STAR Coast-wide Widow Rockfish and Oregon Kelp Greenling Assessments Center for Independent Experts (CIE) Independent Peer Review Report

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1 Executive Summary

This STAR panel reviewed benchmark stock assessments for widow rockfish and kelp greenling. As a result of the meeting, the Panel produced a STAR Panel Review Report, which represented the consensus view of the Panel and the STAT for each assessment.

For widow rockfish, the main issues discussed were the suitability of bottom trawl surveys for a species (which is, at least some of the time, semi-pelagic), the treatment of historical catches, stock definitions, treatment of age-length data and development of prior probabilities. For kelp greenling, the main issues discussed were fixing errors in the MRFSS data sets, making improvements to the growth model, development of a prior probability for natural mortality.

Base case models were agreed for both assessments after suitable explorations and adjustments of the assessments and uncertainty. For widow rockfish, a suitable range that bracketed uncertainty around the base case, based on natural mortality, stock-recruit steepness and the 2010 year class strength, was used as the basis for a decision table. For kelp greenling, the natural mortality prior was used to bracket uncertainty for the same purpose.

The main limitations on the assessments are due to the available data. The most important recommendations for these assessments, in my opinion, are:

- Clean the MRFSS data for recreational fisheries and make the documented cleaned data set available for future stock assessments.
- Develop an alternative likelihood to the conditional age-at-length in SS3, which allows direct use of the age composition in determining population age structure, where appropriate.
- Sample shore-based and estuary recreational fisheries for length and age.
- Incorporate age-length data in a kelp greenling assessment that can account for within-year growth.
- Consider adding a data workshop to the STAR process to ensure best use of the available data.

The conclusion of the review was that the final agreed base models were well structured, thoroughly investigated by the STAT and were the best currently available for the formulation of management advice.

2 Background

The Office of Science and Technology coordinates and manages a contract providing external expertise through the (CIE) to conduct independent peer reviews of National Marine Fisheries Service (NMFS) scientific projects. This independent peer review report is a deliverable for this process. The Statement of Work (Appendix 2) provides more details of the process and requirements.

This STAR panel reviewed benchmark stock assessments for widow rockfish and kelp greenling. The National Marine Fisheries Service and the Pacific Fishery Management Council have conducted four stock assessment review (STAR) panels to evaluate and review benchmark assessments of Pacific coast groundfish stocks, of which this was the last scheduled for 2015.

Widow rockfish is an important species to the commercial trawl fishery. It was managed under a rebuilding plan for roughly a decade, until the 2011 assessment provided a basis for determining that the stock had surpassed the rebuilding target. A benchmark assessment was commissioned, supported by the Scientific and Statistical Committee (SSC), to fully review the structure and parameterization of the widow model, and reduce uncertainty regarding the true state of the stock before a large-scale target fishery would be initiated.

Kelp greenling is an important species in nearshore recreational and commercial line-gear fisheries. This stock has been managed in recent years based on an Oregon-only 2005 benchmark assessment, and the results of more recent data-poor (catch-only) assessments for other portions of its range. A

new assessment was considered important for Oregon due to changes in estimates of the historical catch.

These assessments should provide the basis for the management of the widow rockfish and kelp greenling stocks off the West Coast of the U.S., including providing scientific basis for setting OFLs and ABCs as mandated by the Magnuson-Stevens Act.

3 Description of the Individual Reviewers Role in the Review Activities

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.

In general, documentation of the stock assessments was complete. Reporting of the assessments, models and data were provided in good time before the review allowing reviewers to become familiar with the assessments and any issues identified by the STAT. Appendix 1 contains a list of the documents provided, which included the stock assessment report, models and data, previous stock assessments and other background documents.

Access to documents, including data, models, software and diagnostic output, were provided by through an FTP site. This was used as the main way to share documents during the review and the approach worked well.

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

The technical review took place during a formal, public, five-day meeting of fishery stock assessment experts. The 2015 STAR Panel 4 Review Meeting took place as scheduled, in Newport, Oregon during the dates of July 27-31, 2015.

