Center for Independent Experts (CIE) Reviewer's Independent Peer Review Report on the 2015 Stock Assessment Review (STAR) Panel 1 on assessments of Darkblotched and Canary rockfish

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Prepared for

The Center for Independent Experts

Review Meeting
Seattle, Washington
27 April – 1 May 2015

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2.3.6 When possible, provide specific suggestions for future improvements in any relevant aspects of data collection and treatment, modeling approaches and technical issues, differentiating between the short-term and longer-term time frame.

2.3.7 Provide a brief description on panel review proceedings highlighting pertinent discussions, issues, effectiveness, and recommendations.

Appendix 1: Bibliography of materials provided for review
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Executive Summary

The 2015 Stock Assessment Review (STAR) Panel 1 on assessments of darkblotched rockfish (*Sebastes crameri*) and canary rockfish (*Sebastes pinniger*) met in Seattle, Washington, from Monday, April 27 to Friday, May 1 2015. The meeting was chaired by Tom Jagielo from the Scientific and Statistical Committee. The review panel (the Panel) was composed of James Ianelli, NMFS Alaska Fisheries Science Center and two scientists affiliated with the Center for Independent Experts: Stuart Reeves and Neil Klaer. The meeting generally followed the draft agenda and included presentations by the stock assessment teams (STATs) mixed with questions and open discussion. Additional analyses were requested by the Panel from the STATs and the results of those were also subsequently presented. The Panel participated in the review of each Term of Reference (ToR) for the meeting. After model presentations and general discussions, the first four days of the meeting were devoted to the examination of various aspects of the models through the request and response process. New information regarding catch history affecting canary rockfish in particular resulted in a diversion of effort to resolve those issues – mostly achieved outside of the meeting. My own particular interests for the requests was to attempt inclusion of Canadian catches in the assessments as sensitivities, to set plausible bounds on natural mortality for inclusion with steepness as a principle axis of uncertainty for management advice, and to investigate the minimal influence of abundance indices for both models.

Findings for Darkblotched rockfish

The assessment approach as developed using SS3 was technically sound. During the meeting some adjustments to the base case were made by time-blocking of selectivity for the individual fishing quota (IFQ) portion of the shoreside fishery, and modifying the number of recent years for which recruitment was allowed to be estimated. Other than adjustments to the base model configuration already noted, the Panel had no specific suggestions for further changes, so the modified base case was the best currently available for the provision of management advice.

A catch history for darkblotched rockfish by fishing fleet 1930-2007 in British Columbia (BC) waters is available from COSEWIC (2009). During the meeting, a sensitivity analysis was constructed that added these BC catches to those in the base model, and assumed average recent catches for the years past 2007 where BC catches were unavailable. While these catches were relatively low and constant throughout the fishery history, they did lower the apparent recent extent of stock rebuilding, because they recently make a higher proportion of the total catch. A true combined assessment would require an updated catch series and inclusion of composition and index data from BC, so this sensitivity was considered as a preliminary investigation only, and did not cause an adjustment of the current base case.

As steepness and natural mortality were both chosen as fixed values (based on meta-analyses), these rightly remain as major assessment uncertainties and a recommendation was made by the Panel to use both as major axes of uncertainty in presentation of results to management.

The assessment outcome – particularly regarding the level of recent rebuilding – is largely driven by catches, and assumptions about steepness and natural mortality. Somewhat unusually, abundance indices have little influence on the assessment. Generally, abundance indices cover reasonably short periods of the stock history, and any trends shown by abundance indices are consistent with signals in composition data and assumptions made about stock productivity. The only available abundance index covering recent years has a selectivity pattern that says it is mostly on fish younger than those caught commercially. This means that there is no direct measure of recent rebuilding of the adult portion of the stock, and any work to commence collection of such a measure, or use of existing data to derive such an index would greatly assist with this assessment. Efforts particularly since 2000 to greatly reduce fishing mortality on this species are commendable, and rebuilding of the stock after such efforts is to be expected. It is unfortunate that the available data and the assessment are unable to provide good precision on the current level of rebuilding. Values for steepness and natural mortality chosen for the base case have been

justified by the STAT, and the base case does represent the best currently available assessment of the status of the fishery for management advice.

I have made some recommendations for procedures and diagnostics regarding bridging analysis and comparison of sensitivity analyses that might be considered as additions to standard assessment documentation.

Findings for Canary rockfish

The spatial assessment approach as developed using SS3 was technically sound. During the meeting some adjustments to the base case were made to the base case historical catch series. Other than this adjustment to the base model, the Panel had no specific suggestions for further changes, so the modified base case was the best currently available for the provision of management advice.

A catch history for canary rockfish by trawl and handline fleet 1930/31-2009/10 in BC waters is available from the Canadian Department of Fisheries and Oceans (DFO) (2010). During the meeting, a sensitivity analysis was constructed that added BC catches to those in the base model for Washington. As a divergence zone at the northern edge of Vancouver Island likely creates a barrier for pelagic dispersal, the portion of available BC catches below the divergence was estimated and used for the sensitivity. Results showed that inclusion of these catches does lower the apparent recent extent of stock rebuilding. A true combined assessment would require an updated catch series and inclusion of composition and index data from BC, so this sensitivity was considered as a preliminary investigation only, and did not cause an adjustment of the current base case.

As steepness and natural mortality were both chosen as fixed values (based on meta-analyses), these rightly remain as major assessment uncertainties and a recommendation was made by the Panel to use both as major axes of uncertainty in presentation of results to management.

The assessment outcome – particularly regarding the level of recent rebuilding – is largely driven by catches, and assumptions about steepness and natural mortality. Somewhat unusually, abundance indices have little influence on the assessment. Generally, in this assessment, abundance indices cover reasonably short periods of the stock history, and any trends shown by abundance indices are consistent with signals in composition data and assumptions made about stock productivity. Model results would be considerably improved if a reliable abundance index for older fish were available. The WCGBTS survey is currently the best available source of abundance information for older fish in recent years as a direct measure of the extent of rebuilding, although it has been recognized that the survey infrequently encounters canary rockfish, and occasional large catches occur when canary aggregations are encountered. Good progress has been made in the development of appropriate analysis methods for these types of data.

I have made some recommendations for procedures and diagnostics regarding bridging analysis and comparison of sensitivity analyses that might be considered as additions to standard assessment documentation.

