Stock Assessment Review (STAR) Panel for Widow Rockfish and Spiny Dogfish

A Center for Independent Experts Report

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Executive Summary

The review was conducted in Seattle, WA during July 11-15, 2011. Widow rockfish and Spiny dogfish were the stocks and assessments examined during the review. From the outset, both assessments had a number of challenges associated with them. These included difficulties and challenges in both the input data as well as assumed parameters based on those data. In both cases, data and data availability hampered the process, and in one case did not allow for exploration of model behavior.

In the case of Widow rockfish, the final result was a model that was not deemed useful for decision making by managers. One difficulty in Widow rockfish assessment was the instability of the model when assuming logistic selectivity, while another difficulty focused on the unit stock. Both of these difficulties preclude the use of this approach as a basis for management advice.

In the case of Spiny dogfish, the model as modified during the meeting was acceptable, with some trepidation. Here the "new" stock recruitment relationship is one source of uncertainty. Further, the retrospective pattern, while predictable given the data, is quite large. This pattern is also not fully captured in the traditional uncertainty calculations which normally inform the US fishery management process.

Overall the meeting was quite enjoyable. Both STAT teams were well prepared, and both showed a willingness to reexamine their formulations at the request of Panel members. However, a number of issues became apparent during the meeting, some of which can be quickly resolved, others which may require a reexamination of the STAR process. Most important is the institutionalization of a formal data process. Such a process would generally speed up and make more transparent how the input data are derived and collected. Also, the use of technical reviewers serving as rapporteurs is another issue worth being addressed for the STAR process.

Background

Draft assessments of the Widow rockfish (*Sebastes entomelas*) and Spiny dogfish (*Squalus suckleyi*) off the U.S. west coast were reviewed by the STAR panel during July 11-15, 2011.

The last full assessment of Widow rockfish was conducted in 2009. This assessment is similar to the 2009 assessment in model structure and data sources, including the use of two separate areas which are assessment independently, but managed as one unit. Changes in this assessment relative to the 2009 assessment include:

- New SS3 version
- New data:
  - 2009-10 data: catch, age, and survey
  - New ASP fishery (at-sea whiting processor)

    - Previously lumped to OR mid-water trawl
    - New age and length data
    - OR historical catches
- Number of age group changed from 30+ to 35+
- Updated steepness (*h*) prior

This review was asked to examine a number of different aspects of the previous assessment, including meeting the revisions as requested during the last STAR panel.

For Spiny dogfish, this was the first stock assessment conducted for the stock off the US west coast. This new stock assessment focuses on the area between the U.S.-Canada border and U.S.-Mexico border. Although Spiny dogfish are known to be distributed further north and south, the assessed stock is assumed to be discrete. The assessed stock has been/is subject to eight fisheries – bottom trawl, bottom trawl discard, mid-water trawl, hook-and-line, hook-and line discard, others (primarily nets), recreational, and at-sea hake bycatch. The base case assessments used was Stock Synthesis (version 3.21f) and incorporate a variety of fisheries-dependent and -independent data sources into the assessment.

The meeting format was that one assessment team would present the model structure and inputs, receive comments and suggestions, and then make changes as directed (if possible). While one assessment team was making its changes, the other team would present the assessment for the next stock under review. As such there was a rotation between stock assessment teams, with one making changes and running sensitivity analysis, while the other team was presenting results.

Description of the Individual Reviewer's Role in the Review Activities

During the review, this reviewer was charged with meeting the term of reference as outlined in Summary of Findings (below). More concisely, I was charged with reviewing the technical merits of both Widow rockfish and Spiny dogfish assessments. This included an examination of the data used as inputs, major assumptions, uncertainties and overall conclusions. During this review I focused on these technical aspects, and I did not consider the management implications as directed by the Center.

Also during the review, the Chair of the Panel, Theresa Tsou, asked me to serve as rapporteur for the sessions on Spiny dogfish.

Summary of Findings

TOR 1. Become familiar with the draft stock assessment and background materials.