I took full part in the panel review meeting, which mainly consisted of presentations by the STAT of their stock assessments and outlining the main issues which needed to be resolved, discussions of the assessments between the Review Panel and the STAT, and setting additional runs to check on model behavior and identifying appropriate runs to represent the range of uncertainty for the decision table.

The main issues discussed were:

- Widow survey data and the suitability of bottom trawl surveys for a species which is, at least some of the time, semi-pelagic.
- Appropriate methods to provide relative weights to data sources, particularly age and size compositions.
- Conditional age-at-length likelihood and how to make best use of the available age composition data.
- Problems with the MRFSS data and fixes applied in the kelp greenling assessment.
- Improving estimation of growth in kelp greenling.
- Historical catches of both species, and recent inshore catches of kelp greenling.
- Stock delineation with Canada for widow rockfish, and between Oregon and adjoining states for kelp greenling.
- Basis for the prior probabilities for natural mortality and steepness

For each stock, the STAT and review panel agreed the base case, which was the STAT original base case with some adjustments in data used, weighting and model structure as outlined in the STAR Panel

Report. In addition, two sensitivity runs were identified to bracket the uncertainty around this base case consistent with guidance provided by the SSC.

Generally, the diagnostics provided by the STAT were excellent. No significant retrospective patterns were evident in the assessments. For the final agreed assessments, errors in residual and observed expected plots seemed acceptable.

Industry and fishery management representatives were present at the meeting. It was noted that these meetings use unavoidable technical jargon, which makes it difficult for people who are not fishery scientists to follow.

As a result of the meeting, the Panel produced a joint STAR Panel Review Report, which I contributed to as a rapporteur focused on the assessment uncertainty as well as other sections. This report represented the consensus view of the Panel and the STAT for each assessment. There were no major disagreements between members of the Panel or STAT. There were some small differences in opinion over importance of different issues and the following report represents my view on these.

4 Summary of Findings

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

The assessments used the latest version of Stock Synthesis 3 (v. 3.24u). Stock Synthesis software (SS3) is well-tested standard software implementing a catch-at-age stock assessment model that can be adapted to use a wide variety of data. Stock Synthesis was originally developed for US west coast fisheries, so is particularly appropriate for these stocks. However, SS3 is developing faster than it is being documented, so that a number of technical features are omitted or inadequately described. Fortunately, some members of the panel were very familiar with SS3 software and able to provide good insight into how it functioned.

It is possible that the widow rockfish coast-wide US stock is shared with Canada. Little is known about the Canada widow rockfish population; the last assessment was attempted in 2000. No recent information from Canada was available for this stock assessment.

The kelp greenling assessment was limited to Oregon waters, again without strong evidence that this constitutes a single biological stock, albeit it might form a convenient management unit. Since adults are not likely to migrate much, this is not an unreasonable approach to manage areas convenient to the management system.

Widow catches were not considered a significant source of uncertainty after 1980, when landings were recorded for widow rockfish separate to other rockfish. This had been done for the majority of catches since the major expansion in landings (“hunt for widow rockfish”). The main uncertainty in the 1980s is most likely associated with demersal trawl landings, which recorded a significantly smaller proportion of the landings than midwater trawl. Before 1980, substantial catches may have been taken by foreign fleets, but sensitivity analyses indicated that this uncertainty has little impact on current stock status. Information is available to estimate discarding consistent with changes in fisheries management and there is no reason to think discarding could substantially increase uncertainty.

Significant amounts of catch data are missing for kelp greenling, specifically inshore recreational catches. Given this, the approach to estimating recent catches was not unreasonable (interpolation). However, it will be important that trip sampling cover shore-based and estuary fisheries, so that more accurate stock assessments can be carried on all inshore stocks targeted by these fisheries in future.

The available widow rockfish maturity curves for Oregon and California were based on maturity data from 1980s. The maturity ogive was a combined curve weighted by sampling rather than population

biomass. Given the limited data available, this is reasonable, as data are insufficient to detect differences in age-at-maturity in different areas.