1 Introduction

1.1 Background

The 2015 Stock Assessment Review (STAR) Panel 1 on assessments of darkblotched rockfish (*Sebastes crameri*) and Canary rockfish (*Sebastes pinniger*) met in Seattle, Washington, from Monday, April 27 to Friday, May 1 2015. The meeting was chaired by Tom Jagielo from the Scientific and Statistical Committee. The review panel (the Panel) was composed of James Ianelli, NMFS Alaska Fisheries Science Center and two scientists affiliated with the Center for Independent Experts (CIE): Stuart Reeves and Neil Klaer.

Draft stock assessment reports as well as all associated background documents were made available via a public FTP site to the Panel on 14 April prior to the review meeting. During the meeting, all documents were available electronically via the same FTP site, and additional documents and presentations made during the meeting were also posted there.

The meeting generally followed the draft agenda and included presentations by the stock assessment teams (STATs) mixed with questions and open discussion. Additional analyses were requested by the Panel from the STATs and the results of those were also subsequently presented. A summary of those requests, rationale and STAT responses is contained in the Stock Assessment Review (STAR) Panel Meeting Reports for each species. The Panel participated in the review of each Term of Reference (ToR) for the meeting.

1.2 Review Activities

After model presentations and general discussions, the first four days of the meeting were devoted to the examination of various aspects of the models through the request and response process. New information regarding catch history affecting canary rockfish in particular resulted in a diversion of effort to resolve those issues – mostly achieved outside of the meeting. My own particular interests for the requests was to attempt inclusion of Canadian catches in the assessments as sensitivities, to set plausible bounds on natural mortality inclusion with steepness as a principle axis of uncertainty for management advice, and to investigate the minimal influence of abundance indices for both models. Draft STAR Panel Meeting for Reports were completed on the last day, and edited during the two weeks following the meeting via email.

2 Review of assessments of Darkblotched and Canary rockfish

2.1 Terms of reference

The Panel considered the assessments in light of the terms of reference provided as follows:

1. Become familiar with the draft stock assessment documents, data inputs, and analytical models along with other pertinent information (e.g. previous assessments and STAR panel report when available) prior to review panel meeting.

2. Discuss the technical merits and deficiencies of the input data and analytical methods during the open review panel meeting.

3. Evaluate model assumptions, estimates, and major sources of uncertainty.

4. Provide constructive suggestions for current improvements if technical deficiencies or major sources of uncertainty are identified.

5. Determine whether the science reviewed is considered to be the best scientific information available.

6. When possible, provide specific suggestions for future improvements in any relevant aspects of data collection and treatment, modeling approaches and technical issues, differentiating between the short-term and longer-term time frame.

7. Provide a brief description on panel review proceedings highlighting pertinent discussions, issues, effectiveness, and recommendations.

2.2 Findings by term of reference for Darkblotched rockfish

The comments below refer to aspects that were examined during the meeting, but include my own additional commentary for preparation of this CIE report.

2.2.1 Become familiar with the draft stock assessment documents, data inputs, and analytical models along with other pertinent information (e.g. previous assessments and STAR panel report when available) prior to review panel meeting.

The PFMC (2014) Status of the Pacific Coast Groundfish Fishery: Stock Assessment and Fishery Evaluation report provides a very useful summary of the distribution and life history, and stock status and management history for the rockfish species. The previous assessment and associated STAR panel and CIE reports provide a useful starting point for the evaluation of progress by the STAT in addressing previous concerns, and for noting those that remain. The inclusion of a specific section in the draft assessment document regarding how previous recommendations have been addressed is commendable.

2.2.2 Discuss the technical merits and deficiencies of the input data and analytical methods during the open review panel meeting.

Stock boundary

Background documents state that based upon genetic information and the absence of large gaps in catches, there are no clear stock delineations for darkblotched rockfish in US waters. The distribution of the species continues north of US waters where they are still common off British Columbia (BC). Some justification for treating the US stock as a unit without consideration of the species beyond the US border is required. Factors such as the species being demersal and unlikely to migrate long distances and evidence of genetic sub-structuring of the US stock (Richards and Laroche 1979) support the current stock delineation of the assessed stock. The effect of a potential wider spawning stock on pelagic larval recruitment and therefore contribution to the US spawning stock biomass is unknown at present.

A catch history for darkblotched rockfish by fishing fleet 1930-2007 in BC waters is available from COSEWIC (2009). During the meeting, a sensitivity analysis was constructed that added these BC catches to those in the base model, and assumed average recent catches for the years past 2007 where BC catches were unavailable. While these catches were relatively low and constant throughout the fishery history, they did lower the apparent recent extent of stock rebuilding because they recently make a higher proportion of the total catch. A true combined assessment would require an updated catch series and inclusion of composition and index data from BC, so this sensitivity was considered as a preliminary investigation only, and did not cause an adjustment of the current base case.

Catches

Darkblotched rockfish are caught mainly by trawl and as part of a complex of species (Pacific ocean perch, splitnose rockfish, yellowmouth rockfish and sharpchin rockfish). They have mainly been caught since the mid-late 1940's by both domestic and foreign fleets (although foreign fishing ended by the mid 1980s). Both the proportion of recorded combined rockfish catches that

were darkblotched, and the total rockfish catch is uncertain to differing degrees depending on the period and source. The non-trawl commercial catch has increased its relative proportion of the total catch from 20% in the mid-1990s to 25-40% more recently of a smaller total. Recreational catch was less than 10% of the total catch prior to 1995 and has fluctuated from about 20-50% of the total catch in recent years 2006-2014.

2.2.3 Evaluate model assumptions, estimates, and major sources of uncertainty.

The assessment approach as developed using SS3 was technically sound. During the meeting some adjustments to the base case were made by time-blocking of selectivity for the IFQ portion of the shoreside fishery, and modifying the number of recent years for which recruitment was allowed to be estimated. The Panel concluded that information was available to allow recruitment to be estimated to the second last year (2013) as the composition data provided some information on age 0 in 2013 and 1 in 2014, but none or very little for age 0 in 2014.

High and low historical catch scenarios were developed by the STAT as sensitivity analyses. Further work can be done to better capture uncertainty in historical catches as this remains as a considerable uncertainty for the darkblotched assessment.

The assessment outcome – particularly regarding the level of recent rebuilding – is largely driven by catches, and assumptions about steepness and natural mortality. Somewhat unusually, abundance indices have little influence on the assessment. Generally, abundance indices cover reasonably short periods of the stock history, and any trends shown by abundance indices are consistent with signals in composition data and assumptions made about stock productivity. The only available abundance index covering recent years has a selectivity pattern that says it is mostly on fish younger than those caught commercially. This means that there is no direct measure of recent rebuilding of the adult portion of the stock, and any work to commence collection of such a measure, or use of existing data to derive such an index would greatly assist with this assessment. Efforts particularly since 2000 to greatly reduce fishing mortality on this species are commendable, and rebuilding of the stock after such efforts is to be expected. It is unfortunate that the available data and the assessment are unable to provide good precision on the current level of rebuilding. Values for steepness and natural mortality chosen for the base case have been justified by the STAT, and the base case does represent the best currently available assessment of the status of the fishery for management advice.