For both Widow rockfish and Spiny dogfish, pre-Panel reports were submitted prior to the Panel meeting. Prior assessments and working papers were submitted prior to the meeting in addition. Reports were all read before arrival in Seattle and notes on pertinent

points were made before the 1st day of meeting. During the meeting, the assessment personnel, STAT, presented the highlights of the assessment including major assumptions, data inputs, conclusions, and other pertinent information which to conduct a formal review.

TOR 2. Comment on the quality of data used in the assessments including data collection and processing.

Widow Rockfish

Data in the Widow rockfish assessment included catch and catch sampling from five major fisheries, one southern and two northern.

Landings data included (from the pre-Panel report) "total fishery catches from 1916 to 2011. These catch statistics were derived from the following sources:

- Landings from all fisheries, except the ASP fishery, between 1981 and 2001, and between 2008 and 2010, were extracted from the PacFIN database, and landings between 2002 and 2007 were the same as in the 2009 assessments, which were constructed from the West Coast Groundfish Observer Program.
- The very small annual recreational catches of widow rockfish from 1980 to 2010 were extracted from the Marine Recreational Fishing Statistics Survey (MRFSS) database. Because there were no estimates in the database between 1990 and 1992, catches for these three years were linearly interpolated.
- All foreign landings from 1966 to 1972, and some landings from 1973 to 1976 were taken directly from Rogers (2003), who compiled summaries of foreign catches in that period.
- Some landings from 1973 to 1976 and all landings from 1977 to 1979 were directly copied from the 2000 assessment.
- Historical California landing data from 1916 to 1968 recently reconstructed.
- Historical Oregon landing data from 1915 to 1986 were recently reconstructed
- Landings from the ASP fishery from 1991 to 2007 were provided by the NWFSC (Jim Hastie and Eliza Heery, personal communication), and landings from 2008 to 2010 were downloaded from the NWRO NOAA website."

Fishery independent data included:

- Mid-water trawl pelagic juvenile survey (SCJuvSurvey)
- NWFSC trawl survey
- Triennial trawl survey

Aging data were also presented by the assessment team.

From the pre-Panel report:

> Widow rockfish otolith samples collected coast wide since 1989 have been aged at the NMFS SWFSC Fisheries Ecology Division in Santa Cruz (formerly the Tiburon Laboratory) using the break-and-burn aging method. Most fish were aged by Fisheries Ecology

Division staff (Don Pearson). Prior to 1989, the ages of all Vancouver-Columbia fish were obtained by researchers in the State of Washington, who used surface readings. Prior to 1982, Oregon widow rockfish were aged by investigators in Oregon, who used the break-and-burn ageing method. At the 2009 widow rockfish STAR Panel, it was requested that a comparison be conducted to see if significant bias exists between the break-and-burn and surface ageing methods. The study was completed in 2010, showing no significant bias between these two ageing methods.

Overall the Panel concluded that the data used in the assessment were the best available in evaluation of the resource, but the Panel had many reservations about the data. There were some questions dealing with discards in this fishery and if they were accounted prior to mandatory observer coverage. The Panel noted the inclusion of the new data from the ASP fishery and the comparison study between both aging methods.

It was noted however that there was a lack of length data in the assessment. Oddly, it seemed that there were more ages than lengths, which most Panel members found to be odd. Additionally, the length data was not available to the Panel making alternative hypothesis testing difficult. The Panel wished to explore using length rather than age-based selectivity, but such an undertaking was not possible due to data availability issues.

A second area of data uncertainty centered on the landings data. While discussion of the one vs. two area model is detailed elsewhere (below) a plot of catches spatially was requested. The rationale was to examine if the 43-degree split in North-South landings was appropriate. Unfortunately that request remained unfulfilled, and the analysis could not be accomplished within the time frame of this review. Such an analysis, and the results, should be incorporated into future assessment, should a two-area model be used.