It was determined that the rockfish prior on steepness used for widow rockfish contained the previous likelihood profile from the 2011 widow rockfish stock assessment. This is incorrect and, therefore, a new prior was generated and used based on all other rockfish excluding widow.

Although fleet definitions have changed since the last stock assessment, they seem consistent with the available information. Sensitivity runs confirm that new fleet definitions are consistent with main differences observed in the data. Selectivity blocks were defined to coincide with changes in management, so clear reasons exist for the blocks selected.

A new juvenile (recruitment) index was added to the widow assessment. There was little evidence that the index was reliably estimating recruitment. The index did influence the most recent year classes and would affect projections. However, without confirmation from other information sources, particularly age and length compositions, that it can detect strong year classes, the juvenile index may be providing misleading information. Given a time series of recruitment deviates from the assessment, different treatments of the juvenile index data might be explored to see whether it could be improved.

Unlike assessments for other species, the triennial survey was not split into two time periods. The split has been used to reduce the impact of possible changes in catchability. However, it was noted that splitting index time series significantly reduced their usefulness, and there was no evidence that such a split was necessary in this case. For widow rockfish, the survey was not particularly informative, which might be the underlying reason why it was not necessary to split the time series.

Survey length compositions were expanded based on generalized linear mixed model (GLMM) estimates of biomass. It was recognized that this was better than using area-based expansions. However, it was noted that the approach would be improved if the expansion across strata was based on estimated numbers rather than biomass. This was corrected by converting GLMM biomass to numbers using an estimate of mean weight within each stratum. This approach to weighting should be better than alternatives since it was more internally consistent than generating weights from outside the GLMM.

Surveys covering widow rockfish are affected by “extreme catch events” (ECE), where single hauls with large widow catch can have an undue influence on survey abundance estimates. The survey index was generated using a GLMM standardization that allowed for these rare events. Although the STAR Panel did not review the ECE models in detail, in principle GLMM do make sense in adjusting indices, since they account for noise which otherwise may obscure the signal in the index.

It is possible that growth differences might occur between areas for widow rockfish. However, examination of diagnostics did not indicate systematic changes in length at age either over time or latitude. Specifically, CVs on length at age were relatively low. Kelp greenling data covered a narrow latitude range and this is also likely not a significant source of uncertainty.

Stock recruitment steepness was examined as a potential source of uncertainty. For widow, there is no information in the data to estimate steepness, despite the depletion of the stock from 1980-2000 and subsequent recovery over 2000-2015. Therefore, the widow steepness depends on the prior generated from other rockfish stocks. Kelp greenling is probably relatively lightly exploited, so steepness will be difficult to estimate for this stock.

For widow rockfish, MCMC was used to estimate the parameter probability density. Although the simulation was not completed, diagnostics indicated that the majority of parameters had most likely converged. No MCMC was carried out for kelp greenling. MCMC is very useful as it maps out the likelihood rather than focusing on the single point just the mode. However, it can be very time consuming to complete and does not always provide reliable results.

The estimated natural mortality for widow rockfish from the model is much higher than expected, considering the maximum age. However, it is clear that there is strong support in the data for the estimated natural mortality. Data were insufficient to estimate natural mortality in the kelp greenling

assessment. The lack of information on steepness suggests that steepness is high and/or the stock was not as depleted as previously thought during this period.

While there was concern over the approach to weighting different sources of information, the results do not appear to be sensitive to any of the available choices ("Francis" or harmonic mean weights), at least for these stock assessments. The approach to this issue may be revised based on planned simulation work, which appears to be the only way it will be resolved.

A problem identified in SS3 is that minimum effective sample size on composition data is 1.0, which could lead to over-weighting the smallest samples as relative weights are adjusted. This was checked and determined not to be a problem in these cases.

Often, reviews have identified domed-shaped selectivity as a significant source of uncertainty because stock status is sensitive to this selectivity assumption. For these assessments this was not the case because selectivity for key abundance indices was not domed-shaped.