As steepness and natural mortality were both chosen as fixed values (based on meta-analyses), these rightly remain as major assessment uncertainties and a recommendation was made by the Panel to use both as major axes of uncertainty in presentation of results to management.

An objective procedure was used to determine bounds for steepness for an axis of uncertainty based on the available prior distribution. Other CIE reviews that I have been involved with also examined projections as part of the review – which was not done here, possibly because of the need for rebuilding analysis. Uncertainty in natural mortality has the potential for quite different influence on projection results to steepness. An objective procedure for the choice of bounds for natural mortality was unavailable so a pragmatic decision was taken to choose bounding *M* values that obtained the same current depletion levels as bounding steepness values. Such a choice specifically restricts the influence of uncertainty in natural mortality to projection results alone. Further work on an objective procedure for choosing bounds on natural mortality is required.

Evidence for model convergence was based on jittering starting values for estimated parameters. Additional evidence is provided by the smooth transitions of the likelihood profiles. The Panel agreed that acceptable evidence of convergence was provided.

There is a systematic lack of fit by the base case to the right hand side of length compositions from surveys and the at-sea

hake fishery. The fit for both length and age compositions is more acceptable for the domestic fishery (from which the fishery removals are mostly modeled). Further work is required to determine whether alternative functional forms for selectivity or changes in other aspects of the model might better resolve this difficulty.

Standardized procedures for relative weighting within and across different data sources (particularly length and age composition, age at length composition and abundance indices) is still an active area of current research. The STAT has used currently recommended procedures.

A retrospective analysis was provided that caused some discussion during the meeting, as the addition of the most recent year of data caused a change in the model output that was not evident for longer peels. The cause of the pattern was determined to be 2014 NWFSC composition data. The STAT pointed out that such a pattern is not uncommon for other stocks when new data are incorporated. Changes due to the addition of 2014 data were within the bounds of uncertainty from other sources (principally steepness and natural mortality) so this was not seen as an issue that required a change to the base case. How to interpret and what to do about retrospective patterns is an active area of current research (e.g. Hurtado-Ferro et al. 2014).

2.2.4 Provide constructive suggestions for current improvements if technical deficiencies or major sources of uncertainty are identified.

Other than adjustments to the base model configuration already noted, the Panel had no specific suggestions for further changes, so the modified base case was the best currently available for the provision of management advice.

2.2.5 Determine whether the science reviewed is considered to be the best scientific information available.

Responses to earlier review recommendations

A required section of the draft stock assessment document is responses to STAR panel recommendations from the most recent previous assessment. The STAT adequately responded to most of those recommendations. Those that remain to be further address were the development of a prior for M for use directly in the assessment, continued collection of maturity samples, further exploration of latitudinal differences in life history traits, evaluation of the impact of not including any Canadian portion of the population abundance, continued research on meta-analyses for steepness and natural mortality, and the development of a fully Bayesian assessment.

Requests and responses during the meeting

The Panel requested additional model runs as part of its review. However none of those runs resulted in new information that required a change to the base case, except in the modification of the final year to allow the model to estimate recruitment. The Panel considers the modified base case as presented during the meeting to adequately capture the best available science and the status of the stock.

2.2.6 When possible, provide specific suggestions for future improvements in any relevant aspects of data collection and treatment, modeling approaches and technical issues, differentiating between the short-term and longer-term time frame.

Assessment documentation (short-term)

It would assist in the review process if reviewers were routinely given access to model source code so that they can run the draft base case prior to the review for themselves if they wish – particularly for SS assessments. It has been good practice to include the starter, data and control files in the draft assessment documentation so that settings can be examined directly in the document. However, there is advantage for reviewers to run the model and examine r4ss output – particularly as it may include diagnostics and plots that are not included in the draft assessment document. As SS is constantly under development, it may also be the case (as here) that the SS version used is more recent than that available publicly from the NOAA toolbox. A simple solution would be to provide the draft base model source files and also the SS version used on the FTP site used for the review, at the same time as documents are made available prior to the meeting.

Standard inclusions in stock assessment documentation (short-term)

The Terms of Reference for the Groundfish and Coastal Pelagic Species Stock Assessment Review by the Pacific Fishery Management Council (September 2014) provides a good outline for stock assessment documents (Appendix B) that ensures consistency for draft assessments. While I hesitate to add to the standard requirements, and therefore the work required of the STAT prior to review, there are a couple of items that could be considered, regarding bridging analysis and tables for comparison of sensitivity analyses.

Where assessments are regularly made for the same species using the same modeling framework, as for darkblotched and SS here, an opportunity arises to comprehensively and transparently provide an audit trail on model changes since the last assessment – commonly called a bridging analysis. Some such information was provided by the STAT for darkblotched, but not in full detail. We use a detailed bridging process in Australia for the national assessment of species in a multi-species trawl fishery, and it has proved to be useful in a number of occasions in assessments I've worked on. For example, I was required to explain to industry in detail why the removal of a penalty on maximum annual *F* values in an assessment was justified, as it did create an overall change in the stock trend. Our bridging analysis involves examination of absolute spawning biomass and recruitment trends over time after the application of sequential changes to model source code version revision, structural assumptions, changes to fixed parameter values or priors, and the inclusion of recent data (source by source where possible – catch, index, age and length composition by fleet). This provides a continuum from the previous assessment to the current base case. Such a process (or an improvement on it) could be considered in the future for any regular SS assessments in the US. It is understood that a detailed

bridging analysis may not be required if the absolute biomass and recruitment series have changed little from one assessment to the next, but experience says that this is rarely the case.

For comparison and evaluation of sensitivity analyses it has become standard practice elsewhere to construct tables as detailed for the canary assessment that I think should be considered as standard procedure. The darkblotched assessment did provide this information for individual sensitivities, but not as tables for all sensitivities.

Examination of model input data (short-term)

A specific meeting to examine and sign off on assessment input data prior to the development of draft stock assessments would assist in the prevention of data issues becoming apparent later in the process – as occurred during this review particularly for canary rockfish. I understand that such meetings were held in the past, but the current process relies on good communication among individuals across the variety of federal and state organizations responsible for the various data sources. A specific data meeting could examine information across a broad range of species due for assessment, and would also assist with the development of more specific documentation of protocols used to compile best available data sets for stock assessment, and also begin work on procedures for the development of alternative series that capture uncertainty – particularly for historical catch and discards.