Spiny Dogfish

Landings and Catch data for this assessment came from a variety of sources including:

- Bottom trawl
- Bottom trawl discard
- Mid-water trawl
- at-sea hake fishery bycatch
- Hook-and-line
- Hook-and-line discard
- Other gear types
- Recreational

Data on discards were either provided directly via the at-sea observer program, or extrapolated using dogfish landings, across the time series assuming a 100% discard mortality rate. Given that this is a major source of fishery-related mortality for this species, estimates of discards and mortality associated with discarding are crucial to the

assessment. However, given the data-limited nature, the discard rates assumed in the pre-Panel assessment were the best available.

Survey data included:

- AFSC triennial shelf survey
- AFSC slope survey
- NWFSC shelf-slope survey
- NWFSC slope survey
- A hook-and-line survey conducted by the International Pacific Halibut Commission (IPHC)

Fishery dependent age and length data were also available from a variety of sources, but almost all were from portside sampling. Data were sparse during the height of the fishery after WWII (termed the Vitamin A fishery). Data from the bycatch fisheries were also only available recently via the at-sea observer program.

During the 1st day some issues with the reconstruction of historical catch were identified with respect to Spiny dogfish. While the issue was resolved during later deliberations, it highlighted the need for transparency and formalized process for formulation of the input data during the STAR

Age data in this assessment were problematic. Unlike teleost fishes, dogfish have no otoliths. Therefore, aging information requires the use of spines. However, these spines are often subjected to wear, and may seriously bias the age composition if used directly. As such, methods have been developed to reconstruct ages using estimates of the diameter before the spine was worn.

In this assessment two methods to reconstruct ages were presented. Both show high degrees of variability and low agreement between the methods. As such, the panel noted this as a research recommendation and suggested the exclusion of aging data for this assessment.

TOR 3. Evaluate and comment on analytic methodologies.

Both Widow rockfish and Spiny dogfish utilized the Stock-Synthesis 3 program (SS3) as the base analytical methodology. It was notable that each of the assessments used different versions: Version 3.20d in the case of Widow rockfish and Version 3.20f in the case of Spiny dogfish.

It is notable that there was fairly pronounced differences in the outputs between two different versions of SS3. In the assessment for Widow rockfish, the STAT provided a sensitivity analysis comparing the previous version used during the 2009 assessment, with the new version used in their pre-panel base case. Most of these differences were due to the inclusion of growth within the plus group in the latest version of SS3.

Also of note, neither assessment brought forward used any other analytical model other than SS3. While SS3 is a tried and true method used on west coast and other regions, the lack of other modeling approaches was less than desirable. Alternative modeling

approaches, in this reviewer's opinion, should always be explored. While it may seem unlikely that these alternative models, such as surplus production, virtual population analysis, or even swept area biomass, may not be useful for management purposes, they can inform the analysis and the reviewer on the appropriateness of the data. In this case the simple question of "Does a surplus production or alternative age-structure method give you similar magnitude or tend?" remained unanswerable. As such, the question on if Stock Synthesis is the most appropriate model remains unanswered.

TOR 4. Evaluate model assumptions, estimates, and major sources of uncertainty and provide constructive suggestions for improvements if technical deficiencies or additional major sources of uncertainty are identified.

All analytical models in fisheries stock assessment have some degree of assumptions. Many of these are based on biological information or informed decision-making. As such, the "reasonableness" of the assumptions can be quite subjective. Both assessments had major sources of uncertainty, in this reviewer's opinion.

Widow Rockfish

In the case of Widow rockfish, major assumptions included the unit stock, dome-shape vs. logistic selectivity, and others. Overall, full analysis of these assumptions could not be derived given the questions surrounding the unit stock and the selectivity. These issues were further compounded by the lack of length composition data available during the review meeting.

In the pre-Panel base case model, as had been used previously, the model assumed two separate stocks, each with different growth and recruitment. The rational for using two stocks was based on the identification of two separate growth trajectories; one for the northern and one for the southern "stock". Data, however, were not presented that indicated if the distribution of growth was discreet or continuous. Many stocks experience differential growth by latitude, yet are still considered to be part of the same stock. Further management and reference points are calculated based on one stock, rather than two stocks. The STAT did perform a simulation analysis as suggested by previous review panels. However, the STAT did not have the ability to examine the effects of one vs. two areas during the meeting. As such, the issues noted in the model were compounded by uncertainty in the appropriateness of the unit stock.