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

The sensitivity analyses suggested that the models are robust to their main assumptions. Estimates of most of the critical parameters for determining stock productivity and long term sustainable catches are reasonable. The Beverton and Holt stock-recruit relationship steepness parameter could not be estimated, which is a common problem in stock assessments. Natural mortality was estimated for widow, but not for kelp greenling. Other key parameters, such as R_0, were estimated in these assessments.

Natural mortality was a major source of uncertainty for both assessments, particularly in determining sustainable catch. For widow, natural mortality, steepness and the strength of the 2010 year class were combined into a single axis of uncertainty. For kelp greenling, natural mortality was used alone. These parameters determined the most plausible uncertainty for these assessments.

It was not possible to determine good weighting procedures for composition data. The Francis (2011) procedure could work well, but was not used for these assessments because the SS3 implementation was not reliable. Therefore, the harmonic mean approach was used. Perhaps the main problem with the Francis approach is that data that fit the model better will tend to get higher weight, which may lead to underestimates of uncertainty. While evidence in the data of an appropriate response might validate a data source (e.g. changes in catches matched to corresponding changes in abundance), it is better to provide some sort of logical justification for causality rather than rely on measures of fit.

Information on widow catches before 1980 is poor. The estimates of catch from this period are likely to be as good as can now possibly be obtained. However, for the widow assessment, the current stock status is not sensitive to reasonable range of catches from this period. In order to explain more recent data, the model predicts higher than expected recruitment just before the very high catches observed in the "hunt for widow" period. This is not unreasonable as strong recruitment and inflated widow biomass could easily have initiated this rapid increase in widow catch as catch rates for this species would encourage its exploitation. This should therefore remain the base case.

An alternative hypothesis is that catches of widow before 1980 are much higher than currently estimated. This would likely increase the initial stock size (B_0), which would likely require adjustments in productivity parameters (growth, maximum recruitment, steepness, natural mortality). However, the model is essentially extrapolating the stock size from the period where information exists (after 1982) to the start of the fishery using only catches. There is no reason why the dynamics or productivity might have changed, but if they have changed, the recent productivity regime is still the most relevant for management decisions now.

The widow model estimates a different natural mortality for males and females. The estimated difference explains the different sex ratio at age, and can itself be explained by size dependent natural mortality. Based on the model described by Lorenzen (2005), natural mortality at unit size can be calculated from the mortality and growth parameters. Assuming this natural mortality at unit length is

the same for both males and females, the natural mortality for males can be calculated from the female estimate:

$$M_M = \frac{M_F L_{\infty F} K_F \,\mathrm{Ln}\left(\frac{L_{aM}}{L_{aM} + L_{\infty M}\left(e^{K_M t} - 1\right)}\right)}{L_{\infty M} K_M \,\mathrm{Ln}\left(\frac{L_{aF}}{L_{aF} + L_{\infty F}\left(e^{K_F t} - 1\right)}\right)}$$

Where subscripts M and F refer to males and females respectively, K and L_∞ = von Bertalanffy growth parameters, L_a = length at the minimum age, and t = maximum age – minimum age. Based on the female natural mortality estimate and the estimated growth parameters for both sexes, using this equation the male natural mortality would be 0.1741, whereas the free estimate within the stock assessment (original base model) was 0.1730. These estimates are very similar suggesting that, at least in this case, size dependent mortality provides a mechanism for observed sex ratios.

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

Some improvements were identified in the STAR Panel review meeting and implemented by the STAT. Based on the diagnostics, these changes seem to improve the assessments.

For widow rockfish, changes to the assessment were relatively small. The main changes included weighting using numbers of fish rather than biomass when combining composition data, adjustments to using age and length separately in the fisheries-dependent composition data, using conditional age-at-length in the fishery-independent data to estimate growth, and using a prior on steepness excluding the 2011 widow likelihood. The various adjustments to the model resulted in the 2010 year class being less extreme than previously estimated, and the new estimate being more believable.