Abundance index for adult fish as an indicator of rebuilding (short-term)

The current darkblotched assessment has the selectivity for the NWFSC shelf-slope survey as semi-dome-shaped, with the peak at size less than that caught by the commercial fisheries. Some work should be directed towards further justification of why the survey appears to be such a poor indicator of the abundance of older fish. As the current base model structure has no direct measure of recent rebuilding of the adult portion of the stock, any work to commence collection of such a measure, or use of existing data to derive such an index would greatly assist with this assessment.

Further investigation of appropriate values for natural mortality and steepness (short/medium term)

Basic life history research may help to resolve assessment uncertainties regarding appropriate values for natural mortality and steepness.

2.2.7 Provide a brief description on panel review proceedings highlighting pertinent discussions, issues, effectiveness, and recommendations.

Terms of Reference and assignment of reporting duties

The agenda had assignment of reporting duties for the first day. As the proceedings tend to concentrate on STAR Panel requests and responses for the first four days, with drafting of the report on the last day, the assignment of duties concentrated more specifically on the recording of the Panel requests and responses. As this duty is better done by someone more familiar with local practices, Jim Ianelli volunteered to do this recording for both species. While this recording is certainly required, it may not necessarily require a member of the review panel to do this task. At other US independent reviews I have been involved with, the terms of reference for the review

are more specifically broken down into sections that look at (1) appropriateness of the compilation and use of available input data, (2) appropriate and best practice in application of the assessment model and (3) appropriate capture of data and model uncertainty in recommendations for management. Given such clear delimitation of aspects of the assessment that require comment in the final report, on the first day it makes for efficient use of all reviewers in assigning the drafting of comments on these aspects separately to different reviewers, depending on their expertise. That allows a better compilation of comments about most important aspects of the stock assessment on the final day when drafting the report. While the final report for this meeting did capture the important aspects of items (1) to (3) above, I feel that if efforts were made to address each of them more specifically in a directed way throughout the meeting, the review would have been improved.

Agreement on the STAR Panel Meeting Report

All three Panel reviewers and the Chair provided consensus on the language that appears in the STAR Panel Meeting Report.

2.3 Findings by term of reference for Canary rockfish

The comments below refer to aspects that were examined during the meeting, but include my own additional commentary for preparation of this CIE report.

2.3.1 Become familiar with the draft stock assessment documents, data inputs, and analytical models along with other pertinent information (e.g. previous assessments and STAR panel report when available) prior to review panel meeting.

The PFMC (2014) Status of the Pacific Coast Groundfish Fishery: Stock Assessment and Fishery Evaluation report provides a very useful summary of the distribution and life history, and stock status and management history for the rockfish species. The previous assessment and associated STAR panel and CIE reports provide a useful starting point for the evaluation of progress by the STAT in addressing previous concerns, and for noting those that remain. The inclusion of a specific section in the draft assessment document regarding how previous recommendations have been addressed is commendable.

2.3.2 Discuss the technical merits and deficiencies of the input data and analytical methods during the open review panel meeting.

Stock boundary

The distribution of the species continues north of US waters where they are still common off British Columbia (and also occur in Alaska and Mexico). Biological characteristics of canary rockfish in Canadian waters are consistent with the US west coast. The effect of a potential wider stock on pelagic larvae and therefore contribution to the US west coast spawning stock biomass is unknown at present. Limited tagging research has shown canary movements of up to hundreds of kilometers.

A catch history for canary rockfish by trawl and handline fleet from 1930/31-2009/10 in BC waters is available from the Canadian Department of Fisheries and Oceans (DFO) (2010). During the meeting, a sensitivity analysis was constructed that added BC catches to those in the base model for Washington. As a divergence zone at the northern edge of Vancouver Island likely creates a barrier for pelagic dispersal, the portion of available BC catches below the divergence was estimated and used for the sensitivity. Results showed that inclusion of these catches does lower the apparent recent extent of stock rebuilding. A true combined assessment would require an updated catch series and inclusion of composition and index data from BC, so this sensitivity was considered as a preliminary investigation only, and did not cause an adjustment of the current base case.

Catches

Canary rockfish are caught mainly by trawl historically and often with bocaccio, sharpchin, yelloweye, yellowtail, silvergray and widow rockfishes, and lingcod. They have mainly been caught since the mid-late 1940's by both domestic and foreign fleets. Estimation of total canary rockfish historical landed catch by fleet is uncertain, particularly as earlier sources recorded species complexes – rockfish, or rockfish other than Pacific ocean perch. Good efforts have been

made in California and Oregon in recent years to create more definitive species-specific historical catch reconstructions. Such effort is still required for Washington.

Discards

Discard rates for all fleets in the draft assessment were assumed to be 0.05 for all fleets prior to 2002. Discard rates by area (California (CA)/Oregon (OR)/Washington (WA)) were relatively similar, in the order of 0.30 in 2002, 0.70 in 2008, and declining to 0.01 in 2014. Non-trawl discard rates for CA and OR were at or near 1.0 from 2002-2014, and about 0.25 declining to 0.01 in WA.

Adjustments to base case catch history during the meeting

Due to discussions and updated information that came to light during the meeting, the base case catch series was adjusted to account for alternative discard rates through history to better account for management decisions, replacement of Oregon recreational catches for 2004 – 2014 and removal of BC and Alaskan catches from the WA region. It is undesirable that such information becomes available late in the assessment process, and there are notes below recommending an improved data evaluation process prior to commencement of assessments.

2.3.3 Evaluate model assumptions, estimates, and major sources of uncertainty.

It was agreed that the assessment approach as developed using SS3 was technically sound. During the meeting some adjustments to the base case historical catch series were made as detailed above.

Examination of the effect of catch uncertainty on assessment results

High and low historical catch scenarios were not specifically developed by the STAT as sensitivities as part of the draft assessment document, although various sensitivities were examined during the meeting (alternate WA, Base + foreign N->S, Base + BC catches). Further work can be done to better capture uncertainty in historical catches as this remains as a considerable uncertainty for the canary assessment.

Spatial structure

Spatial structure was introduced for this assessment to take advantage of tracking spatial differences in stock dynamics due to different exploitation histories among areas, and as a first step towards a combined US/Canadian assessment. The STAT demonstrated an improved fit to available data through introduction of spatial structure, and resulting biomass trends among areas, while similar, did show some differences. Comparison of spatial and non-spatial model results showed that the spatial model did not greatly change the overall biomass trend or current stock status. Assignment of catch to spatial strata according to port of landing is an imperfect procedure, but no improved alternative was suggested. The Panel was unable to find flaws with the approach, and the spatial version of the assessment is the best currently available for the provision of management advice.

