

**Center for Independent Experts (CIE) Independent Peer  
Review Report,  
Stock Assessment Review (STAR) Panel 1:  
Darkblotched and Canary Rockfish**

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Seattle, Washington, 27 April to 1 May 2015

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**2 June 2015**



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## Executive summary

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- A Stock Assessment Review (STAR) panel met in Seattle over 27 April to 1 May 2015 to review benchmark assessments of darkblotched and canary rockfish stocks. The review process gave the opportunity to look at the assessments and other associated documentation in some detail.
- Both stocks extend into Canadian waters but this is not routinely reflected in the assessments. Accounting for Canadian catches should mean that the assessments are more consistent with the underlying biological populations.
- The assessments use estimates of total landings and discards as well as age and length compositions of these catches. Discards and age compositions are well handled in the assessment process but there are surprising uncertainties in the estimated catches in Washington waters. This should be resolved.
- Separating trawl catches of canary rockfish into directed catches and bycatches should be explored given the importance of catch composition data in determining estimated stock dynamics.
- Data from a number of trawl surveys, most of which have now been discontinued, are used in the assessments. For reasons which seem to be connected to the relatively short time-series' of data that are available, abundance indices from these surveys do not contribute much to the assessments. However, the composition data from the surveys appear more informative.
- The assessment model used for both stocks is stock synthesis which is a modern and well-tested approach and which is appropriate for the data available and the characteristics of the stocks.
- In recent years the trajectories of both stocks have been determined largely by natural processes, particularly natural mortality, growth and recruitment. Of these, natural mortality and recruitment (represented as recruitment steepness) appears to be the greatest sources of uncertainty in these assessments. External estimates of both parameters are required. Given the biological characteristics of the species concerned, it is not possible to estimate these parameters directly so indirect methods have to be used. The meta-analytical approach used to estimate both natural mortality and recruitment steepness for these two stocks represents the best approach currently available for this.
- For both stocks the conclusion was that the assessments provide an appropriate basis for projections to provide the basis for the future management of fisheries on these stocks. It was also clear from the review process that the assessments are based on very high quality science, hence it can be concluded that scientific advice on these stocks is based on the best available science.
- The review process itself is both effective and transparent. However, it would benefit from ensuring that the input data are fully agreed to before the assessment review process starts.
- In general, the quality of the stock assessments is limited by the quality of the available data. There is limited scope for improvements in the data, but in the longer term more targeted surveys could be developed to provide more informative abundance indices.

## Background

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A Stock Assessment Review Panel (STAR) took place in Seattle, Washington, from 27 April to 1 May 2015. It was the first of four such STAR panels scheduled for 2015 hence the designation STAR 1. I participated as an external reviewer contracted through the Center for Independent Experts (CIE). Two other reviewers also participated; Neil Klaer as another CIE reviewer, and Jim Ianelli from the NMFS Alaska Fisheries Science Center. No specific allocation of reviewer responsibilities was made; all three reviewers contributed throughout the review process for both of the stocks considered. The statement of work for the review, which includes the terms of reference, is given in Appendix 1. Appendix 2 lists the literature cited in this report, and Appendix 3 gives more details of the panel membership.

STAR 1 was convened to look at benchmark assessments of the stocks of two of the many species of rockfish which are an important component of groundfish fisheries of the US west coast. The species under review were darkblotched rockfish (*Sebastes crameri*) and canary rockfish (*Sebastes pinniger*). Darkblotched rockfish forms part of the slope complex of rockfish. The last benchmark assessment for the stock took place in 2013. Canary rockfish is a member of the shelf complex of rockfish species. The most recent benchmark assessment for the Canary Rockfish stock dates from 2007, although update assessments were conducted in 2009 and 2011.

