
**Center for Independent Experts (CIE) review report on the 2013
STAR --- Data-Moderate Stock Assessment**

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Prepared for

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Executive Summary

The 2013 assessments of “Pacific Coast Groundfish – Data Moderate Assessment”, were reviewed by a Stock Assessment Review (STAR) Panel. The STAR Panel met at Southwest Fisheries Science Center, Santa Cruz, CA from April 22 - 26, 2013. The assessments of the stock, completed by the stock assessment team (STAT) (composed of stock assessment scientists from Northwest Fisheries Science Center and Southwest Fisheries Science Center) were presented to the STAR Panel and the validity of the data, stock structure, assessment procedures, and results were discussed. The Panel operated under the U.S. Pacific Fishery Management Council’s Terms of Reference (ToR) for the Groundfish and Coastal Pelagic Species Stock Assessment and Review Process for 2013-2014 (PFMC 2012).

Two types of stock assessment methods for nine category 2 (data moderate) species, as well as two new approaches used to assess relative abundance indices, were provided for review (Cope et al. 2013a, 2013b). The two types of proposed stock assessment models were XDB-SRA (extended depletion-based stock reduction analysis) and exSSS (Extended Simple Stock Synthesis). Because of questions on the MCMC or AIS convergence of the models, stock structure, and methods in dealing with relative abundance indices, the results in the draft stock assessment report distributed to the STAR panel before the meeting was updated through presentations during the review. In addition, the STAR panel requested a list of questions to explore the reasons of the differences of the model results, models with different relative abundance data, priors and stock structure scenarios, and a summary of life history and fisheries information from similar species to validate the priors used in the models. Extra discussions on the model structure and priors used were emphasized. The STAR Panel chair, Dr. Martin Dorn, led the STAR Panel report and communicated the report with the STAT panel members, the STAR Advisory Panel, and other attendees to avoid possible confusion. STAR Panel Members then prepared their individual reviews.

The stock assessments were conducted using XDB-SRA and exSSS. XDB-SRA is an extension of DB-SRA, which has been suggested, to be adopted in data-poor species stock assessments; exSSS is a simplified stock synthesis model that assumes that recruitment follows a deterministic stock recruitment relationship (Beverton-Holton in all these data-moderate species reviewed). Among these nine species, seven of them have no previous council-approved assessments; two of them (English sole and yellowtail rockfish) had council approved stock assessments that are now outdated. Both models were fitted to CPUEs from fishery independent or dependent surveys, and a Bayesian approach was employed with multiple algorithms (MCMC, AIS and SIR) tried and presented. Both models used informative priors from meta-analysis heavily, which is reasonable and often suggested for data-poor and data moderate species.

The panel advisors, Drs. John DeVore, John Budrick, and Gerry Richter, and observer Dr. David Sampson, contributed significantly in the discussion of the stock structure. Both historical studies on stock structure (such as Bounaccorsi et al. 2005; Sivasundar and Palumbi 2010; Hess et al. 2011) and knowledge on these historical surveys were used to judge whether or not multiple stocks should be assessed instead of assuming a homogenous unique stock for each species. Agreement/robustness of the modelling results from different scenarios was examined carefully and was basically used as one of the criteria as to whether the scenarios/models can be considered for management purposes (to provide stock status and OFL recommendation).

The XDB-SRA working group led by Dr. E.J. Dick, investigated several data or stock structure scenarios for almost every species: disaggregate the catch and relative abundance indices data by biogeographic region, considered informative priors of q (catchability) to calibrate population size, and consider the prior of Zhou et al. 2011 with prior distribution diffusion (increase the standard deviation of prior distribution). These investigations are very valuable, though many of them were not used in the final selected benchmark model and were not fully discussed because of time limitations and the similarity of the results with the preferred base XDB-SRA model scenario.

The exSSS working group led by Dr. Jason Cope, investigated different Bayesian computing algorithms, and data or stock structure scenarios as did by XDB-SRA team. Results from MLE (posterior maximum likelihood estimation here), MCMC, and AIS were presented to show the differences caused by the computing algorithms when estimating model parameters. The STAR panel suggested that estimation from AIS be presented since the exSSS is a Bayesian model. Although the STAR panel recommended AIS, the differences of the results between AIS and MCMC should prompt a deep exploration of the algorithms that should be used in the future.

Both teams also developed “new” modelling approaches to standardize catch per unit effort from fishery independent or dependent surveys. Drs. Melissa Monk and E.J. Dick developed an alternative method to filter data of structural zeros observed in the onboard observer program data for the commercial passenger fishing vessels (CPFV) and to identify suitable habitat (Hull) in the documents. The hulls identified were further treated as a fixed factor in the GLM analyses. I find this approach interesting and valuable in dealing with high% of zeros in CPUE data. A further systematic study of its model prediction ability, appropriate buffer area, biological explanations on the non-suitable and suitable habitats identified based on the method for each species, is suggested to explore whether this approach can compete with the commonly used delta-GLM for each species (see recommendations below also). Dr. Jason Cope presented a delta-GLMM (generalized linear mixed model) approach employed in a Bayesian framework. This approach tried to incorporate the reality that positive catch may follow a mixed distribution instead of one probability distribution. The idea is reasonable and

valuable, but systematic model selection is needed for each species to explore whether this approach can compete with commonly used delta-GLM for each species. In other words, different models may be appropriate for different species, so that a systematic model comparison framework is needed for both approaches before they are applied directly to the species of interests.

The data-moderate stock assessment done by STAT panel is considered to be the best scientific information and adequate for evaluating stock status for some of the species (see responses to ToRs for each species). There were still differences in both biomass estimation, and fishery status and population status evaluation (here, F_{2012}/F_{msy} and SB_{2013}/SB_0) estimates when different models or data scenarios were used. This is understandable. However, understanding how sensitive the output is to input and why the input causes the output to change is always important. Because of the time limitations during the review, the discussion on data scenarios and model scenarios to use was not enough. Uncertainty estimation of the parameters, population size, and biological reference points based on fully developed Bayesian analysis should be continued. Priors and model structures should be validated based on the life history of the species itself and similar species. Full exploration of the influence of the priors and different parameterization in both models and in miscellaneous scenarios was suggested and compared between the two models. It is important to identify which differences should be kept. Future systematic studies on model selection and uncertainty evaluation are suggested.