For kelp greenling, changes to the assessment were more significant, and included the following. The MRFSS length compositions were corrected as far as possible, but the MRFSS CPUE index was excluded because trips could not be reliably identified. The growth model and data were adjusted to improve the growth model fit, and a new ageing error vector was used. Finally, the commercial logbook filter was adjusted to include more data, hopefully making the CPUE index more accurate.

These are the changes that could be undertaken to improve these assessments at this time. Further improvements have been recommended, but are not critical for determining immediate management actions.

5 Conclusions and Recommendations

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

For both assessments, the final agreed base models were well structured, thoroughly investigated by the STAT and were the best currently available for the formulation of management advice. Some further improvements in the models are possible, particularly the kelp greenling assessment, but the data remain the main limitation in providing scientific advice for these stocks. The main issues are addressed by improvements outlined below.

5.2 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.

A more complete list of recommendations was provided in the STAR Panel Review report. The following recommendations are those that I believe could have the greatest impact on future assessments.

The MRFSS data should be cleaned at source. As the MRFSS program is complete, it should only be necessary to do this once, and the clean data provided to all future assessments for all species covered by this program. This would avoid the STAT having to repeat the task each cycle, not only making time for other work, but reducing the chance of errors in data preparation. Specifically, the following tasks need to be completed:

- Identify all catch and effort records belonging to the same fishing trip.
- Remove all calculated values (length and weight) to avoid them being used as observations.
- Remove, or clearly mark as not valid data, outliers and values that are incorrect. In some cases, obvious corrections can be applied (correct the decimal place etc.).
- Document the data and the cleaning process clearly.

Where historical catches are uncertain, it may be worth routinely excluding historical catches and running the model starting from the point where catches were recorded reliably. This would provide a test of the importance of historical catch assumptions.

Although historical catches can have a significant impact of stock assessment results, it is rarely possible to improve on previous catch reconstructions, and therefore it is probably not worth trying to re-estimate them. If the assessment is sensitive to historical catch assumptions, it may be better to develop an acceptable minimum and maximum plausible range for the catches for use in sensitivity analyses rather than a single “best guess” time series. A range would improve assessments even if more accurate historical catch data cannot be obtained.

It is worth considering alternative options to conditional age-at-length in SS3. Conditional age-at-length removed any direct relationship between age and population age-structure. When that was restored, the assessments in this case appeared to improve. Conditional length-at-age or joint age-length likelihoods could be included in SS3 easily enough. As argued for conditional age-at-length, these likelihoods would avoid the double use of fish for both age and size information as well as contain more detailed information on size-at-age for improving the growth parameter estimates. Unlike conditional age-at-length, the ages must be randomly sampled so that they reflect the catch length and age composition. However, where age compositions are thought to reflect population age structure and particularly if samples are close to the asymptotic length, these alternative likelihoods would be an improvement.

The composition data can be fitted either as a joint age-length (effectively fitting the expected number of observations in the age-length key) or as conditional length-at-age. In the former case, both the age and length frequency should represent the catch age and length composition, whereas in the latter case only the age needs to reflect the catch age composition. If sampling is random with respect to length, it can be assumed that it is also random with respect to age. Therefore, there seems little reason not to fit the expected to observed numbers in the sample in each age-length bin (i.e. fit the age-length key). Note that it is possible to improve the model fitting efficiency if it is assumed that growth does not change over time, in which case data can be combined across years into a single age-length matrix.

Sampling from the estuary and shore based recreational fisheries should be a priority for kelp greenling. Sampling would estimate catches for these sectors correctly, develop an abundance index for young fish and provide improved estimates of growth.

The kelp greenling growth model was not well-estimated mostly due to a lack of length and age data for smaller fish, which seemed primarily caught close to shore. If significant numbers of these fish can be aged, random samples can be taken to get both age and length composition. Otherwise, age sampling can target a range of sizes and use conditional age-at-length to estimate growth.

It would be valuable to try to account for within-season growth for kelp greenling. This would depend on getting more samples of younger fish, but would also be improved by using within-year time steps in SS3. A more efficient option, if it became available, would be to record ages with smaller increments than a year. This would avoid splitting data into smaller time steps but capture the fast growth of young fish. The age would be determined by the number of rings and the time of year when the kelp greenling is caught.

