44-57.
- B7. Hart, D.R. & Chute, A.S., 2009. Verification of Atlantic sea scallop (*Placopecten magellanicus*) shell growth rings by tracking cohorts in fishery closed areas. *Canadian Journal of Fisheries and Aquatic Sciences*, **66**, 751-758.
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Sea Scallop working papers

- WP1. Invertebrate Subcommittee, 2010. *B. Atlantic Sea Scallop Stock Assessment for 2010*. 50th Northeast Stock Assessment Workshop, Assessment Report.
- WP1-Appendices. Invertebrate Subcommittee, 2010. *Appendices to the Sea Scallop Assessment Report for 2010*. 50th Northeast Stock Assessment Workshop, Appendices to Assessment Report.
- WP2. Invertebrate Subcommittee, 2010. *B. Sea Scallop Assessment Summary for 2010*. 50th Northeast Stock Assessment Workshop, Assessment Summary Report.

Pollock background documents

- C1. Northeast Fisheries Science Center, 2008. *Pollock in subareas 5 and 6*. pp. 642-657 in: *Assessment of 19 Northeast Groundfish Stocks through 2007 Report of the 3rd Groundfish Assessment Review Meeting (GARM III), Northeast Fisheries Science Center, Woods Hole, Massachusetts, August 4-8, 2008*. Northeast Fisheries Science Center Reference Document 08-15.
- C2. Thompson, N., 2009. *Update on status of pollock, including Autumn 2008 NEFSC survey data*. Unpublished memo to Pat Kurkul.

- C3. Mayo, R.K., 1998. *Pollock*. pp. 67-69. in: *Status of Fishery Resources off the Northeastern US for 1998*. Northeast Fisheries Science Center.
- C4. Northeast Fisheries Science Center, 1993. *Pollock*. pp. 7-38 in: *Report of the 16th Northeast Regional Stock Assessment Workshop (16th SAW): Stock Assessment Review Committee (SARC) Consensus Summary of Assessments*. Northeast Fisheries Science Center Reference Document 93-18.
- C5. Mayo, R.K., 2001. *Scotian Shelf/Georges Bank/Gulf of Maine Pollock*. pp. 155-161. in: *Assessment of 19 Northeast Groundfish Stocks through 2000: A Report to the New England Fishery Management Council's Multi-Species Monitoring Committee*. Northeast Fisheries Science Center Reference Document 01-20.
- C6. Mayo, R.K., Col, L. & Traver, M., 2005. *Georges Bank/Gulf of Maine Pollock*. pp. 359-371 in: *Assessment of 19 Northeast Groundfish Stocks through 2004: 2005 Groundfish Assessment Review Meeting (2005 GARM), Northeast Fisheries Science Center, Woods Hole, MA, 15-19 August 2005*. Northeast Fisheries Science Center Reference Document 05-13.
- C7. NOAA, 1989. *Stock Assessment Information for Pollock, Pollachius virens (L.), in the Scotian Shelf, Georges Bank, and Gulf of Maine Regions*. NOAA Technical Memorandum NMFS-F/NEC-65.
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- C9. North East Fisheries Science Center, 2010. *Pollock Data Meeting*. Unpublished background document.
- C10. Clay, D., Stobo, W.T., Beck, B. & Hurley, P.C.F., 1989. Growth of juvenile pollock (*Pollachius virens* L.) along the Atlantic coast of Canada with inferences of inshore-offshore movements. *Journal of Northwest Atlantic Fishery Science*, **9**, 37-43.
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- C14. Nies, T.A., 2010. *Management of the Northeast Multispecies Fishery 1977-2009*. New England Fishery Management Council, Pre-Decisional Information.

Pollock working papers

- WP1. Northern Demersal Working Group, 2010. *C. Stock Assessment of Pollock in US Waters for 2010*. 50th Northeast Stock Assessment Workshop, Assessment Report.
- WP2. Northern Demersal Working Group, 2010. *C. Pollock Assessment Summary for 2010*. 50th Northeast Stock Assessment Workshop, Assessment Summary Report.