Some key recommendations are summarized below:

- The final decision on the recommended model for each species, i.e., XDB-SRA or exSSS, was not based on a systematic model selection procedure. Because of time limitations, the STAR and STAT agreed that XDB-SRA should be used for near shore species and exSSS for others (those with survey data). Future study on the selection of the appropriate model(s) based on model characteristics and population characteristics of each species are needed. Measurements in selecting models can be a combination of model goodness-of-fit, model prediction ability, model robustness, and fisheries-specific measurements such as retrospective and BRP robustness.
- Investigate the practical application of Bayesian delta-GLMM and the Hull data filtering approach. Consider evaluating 1) model error assumption, such as the assumed probability distributions; 2) model goodness-of-fit and model complexity, such as AIC or DIC depending on the statistical paradigms used in solving models; 3) model predictive ability, such as posterior p-value. When data are not comparable, cross validation may be considered to compare models, such as in the case when comparing different data filtering approaches.

- Investigate the nonstationarity of the spatial distribution of these species, and combine genetic evidence and biogeographic knowledge to decide appropriate models (Brunsdon 1996; Fuentes 2001).
- Investigate the pattern and/or driving factors of the spatial distribution of these species.
- Systematically investigate the influence of the priors and parameterization on natural mortality, depletion, F_{msy}/M , B_{msy}/B_0 , selectivity, maturity, steepness h , and the recruitment function; explore the reasons for the differences in the results (current B , current F , B/B_0 and F/F_{msy}) between XDB-SRA and exSSS. Combine biological knowledge to justify which model should be more appropriate for the specific species given their differences in productivity patterns.
- The suggestion of using stochastic stock recruitment is reasonable because it can decrease the influence of the assumption of a deterministic Beverton-Holt stock recruitment relationship used in the exSSS.
- Estimability of catchability, which was a concern for multiple species in this review, may be explored in at least two ways: 1) simulation study to explore whether catchability is estimable based on the data characteristics of specific species (Jiao et al. 2012); and 2) data cloning (Lele et al. 2007; Lele 2010). Comparison of estimated catchability of other key species observed in the NWFSC survey and discussion with the survey staff may help to collect some direct evidence on the scale of q .
- A more detailed description on model equations, symbols used in the equations, submodels used in different scenarios, and the priors used should be provided in future reports.

1. BACKGROUND

This report reviews the 2013 stock assessments of nine species in category 2 (Data Moderate) Assessment, off the Pacific coast at the request of the Center for Independent Experts (CIE). I was provided with draft stock assessment reports and web access to relevant files and documents (Appendix 1) and participated in the Stock Assessment Review (STAR) Meeting. The nine species that were included in the draft report are brown, China, copper, sharpchin, stripetail, vermillion, and yellowtail rockfishes and English and rex soles. Among these nine species, seven of them have not been previously assessed; two of them, English sole and yellowtail rockfish, had council approved stock assessments that are now outdated. The data moderate stock assessments will provide the basis for the management of the nine fish species off the Pacific Coast.

The review committee was composed of Drs. Martin Dorn, Vivian Haist, Selina Heppell, Yan Jiao, and Andre Punt. The review was assisted by Drs. Stacey Miller, Jim Hastie, and John DeVore. The data-moderate stock assessment report was prepared and was presented at the meeting by Drs. E.J. Dick, Jason Cope, Melissa Monk and Alec MacCall. Among them, Drs. E.J. Dick, Melissa Monk and Alec MacCall were in charge of the assessment done using XDB-SRA; Dr. Jason Cope and Chantell Wetzel were in charge of the assessment done using exSSS.

2. REVIEW ACTIVITIES

The STAR Panel meeting took place at the Southwest Fisheries Science Center, Santa Cruz, California from April 22 – 26, 2013. The meeting followed the “tentative agenda” of the STAR review. The meeting was open to public and was attended by observers including members of the fishing industry.

About two weeks before the meeting, assessment documents and supporting materials were made available to the review panel via emails and an ftp website. On the morning of April 22 before the meeting, the assessment review committee met with the STAT team to discuss the meeting agenda, reporting requirements, and meeting logistics. Dr. Martin Dorn (chair of the STAR panel) reviewed the Terms of Reference for Assessment and Review Panel, and tasks/components of the STAR panel report, and assigned reporting duties to each of the STAR members. Dr. Jim Hastie quickly reviewed the evolution of the data-limited assessments for Pacific coast groundfish species since 2007. During the STAR meeting, all documents were made available electronically.

The draft assessments of data-moderate species were presented by the XDB-SRA team and the exSSS team to the Panel and other attendees, and the input data, models, parameter estimates, fishery and population status were evaluated through open discussion. The STAT members were always available when required for further discussion, for additional model runs for clarification, and for clarification of how the STAR ToRs were addressed. The ToRs for each

species/stock were reviewed to ensure they had been fully addressed. A conclusion was then drawn on which model to recommend, which data scenario as the base scenario, and whether to accept the assessment as a basis for management of this fishery.

3. ROLE OF INDIVIDUAL REVIEWER

My role as a CIE independent reviewer was to conduct an impartial and independent peer review in accordance with the SoW and the predefined ToRs (Appendix 2) herein. I reviewed reports and related documents provided by the STAR meeting coordinator before the review meeting, and reviewed the presentations and report and participated in the discussion on these documents/presentations during the panel review week. During the review, I helped the STAR panel to organize and prepare the Panel report. After the peer review meeting, I summarized the findings and recommendations according to the predefined ToRs. This review report is formatted according to my interpretation of the required format and content described in Annex 1 of Appendix 2.

4. SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS IN ACCORDANCE WITH THE TERMS OF REFERENCES

I participated in the Panel review meeting to conduct independent peer reviews of the data-moderate assessments of groundfish stocks managed by the Pacific Fishery Management Council. The review solely concerns technical aspects of the methods. Below I provide the summary of findings of each ToR for each species reviewed in which the weaknesses and strengths are described and conclusions and recommendations in accordance with the ToRs.

The final decision on the recommended model for each species between XDB-SRA or exSSS was not based on a systematic model selection procedure. Because of time limitations, the STAR and STAT agreed that XDB-SRA be used for nearshore species and exSSS for others (those with survey data). Then for the recommendation on base model scenario and algorithm to be used, the STAR panel considered the following factors based on information available: model goodness of fit visually, convergence of the AIS, stock structure evidence, robustness of the results (such as fishery status, population status and OFL) and whether the estimated parameters are biologically or technically reasonable.

Common questions on CPUE and catch composition data are the same among species. So, I only address them in the first species listed below, i.e., based on Brown rockfish for the hull data filtering approach, and based on sharpchin rockfish for the delta-GLMM with ECE approach. For the rest of the species, I then address questions/problems that are more species specific.