As with the issue of unit stock, the use of dome-shaped selectivity in both fishery dependent and independent data was another source of uncertainty. Overall, the rational for using dome-shaped, as opposed to logistic, was not forthcoming during the meeting. It was clear that this assumption had been in place for this stock for some time, but no known rational, other than model fit, was given.

Dome shaped selectivity can be valid in many fisheries and surveys, particularly in cases where older individuals are not available to a particular gear type, or migrate out of the survey/fishery area. But this should be used with caution as it can result in "cryptic biomass".

More troublesome was the reliance of the model on a dome-shape selectivity pattern. The model simply didn't function without that base assumption and gave unreasonable

estimations of steepness when forced to a logistic function for selectivity. Further the stability of the model was not improved when natural mortality was allowed to be estimated for older ages. This problem was exacerbated by the unavailability of length composition data to the Panel. As such, examination of a dome-shaped selectivity pattern could not be differentially tested using age or length based selectivity, which could have shown if the dome-shaped pattern was reasonable. This issue was further compounded by the lack of area specific data and the ability to run a one-area model. A one-area model may provide some insight into this issue by pooling length and age data across the fisheries. As such, the issues with the assumptions confounded each other.

In addition, in both pre-Panel and in iterations during the Panel, it became clear that the model had very large sensitivities to small changes in natural mortality and steepness, both highly uncertain parameters. Moreover, it was clear that the model had to specify these parameters, and that these were unpredictable when other parameters where changed and then fixed.

It was also noted that many of the issues related in this report, and the Panel's summary findings were similar to the ones suggested in the last STAR for this species.

Spiny Dogfish

The Panel, during its 1st day of meetings, noted that the age composition data were highly suspect. The variability and overall difficulties expressed under TOR 2 suggested their exclusion from the analysis. Also, during that 1st day, it was noted that the selectivity used in some of the surveys reflected selectivity in fisheries in the same gear. While appropriate, it was apparent that the STAT had developed the selectivity using landed age/length rather than data from the full catch. As such, the panel made a number of recommendations including removal of the age composition data from the analysis and a change in the survey selectivity to reflect catch, rather than landed fish. After examination of the diagnostics, the Panel and the STAT acknowledged that the proposed changes improved the models fit and stability. Therefore a New Base case model formulation was created which incorporated these changes.

Other suggested runs did not produce better fits for the model. Assumption of a logistic selectivity for the mid-water trawl fishery produced worse fits than the dome-shaped one. Unlike Widow rockfish, a dome-shaped selectivity is warranted for this fish because older individuals tend to be found closer to the bottom, and so may be unavailable to that particular gear type.

Another major source of uncertainty included the use of a new SR relationship. As such, the full properties of this relationship have not been tested and more explicit testing should be competed prior to the next assessment cycle. In both the new and prior formations of the SR, levels of steepness have to be assumed, rather than estimated within the model.

Additionally, the SSB trend declined over the entire period assessment. The result of this is that the model does not have a lot of contrast and therefore has a high degree of uncertainty in the scale rather than the trajectory of depletion.

Overall, the retrospective pattern seen in the models diagnostics also indicates a further

source of uncertainty, one unaccounted for in the figures and tables showing within model uncertainty.

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

In the case of Widow rockfish, a lack of justification for a highly domed age-based selectivity in trawl fisheries, an extreme sensitivity of the model to small changes in steepness, inability to test a one vs. two area model with length based selectivity, and other difficulties with the unavailability of data, rendered the assessment unreliable as a basis for making management decisions. Moreover, previous assessments which have relied on the assumptions are, in this reviewer's opinion, highly circumspect.

For Spiny dogfish, the model as reconfigured during the Panel meeting is acceptable for management decision-making. However, there are significant issues with this formation including the use of a previous unknown stock recruitment relationship, and a large retrospective pattern suggests a high degree of caution in the interpretation of the results for management and quota setting. As such, the uncertainty expressed in the Summary Report should be viewed as an underestimate of the true uncertainty associated with status determination.