Appendix 2: Copy of CIE Statement of Work

Statement of Work

(v. 5 April 2010)

External Independent Peer Review by the Center for Independent Experts

50th Stock Assessment Workshop/ Stock Assessment Review Committee (SAW/SARC) Monkfish, Sea scallop, and Pollock

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.com.

Project Description: The purpose of this SARC50 meeting will be to provide an external peer review of benchmark stock assessments for monkfish (also called goosefish, *Lophius americanus*), sea scallop (*Placopecten magellanicus*), and pollock (*Pollachius virens*). Goosefish are piscivorous, and they rest partially buried on soft bottom substrates and attract prey using a modified fin ray that resembles a fishing pole and lure. Sea scallops are relatively large filter-feeding bivalves that rest on the bottom. Pollock are fast swimming, schooling fish. This review determines whether the scientific assessments are adequate to serve as a basis for developing fishery management advice. Results form the scientific basis for fishery management in the northeast region. This meeting satisfies Prioritization criteria 1-3. The Terms of Reference (ToRs) of the peer review 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 SARC50 review panel will be composed of three appointed reviewers from the Center of Independent Experts (CIE), a reviewer from the New England Fishery Management Council's

Science and Statistics Committee (SSC) and an independent chair from SSC of the New England or Mid-Atlantic Fishery Management Council. The reviewer from the NEFMC SSC is expected to perform duties similar to those described herein for CIE reviewers and on a similar schedule. The SARC panel will write the SARC Summary Report and each CIE and SSC 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. In general, CIE reviewers for SARC meetings shall have working knowledge and recent experience in the application of modern fishery stock assessment models (e.g., statistical catch-at-age, delay-difference, and traditional VPA). Reviewers should also have experience in evaluating measures of model fit, identification, uncertainty, and forecasting, as well as in development and application of biological reference points. Direct experience with the biology and population dynamics of species on the agenda would be beneficial.

Specifically for the monkfish assessment, reviewers should be familiar with length-based statistical assessment models and methods for experimentally estimating trawl capture efficiency, and survey trawl calibration studies. Familiarity with statistical methods for ageing fish, and monkfish in particular, is desirable.

For the scallop assessment, reviewers should be familiar with methods for assessing invertebrates, especially length-based approaches. Expertise in the implications of spatially distinct harvest patterns for stock dynamics and implications for appropriate harvest rates and biological reference points is essential.

For the pollock assessment, reviewers should be familiar with methods for estimating relative abundance of a schooling fish, statistical catch at age models, and potentially methods for model averaging.

Each CIE reviewer's duties shall not exceed a maximum of 17 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 17 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 and Date of Peer Review: Each CIE reviewer shall conduct an independent peer review during the panel review meeting scheduled at the Woods Hole Laboratory of the Northeast Fisheries Science Center (NEFSC) in Woods Hole, Massachusetts during June 1-5, 2010.

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) 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 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 can 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 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**.

Other Tasks – Contribution to SARC Summary Report: Each CIE reviewer will assist the Chair of the panel review meeting with contributions to the Summary Report, based on the terms of reference of the review. CIE reviewers are not required to reach a consensus, and should provide a brief summary of the reviewer’s views on the summary of findings and conclusions reached by the review panel in accordance with the ToRs.

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 in Woods Hole, Massachusetts during June 1-5, 2010, and conduct an independent peer review in accordance with the ToRs (**Annex 2**).
- 3) No later than 18 June 2010, 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 Dr. David Sampson, CIE Regional Coordinator, via email to david.sampson@oregonstate.edu. Each CIE report shall be written using the format and content requirements specified in **Annex 1**, and address each 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.