4.1. Brown rockfish

4.1.1 ToR 1 – Review documents detailing data-moderate methodologies according to the PFMC’s ToR for the Methodology Review Process for Groundfish and Coastal Pelagic Species and draft data-moderate assessments. Evaluate if the documented and presented information is sufficiently complete. Document the meeting discussions and contribute to a summary panel report.

The information documented and presented is complete. Catch composition based on different sources was suggested to be provided in the final report, so that the uncertainty in the catch data can be reviewed or evaluated. However, the organization of the document may be improved based on species, and the pages, figures and legends should be clearly labelled. The updated stock assessment after the STAR panel review meeting is expected to be available to the panel ASAP. I documented the meeting discussions on this species and wrote a summary for the panel report, which includes: an overview of the species, model and data scenarios recommended, questions from the STAR review, and formal requests sent to the STAR panel.

4.1.2 ToR 2 – Evaluate the technical merits and deficiencies of the proposed method(s) taking into consideration the data requirements of each method, the conditions under which the method is applicable, the assumptions of each method, and the robustness of model results to departures from model assumptions and atypical data inputs. Recommend alternative methods or modifications to the proposed methods, or both, during the panel meeting. Recommendations and requests for additional or revised analyses during the panel meeting must be clear, explicit, and in writing. Comment on the degree to which the methods describe and quantify the sources of uncertainty in the results.

The brown rockfish is identified as a category 2 species by PFMC. It is a long-lived species (about 34 years). Its catch is mainly from central CA area (80% of the total catch) with the northern area being about 1% and the southern area being 19%. Three or four CPUEs were used which are all fishery dependent, and they are central CA onboard CPFV, southern CA onboard CPFV and central CA RecFIN (southern RecFIN).

The proposed two data-moderate stock assessment methods: XDB-SRA and exSSS, are appropriate. They both use informative priors on M , F_{msy}/M , B_{msy}/B_0 and depletion in XDB-SRA, or M and steepness h in Beverton-Holt recruitment model in exSSS, and at the same time fitting the data of standardized relative abundance indices. Both models are Bayesian models because of the nature of using informative priors, so that Bayesian algorithms instead of MLE are recommended when solving the models.

The models proposed and applied apparently have different assumptions on productivity pattern. How the priors influence the productivity patterns, and eventually influence the stock assessment were not fully evaluated in the draft report. This question was discussed during the panel meeting and a request was made to the STAT panel. However, because of time limitations, this question was not fully explored during the review meeting. Uncertainty caused by the prior application and model application was not fully explained and explored.

4.1.3 ToR 3 – Evaluate technical merits and deficiencies of the application of data-moderate methodologies to each stock assessment and for their ability to monitor trends at the population level. The STAR panel can make requests of the stock assessment teams (STATs) for additional runs, but should not impose an alternative method if STATs consider this is not appropriate for the stock concerned. In the event that more than one model is presented, the review panel should recommend adoption of a preferred model, if one can be identified, for use in management.

Both XDB-SRA and exSSS were applied and results were presented on 23 April. The exSSS team included results based on computing algorithms of MLE, AIS, and MCMC. The exSSS team indicated that the results could be different when different Bayesian algorithms were used. This is clearly true for brown rockfish exSSS assessment. The team also indicated that the MLE estimate was used as the mean of the prior in the AIS computing. The STAR panel recommended that AIS or MCMC algorithms be used since both models are Bayesian models. However, the differences caused by computing algorithms, especially between AIS and MCMC, were not explored, and should be further investigated for the accuracy of the stock assessment results.

The XDB-SRA results were compared with those from exSSS, and large differences between their joint posterior distributions of $F/F_{msy} \sim SB/SB_0$ were observed. The trends of the relative abundance indices from central CA onboard CPFV and southern CA onboard CPFV are not consistent and large genetic differences have been observed (Bounaccorsi et al. 2005), so STAR panel requested separated stock assessments: a central stock assessment, and a southern stock assessment.

The updated XDB-SRA assessments with coastal wide stock, and central and south separated stock were further presented and discussed on April 25. The decision of the base model scenario recommendation was made mainly based on 1) visual observation of the model fit to the relative abundance indices; 2) fishery status recommendation from different model scenarios; 3) reasonableness of the estimated key parameters. For brown rockfish, the model fits to separated stock were better, but the estimated M

and productivity was very high and were treated as implausible. The STAR panel after compiling the comments from all the attendees, suggested that the XDB-SRA be used, and that a coastal wide stock assessment be used to recommend stock status and total ACL; and that the central and south stock assessments be used for ACL apportionment.

4.1.4 ToR 4 – Decide through Panel discussions if the ToRs and goals of the peer review have been achieved and determine whether the science reviewed is considered to be the best scientific information available. If agreement cannot be reached, or if any ToR cannot be accomplished for any reason, then the nature of the disagreement or the reason for not meeting all the ToRs must be described in the Summary Panel Report and CIE Reviewer's report. Describe the strengths and weaknesses of the review process and Panel recommendations.

The ToRs and goals of the peer review have been achieved. The science reviewed is considered to be the best scientific information available. However, both the STAT and STAR panel agreed that the work was done with limited time, and further exploration on model assumption and model responses to priors and productivity patterns, and a more systematic and quantitative framework are needed in the future.

4.1.5 ToR 5 - Provide specific suggestions for future improvement in any relevant aspects of data collection and treatment, modeling approaches and technical issues.

When standardizing CPUE, the newly proposed methods should be further validated. The Hull data filtering approach is supported in theory but needs to be validated in real application, probably through cross validation since data after filtering is not comparable with the original data. Also biological explanation of the areas filtered as areas full of structural zeros needs to be provided when used.

The differences between central and south CA onboard CPFV and area separated RecFIN may be because of the spatial nonstationarity over time of the spatial distribution of brown rockfish. This can be observed for species without obvious genetic substocks.

A set of model scenarios may be done to explore how priors on productivity and other parameterization influence the results for both modelling approaches.

The differences between the results from MCMC and AIS algorithm may be because of technical failures in one or both of them. Further coding and a simulation with true or known values will help validate the appropriate algorithms.

4.2. China rockfish

4.2.1 ToR 1 – Review documents detailing data-moderate methodologies according to the PFMC's ToR for the Methodology Review Process for Groundfish and Coastal Pelagic Species and draft data-moderate assessments. Evaluate if the documented and presented information is sufficiently complete. Document the meeting discussions and contribute to a summary panel report.