Extensive background documentation was provided in advance of the meeting in order to support the review. This is listed in Appendix 2. For darkblotched rockfish the key document was the draft assessment report (Gertsava Matson & Council, 2015), but other documentation included the report of the previous benchmark assessment of the stock (Gertseva and Thorson, 2014) as well as the associated STAR report (STAR, 2013) and reports by CIE reviewers (Cadigan, 2013; Jiao, 2013). Similarly, for canary rockfish, the main document for review was the draft 2015 stock assessment (Thorson & Wetzel, 2015), with additional relevant information provided in the report of the previous benchmark assessment (Stewart, 2007), as well as the STAR report (STAR, 2007) and CIE reviewers reports (Cordue, 2007; Medley 2007). For both stocks, reports of recent update assessments were also provided. For darkblotched rockfish, an update assessment was made in 2011 (Stephens et al. 2011), and for canary rockfish update assessments were available from 2009 (Stewart, 2009) and 2011 (Wallace & Cope, 2011).

In addition to the specific assessment documents, a number of working documents and papers were provided as background to specific aspects of the data and methods used in the assessments. In relation to historic catch data, work done to reconstruct California catch data was documented by Ralston et al. (2009), with similar work for Oregon fisheries summarised by Karnowski, Gertseva and

Stephens (2014). Wallace (2014) describes work done to estimate discards for the stocks using data from past studies. Thorson et al. (2015) described a geostatistical approach to preparing abundance indices from survey data, and this work built on earlier work on abundance indices for rockfish that reflected their pattern of occurrence in survey hauls (Thorson, Stewart & Punt, 2011). Hammil (2015) describes a method used to derive a prior distribution for estimates of natural mortality using meta-analysis, and Thorson (2015) also uses a meta-analytical approach to derive a prior distribution for the steepness parameter of the stock-recruitment model fitted within the stock assessment model. The stock assessment mode used for both stocks was *Stock Synthesis* (Methot and Wetzel, 2013) and the background information provided on this approach comprised the user manual (Methot, 2015) and a technical description of the method which forms an annex to Methot & Wetzel (2013).

## Data and methods

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### ***Stock identity***

For both darkblotched and canary rockfishes the initial assessments assumed stock boundaries based on geographical rather than biological considerations in that they assumed that the stocks were confined to US waters. For both stocks, there are indications of relatively high abundances at the northern edge of this area where it borders with Canadian waters. Reflecting this, exploratory attempts to include Canadian catches were made for both stocks. While these made relatively little difference to the assessment results, it would be desirable to have assessments based on more realistic assumptions about stock identity.

### ***Catch data***

The assessments for both stocks uses estimates of total landings and discards as well as length and age composition data. Of these data sources, substantial work has gone in to estimating discard for both stocks for earlier years for which only limited sampling data is available. For the age data, I wonder how much information there is in the older age classes when data out to age 35 are included in the assessment, given the relative scarcity of fish of these ages and the risk of error in age determination at older ages. However, these concerns to some extent reflect my European prejudice, as it is rare for ICES assessments to include age data beyond age 10, as fish of older ages are generally rare even in relatively lightly fished stocks. In the current context there has been detailed investigation of age-reading methods including cross-validation so that ageing errors are relatively well understood and can be incorporated in the model.

Perhaps the greatest weakness in the catch data is the uncertainty about the estimates of total landings for some periods of the past. This appears to have been resolved for landings into California

and Oregon following the work of Ralston et al. (2009) and Karnowski, Gertseva and Stephens (2014), but it still seems to be an issue for Washington catches, particularly of canary rockfish. While the estimates have rather little impact on the results of the assessments, it is nonetheless surprising that these issues have not yet been resolved.

For canary rockfish, sensitivity analyses indicated that the estimated stock dynamics during the earlier part of the time series were driven largely by the length and age composition data within the commercial catches. As a result, there is a need to ensure that these composition data are an adequate reflection of how the fishery operates. The commercial catch data are divided into a number of different fleets including a trawl fleet which includes catches by the main rockfish fleet but also by-catches of canary rockfish in the shrimp and hake fisheries. Given that these fisheries, particularly the shrimp fishery, are likely to have rather different selectivity characteristics than the main rockfish fishery, there may be some merit in separating out the catches into a rockfish trawl fleet and an 'other' trawl fleet. This should ensure that the data represent the true selectivity of the rockfish fleet, and thus should allow this selectivity to be well estimated by the model.