30 April 2010	CIE sends reviewer contact information to the COTR, who then sends this to the NMFS Project Contact
18 May 2010	NMFS Project Contact will attempt to provide CIE Reviewers the pre-review documents by this date
1-5 June, 2010	Each reviewer participates and conducts an independent peer review during the panel review meeting in Woods Hole, MA
4-5 June 2010	SARC Chair and CIE reviewers work at drafting reports during meeting at Woods Hole, MA, USA
18 June 2010	CIE reviewers submit draft CIE independent peer review reports to the CIE Lead Coordinator and CIE Regional Coordinator
21 June 2010	Draft of SARC Summary Report, reviewed by all CIE reviewers, due to the SARC Chair *
28 June 2010	SARC Chair sends Final SARC Summary Report, approved by CIE reviewers, to NEFSC contact (i.e., SAW Chairman)
2 July 2010	CIE submits CIE independent peer review reports to the COTR
9 July 2010	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, Contracting Officer's Technical Representative (COTR)
NMFS Office of Science and Technology
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
Northern Taiga Ventures, Inc.
10600 SW 131st Court, Miami, FL 33186
shivlanim@bellsouth.net Phone: 305-383-4229

Key Personnel:

Dr. James Weinberg, NEFSC Stock Assess. Workshop (SAW) Chair, (NMFS Project Contact)
National Marine Fisheries Service, NOAA
Northeast Fisheries Science Center
166 Water St., Woods Hole, MA 02543
james.weinberg@noaa.gov Phone: 508-495-2352

Dr. Nancy Thompson, NEFSC Science Director
National Marine Fisheries Service, NOAA
Northeast Fisheries Science Center
166 Water St., Woods Hole, MA 02543
nancy.thompson@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 as separate appendices as follows:
 - 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/SARC50 (June 2010)
(file vers.: 12/22/09-c)

A. Monkfish

1. Characterize the commercial catch including landings, effort, LPUE and discards. Describe the uncertainty in these sources of data.
2. Report results of 2009 cooperative monkfish survey and describe sources of uncertainty in the data and results.
3. Characterize other survey data that are being used in the assessment (e.g., regional indices of abundance, recruitment, length data, state surveys). Describe the uncertainty in these sources of data.
4. Estimate annual fishing mortality, recruitment and stock biomass (both total and spawning stock) for the time series, and characterize the uncertainty of those estimates.
5. Update or redefine biological reference points (BRPs; estimates or proxies for B_{MSY} , $B_{THRESHOLD}$, and F_{MSY} ; and estimates of their uncertainty). Comment on the scientific adequacy of existing and redefined BRPs.
6. Evaluate stock status with respect to the existing BRPs, as well as with respect to updated or redefined BRPs (from TOR 5).
7. Evaluate monkfish diet composition data and its implications for population level consumption by monkfish.
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).
 - d. Provide numerical short-term projections (through 2016). 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 to examine important sources of uncertainty in the assessment.
 - e. Comment on which projections seem most realistic, taking into consideration uncertainties in the assessment.
 - f. Describe this stock's vulnerability to becoming overfished, and how this could affect the choice of ABC.
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. Sea scallop

1. Characterize the commercial catch including landings, effort, LPUE and discards. Describe the uncertainty in these sources of data.
2. Characterize the survey data that are being used in the assessment (e.g., regional indices of abundance, recruitment, state surveys, length data, etc.). Describe the uncertainty in these sources of data. Document the transition between the survey vessels and their calibration. If other survey data are used in the assessment, describe those data as they relate to the current assessment (Exclude consideration of future survey designs and methods).
3. Estimate annual fishing mortality, recruitment and stock biomass (both total and spawning stock) for the time series, and characterize the uncertainty of those estimates.
4. Update or redefine biological reference points (BRPs; estimates or proxies for B_{MSY} , $B_{THRESHOLD}$, and F_{MSY} ; and estimates of their uncertainty). Comment on the scientific adequacy of existing and redefined BRPs.
5. Evaluate stock status with respect to the existing BRPs, as well as with respect to updated or redefined BRPs (from TOR 4).
6. 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).
 - d. Provide numerical short-term projections (through 2014). 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 to examine important sources of uncertainty in the assessment.
 - e. Comment on which projections seem most realistic, taking into consideration uncertainties in the assessment.
 - f. Describe this stock's vulnerability to becoming overfished, and how this could affect the choice of ABC.
7. 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. Pollock