The information documented and presented is complete. Catch composition based on different sources was suggested to be provided in the final report, so that the uncertainty in the catch data can be reviewed or evaluated. I documented the meeting discussions on this species and wrote a summary for the panel report, which included: an overview of the species, model and data scenarios recommended, questions from the STAR review, and formal requests sent to the STAT panel.

4.2.2 ToR 2 – Evaluate the technical merits and deficiencies of the proposed method(s) taking into consideration the data requirements of each method, the conditions under which the method is applicable, the assumptions of each method, and the robustness of model results to departures from model assumptions and atypical data inputs. Recommend alternative methods or modifications to the proposed methods, or both, during the panel meeting. Recommendations and requests for additional or revised analyses during the panel meeting must be clear, explicit, and in writing. Comment on the degree to which the methods describe and quantify the sources of uncertainty in the results.

The China rockfish is identified as a category 2 species by PFMC. It is a long-lived species (almost 80 years). Catch is mainly from the central CA and northern area. The STAT panel prepared two models (XDB-SRA and exSSS) and for each model 3 separated stock assessments (coastal wide, north (north of Cape Mendocino), and central stock assessments) were presented. Three or four CPUEs were used which are all fishery dependent, and they are central CA onboard CPFV, northern CA and Oregon onboard CPFV and dockside coastal wide RecFIN (separated in area separated stock assessments). Multiple results/scenarios/model algorithms were presented which include: exSSS with MLE, AIS and MCMC algorithms, and XDB-SRA with AIS algorithm.

The proposed two data-moderate stock assessment methods: XDB-SRA and exSSS are appropriate. They both use informative priors (M , F_{msy}/M , B_{msy}/B_0 and depletion in XDB-SRA, or M and steepness h in Beverton-Holt recruitment model in exSSS), and at the same time fitting the data of standardized relative abundance indices. Both models are Bayesian

models because of the nature of using informative priors, so that Bayesian algorithms are recommended when solving the models.

The models proposed and applied apparently have different assumptions on productivity patterns. How the priors or parameterization (such as selectivity in the exSSS) influence the productivity patterns, and eventually influence the stock assessment were not fully evaluated in the draft report. This question was discussed during the panel meeting. However, because of time limitations, this question was not fully explored during the review meeting. Uncertainty caused by the prior application and model application was not fully explained and explored.

4.2.3 ToR 3 – Evaluate technical merits and deficiencies of the application of data-moderate methodologies to each stock assessment and for their ability to monitor trends at the population level. The STAR panel can make requests of the stock assessment teams (STATs) for additional runs, but should not impose an alternative method if STATs consider this is not appropriate for the stock concerned. In the event that more than one model is presented, the review panel should recommend adoption of a preferred model, if one can be identified, for use in management.

Both XDB-SRA and exSSS were applied and results were presented on April 23. The exSSS team included results based on computing algorithms of MLE, AIS, and MCMC. The exSSS team indicated that the results could be different when different Bayesian algorithms were used. This is not that obvious for China rockfish exSSS assessment when both Bayesian algorithms were used. The STAR panel recommended that AIS or MCMC algorithms be used since both models are Bayesian models.

The XDB-SRA results were compared with those from exSSS, and extremely large differences between their joint posterior distributions of $F/F_{msy} \sim SB/SB_0$ were observed. The trends of the relative abundance indices from central CA onboard CPFV and southern CA onboard CPFV are not consistent and large genetic differences have been observed (Bounaccorsi et al. 2005), so the STAR panel requested separated stock assessments: a central stock assessment, and a northern stock assessment.

The updated assessments with coastal wide stock, and central and north (north of Cape Mendocino) separated stock were further presented and discussed on April 25. The decision was made based on 1) visual observation of the model fit to the relative abundance indices; 2) fishery status recommendation from different model scenarios; 3) reasonableness of the estimated key parameters; and 4) evidence of stock structure. For China rockfish, the model fits to separated stocks were better, and the estimated M and productivity is not unreasonable. The STAR panel after

compiling the comments from all the attendees, suggested that the XDB-SRA be used, and that the central-north separated stock assessments be used to recommend stock status and total ACL.

4.2.4 ToR 4 – Decide through Panel discussions if the ToRs and goals of the peer review have been achieved and determine whether the science reviewed is considered to be the best scientific information available. If agreement cannot be reached, or if any ToR cannot be accomplished for any reason, then the nature of the disagreement or the reason for not meeting all the ToRs must be described in the Summary Panel Report and CIE Reviewer's report. Describe the strengths and weaknesses of the review process and Panel recommendations.

The ToRs and goals of the peer review have been achieved. The science reviewed is considered to be the best scientific information available. However, both the STAT and STAR panel agreed that the work was done with limited time, and further exploration on stock structure, model assumption (including assumption on stock structure) and model responses to priors and productivity patterns and a more systematic and quantitative framework are needed in the future.

4.2.5 ToR 5 - Provide specific suggestions for future improvement in any relevant aspects of data collection and treatment, modeling approaches and technical issues.

My comments and suggestions on the CPUE standardization are the same as these for the brown rockfish.

A set of model scenarios may be done to explore how priors on productivity and other parameterization influence the results for both modelling approaches. This should help to understand the huge differences in the joint distributions of $F/F_{msy} \sim SB/SB_0$ when the two proposed data-moderate approaches were used. This should also help suggest appropriate productivity pattern that can be adopted into the model in the future.

4.3. Copper rockfish

4.3.1 ToR 1 – Review documents detailing data-moderate methodologies according to the PFMC's ToR for the Methodology Review Process for Groundfish and Coastal Pelagic Species and draft data-moderate assessments. Evaluate if the documented and presented information is sufficiently complete. Document the meeting discussions and contribute to a summary panel report.

The information documented and presented is complete. Catch composition based on different sources was suggested to be provided in the final report, so that the uncertainty in the catch data can be reviewed or evaluated. I documented the meeting discussions on this species and wrote a summary for the panel report, which included an overview of the species, model and data scenarios recommended, questions from the STAR review, and formal requests sent to the STAT panel.

4.3.2 ToR 2 – Evaluate the technical merits and deficiencies of the proposed method(s) taking into consideration the data requirements of each method, the conditions under which the method is applicable, the assumptions of each method, and the robustness of model results to departures from model assumptions and atypical data inputs. Recommend alternative methods or modifications to the proposed methods, or both, during the panel meeting. Recommendations and requests for additional or revised analyses during the panel meeting must be clear, explicit, and in writing. Comment on the degree to which the methods describe and quantify the sources of uncertainty in the results.