### **Survey data**

The assessments of both rockfish stocks included composition data and abundance indices from a number of surveys, most of which are now discontinued. The only current survey has run since 2003 and is known, variously, as the NWFSC shelf/slope survey, the west coast groundfish bottom trawl survey, and the 'combo' survey. Of the other surveys used, the longest time series was the triennial survey that ran from 1977 and 2004, although the series is used in two blocks, with a break between the 1992 and 1995 survey points. This break was made following concerns about a change in catchability due to a change in survey timing that were expressed by the 2007 STAR panel during their review of the 2007 canary rockfish assessment (STAR, 2007). Over recent years, the two rockfish stocks have shown similar stock trends, with a steady decline, followed by a period of slow rebuilding. The key difference is in the timing of the shift from decline to rebuilding; for canary rockfish this occurred in the early 1990s, whereas the decline of darkblotched rockfish occurred at about the year 2000. This timing relative to survey coverage is important for the influence of the surveys on the assessment results as it led to contrast in the stock abundance which should be reflected in the survey data. Unfortunately, the NWFSC shelf/slope survey only covers a period when both stocks were in a rebuilding phase, and the break in the triennial survey occurs close to the point where the canary rockfish stock started rebuilding, and not long before the same process happened for darkblotched rockfish. As a result there is rather limited survey coverage over the recent period of contrast in abundance of the stocks, and this may help explain why the survey indices contribute relatively little to the assessment results. In addition, the NWFSC survey is a general shelf and slope

survey rather than a specialist survey for either area. This is understandable given the costs and logistics of running a survey over the whole Pacific coast between California and Washington, but it also means that the results are likely to be less effective as abundance indices than would otherwise be the case.

While the indices of abundance from the surveys do not contribute very much to the assessment results, the surveys also provide information on age and length composition of the populations and this information does contribute to the estimates of stock dynamics.

The geostatistical approach developed by Thorson et al. (2015) and used to derive abundance indices for canary rockfish is an effective way of handling the rather discontinuous distribution of rockfish as sampled by the trawl survey. However, the way this approach was used to estimate separate indices for California, Oregon and Washington waters for the spatial model used for the canary rockfish assessment leads to very similar indices for the three areas. This seems inconsistent with using an area-structured model in this way.

### **Assessment method**

The assessments for both stocks used stock synthesis (Methot & Wetzel, 2013). This is a well-established and well-tested method which was developed in-house within NWFSC and which is continuously maintained and updated. These considerations mean that the method is appropriate for use for the assessments of stocks of darkblotched and canary rockfish, and further that stock synthesis can be considered to represent the state of the art in stock assessment models.

## **Model assumptions and uncertainty**

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Given the recent very low fishing mortality on both rockfish species, the recent dynamics of the stocks have been driven largely by natural processes associated with productivity, namely natural mortality, growth and recruitment. Growth can be estimated within the model given data on observed weight and length at age, but natural mortality and steepness are more problematic and are probably the greatest source of uncertainty for both stock assessments.

As relatively deepwater species, these rockfish do not lend themselves to tagging studies (although I believe the Icelanders have made some progress in tagging *Sebastes* species in situ) which limits the extent to which natural mortality can be estimated directly. This leaves indirect methods, and these have been well addressed in the current context through the development of a meta-analytical approach which uses a number of such approaches (Hammil, 2015). The apparent increase in natural

mortality among older female canary rockfish poses additional problems, but this was also well explored within the assessment process.

Recruitment steepness is a measure of the rate at which recruitment is reduced as spawning stock size is reduced below pristine levels. As such, it does not have a single biological analogue; rather it represents the cumulative effects of a whole series of biological processes including egg production and survival, and larval survival and settlement. The assessment reports do not give any information about spawning location or behaviour of the two rockfish species, but assuming spawning occurs throughout the range of both species, it is unlikely that biological studies would prove informative on the processes contributing to recruitment steepness. As a result, indirect approaches to estimating steepness are likely to be more useful, and the meta-analytic approach, which has been used here, is probably the best approach given currently available data.