1. Characterize the commercial and recreational catch including landings, effort, LPUE and discards. Describe the uncertainty in these sources of data, including consideration of stock definition.
2. Characterize the survey data that are being used in the assessment (e.g., regional indices of abundance, recruitment, state surveys, age-length data, etc.). Describe the uncertainty in these sources of data, including consideration of stock definition.
3. Estimate annual fishing mortality, recruitment and stock biomass (both total and spawning stock) for the time series, and characterize the uncertainty of those estimates.
4. Update or redefine biological reference points (BRPs; estimates or proxies for B_{MSY} , $B_{THRESHOLD}$, and F_{MSY} ; and estimates of their uncertainty). Comment on the scientific adequacy of existing and redefined BRPs.
5. Evaluate stock status with respect to the existing BRPs, as well as with respect to updated or redefined BRPs (from TOR 4).
6. Evaluate pollock diet composition data and its implications for population level consumption by pollock.
7. 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).
 - e. Provide numerical short-term projections (through 2017). 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 to examine important sources of uncertainty in the assessment.
 - f. Comment on which projections seem most realistic, taking into consideration uncertainties in the assessment.
 - g. For a range of candidate ABC scenarios, compute probabilities of rebuilding the stock by 2017.
 - h. Describe this stock's vulnerability to becoming overfished, and how this could affect the choice of ABC.
8. Review, evaluate and report on the status of the SARC and Working Group research recommendations listed in 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 Assessment 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, $OFL \geq ABC$.*]

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: Meeting Agenda (Preliminary)

**50th Northeast Regional Stock Assessment Workshop (SAW 50)
Stock Assessment Review Committee (SARC) Meeting**

June 1-5, 2010

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

This is a Preliminary AGENDA (version: 2 Feb 2010)

TOPIC	PRESENTER(S)	SARC LEADER	RAPPORTEUR
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Tuesday, June 1

8:45-9 AM

Opening

Welcome

Introduction

Agenda

Conduct of Meeting

James Weinberg, SAW Chairman

TBD, SARC Chairman

9-11

Assessment Presentation (A. Monkfish)

TBD

TBD

TBD

11-11:15

Break

11:15 -Noon

SARC Discussion w/ presenters (A. Monkfish)

TBD, SARC Chairman

Noon – 1:15 Lunch

1:15 – 3:30

Assessment Presentation (B. Sea Scallop)

TBD

TBD

TBD

3:30-3:45

Break

3:45-5:30 PM

SARC Discussion w/ presenters (B. Sea Scallop)

TBD, SARC Chairman

Wednesday, June 2

8:45-10:45 Assessment Presentation (C. Pollock)
TBD **TBD** **TBD**

10:45-11 Break

11 -Noon SARC Discussion w/ presenters (C. Pollock)
TBD, SARC Chairman

Noon – 1:15 Lunch

1:15 – 3:15 Revisit w/ presenters (A. Monkfish)
TBD, SARC Chairman

3:15-3:30 Break

3:30-5:30 PM Revisit w/ presenters (B. Sea Scallop)
TBD, SARC Chairman

Thursday, June 3

8:45-10:45 Revisit w/ presenters (C. Pollock)
TBD, SARC Chairman

10:45 – 11 Break

11 - Noon Review/edit Assessment Summary Report (A. Monkfish)
TBD, SARC Chairman

Noon – 1:15 Lunch

1:15 – 2:30 cont. Review Assessment Summary Report (A. Monkfish)
TBD, SARC Chairman

2:30 – 2:45 Break

3 – 5:30 PM Review/edit Assessment Summary Report (B. Sea Scallop)
TBD, SARC Chairman

Friday, June 4

9 - 11:30 Review/edit Assessment Summary Report (C. Pollock)
TBD, SARC Chairman

11:30 – 1:00 Lunch

1 – 5:30 PM SARC Report writing. (closed meeting)

Saturday, June 5

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.

Appendix 3: Panel Membership.

R. O'Boyle (Chair)

Beta Scientific Consulting Inc.
Nova Scotia, Canada

M. Bell

International Centre for Island Technology
Heriot-Watt University
United Kingdom

P. Sullivan

Cornell University
Ithaca, New York, USA

K. Trzcinski

Department of Fisheries and Oceans
Nova Scotia, Canada

J. Wheeler

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