The copper rockfish is identified as a category 2 species by PFMC. It is a long-lived species (at least 50 years). Catch is mainly from the central CA and southern area with landing north of Cape Mendocino 4% only of the total catch. The STAT panel prepared two models: XDB-SRA and exSSS. For XDB-SRA model, three separated stock assessments (coastal wide, north (north of Point Conception), and south stock assessments) were presented. Three or four CPUEs were used which are all fishery dependent, and they are central CA onboard CPFV, southern CA onboard CPFV, Oregon onboard CPFV and dockside coastal wide RecFIN (separated in area separated stock assessments). Multiple results/scenarios/model algorithms were presented which include exSSS with MLE, AIS and MCMC algorithms, and XDB-SRA with AIS algorithm.

The proposed two data-moderate stock assessment methods: XDB-SRA and exSSS are appropriate. They both use informative priors and at the same time fitting the data of standardized relative abundance indices. Both models are Bayesian models because of the nature of using informative priors, so that Bayesian algorithms were recommended to solve the models.

The models proposed and applied apparently have different assumptions on productivity patterns. How the priors or parameterization (such as selectivity in the exSSS) influence the productivity patterns, and eventually influence the stock assessment were not fully evaluated in the draft report. This question was discussed during the panel meeting and a request was made to the STAT panel. However, because of time limitations, this question was not fully explored during the review meeting. Uncertainty caused by the prior application and model application was not fully explained and explored.

4.3.3 ToR 3 – Evaluate technical merits and deficiencies of the application of data-moderate methodologies to each stock assessment and for their ability to monitor trends at the population level. The STAR panel can make requests of the stock assessment teams (STATs) for additional runs, but should not impose an alternative method if STATs consider this is not appropriate for the stock concerned. In the event that more than one model is presented, the review panel should recommend adoption of a preferred model, if one can be identified, for use in management.

Both XDB-SRA and exSSS were applied and results were presented on April 25. The exSSS team included results based on computing algorithms of MLE, AIS, and MCMC. The exSSS team indicated that the results could be different when different Bayesian algorithms were used. This is obvious for copper rockfish exSSS assessment when both Bayesian algorithms were used. The STAR panel recommended that AIS or MCMC algorithms be used in the future since both models are Bayesian models.

There had been concerns on how the Oregon onboard CPFV index influenced the northern stock assessment. The STAT panel compared the stock assessment results with and without this index. The influence from this index is very limited. Based on the comments from the Panel Advisors and the STAT model results, the STAR panel recommended that XDB-SRA be used, and northern and southern stock assessments be used. The population in the north-central and southern area seem to have different dynamic patterns based on the biological knowledge from the Panel Advisors and the stock assessment results. The base scenario of the northern stock assessment recommended is: central-northern stock using central CA onboard CPFV, southern CA onboard CPFV, Oregon onboard CPFV and dockside coastal wide RecFIN; southern stock using southern CA onboard CPFV, dockside RecFIN in southern CA area. The decision was made based on 1) visual observation of the model fit to the relative abundance indices; 2) fishery status recommendation from different model scenarios; 3) reasonableness of the estimated key parameters; 4) evidence of stock spatial structure. For copper rockfish, the model fits to separated stocks were better, and the estimated biomass and fishery and population status are not unreasonable.

4.3.4 ToR 4 – Decide through Panel discussions if the ToRs and goals of the peer review have been achieved and determine whether the science reviewed is considered to be the best scientific information available. If agreement cannot be reached, or if any ToR cannot be accomplished for any reason, then the nature of the disagreement or the reason for not meeting all the ToRs must be described in the Summary Panel Report and CIE Reviewer's report. Describe the strengths and weaknesses of the review process and Panel recommendations.

The ToRs and goals of the peer review have been achieved. The science reviewed is considered to be the best scientific information available. However, both the STAT and STAR panel agreed that the work was done with limited time and further exploration on stock structure, model assumption (including assumption on stock structure) and model responses to priors and productivity patterns, and a more systematic and quantitative framework are needed in the future.

4.3.5 ToR 5 - Provide specific suggestions for future improvement in any relevant aspects of data collection and treatment, modeling approaches and technical issues.

My comments and suggestions on the CPUE standardization for this species are the same as these for the brown rockfish. Spatial nonstationarity and how it changes over time may be explored in the future.

A set of model scenarios may be done to explore how priors on productivity and other parameterization influence the results for both modelling approaches of copper rockfish. This should help better understand which one is more appropriate between the two proposed data-moderate approaches. This should also help suggest appropriate productivity patterns that can be adopted into the model in the future.

The differences for this species between the results from MCMC and AIS algorithm may be because of technical failures in one or both of them. Further coding and a simulation with true or known values will help validate the appropriate algorithms.

4.4 Sharpchin rockfish

4.4.1 ToR 1 – Review documents detailing data-moderate methodologies according to the PFMC's ToR for the Methodology Review Process for Groundfish and Coastal Pelagic Species and draft data-moderate assessments. Evaluate if the documented and presented information is sufficiently complete. Document the meeting discussions and contribute to a summary panel report.

The information documented and presented is complete. Catch composition based on different sources was suggested to be provided for all species in the final report, so that the uncertainty in the catch data can be reviewed or evaluated. However, for this species, the recreational catch is negligible compared with the commercial catch, so uncertainty caused by the recreational catch statistic should be low. Dr. Haist documented the meeting discussions on this species and wrote a summary for the panel report, which include an overview of the species, model and data scenarios

recommended, questions from the STAR review and formal requests sent to the STAT panel. My comments below for this species are based on my view of its stock assessment.

4.4.2 ToR 2 – Evaluate the technical merits and deficiencies of the proposed method(s) taking into consideration the data requirements of each method, the conditions under which the method is applicable, the assumptions of each method, and the robustness of model results to departures from model assumptions and atypical data inputs. Recommend alternative methods or modifications to the proposed methods, or both, during the panel meeting. Recommendations and requests for additional or revised analyses during the panel meeting must be clear, explicit, and in writing. Comment on the degree to which the methods describe and quantify the sources of uncertainty in the results.

The sharpchin rockfish is identified as a category 2 species by PFMC. It is a long-lived species (at least 58 years). Catch is mainly from the northern region (97%) and the recreational landing is negligible compared with the commercial landings. The STAT panel prepared two models (XDB-SRA and exSSS) and multiple data scenarios were prepared for each model as sensitivity runs. Two or three CPUEs were used, which are all fishery independent, and they are Triennial survey (one combined index, or early-late separated indices) and NWFSC shelf-slope trawl survey. Multiple results/scenarios/model algorithms were presented, which include exSSS with MLE, AIS and MCMC algorithms, and XDB-SRA with AIS algorithm.