TOR 6. Provide specific suggestions for future improvement in any relevant aspects of data collection and treatment, modeling approaches and technical issues.

For Widow rockfish, the following is suggested:

- A full reexamination of analytical methodologies be undertaken (i.e. if SS3 is the appropriate framework)
- A full examination of one vs. two area modeling for each of the other suggestions (below)
- Full justification and sensitivity of the model to dome vs. logistic selectivity.
- A complete reexamination of steepness, and natural mortality with emphasis placed on biological relevance. Verify with external analysis as much as possible.
- Provide data and/or maps on spatial patterns of fishing harvest and/or effort, particularly as it relates to the split between the northern and southern areas.
- Report not only depletion but also some measure of abundance and/or biomass.

For Spiny dogfish, the following is suggested:

- Improve age estimates and aging methods. Reexamine methods used to account for warn spines.
- Examine the uncertainties regarding the catch data and discard mortality. In

particular bycatch estimations are very important, given that these are larger than the recoded landings over recent years. A stratification of at-sea observer data and other information may reduce this uncertainty.

- Research on dogfish movement. This would be informative in providing a better definition of the unit stock and also aid addressing the movement of fish into Canadian waters.
- Linkage with fish on Canadian side of the border and exploration of a joint assessment process for this stock.
- Continuation of the commercial catch and bycatch sampling.
- Examination of catchability priors in the New Base model as well as a method for deriving future priors.
- Examination of the BH derivation, as it relates to dogfish, and comparison with new stock-recruitment relationship as outlined in the STAT pre-Panel documentation.
- Report not only depletion but also on some measure of abundance and/or biomass.

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

Widow rockfish

Questions concerning the data (and omissions thereof) and model structure were unanswerable with the pre-STAR model formulations and data available to the STAR Panel, though most of the data and supporting analysis seemed reasonable. These data omissions, particularly length compositions, made model exploration difficult. The one-area model, requested by the 2009 Panel, was also not available for exploration during the meeting, though a simulation analysis was provided in the pre-Panel documentation. Concerns about the model included very large sensitivities to small changes in natural mortality and steepness. Attempts to fit length or age based asymptotic selectivity during the meeting were unsuccessful. Further, it appeared that the model, as configured, relied on a dome-shaped selectivity for fishery dependent and independent data. Given the lack of data available, the Panel considered it necessary to undertake more exploration before a credible base case can be determined.

Spiny Dogfish

The new Base model as developed during the Panel meeting used catch, indices, and other data sources in line with standard methods of fishery stock assessment. However, the lack of reliable aging data precluded the use of growth within the model structure. Also, this lack of age data is troubling in other aspects, particularly with reference to selectivity and fecundity.

Another major source of uncertainty included the use of a new stock-recruitment relationship. The full properties of this relationship have not been tested and more explicit testing should be competed prior to the next assessment cycle. In both the new

and prior formations of the SR, levels of steepness have to be assumed, rather than estimate within model.

Additionally, the SSB trend declined over the entire period assessment. The result of this is that the model does not have a lot of contrast and therefore has a high degree of uncertainty in the scale rather than the trajectory of depletion.

Overall, the retrospective pattern seen in the models diagnostics also indicates a further source of uncertainty not captured in the confidence intervals reported. It was determined that while there are considerable uncertainties in the input data, the models themselves seemed to reliably handle these uncertainties as expected.

Conclusions and Recommendations

Overall this was a most enjoyable Panel meeting. The staff was helpful and supportive. The accommodations and meeting venue were adequate. The choice of location was ideal, and the technical aspects of this review were intriguing. That said, there were a number of different issues that became apparent during the review. Some of these are rather mundane while others loftier.