Absence of old females (>50y)

It has been assumed that there is an increased natural mortality at older ages for females. Considerable uncertainty remains regarding the most appropriate method to account for the lack of older females in the stock (either by age-specific change in M for older females, or selectivity effects).

Recent rebuilding

The assessment outcome – particularly regarding the level of recent rebuilding – is largely driven by catches, and assumptions about steepness and natural mortality. Somewhat unusually, abundance indices have little influence on the assessment. Generally, in this assessment, abundance indices cover reasonably short periods of the stock history, and any trends shown by abundance indices are consistent with signals in composition data and assumptions made about stock productivity. Model results would be considerably improved if a reliable abundance index for older fish were available. The WCGBTS survey is currently the best available source of abundance information for older fish in recent years as a direct measure of the extent of rebuilding, although it has been recognized that the survey infrequently encounters canary rockfish, and occasional large catches occur when canary aggregations are encountered. Good progress has been made in the development of appropriate analysis methods for these types of data. Selectivity for this survey was modeled as potentially dome shaped, but the fitted result was asymptotic. The overall trend for the survey is flat to declining from 2003 to 2013, with an increase in 2014. While the base model available biomass for this index falls mostly within the 95% confidence interval for the index, there are considerable systematic patterns in residuals.

Steepness and natural mortality

As steepness and natural mortality were both chosen as fixed values (based on meta-analyses), these rightly remain as major assessment uncertainties and a recommendation was made by the Panel to use both as major axes of uncertainty in presentation of results to management.

An objective procedure was used to determine bounds for steepness for an axis of uncertainty based on the available prior distribution. Other CIE reviews that I have been involved with also examined projections as part of the review – which was not done here, possibly because of the need for rebuilding analysis. Uncertainty in natural mortality has the potential for quite different influence on projection results to steepness. An objective procedure for the choice of bounds for natural mortality was unavailable so a pragmatic decision was taken to choose bounding *M* values that obtained the same current depletion levels as bounding steepness values. Such a choice specifically restricts the influence of uncertainty in natural mortality to projection results alone. Further work on an objective procedure for choosing bounds on natural mortality is required.

Model convergence

Evidence for model convergence was based on jittering starting values for estimated parameters. Additional evidence is provided by the smooth transitions of the likelihood profiles. The Panel agreed that acceptable evidence of convergence was provided.

Relative data weighting

Standardised procedures for relative weighting within and across different data sources (particularly length and age composition, age at length composition and abundance indices) is still an active area of current research. The STAT has used currently recommended procedures and demonstrated that alternative methods had little influence on model results.

2.3.4 Provide constructive suggestions for current improvements if technical deficiencies or major sources of uncertainty are identified.

Other than adjustments to the base model input data already noted, the Panel had no specific suggestions for further changes. The modified base case is the best currently available for the provision of management advice.

2.3.5 Determine whether the science reviewed is considered to be the best scientific information available.

Responses to earlier review recommendations

A required section of the draft stock assessment document is responses to STAR panel recommendations from the most recent previous assessment. Earlier recommendations that remain to be further address were: consideration of Canadian and Alaskan catches, comprehensive historical catch reconstruction for Washington, a joint US/Canadian assessment, establishment of a meta database of all data relevant to groundfish stock assessment, establishment of accessible online databases of all raw data relevant to groundfish assessments, establishment of a database of historical groundfish catch histories that include best estimates and also estimates of uncertainty.

Requests and responses during the meeting

The Panel requested additional model runs as part of the review. However, none of those runs resulted in new information that required a change to the base case, except in the modification of the historical catch series. The modified base case as presented during the meeting adequately employs the best available science to determine the status of the stock.

2.3.6 When possible, provide specific suggestions for future improvements in any relevant aspects of data collection and treatment, modeling approaches and technical issues, differentiating between the short-term and longer-term time frame.

Assessment documentation (short-term)

It would assist in the review process if reviewers were routinely given access to model source code so that they can run the draft base case prior to the review for themselves if they wish – particularly for SS assessments. It has been good practice to include the starter, data and control files in the draft assessment documentation so that settings can be examined directly in the document. However, there is advantage for reviewers to run the model and examine r4ss output – particularly as it may include diagnostics and plots that are not included in the draft assessment

document. As SS is constantly under development, it may also be the case (as here) that the SS version used is more recent than that available publicly from the NOAA toolbox. A simple solution would be to provide the draft base model source files and also the SS version used on the FTP site used for the review, at the same time as documents are made available prior to the meeting.

Standard inclusions in stock assessment documentation (short-term)

The Terms of Reference for the Groundfish and Coastal Pelagic Species Stock Assessment Review by the Pacific Fishery Management Council (September 2014) provides a good outline for stock assessment documents (Appendix B) that ensures consistency for draft assessments. While I hesitate to add to the standard requirements and therefore the work required of the STAT prior to review, there are a couple of items that could be considered, regarding bridging analysis and tables for comparison of sensitivity analyses.

A simple bridging analysis was provided by the STAT for canary rockfish, but a more complete analysis as I have detailed under 2.2.6 for the darkblotched assessment should be considered as a potential standard practice.

For comparison and evaluation of sensitivity analyses it has become standard practice elsewhere to construct tables such as those exampled below. I find such tables to be useful, and the construction of them could be considered as a specific requirement as part of the assessment outline within the ToR. My own preference is to examine pre-lambda likelihood components as a difference from the base model, but I understand that there may be further discussion on how this might be done if it was implemented as a standard procedure. The production of these tables could be automated to some extent via r4ss, to save cutting and pasting into a spreadsheet from various output files.

Case		SSB0	SSB2014	SSB2014/SSB0	M	RBC2014	RBClongterm
0	base case 20:35:43 *h* 0.75 *M* est	9,321	4,200	0.45	0.2367	1,146	1,106
1	steepness *h* 0.65	9,625	4,051	0.42	0.2399		1,034
2	steepness *h* 0.85	9,097	4,334	0.48	0.2344		1,164
3	natural mortality *M* 0.19	9,243	2,919	0.32	0.1900		872
4	natural mortality *M* 0.27	9,659	5,235	0.54	0.2700		1,319
5	age comp weighting 0.5	8,963	3,865	0.43	0.2375		1,051
6	age comp weighting 2	9,311	4,366	0.47	0.2358		1,117
7	age comp weighting 4	9,331	4,718	0.51	0.2333		1,117
8	length comp weighting 0.5	9,132	3,816	0.42	0.2340		1,087
9	length comp weighting 2	9,016	4,490	0.50	0.2418		1,077
10	recruitment to 2007/08	9,507	4,685	0.49	0.2379		1,134
11	no FIS	9,699	5,210	0.54	0.2422		1,179

Note: the 2014 RBC value is only shown for fully tuned models.