The proposed two data-moderate stock assessment methods: XDB-SRA and exSSS are appropriate. They both use informative priors and at the same time fitting the data of standardized relative abundance indices. We recommended that Bayesian algorithm be used to solve them since both of them are Bayesian models because of the nature of using informative priors.

The models proposed and applied apparently have different assumptions on productivity patterns. How the priors or parameterization (such as selectivity in the exSSS) influence the productivity patterns, and eventually influence the stock assessment were not fully evaluated in the draft report. This question was discussed for several of the species reviewed during this meeting, but not discussed for this species because of time limitations and similarity of the questions to other species. Uncertainty caused by the prior application and model application was not fully explained and explored.

4.4.3 ToR 3 – Evaluate technical merits and deficiencies of the application of data-moderate methodologies to each stock assessment and for their ability to monitor trends at the population level. The STAR panel can make requests of the stock assessment teams (STATs) for additional runs, but should not impose an alternative method if STATs consider this is not appropriate for

the stock concerned. In the event that more than one model is presented, the review panel should recommend adoption of a preferred model, if one can be identified, for use in management.

Both XDB-SRA and exSSS were applied and results were presented on April 25. The exSSS team included results based on computing algorithms of MLE, AIS and MCMC. The exSSS team indicated that the results could be different when different Bayesian algorithms were used. This is obvious for the sharpchin rockfish exSSS assessment when both Bayesian algorithms were used. The STAR panel recommended that AIS algorithm be used in the future since the model is a Bayesian model and AIS convergence diagnostic seems reasonable.

There had been concerns on how the Triennial index influences the stock assessment. The STAT panel compared the stock assessment results with 1977 year data included/ excluded, and with the index split or not, as different sensitivity runs. Based on the comments from the Panel Advisors and the STAT model results, the STAR panel recommended that exSSS be used. The base scenario of the stock assessment recommended is: using split triennial surveys with 1977 year data excluded, and the NWFSC survey index. For both CPUE standardizations, no ECEs are suggested in the GLMM models because of lacking strong evidence to support it comparing with the commonly used GLMM. Because the sensitivity analyses suggested that the fishery status and population status estimated were robust, but not for biomass estimates, this model is suggested to inform fishery status but not to recommend ACL.

4.4.4 ToR 4 – Decide through Panel discussions if the ToRs and goals of the peer review have been achieved and determine whether the science reviewed is considered to be the best scientific information available. If agreement cannot be reached, or if any ToR cannot be accomplished for any reason, then the nature of the disagreement or the reason for not meeting all the ToRs must be described in the Summary Panel Report and CIE Reviewer's report. Describe the strengths and weaknesses of the review process and Panel recommendations.

The ToRs and goals of the peer review have been achieved. The science reviewed is considered to be the best scientific information available. However, both the STAT and STAR panel agreed that the work was done with limited time and further exploration on CPUE standardization, model assumption and model responses to priors and productivity patterns, and a more systematic and quantitative framework are needed in the future.

4.4.5 ToR 5 - Provide specific suggestions for future improvement in any relevant aspects of data collection and treatment, modeling approaches and technical issues.

When standardizing CPUE, the newly proposed method should be further validated. The idea of ECE-GLMM is supported, but the application of this model should be compared with other commonly used models based on at least model goodness of fit, such as DIC, and model predictive ability, such as posterior p-value or cross validation. The reason is that deviance (mean of deviance was reported in the document and presentation) itself cannot reflect model complexity. DIC is often suggested when mixed or hierarchical models with a Bayesian estimator are used, which is based on the distribution of deviance. Model selection based on one single criterion is always hard, so that multiple criteria are often used to validate the selection procedure.

A set of model scenarios may be done to explore how priors on productivity and other parameterization influence the results for both modelling approaches. The STAT panel intended to compare the productivity patterns of the two proposed models for this species, but was not done because of time limitations. Such an exercise should help better understand which one is more appropriate between the two proposed data-moderate approaches, and help suggest appropriate productivity patterns that can be adopted into the models in the future.

The differences for this species between the results from MCMC and AIS algorithm may be because of technical failures in one or both of them. Further coding and a simulation with true or known values will help validate the appropriate algorithms.

4.5. Stripetail rockfish

4.5.1 ToR 1 – Review documents detailing data-moderate methodologies according to the PPMC's ToR for the Methodology Review Process for Groundfish and Coastal Pelagic Species and draft data-moderate assessments. Evaluate if the documented and presented information is sufficiently complete. Document the meeting discussions and contribute to a summary panel report.

The information documented and presented is incomplete and only XDB-SRA was provided and fully reviewed. For this species, the recreational catch is negligible compared with the commercial catch, so uncertainty caused by recreational catch statistic should be low. Dr. Haist documented the meeting discussions on this species and wrote a summary for the panel report, which included an overview of the species, model and data scenarios recommended, questions from the STAR review, and formal requests sent to STAT panel. My comments below for this species are based on my view of its stock assessment.

4.5.2 ToR 2 – Evaluate the technical merits and deficiencies of the proposed method(s) taking into consideration the data requirements of each method, the conditions under which the method is applicable, the assumptions of each method, and the robustness of model results to departures from model assumptions and atypical data inputs. Recommend alternative methods or modifications to the proposed methods, or both, during the panel meeting. Recommendations and requests for additional or revised analyses during the panel meeting must be clear, explicit, and in writing. Comment on the degree to which the methods describe and quantify the sources of uncertainty in the results.

The striptail rockfish is identified as a category 2 species by PFMC. It is a moderately long-lived species (at least 38 years). Catch is mainly from the central CA and northern area, and is mainly composed of commercial catch. Because of time limitations and low priority of this species, only results from XDB-SRA were presented. The STAR panel reviewed and recommended the preferred model based on the one that was accessible before the meeting end.

The proposed data-moderate stock assessment method, XDB-SRA, is a Bayesian model and is appropriate ideally. It uses informative priors on M , F_{msy}/M , B_{msy}/B_0 and depletion, and at the same time fitting the data of standardized relative abundance indices.

4.5.3 ToR 3 – Evaluate technical merits and deficiencies of the application of data-moderate methodologies to each stock assessment and for their ability to monitor trends at the population level. The STAR panel can make requests of the stock assessment teams (STATs) for additional runs, but should not impose an alternative method if STATs consider this is not appropriate for the stock concerned. In the event that more than one model is presented, the review panel should recommend adoption of a preferred model, if one can be identified, for use in management.