STAT Preparedness

Overall the STAT teams were both well prepared. Both were very accommodating to the request of the Panel, and it was clear that a lot of work had gone into both assessments. However, it was clear that the STAT for Widow rockfish was unable to perform many of the requested runs because of data issues. Also, despite reviewer comments from the last Panel, a full working model using one area was not available for examination. It seemed clear that having only the primary analyst available at the meeting hampered the exploration of different model assumptions. To solve this issue, more than one analyst should be present during the meeting, including someone who can explain the data inputs and how they are formulated. Additionally, analysts should be prepared with the raw data in various stages of analysis to incorporation into different model configurations. While it is understood that multiple model runs during the review process are undesirable, it would be helpful for future reviews to have more access to the data by the STAT. In reviews with which this reviewer is familiar (NE and SE US), typically three individuals are dispatched to a Panel meeting: a lead analyst, a secondary analyst, and the primary data handler. Another approach to address this issue would be to have a conference call prior to the full panel review meeting. This could prepare the STAT as to what concerns the Panel members have prior to the 1st meeting day.

Communication

Also apparent was the miscommunication between Panel and STAR panel for Widow rockfish. In the days and weeks after the meeting, it was clear that the STAT misinterpreted the comments provided by the Panel in regards to the model assumptions and weaknesses. To avoid such problems in the future, notes should be available to the STAT teams during the meeting.

Rapporteuring

While Center for Independent Experts reviewers are compensated for their time in the

review, it is not appropriate (in my opinion) to expect them to be rapporteurs while providing a technical review of the assessment. Such a burden is too large for any one person to accomplish during the meeting. Independent reviewers should be focusing on technical aspects and asking questions instead of taking concise notes for later use by panel members. In other regions, this task is assigned to staff members and the notes are made available the following day.

Data Process

During the 1st Day of the Panel meeting, it became clear that there were issues with the data process for the STAR. During the Dogfish presentation, questions about the historical reconstruction, as well as ageing, came forth. In other regions, a "data workshop" is held prior to the assessment meeting. During this meeting, state, federal, and academic scientists, as well as stakeholders, are invited to presented what they feel might be useful during the assessment process. This workshop produces a final report detailing how the data (e.g. catch, landings, natural morality, fecundity, etc.) were derived or collected. While data in any assessment are an issue, such a framework allows the review to focus on the analysis, rather than data collection or data handling.

Reliance on One Analytical Approach

It is obvious that status determination in this region is dependent on the SS3 framework and method. While such reliance provides consistency from assessment to assessment, it limits the analysis to one particular method, whether supported by the data or not. Clearly, different data situations require the use of different methods. Moreover, exploration of additional modeling frameworks can provide insight not only into the data themselves, but the population as a whole. Therefore, in future assessments, it is recommended that analysts at least explore other modeling options, even if not chosen as the primary model.

Appendix 1: Bibliography of materials provided for review

Cheng, Y. 2012. Modeling the Missing Annuli Count in North Pacific Spiny Dogfish (*Squalus suckleyi)* by Non-Linear Mixed Effect Models. International Journal of Applied Mathematics and Statistics. In press.

Gertseva, V. Taylor, I. 2011. Status of the spiny dogfish shark resource off the continental U.S. Pacific Coast in 2011. National Marine Fisheries Service. Northwest Fisheries Science Center.

Karnowski, M. Gertseva, V. Stephens, A. 2011. Historical Reconstruction of Oregon's Commercial Fisheries Landings. National Marine Fisheries Service. Northwest Fisheries Science Center.

Ketchen, K.S. 1975. Age and Growth of Dogfish In British Columbia waters. J. Fish. Res. Board Can. 32: 43-59

PFMC. 2009. Science and Statistical Committee Report on Part II of Stock Assessments for 2011-2012 Groundfish Fisheries. Agenda Item E.2.c. Supplemental SSC Report. September 2009. Pacific Fishery Management Council

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STAR. 2009. Widow Rockfish STAR Panel Report. July 13-17, 2009. National Marine Fisheries Service. Southwest Fisheries Science Center.

Xi, H. Pearson, D. Dick, E.J. Field, J.C. Ralston, S. MacCall, A.D. 2011. Status of the widow rockfish resource in 2011 National Marine Fisheries Service. Southwest Fisheries Science Center.