Case		Likelihood						
		TOTAL	Survey+CPUE	Length comp	Age comp	Recdevs	Parm_priors	Other
	base case 20:35:43 *h* 0.75							
0	*M* est	3523.13	-17.40	214.85	3337.11	-11.69	0.26	0.00
1	steepness *h* 0.65	1.15	-0.01	0.22	0.32	0.49	0.13	0.00
2	steepness *h* 0.85	-0.80	0.03	-0.17	-0.22	-0.34	-0.10	0.00
3	natural mortality *M* 0.19	55.02	-0.83	2.39	52.19	1.28	-0.01	0.00
4	natural mortality *M* 0.27	18.69	1.04	-0.37	17.77	0.22	0.03	0.00
5	age comp weighting 0.5	218.11	-0.25	-19.01	235.15	2.02	0.20	0.00
6	age comp weighting 2	-113.41	0.71	17.48	-131.59	0.05	-0.07	0.00
7	age comp weighting 4	-158.29	1.95	31.91	-193.64	1.58	-0.10	0.00
8	length comp weighting 0.5	-102.75	-1.34	20.02	-120.08	-1.28	-0.07	0.00
9	length comp weighting 2	251.57	1.75	-23.94	269.02	4.52	0.23	0.00
10	recruitment to 2007/08	0.85	0.32	0.46	-0.29	0.35	0.01	0.00
11	no FIS	-1.23	5.85	-1.06	-6.96	0.94	0.00	0.00

Examination of model input data (short-term)

A specific meeting to examine and sign off on assessment input data prior to the development of draft stock assessments would assist in the prevention of data issues becoming apparent later in the process – as occurred during this review particularly for canary rockfish. I understand that such meetings were held in the past, but the current process relies on good communication among individuals across the variety of federal and state organizations responsible for the various data sources. A specific data meeting could examine information across a broad range of species due for assessment, and would also assist with the development of more specific documentation of protocols used to compile best available data sets for stock assessment, and also begin work on procedures for the development of alternative series that capture uncertainty – particularly for historical catch and discards.

Continue work towards a joint US/Canadian assessment (short-term)

Incorporation of the best available Canadian composition, abundance index and catch data is required for the construction of a joint model. A decision also needs to be made regarding the best northern limit to use for the stock, potentially the Vancouver Island divergence zone.

Develop a more reliable index of adult abundance as an indicator of rebuilding (short/medium term)

Through examination of existing data (logbook?), or the commencement of a new survey (hook and line has been suggested by the STAT).

Further investigation of appropriate values for natural mortality and steepness (short/medium term)

Basic life history research may help to resolve assessment uncertainties regarding appropriate values for natural mortality and steepness, and how to best account for the apparent loss of older females in the population.

Continued improvement of the spatial model (short/medium term)

As suggested by the STAT, new tagging studies would be a good approach to determine movement rates among areas for inclusion in the model. Additional work on the geospatial index may better resolve differences in abundance trends among areas. An additional uncertainty made apparent by the spatial model is allocation of input data to individual areas. There was some concern that allocation according to port of landing may not be appropriate, and any further work to improve spatial assignment of data would be beneficial.

Standard diagnostics for spatial models (medium-term)

A recent paper by Punt et al. (2015) highlights that adding spatial model structural components (allowing separate stock dynamics by area, including distdevs, area-specific selectivity, allowing mixing) have the potential for the introduction of bias. How far this process should be taken depends on available data. There is a question of what standard diagnostics might assist with making the decision on how far to go with a spatial analysis, and what structural aspects are supported by available data. Punt et al. (2015) state that "we propose conducting sensitivity analyses based on several model configurations to select the appropriate structure for an assessment" and "the capacity to examine model residuals spatially remains valuable for inferring problems with model specification". What additional standard diagnostics (specifically that could be added to r4ss) might assist with this is an open question. New spatial models are likely to become more commonly proposed as the best currently available, and standard objective procedures for evaluation of spatial models are a work in progress.

2.3.7 Provide a brief description on panel review proceedings highlighting pertinent discussions, issues, effectiveness, and recommendations.

Terms of Reference and assignment of reporting duties

Additional detail on this item has been provided under 2.2.7 for darkblotched rockfish.

Agreement on the STAR Panel Meeting Report

All three Panel reviewers and the Chair provided consensus on the language that appears in the STAR Panel Meeting Report.

References

COSEWIC. 2009. COSEWIC assessment and status report on the Darkblotched Rockfish (Sebastes crameri) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 48 pp. (www.sararegistry.gc.ca/status/status_e.cfm).

DFO. 2010. Stock assessment update for British Columbia canary rockfish. DFO Can. Sci. Advis. Sec. Sci. Resp. 2009/019.

Hurtado-Ferro, F., Szuwalski, C. S., Valero, J. L., Anderson, S. C., Cunningham, C. J., Johnson, K. F., Licandeo, R., McGilliard, C. R., Monnahan, C. C., Muradian, M. L., Ono, K., Vert-Pre, K. A., Whitten, A. R., and Punt, A. E. 2014. Looking in the rear-view mirror: bias and retrospective patterns in integrated, age-structured stock assessment models. ICES J. Mar. Sci. doi: 10.1093/icesjms/fsu198

Punt, A.E., Haddon, M., Tuck, G.N. 2015. Which assessment configurations perform best in the face of spatial heterogeneity in fishing mortality, growth and recruitment? A case study based on pink ling in Australia. Fisheries Research 168:85–99

Appendix 1: Bibliography of materials provided for review

Draft Stock Assessment Documents:
Draft 2015 Canary rockfish assessment
Draft 2015 Darkblotched rockfish assessment

Background Materials
2013 Canary rockfish assessment
2013 Canary rockfish STAR panel report
2013 Canary rockfish CIE Reports

2013 Darkblotched rockfish assessment
2013 Darkblotched rockfish STAR Panel report
2013 Darkblotched rockfish CIE Reports

Hamel, O. Development of prediction intervals and priors for the natural mortality rate using multiple meta-analyses using life-history correlates. NOAA Fisheries, Northwest Fisheries Science Center, Seattle. 4/28/2013.