XDB-SRA was applied and results were presented on April 25. The results, especially the magnitude of biomass, depended on prior elicitation of q heavily. The panel recommend that a relationship between q and depletion explored. The base run is recommended to be XDB-SRA with triennial and NWFSC survey indices used to calibrate population size but no scenarios on the prior selection were recommended. The panel also recommended that this model be used to inform population and fishery status but not for OFL recommendation.

4.5.4 ToR 4 – Decide through Panel discussions if the ToRs and goals of the peer review have been achieved and determine whether the science reviewed is considered to be the best scientific information available. If agreement

cannot be reached, or if any ToR cannot be accomplished for any reason, then the nature of the disagreement or the reason for not meeting all the ToRs must be described in the Summary Panel Report and CIE Reviewer's report. Describe the strengths and weaknesses of the review process and Panel recommendations.

The ToRs and goals of the peer review have been achieved. The science reviewed is considered to be the best scientific information available. However, both the STAT and STAR panel agreed that the work was done with limited time and further exploration of model responses to priors and productivity patterns is needed in the future. The review time on this species was very short also. A further stock assessment update, including exSSS, and careful review is suggested before the results are used for management purposes.

4.5.5 ToR 5 - Provide specific suggestions for future improvement in any relevant aspects of data collection and treatment, modeling approaches and technical issues.

My comments and suggestions on the CPUE standardization are the same as these for the sharpchin rockfish.

4.6. Vermillion rockfish

This species was dropped from the review list, because there were species identification problems and the data used were for multi-species.

4.7. Yellowtail rockfish

4.7.1 ToR 1 – Review documents detailing data-moderate methodologies according to the PFMC's ToR for the Methodology Review Process for Groundfish and Coastal Pelagic Species and draft data-moderate assessments. Evaluate if the documented and presented information is sufficiently complete. Document the meeting discussions and contribute to a summary panel report.

The information documented and presented is complete. Catch composition based on different sources was suggested to be provided for all the species in the final report, so that the uncertainty in the catch data can be reviewed or evaluated. However, for this species, the recreational catch is only about 5% of the total catch and mainly composed of juveniles, so uncertainty caused by recreational catch statistic should be low. The panel suggested that only fishery independent surveys be used in the models to calibrate population size. Dr. Haist documented the meeting discussions on this species and wrote a summary for the panel report, which included an overview of the species, model and data scenarios recommended,

questions from the STAR review, and formal requests sent to STAT panel. My comments below for this species are based on my view of its stock assessment.

4.7.2 ToR 2 – Evaluate the technical merits and deficiencies of the proposed method(s) taking into consideration the data requirements of each method, the conditions under which the method is applicable, the assumptions of each method, and the robustness of model results to departures from model assumptions and atypical data inputs. Recommend alternative methods or modifications to the proposed methods, or both, during the panel meeting. Recommendations and requests for additional or revised analyses during the panel meeting must be clear, explicit, and in writing. Comment on the degree to which the methods describe and quantify the sources of uncertainty in the results.

The yellowtail rockfish is identified as a category 2 species by PFM. It is a long-lived species (almost 80 years). Catch is mainly from the central CA and northern area, and is mainly composed of commercial catch (95%). The STAT panel prepared two models (XDB-SRA and exSSS) and multiple data scenarios were prepared for each model as sensitivity runs.

The proposed two data-moderate stock assessment methods, XDB-SRA and exSSS, are appropriate (in theory) for this species. They both use informative priors and at the same time fitting the data of standardized relative abundance indices.

The models proposed and applied apparently have different assumptions on productivity patterns. How the priors (such as h) or parameterization (such as selectivity in the exSSS) influence the productivity patterns, and eventually influence the stock assessment were not fully evaluated in the draft report. This question was discussed for several of the species reviewed during this meeting, but not discussed for this species because of time limitations and similarity of the questions to other species. Uncertainty caused by the prior application and model application was not fully explained and explored.

4.7.3 ToR 3 – Evaluate technical merits and deficiencies of the application of data-moderate methodologies to each stock assessment and for their ability to monitor trends at the population level. The STAR panel can make requests of the stock assessment teams (STATs) for additional runs, but should not impose an alternative method if STATs consider this is not appropriate for the stock concerned. In the event that more than one model is presented, the review panel should recommend adoption of a preferred model, if one can be identified, for use in management.

Both XDB-SRA and exSSS were applied to yellowtail northern stock and results were presented on April 24 and exSSS was further updated on April 25 based on the STAR request. The results of MSY and SSB_0 from the exSSS were consistent with a council approved but outdated stock assessment on this species (Wallace and Lai 2004). The panel recommend that exSSS be used for stock assessment. The base run is recommended to be only using fishery independent surveys, i.e., triennial survey (excluding 1977 year data and not split) and NWFSC survey indices, to calibrate population size. The panel also recommended that ECEs in the GLMM not be used because of lacking strong evidence to support it based only on Q-Q plot.

4.7.4 ToR 4 – Decide through Panel discussions if the ToRs and goals of the peer review have been achieved and determine whether the science reviewed is considered to be the best scientific information available. If agreement cannot be reached, or if any ToR cannot be accomplished for any reason, then the nature of the disagreement or the reason for not meeting all the ToRs must be described in the Summary Panel Report and CIE Reviewer's report. Describe the strengths and weaknesses of the review process and Panel recommendations.

The ToRs and goals of the peer review have been achieved. The science reviewed is considered to be the best scientific information available. However, both the STAT and STAR panel agreed that the work was done with limited time and further exploration model responses to priors and productivity patterns are needed in the future. The review time on this species was very short also. A further stock assessment update and careful technical review is suggested before the results are used for management purposes.

4.7.5 ToR 5 - Provide specific suggestions for future improvement in any relevant aspects of data collection and treatment, modeling approaches and technical issues.

My comments and suggestions on the CPUE standardization are the same as these for the sharpchin rockfish.

4.8. English sole

4.8.1 ToR 1 – Review documents detailing data-moderate methodologies according to the PFMC's ToR for the Methodology Review Process for Groundfish and Coastal Pelagic Species and draft data-moderate assessments. Evaluate if the documented and presented information is sufficiently complete. Document the meeting discussions and contribute to a summary panel report.

The information documented and presented is complete. For this species, the recreational catch is considered to be very limited, so uncertainty caused by the recreational catch statistic should be low. The panel suggested that only fishery independent surveys be used in the models to calibrate population size. Dr. Haist documented the meeting discussions on this species and wrote a summary for the panel report, which included an overview of the species, model and data scenarios recommended, questions from the STAR review, and formal requests sent to the STAT panel. My comments below for this species are based on my view of its stock assessment.