For both stocks, sensitivity analyses indicated that estimates of stock dynamics during the recent rebuilding phase were driven largely by the assumption about recruitment steepness. As this was the case for canary rockfish, it is unsurprising that the assessment showed no indication of retrospective bias as under those circumstances, removing successive years of data will have little influence on the estimated stock size if steepness is kept the same. For darkblotched rockfish, the addition of the 2014 survey data caused a downward revision of the estimated stock size. This caused some discussion within the panel. In my experience, such changes in level, for recent stock sizes at least, are not uncommon in stock assessments. In the current context, I regard the apparent stability of the canary rockfish assessment as the exception, rather than the rule, as it arises from the assumed steepness parameter rather than the data. In the darkblotched assessment, the issue seems to arise from the size composition of the 2014 survey data, which shows an unusual concentration of small fish. Subsequent surveys should demonstrate whether this results from a one-off 'year-effect' in the survey, or whether it is evidence of a strong year-class recruiting to the stock. Either way, I consider the effect to arise from the data rather than from a model misspecification. Further, as the survey was conducted according to a standard protocol, there is no a priori reason to exclude the data from the assessment.

## Quality of science

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The assessments of both stocks made full and effective use of the data available. The assessment method used represents the state of the art and is appropriate for the stocks and the available data, and the approaches used to model fitting were transparent and well documented. In addition,

additional analyses of inputs such as survey indices and natural mortality have been documented in peer-reviewed scientific papers. It is clear that the scientific advice for the stocks of darkblotched and canary rockfish is based on science of very high quality.

## Review process

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I found the STAR review process to be both effective and transparent. The stock assessment team members were highly responsive to queries and requests and open to constructive comments. The review process also benefitted from the insights into particular issues from the STAR panel advisors and also from stakeholders and scientists in the audience.

The one comment I would make to improve the process would be to ensure that the input data particularly catch data, are agreed beforehand. This might be achieved through a process, analogous to the STAR reviews, where the data are presented to interested parties so that agreement can be reached and the data carried forward into assessments. This would not necessarily require external reviewers, although they are involved in the process in SEDAR reviews in the SW USA. Overall, such a process would mean that the STAR review process should be more effective as there would be less time lost to discussion over relatively small changes in estimated catch.

## Discussion

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I consider that the stock assessments of darkblotched and canary rockfish reviewed by STAR panel 1 made very good use of the available data on these stocks. However, the quality of the assessments is limited by the data that are available. Stock assessment models tend to work best when the fishing mortality on the stock is relatively high so that fishing is the major pressure on the stock with the result that the catches contain quite a lot of information about the stock. Both darkblotched and canary rockfishes have recently been subject to substantial restrictions on catch in order to facilitate the rebuilding of the stocks. As a result fishing mortality on both stocks has been reduced to a low level to the extent that natural processes are now more important in determining the dynamics of both stocks. Under these circumstances, fishery-independent survey data can be useful in estimating stock trends, but in the current context the survey indices do not seem to contribute much information, partly because of the relatively short time-series' of survey data, and partly because of the general nature of the current survey. Given the limitations of the current data, the scope for improving the assessments is limited, although in the longer term it could be supported by the development of more specialised surveys.





## APPENDIX 1: Bibliography

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## APPENDIX 2: Statement of Work.

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*Task Order T01-09, v 07 July 2014*

### Statement of Work

#### External Independent Peer Review by the Center for Independent Experts

##### Stock Assessment Review (STAR) Panel 1

**Scope of Work and CIE Process:** The National Marine Fisheries Service's (NMFS) Office of Science and Technology coordinates and manages a contract providing external expertise through the Center for Independent Experts (CIE) to conduct independent peer reviews of NMFS scientific projects. The Statement of Work (SoW) described herein was established by the NMFS Project Contact and Contracting Officer's Technical Representative (COTR), and reviewed by CIE for compliance with their policy for providing independent expertise that can provide impartial and independent peer review without conflicts of interest. CIE reviewers are selected by the CIE Steering Committee and CIE Coordination Team to conduct the independent peer review of NMFS science in compliance the predetermined Terms of Reference (ToRs) of the peer review. Each CIE reviewer is contracted to deliver an independent peer review report to be approved by the CIE Steering Committee and the report is to be formatted with content requirements as specified in **Annex 1**. This SoW describes the work tasks and deliverables of the CIE reviewer for conducting an independent peer review of the following NMFS project. Further information on the CIE process can be obtained from [www.ciereviews.org](http://www.ciereviews.org).