It may be worth estimating sex difference in mortality as a difference rather than an independent value in widow rockfish. This difference could also be calculated based on size dependent mortality (Lorenzen 2005), which may be more parsimonious and could work well in some circumstances.

There is a dependence on the prior probability for natural mortality based on the maximum age observed in age composition samples. It is not clear that methods currently used in defining natural mortality priors are robust, and this could be easily explored using simulations.

A significant amount of time of the review meeting was spent discussing data rather than the models. A data workshop to address data issues would be valuable before carrying out the assessments. The workshop could make key decisions on making sure the best data available was used in the most appropriate way, rather than relying on the STAT to determine this alone.

It might be more valuable to schedule a part of the STAR review meeting when industry and managers can specifically be invited to attend. This could be used as an opportunity to present initial findings in as non-technical way as possible, and to ask questions particularly of industry representatives. Although representatives may still decide to attend the whole meeting, agreeing a shorter period within the whole review meeting may be more convenient and efficient for them.

Technical documentation of SS3 might be improved by maintaining a living document approach to recording on-going changes in SS3 alongside the manual. It would be useful to have a more up-to-date technical description of exactly what the likelihoods are and how different options treat the data.

6 Appendix 1: Bibliography of materials provided for review

Francis, R. I. C. C. 2011. Data weighting in statistical fisheries stock assessment models. Canadian Journal of Fisheries and Aquatic Sciences 68:1124–1138.

Lorenzen, K. 2005. Population dynamics and potential of fisheries stock enhancement: practical theory for assessment and policy analysis. Philosophical Transactions of the Royal Society of London. Fisheries Theme Issue 2004.

AGENDA_STARPanel4_WidowRF&KelpGreenling.pdf

KelpGreenling2015_STAR.pdf

KelpGreenling2015_preSTARbase.zip

WidowAssessment2015_preSTARdraft.pdf

7.01_Widow2015_PreSTARplots.zip

7.01_Widow2015_preSTARbase.zip

CA Catch Reconstruction.Final.pdf

Downloading and Preparing RecFIN Data Directly.docx

ForeignCatch Reconstruction_Rogers2003.pdf

G4a_Att6_Widow_STAR_Report_final.docx

He_et_al_WidowStockAssessment_2009_PostSTAR_8_26_2009_Council_BriefingBook.pdf

Identifying Trips in RecFIN.docx

KG05_FINAL.pdf

KelpGreenling2015_NewBC_ExecSum.docx

KelpGreenling_Model_Files.zip

KelpGreenling_PreSTAR_Updated_BC _SSfiles/

KelpGreenling_r4ss.zip

Kelp_Greenling_STAR.doc

Methot_Wetzel_2013_SS_Fish_Res_Appendix.pdf

Nearshore_Assessments_Workshop_Report_Final.docx

SAFE_Dec2014_v12.pdf

SS_User_Manual_3.24s.pdf

Steepness_Prior_2015_Thorson.docx

Stock_Assessment_ToR_2015-16.docx

Thorson Shelton Ward Skaug 2015-- ICESJMS.pdf

Thorson Stewart and Punt 2011-- CJFAS.pdf

WidowStockAssessment_2011.pdf

Widow_STAR_report_2009_final.pdf

7 Appendix 2: A copy of the CIE Statement of Work

External Independent Peer Review by the Center for Independent Experts

Stock Assessment Review (STAR) Panel 4

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 widow rockfish and kelp greenling. Widow rockfish is an extremely important species to the commercial trawl fishery. It was managed under a rebuilding plan for roughly a decade, until the 2011 assessment provided a basis for determining that the stock had surpassed the rebuilding target. In the wake of the last assessment concerns were expressed regarding model changes that occurred during the final review panel (i.e. mop-up panel). As a consequence, the Pacific Fishery Management Council has since been more conservative than called for by its default harvest policy in managing the stock. However, following the 2011 start of a catch-share program in the trawl fishery, fleet interest has grown for restoring a mid-water target fishery for widow rockfish. A benchmark assessment is needed, and supported by the SSC, to fully review the structure and parameterization of the widow model and reduce uncertainty regarding the true state of the stock before a large-scale target fishery is initiated.