Appendix 2: Statement of Work

Statement of Work for Dr. Matthew Cieri

External Independent Peer Review by the Center for Independent Experts

Stock Assessment Review (STAR) Panel for Widow Rockfish and Spiny Dogfish

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: A full assessment of widow rockfish was conducted in 2009, which indicated that the stock should be rebuilt soon. However the STAR panel identified further exploration of model properties and alternative formulations as a priority and therefore recommended a benchmark assessment in 2011. The assessment for spiny dogfish represents the first effort to assess this species, which is subject to limited targeting and a high amount of fishery discards. Spiny dogfish has been proposed previously and received one of the highest vulnerability scores in the Pacific Fishery Management Council's GMT's recent vulnerability analysis. These two stock assessments 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 2011, except for the than Pacific hake, to provide a level of consistency between the STAR panels. Reviewers should have expertise 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: Each CIE reviewer shall conduct an independent peer review during the panel review meeting scheduled Seattle, Washington during the tentative dates of 11-15 July, 2011.

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 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;

- Previous stock assessments and STAR Panel reports for widow rockfish;
- 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 can not be made during the peer review, and any SoW or ToRs modifications prior to the peer review shall be approved by the COTR and CIE Lead Coordinator.** Each CIE reviewer shall actively participate in a professional and respectful manner as a member of the meeting review panel, and their peer review tasks shall be focused on the ToRs as specified herein. The NMFS Project Contact is responsible for any facility arrangements (e.g., conference room for panel review meetings or teleconference arrangements). The NMFS Project Contact is responsible for ensuring that the Chair understands the contractual role of the CIE reviewers as specified herein. The CIE Lead Coordinator can contact the Project Contact to confirm any peer review arrangements, including the meeting facility arrangements.

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 panel review meeting in Seattle, Washington during the dates of 11-15 July 2011 as specified herein, and conduct an independent peer review in accordance with the ToRs (**Annex 2**).
3) No later than 29 July 2011, each CIE reviewer shall submit an independent peer review report addressed to the "Center for Independent Experts," and sent to Mr. Manoj Shivlani, CIE Lead Coordinator, via email to shivlanim@bellsouth.net,

and to 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**.

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

6 June 2011	CIE sends reviewer contact information to the COTR, who then sends this to the NMFS Project Contact
27 June 2011	NMFS Project Contact sends the CIE Reviewers the pre-review documents
11-15 July 2011	Each reviewer participates and conducts an independent peer review during the panel review meeting
29 July 2011	CIE reviewers submit draft CIE independent peer review reports to the CIE Lead Coordinator and CIE Regional Coordinator
12 August 2011	CIE submits CIE independent peer review reports to the COTR
19 August 2011	The COTR 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, Program Manager, COTR
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Roger W. Peretti, Executive Vice President
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Key Personnel:

NMFS Project Contact:

Stacey Miller
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Stacey.Miller@noaa.gov Phone: 206-437-5670

Michelle McClure
National Marine Fisheries Service, 2725 Montlake Blvd. E, Seattle WA 98112
Michelle.McClure@noaa.gov

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 for Widow Rockfish and Spiny Dogfish

1. Become familiar with the draft stock assessment and background materials.
2. Comment on the quality of data used in the assessments including data collection and processing.
3. Evaluate and comment on analytic methodologies.
4. Evaluate model assumptions, estimates, and major sources of uncertainty and provide constructive suggestions for improvements if technical deficiencies or additional major sources of uncertainty are identified.
5. Determine whether the science reviewed is considered to be the best scientific information available.
6. Provide specific suggestions for future improvement in any relevant aspects of data collection and treatment, modeling approaches and technical issues.
7. Provide a brief description on panel review proceedings highlighting pertinent discussions, issues, effectiveness, and recommendations