#### **Project Description:**

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

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

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

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

Assessments for these two stocks will provide the basis for the management of the groundfish fisheries off the West Coast of the U.S. including providing scientific basis for setting OFLs and ABCs as mandated by the Magnuson-Stevens Act. The technical review will take place during a formal, public, multiple-day meeting of fishery stock assessment experts. Participation of external, independent reviewer is an essential part of the review process. The Terms of Reference (ToRs) of the peer review are attached in **Annex 2**. The tentative agenda of the panel review meeting is attached in **Annex 3**.

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

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

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

Prior to the Peer Review: Upon completion of the CIE reviewer selection by the CIE Steering Committee, the CIE shall provide the CIE reviewer information (full name, title, affiliation, country, address, email) to the COTR, who forwards this information to the NMFS Project Contact no later than the date specified in the Schedule of Milestones and Deliverables. The CIE is responsible for providing the SoW and ToRs to the CIE reviewers. The NMFS Project Contact is responsible for providing the CIE reviewers with the background documents, reports, foreign national security clearance, and other information concerning pertinent meeting arrangements. The NMFS Project Contact is also responsible for providing the Chair a copy of the SoW in advance of the panel review meeting. Any changes to the SoW or ToRs must be made through the COTR prior to the commencement of the peer review.

Foreign National Security Clearance: When CIE reviewers participate during a panel review meeting at a government facility, the NMFS Project Contact is responsible for obtaining the Foreign National Security Clearance approval for CIE reviewers who are non-US citizens. For this reason, the CIE reviewers shall provide requested information (e.g., first and last name, contact information, gender, birth date, passport number, country of passport, travel dates, country of citizenship, country of current residence, and home country) to the NMFS Project Contact for the purpose of their security clearance, and this information shall be submitted at least 30 days before the peer review in accordance with the NOAA Deemed Export Technology Control Program NAO 207-12 regulations available at the Deemed Exports NAO website: <http://deemedexports.noaa.gov/sponsor.html>.

Pre-review Background Documents: Two weeks before the peer review, the NMFS Project Contact will send (by electronic mail or make available at an FTP site) to the CIE reviewers the necessary background information and reports for the peer review. In the case where the documents need to be mailed, the NMFS Project Contact will consult with the CIE Lead Coordinator on where to send documents. CIE reviewers are responsible only for the pre-review documents that are delivered to the reviewer in accordance to the SoW scheduled deadlines specified herein. The CIE reviewers shall read all documents in preparation for the peer review. Documents to be provided to the CIE reviewers prior to the STAR Panel meeting include:

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

Panel Review Meeting: Each CIE reviewer shall conduct the independent peer review in accordance with the SoW and ToRs, and shall not serve in any other role unless specified herein. **Modifications to the SoW and ToRs cannot be made during the peer review, and any SoW or ToRs modifications prior to the peer review shall be approved by the COTR and CIE Lead Coordinator.** Each CIE reviewer shall actively participate in a professional and respectful manner as a member of the meeting review panel, and their peer review tasks shall be focused on the ToRs as specified herein. The NMFS Project Contact is responsible for any facility arrangements (e.g., conference room for panel review meetings or teleconference arrangements). The NMFS Project Contact is responsible for ensuring that the Chair understands the contractual role of the CIE reviewers as specified herein. The CIE Lead Coordinator can contact the Project Contact to confirm any peer review arrangements, including the meeting facility arrangements.

Contract Deliverables - Independent CIE Peer Review Reports: Each CIE reviewer shall complete an independent peer review report in accordance with the SoW. Each CIE reviewer shall complete the independent peer review according to required format and content as described in Annex 1. Each CIE reviewer shall complete the independent peer review addressing each ToR as described in Annex 2.

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

**Specific Tasks for CIE Reviewers**: The following chronological list of tasks shall be completed by each CIE reviewer in a timely manner as specified in the **Schedule of Milestones and Deliverables**.