Kelp greenling is an important species in nearshore recreational and commercial line-gear fisheries. This stock has been managed in recent years based on an Oregon-only benchmark assessment (conducted in 2005), and the results of more recent data-poor (catch-only) assessments for other portions of its range. The importance of conducting a new assessment for kelp greenling was elevated in early 2014, when the Pacific Fishery Management Council's Scientific and Statistical Committee discovered that the catch history used in the last assessment (2005, for Oregon only) was very different than the reconstructed catch history, which was completed more recently. The 2015 benchmark assessment for kelp greenling will focus on the portion of the stock off of Oregon. As time permits, a data-poor or data-moderate model may also be developed for the portion of the stock off of Washington.

These assessments will provide the basis for the management of the widow rockfish and kelp greenling stocks 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 4 review**, each CIE reviewer shall conduct an independent peer review during the panel review meeting **scheduled in Newport, Oregon during the dates of July 27-31, 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 Newport, Oregon) during the dates of July 27-31 , 2015 as specified herein, and conduct an independent peer review in accordance with the ToRs (Annex 2).
3) No later than August 7, 2015, 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@ntvifederal.com*, 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.

June 15, 2015	CIE sends reviewer contact information to the COR, who then sends this to the NMFS Project Contact
July 6, 2015	NMFS Project Contact sends the CIE Reviewers the pre-review documents
July 27-31, 2015	Each reviewer participates and conducts an independent peer review during the panel review meeting
August 7, 2015	CIE reviewers submit draft CIE independent peer review reports to the CIE Lead Coordinator and CIE Regional Coordinator
August 21, 2015	CIE submits CIE independent peer review reports to the COR
August 28, 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:

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NMFS Office of Science and Technology
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Manoj Shivlani, CIE Lead Coordinator
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Project Personnel:
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Stacey Miller, NMFS Project Contact
National Marine Fisheries Service,
55 Great Republic Drive,
Gloucester, MA 01930
Stacey.Miller@noaa.gov Phone: 978-281-9203

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 4

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

Final Agenda to be provided two weeks prior to the meeting with draft assessments and background materials.

Stock Assessment Review (STAR) Panel 4
Newport Research Station, Bld. 955
2032 SE OSU Drive,
Newport, Oregon 97365
Phone: 541-867-0500

July 27-31, 2015

Monday, July 27

8:30 a.m.	Welcome and Introductions
9:15 a.m.	Review the Draft Agenda and Discuss Meeting Format (SSC 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)
1:30 p.m.	Q&A 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, July 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 4

Wednesday, July 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, July 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, July 31

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 September Meeting Briefing Book Deadline
5:30 p.m.	Review Panel Adjourn.

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

NMFS, Northwest Fisheries Science Center

Newport Research Station, Bld. 955

2032 SE OSU Drive

Newport, OR 97365

July 27-31, 2015

STAR Panel Members

Dr. David Sampson, Oregon State University, SSC (Chair)

Dr. Neil Klaer, Center for Independent Experts

Dr. Paul Medley, Center for Independent Experts

Dr. Ian Stewart, International Pacific Halibut Commission

Stock Assessment Team (STAT) Members

Widow Rockfish

Dr. Allan Hicks, National Marine Fisheries Service Northwest Fisheries Science Center

Kelp Greenling

Dr. Aaron Berger, National Marine Fisheries Service Northwest Fisheries Science Center

Mr. Brett Rodomsky, Oregon Department of Fish and Wildlife

STAR Panel Advisors

Ms. Heather Mann, Midwater Trawl Commission, GAP

Ms. Lynn Mattes, Oregon Department of Fish and Wildlife, GMT

Mr. John DeVore, Pacific Fishery Management Council