Karnowski, M, Vladlena Gertseva, and Andi Stephens. 2012. Historical Reconstruction of Oregon's Commercial Fisheries Landings. September, 2012.

NWFSC Observer Program. 2013. Data Products for Stock Assessment Authors. *8Jan. 2013.*

Punt, A.E., Smith, D.C., KrusicGolub, K. and Robertson, S. 2008. Quantifying age-reading error for use in fisheries stock assessments, with application to species in Australia's southern and eastern scalefish and shark fishery. Can. J. Fish. Aquat. Sci. 65: 1991–2005.

Ralston, S., Pearson, D., Field, J., and Key, M. 2009. Documentation of the California Catch Reconstruction Project. April 20, 2009.

Thorson, J. Estimating a Bayesian prior for steepness in Pacific rockfishes (*Sebastes* spp.) off the U.S. West Coast for the 2013 assessment cycle. April 1, 2013.

Thorson, J. T. and Ward, E. Accounting for space-time interactions in index standardization models.

Wallace, J. R. Applying the U.S. West Coast's First Major Trawl Bycatch and Mesh Size Studies to Fishery data using Post-hoc Fishing Strategies and Geographical Area. DRAFT.

Rare Catch Events-Related Manuscripts
Thorson, J.T., Stewart, I.J., and Punt, A.E. 2012. Development and application of an agent-based model to evaluate methods for estimating relative abundance indices for shoaling fish such as Pacific rockfish (Sebastes spp.). ICES Journal of Marine Science, 69(4), 635–647. doi:10.1093/icesjms/fss003.

Thorson, J.T., Stewart, I.J., and Punt, A.E. 2011. Accounting for fish shoals in single- and multi-species survey data using mixture distribution models. CJFAS – Proof.

Thorson, J.T. and Ward, E.J. *In press.* Accounting for space-time interactions in index standardization models.

Stock Synthesis Model-Related Documents

Methot, R. D. 2012. User Manual for Stock Synthesis Model Version 3.24f. Updated October 3, 2012. NOAA Fisheries, Seattle, Washington.

Methot, R. D. Stock Synthesis Technical Description.

Appendix 2: A copy of the CIE Statement of Work

Statement of Work

External Independent Peer Review by the Center for Independent Experts

Stock Assessment Review (STAR) Panel 1

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 National Marine Fisheries Service and the Pacific Fishery Management Council will hold four stock assessment review (STAR) panels and potentially one mop-up panel if needed, to evaluate and review benchmark assessments of Pacific coast groundfish stocks. The goals and objectives of the groundfish STAR process are to:

1) ensure that stock assessments represent the best available scientific information and facilitate the use of this information by the Council to adopt OFLs, ABCs, ACLs, (HGs), and ACTs;
2) meet the mandates of the Magnuson-Stevens Fisheries Conservation and Management Act (MSA) and other legal requirements;
3) follow a detailed calendar and fulfill explicit responsibilities for all participants to produce required reports and outcomes;
4) provide an independent external review of stock assessments;
5) increase understanding and acceptance of stock assessments and peer reviews by all members of the Council family;
6) identify research needed to improve assessments, reviews, and fishery management in the future; and
7) use assessment and review resources effectively and efficiently.

Benchmark stock assessments will be conducted and reviewed for darkblotched and canary rockfishes. Both species have been declared overfished and have been managed for over a decade under rebuilding plans. The last benchmark stock assessment for darkblotched rockfish

was conducted in 2013, and it indicated that the west coast stock was at 36 percent of the unexploited level. Forecasts indicated that the stock was likely to reach its rebuilding target within the next few years. It appears that the modeled improvement in stock status from prior assessments can be attributed primarily to: 1) reduced fishing mortality since the onset of the rebuilding program in 2000, 2) inferences that follow from more favorable perceptions of steepness, fecundity, and age-at-maturity of the stock, and 3) length and age data indicating relatively large recruitments in 1999, 2000 and 2008. The Pacific Fishery Management Council's Scientific and Statistical Committee (SSC) recommended a full benchmark assessment be conducted for darkblotched rockfish so that model sensitivity to the treatment of uncertain parameters can be further explored during this assessment cycle.

The last benchmark stock assessment for canary rockfish was conducted in 2007 with subsequent updates in 2009 and 2011. The NWFSC anticipates substantial improvements to the treatment and inclusion of data and modeling for the assessment of this stock. Although canary is not expected to finish rebuilding for many decades, the stock is a very important one that creates bycatch challenges for several sectors of the commercial and recreational fishing fleets along the west coast. Because the scope of changes within assessment updates is highly restricted, a full assessment is needed in order to thoroughly examine and review structural and data choices for modeling this stock. The SSC supports the recommendation for this assessment to be conducted as a benchmark.

Assessments for these two stocks will provide the basis for the management of the groundfish fisheries off the West Coast of the U.S. including providing scientific basis for setting OFLs and ABCs as mandated by the Magnuson-Stevens Act. The technical review will take place during a formal, public, multiple-day meeting of fishery stock assessment experts. Participation of external, independent reviewer is an essential part of the review process. 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**.

Requirements for CIE Reviewers: Two CIE reviewers shall conduct an impartial and independent peer review in accordance with the SoW and ToRs herein. One of the CIE reviewers will participate in all STAR panels held in 2015 to provide a level of consistency between the STAR panels. The CIE reviewers shall be active and engaged participants throughout panel discussions and able to voice concerns, suggestions, and improvements while respectfully interacting with other review panel members, advisors, and stock assessment technical teams. The CIE reviewers shall have excellent communication skills in addition to working knowledge and recent experience in fish population dynamics, with experience in the integrated analysis modeling approach, using age-and size-structured models, use of MCMC to develop confidence intervals, and use of Generalized Linear Models in stock assessment models. Each CIE reviewer's duties shall not exceed a maximum of 14 days to complete all work tasks of the peer review described herein.

Location of Peer Review: For the STAR panel 1 review, each CIE reviewer shall conduct an independent peer review during the panel review meeting **tentatively scheduled in Seattle, Washington) during the dates of April 27 through May 1, 2015.**

Statement of Tasks: Each CIE reviewers shall complete the following tasks in accordance with the SoW and Schedule of Milestones and Deliverables herein.

Prior to the Peer Review: 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 than 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: 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. Documents to be provided to the CIE reviewers prior to the STAR Panel meeting include:

- The current draft stock assessment reports;
- The Pacific Fishery Management Council's Scientific and Statistical Committee's Terms of Reference for Stock Assessments and STAR Panel Reviews;
- Stock Synthesis (SS) Documentation
- Additional supporting documents as available.
- An electronic copy of the data, the parameters, and the model used for the assessments (if requested by reviewer).