- 1) Conduct necessary pre-review preparations, including the review of background material and reports provided by the NMFS Project Contact in advance of the peer review.
- 2) Participate during the STAR Panel 1 review meeting in **tentatively scheduled in Seattle, Washington ) during the dates of April 27 through May 1, 2015** as specified herein, and conduct an independent peer review in accordance with the ToRs (**Annex 2**).
- 3) No later than **May 15, 2015**, each CIE reviewer shall submit an independent peer review report addressed to the “Center for Independent Experts,” and sent to Dr. Manoj Shivlani, CIE Lead Coordinator, via email to [shivlanim@bellsouth.net](mailto:shivlanim@bellsouth.net), and to Dr. David Die, CIE Regional Coordinator, via email to [ddie@rsmas.miami.edu](mailto:ddie@rsmas.miami.edu). Each CIE report shall be written using the format and content requirements specified in Annex 1, and address each ToR in **Annex 2**.

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

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

**Modifications to the Statement of Work:** Requests to modify this SoW must be approved by the Contracting Officer at least 15 working days prior to making any permanent substitutions. The Contracting Officer will notify the COTR within 10 working days after receipt of all required information of the decision on substitutions. The COTR can approve changes to the milestone dates, list of pre-review documents, and ToRs within the SoW as long as the role and ability of the CIE reviewers to complete the deliverable in accordance with the SoW is not adversely impacted. The SoW and ToRs shall not be changed once the peer review has begun.

**Acceptance of Deliverables:** Upon review and acceptance of the CIE independent peer review reports by the CIE Lead Coordinator, Regional Coordinator, and Steering Committee, these reports shall be sent to the COTR for final approval as contract deliverables based on compliance with the SoW and ToRs. As specified in the Schedule of Milestones and Deliverables, the CIE shall send via e-mail the contract deliverables (CIE independent peer review reports) to the COTR (William Michaels, via William.Michaels@noaa.gov).

**Applicable Performance Standards:** The contract is successfully completed when the COTR provides final approval of the contract deliverables. The acceptance of the contract deliverables shall be based on three performance standards:

- (1) each CIE report shall be completed with the format and content in accordance with **Annex 1**,
- (2) each CIE report shall address each ToR as specified in **Annex 2**,
- (3) the CIE reports shall be delivered in a timely manner as specified in the schedule of milestones and deliverables.

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



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

1. The CIE independent report shall be prefaced with an Executive Summary providing a concise summary of the findings and recommendations, and specify whether the science reviewed is the best scientific information available.
2. The main body of the reviewer report shall consist of a Background, Description of the Individual Reviewer's Role in the Review Activities, Summary of Findings for each ToR in which the weaknesses and strengths are described, and Conclusions and Recommendations in accordance with the ToRs.
  - a. Reviewers should describe in their own words the review activities completed during the panel review meeting, including providing a brief summary of findings, of the science, conclusions, and recommendations.
  - b. Reviewers should discuss their independent views on each ToR even if these were consistent with those of other panelists, and especially where there were divergent views.
  - c. Reviewers should elaborate on any points raised in the Summary Report that they feel might require further clarification.
  - d. Reviewers shall provide a critique of the NMFS review process, including suggestions for improvements of both process and products.
  - e. The CIE independent report shall be a stand-alone document for others to understand the weaknesses and strengths of the science reviewed, regardless of whether or not they read the summary report. The CIE independent report shall be an independent peer review of each ToRs, and shall not simply repeat the contents of the summary report.
3. The reviewer report shall include the following appendices:
  - Appendix 1: Bibliography of materials provided for review
  - Appendix 2: A copy of the CIE Statement of Work
  - Appendix 3: Panel Membership or other pertinent information from the panel review meeting.

**Annex 2: Terms of Reference for the Peer Review  
Stock Assessment Review (STAR) Panel 1**

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

## **APPENDIX 3: Panel membership**

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### **STAR Panel Members:**

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

### **STAR Panel Advisors:**

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

### **Stock Assessment Team Members (Canary Rockfish):**

James Thorson, NMFS Northwest Fisheries Science Center  
Chantel Wetzel, NMFS Northwest Fisheries Science Center

### **Stock Assessment Team Members (Darkblotched Rockfish):**

Vladlena Gertseva, NMFS Northwest Fisheries Science Center  
Sean Matson, NMFS West Coast Region