Annex 3: Final Agenda

Stock Assessment Review (STAR) Panel for
Widow Rockfish and Spiny Dogfish

July 11-15, 2011
Hotel Deca
4507 Brooklyn Avenue NE
Seattle, WA 98105

Monday, July 11, 2011

9:00 a.m.	Welcome and Introductions
9:15 a.m.	Review the Draft Agenda and Discussion of Meeting Format (Panel Chair)
	- Review Terms of Reference for Assessment and Review Panel
	- Assignment of reporting duties
	- Discuss and agree to format for the final assessment document
9:45 a.m.	Stock Assessment Team (STAT-1) Presentation of Species 1 (Authors)
	- Overview of Data and Stock Synthesis Modeling
12:30 p.m.	Lunch (On Your Own)
1:30 p.m.	Q&A session with the STAT-1 & Panel discussion
3:30 p.m.	Coffee Break
3:45 p.m.	Panel develops request for additional model runs / analyses for STAT 1
4:30 p.m.	Panel provides written requests for additional model runs / analyses to STAT 1
5:00 p.m.	Adjourn for day.

Tuesday, July 12, 2011

9:00 a.m.	Stock Assessment Team (STAT-2) Presentation of Species 2 (Authors)
	- Overview of Data and Stock Synthesis Modeling
12:00 p.m.	Lunch (On Your Own)
1:30 p.m.	Q&A session with the STAT-2 & Panel discussion
3:00 p.m.	Coffee Break
3:15 p.m.	Panel develops request for additional model runs / analyses for STAT 2
4:00 p.m.	Panel provides written requests for additional model runs / analyses to STAT 2
4:30 p.m.	Panel check in with STAT-1 if needed
5:00 p.m.	Adjourn for day.

Stock Assessment Review (STAR) Panel for
Widow Rockfish and Spiny Dogfish

Wednesday, July 13, 2011

9:00 a.m.	STAT-1 Presentation of first set of model runs for Species 1
	- Q&A session with the STAT-1 & Panel discussion
	- Panel develops written request for second round of model runs / analyses for STAT 1
12:00 p.m.	Lunch (On Your Own)
1:30 p.m.	STAT-2 Presentation of first set of model runs for Species 2
	- Q&A session with the STAT-2 & Panel discussion
	- Panel develops written request for second round of model runs / analyses for STAT 2
3:30 p.m.	Coffee Break
3:45 p.m.	Continue Panel discussion with STAT-2
5:00 p.m.	Adjourn for day.

Thursday, July 14, 2011

9:00 a.m.	STAT-1 Presentation of Second Set of Model Runs for Species 1
	- Q&A session with the STAT-1 & Panel discussion
	- Identification of preferred model and elements for the decision table.
	- Panel develops third list of model runs for decision table and begins drafting STAR report.
12:00 p.m.	Lunch (On Your Own)
1:00 p.m.	STAT-2 Presentation of Second Set of Model Runs for Species 2
	- Q&A session with the STAT-2 & Panel discussion
	- Identification of preferrred model and elements for the decision table.
	- Panel develops third list of model runs for decision table and begins drafting STAR report.
3:30 p.m.	Coffee Break
3:45 p.m.	Panel discussion or report drafting continues
5:00 p.m.	Adjourn for day.

Friday, July 15, 2011

9:00 a.m.	Consideration of remaining issues
	- Review decision tables for Species 1 and Species 2
11:00 a.m.	Panel agrees to process for completing final STAR report by Council's September meeting Briefing Book deadline
5:00 p.m.	Review Panel Adjourn.

Appendix 3: List of participants

Panel Membership

Panel Reviewers
Matthew Cieri, Center for Independent Experts (CIE)
Paul Spencer, Alaska Fisheries Science Center
Kevin Stokes, Center for Independent Experts (CIE)
Theresa Tsou, Panel Chair, Scientific and Statistical Committee (SSC)

Panel Advisors
Jason Cope, PFMC Groundfish Management Team (GMT)
Gerry Richter, PFMC Groundfish Advisory SubPanel (GAP)
John DeVore, PFMC staff (on call)

Stock Assessment (STAT) Team Member Present: Dogfish
Vladlena Gertseva, NMFS, Northwest Fisheries Science Center
Ian Taylor, NMFS, Northwest Fisheries Science Center

Stock Assessment (STAT) Team Member Present: Widow rockfish
Xi He, NMFS, Southwest Fisheries Science Center