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 cannot 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.

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 Summary Report: Each CIE reviewer may assist the Chair of the panel review meeting with contributions to the Summary Report, based on the terms of reference of the review. Each CIE reviewer is 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 STAR Panel 1 review meeting in **tentatively scheduled in Seattle, Washington) during the dates of April 27 through May 1, 2015** as specified herein, and conduct an independent peer review in accordance with the ToRs (**Annex 2**).
3) No later than **May 15, 2015**, each CIE reviewer shall submit an independent peer review report addressed to the "Center for Independent Experts," and sent to Dr. Manoj Shivlani, CIE Lead Coordinator, via email to *shivlanim@bellsouth.net*, and to Dr. David Die, CIE Regional Coordinator, via email to *ddie@rsmas.miami.edu*. Each CIE report shall be written using the format and content requirements specified in Annex 1, and address each ToR in **Annex 2**.

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

March 24, 2015	CIE sends reviewer contact information to the COR, who then sends this to the NMFS Project Contact
April 13, 2015	NMFS Project Contact sends the CIE Reviewers the pre-review documents
April 27 through May 1, 2015	Each reviewer participates and conducts an independent peer review during the panel review meeting
May 15, 2015	CIE reviewers submit draft CIE independent peer review reports to the CIE Lead Coordinator and CIE Regional Coordinator
May 29, 2015	CIE submits CIE independent peer review reports to the COR
June 2, 2015	The COR distributes the final CIE reports to the NMFS Project Contact and regional Center Director

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 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, COTR
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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 the findings and recommendations, and specify whether the science reviewed is the best scientific information available.

2. The main body of the reviewer report shall consist of a Background, Description of the Individual Reviewer's Role in the Review Activities, Summary of Findings for each ToR in which the weaknesses and strengths are described, and Conclusions and Recommendations in accordance with the ToRs.

   a. Reviewers should describe in their own words the review activities completed during the panel review meeting, including providing a brief summary of findings, of the science, 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 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 weaknesses and strengths of the science reviewed, regardless of whether or not they read the 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: Terms of Reference for the Peer Review

Stock Assessment Review (STAR) Panel 1

1. Become familiar with the draft stock assessment documents, data inputs, and analytical models along with other pertinent information (e.g. previous assessments and STAR panel report when available) prior to review panel meeting.
2. Discuss the technical merits and deficiencies of the input data and analytical methods during the open review panel meeting.
3. Evaluate model assumptions, estimates, and major sources of uncertainty.
4. Provide constructive suggestions for current improvements if technical deficiencies or major sources of uncertainty are identified.
5. Determine whether the science reviewed is considered to be the best scientific information available.
6. When possible, provide specific suggestions for future improvements in any relevant aspects of data collection and treatment, modeling approaches and technical issues, differentiating between the short-term and longer-term time frame.
7. Provide a brief description on panel review proceedings highlighting pertinent discussions, issues, effectiveness, and recommendations.

Annex 3: Tentative Agenda

Stock Assessment Review (STAR) Panel 1
Hotel Deca
4507 Brooklyn Ave NE, Seattle, WA 98105
Seattle, Washington

April 27 through May 1, 2015

Monday, April 27

8:30 a.m.	Welcome and Introductions
9:15 a.m.	Review the Draft Agenda and Discuss Meeting Format (Chair) - Review Terms of Reference (TOR) for assessments and STAR panel - Assign reporting duties - Discuss and agree to format for the final assessment document - Agree on time and method for accepting public comments
9:30 a.m.	Presentation of Assessment 1 - Overview of data and modeling
12:30 p.m.	Lunch (On Your Own) Q&A
1:30 p.m.	session with STAT_1 STAR Panel discussion - Panel develops written request for additional model runs / analyses
3:30 p.m.	Presentation of Assessment_2 (if time allows) - Overview of data and modeling
5:30 p.m.	Adjourn for Day.

Tuesday, April 28

8:30 a.m.	Continue Presentation of Assessment_2 -- Overview of data and modeling
12:00 p.m.	Lunch (On Your Own)
1:30 p.m.	Q&A Session with STAT_ 2 Panel Discussion - Panel develops written request for additional model runs / analyses
4:30 p.m.	Check in with –STAT_1
5:30 p.m.	Adjourn for Day.

Stock Assessment Review (STAR) Panel 1

Wednesday, April 29

8:30 a.m. Presentation of First Set of Model Runs
- Q&A session with STAT_1 & Panel discussion
- Panel develops request for second round of model runs / analyses –STAT_1

12:00 p.m. Lunch

1:30 p.m. Presentation of First Set of Model Runs
- Q&A session –STAT_2 & panel discussion
- Panel develops request for second round of model runs / analyses –STAT_2.

5:30 p.m. Adjourn for day.

Thursday, April 30

8:30 a.m. Presentation of Second Set of Model Runs
- Q&A session –STAT_1 & panel discussion
- Agreement of preferred model and model runs for decision table - Panel continues drafting STAR report.

12:00 p.m. Lunch (On Your Own)

1:00 p.m. Presentation of Second Set of Model Runs
- Q&A session –STAT_2 & panel discussion
- Agreement of preferred model and model runs for decision table - Panel continues drafting STAR report.

4:00 p.m. Continue Panel Discussion or Drafting STAR Panel Report

5:30 p.m. Adjourn for day.

Friday, May 1

8:30 a.m. Consideration of Remaining Issues
- Review decision tables for assessments

10:00 a.m. Panel Report Drafting Session

12:00 p.m. Lunch (on your own)

2:00 p.m. Review First Draft of STAR Panel Report

4:00 p.m. Panel Agrees to Process for Completing Final STAR Report by Council's June Meeting Briefing Book Deadline

5:30 p.m. Review Panel Adjourn.

Appendix 3: List of participants

STAR Panel Members
Tom Jagielo, Scientific and Statistical Committee, Panel Chair
Neil Klaer, Center for Independent Experts
Stuart Reeves, Center for Independent Experts
James Ianelli, NMFS Alaska Fisheries Science Center

Stock Assessment Team (STAT) Members
Vladlena Gertseva, NMFS Northwest Fisheries Science Center
Sean Matson, NMFS West Coast Region

STAR Panel Advisors
Daniel Erickson, Oregon Department of Fisheries and Wildlife, Groundfish Management Team
Dan Waldeck, Pacific Whiting Conservation Cooperative, Groundfish Advisory Subpanel
John DeVore, Pacific Fishery Management Council