4.8.2 ToR 2 – Evaluate the technical merits and deficiencies of the proposed method(s) taking into consideration the data requirements of each method, the conditions under which the method is applicable, the assumptions of each method, and the robustness of model results to departures from model assumptions and atypical data inputs. Recommend alternative methods or modifications to the proposed methods, or both, during the panel meeting. Recommendations and requests for additional or revised analyses during the panel meeting must be clear, explicit, and in writing. Comment on the degree to which the methods describe and quantify the sources of uncertainty in the results.

The English sole rockfish is identified as a category 2 species by PFMC. It has a relatively low maximum age (about 20+ years) comparing with these long-lived species in this category. Catch is mainly composed of commercial catch (95%). The discard estimates are based on a constant 33% rate. The STAT panel prepared two models (XDB-SRA and exSSS) and multiple data scenarios were prepared as sensitivity runs, especially when exSSS was used.

The proposed two data-moderate stock assessment methods, XDB-SRA and exSSS, are appropriate. They both use informative priors and at the same time fitting the data of standardized relative abundance indices.

The models proposed and applied apparently have different assumptions on productivity pattern. How the priors or parameterization (such as selectivity in the exSSS) influence the productivity patterns, and eventually influence the stock assessment were not fully evaluated in the draft report. This question was discussed for several of the species reviewed during this meeting, but not discussed for this species because of time limitations and similarity of the questions to other species. Uncertainty caused by the prior application and model application was not fully explained and explored.

4.8.3 ToR 3 – Evaluate technical merits and deficiencies of the application of data-moderate methodologies to each stock assessment and for their ability to monitor trends at the population level. The STAR panel can make requests

of the stock assessment teams (STATs) for additional runs, but should not impose an alternative method if STATs consider this is not appropriate for the stock concerned. In the event that more than one model is presented, the review panel should recommend adoption of a preferred model, if one can be identified, for use in management.

Both XDB-SRA and exSSS were applied to English sole and results were presented on April 23, and exSSS was further updated on April 25 based on the STAR request. The results of depletion and SSB_0 from the exSSS were compared with a council approved but outdated stock assessment on this species (Stewart 2007). The panel recommend that exSSS be used for stock assessment (see page 9). The base run is recommended to use split triennial survey (excluding 1977 year data) and NWFSC survey indices. The panel also recommended that ECEs in the GLMM not be used for both CPUE standardizations for this stock assessment because of lacking strong evidence to support it based only on Q-Q plot.

4.8.4 ToR 4 – Decide through Panel discussions if the ToRs and goals of the peer review have been achieved and determine whether the science reviewed is considered to be the best scientific information available. If agreement cannot be reached, or if any ToR cannot be accomplished for any reason, then the nature of the disagreement or the reason for not meeting all the ToRs must be described in the Summary Panel Report and CIE Reviewer's report. Describe the strengths and weaknesses of the review process and Panel recommendations.

The ToRs and goals of the peer review have been achieved for English sole. The science reviewed is considered to be the best scientific information available. However, both the STAT and STAR panel agreed that the work was done with limited time and further exploration model responses to priors and productivity patterns are needed in the future. The review time on this species was very short also. A further stock assessment update and careful technical review is suggested before the results are used for management purposes.

4.8.5 ToR 5 - Provide specific suggestions for future improvement in any relevant aspects of data collection and treatment, modeling approaches and technical issues.

My comments and suggestions on the CPUE standardization are the same as these for the sharpchin rockfish.

4.9. Rex sole

4.9.1 ToR 1 – Review documents detailing data-moderate methodologies according to the PFMC's ToR for the Methodology Review Process for

Groundfish and Coastal Pelagic Species and draft data-moderate assessments. Evaluate if the documented and presented information is sufficiently complete. Document the meeting discussions and contribute to a summary panel report.

The information documented and presented is complete. For rex sole, the recreational catch is negligible, so uncertainty caused by recreational catch statistic should be low. The panel suggested that only fishery independent surveys be used in the models to calibrate population size. Dr. Haist documented the meeting discussions on this species and wrote a summary for the panel report, which included an overview of the species, model and data scenarios recommended, questions from the STAR review, and formal requests sent to STAT panel. My comments below for this species are based on my view of its stock assessment.

4.9.2 ToR 2 – Evaluate the technical merits and deficiencies of the proposed method(s) taking into consideration the data requirements of each method, the conditions under which the method is applicable, the assumptions of each method, and the robustness of model results to departures from model assumptions and atypical data inputs. Recommend alternative methods or modifications to the proposed methods, or both, during the panel meeting. Recommendations and requests for additional or revised analyses during the panel meeting must be clear, explicit, and in writing. Comment on the degree to which the methods describe and quantify the sources of uncertainty in the results.

The rex sole is identified as a category 2 species by PFMC. It is a moderately long-lived species (up to 30 years) comparing with these long-lived rockfishes in this category. Catch is mainly composed of commercial catch and mainly distributed in the northern and central regions. The STAT panel prepared two models (XDB-SRA and exSSS) and multiple data scenarios were prepared as sensitivity runs, especially when exSSS was used.

The proposed two data-moderate stock assessment methods XDB-SRA and exSSS, are appropriate. They both use informative priors and at the same time fitting the data of standardized relative abundance indices.

The models proposed and applied apparently have different assumptions on productivity patterns. How the priors or parameterization (such as selectivity in the exSSS) influence the productivity patterns, and eventually influence the stock assessment were not fully evaluated in the draft report. This question was discussed for several of the species reviewed during this meeting, but not discussed for this species because of time limitations and similarity of the questions to other species. Uncertainty caused by the prior application and model application was not fully explained and explored.

4.9.3 ToR 3 – Evaluate technical merits and deficiencies of the application of data-moderate methodologies to each stock assessment and for their ability to monitor trends at the population level. The STAR panel can make requests of the stock assessment teams (STATs) for additional runs, but should not impose an alternative method if STATs consider this is not appropriate for the stock concerned. In the event that more than one model is presented, the review panel should recommend adoption of a preferred model, if one can be identified, for use in management.

Both XDB-SRA and exSSS were applied to rex sole and results were presented on April 23 and exSSS was further updated on April 25 based on the STAR request. The panel recommend that exSSS be used for stock assessment. The base run is recommended to use split triennial survey (excluding 1977 year data) and NWFSC survey indices. The panel also recommended that ECEs in the GLMM not to be used for both CPUE standardizations for this stock assessment because of lacking strong evidence to support it based only on Q-Q plot. The sensitivity analysis based on 6 runs suggested that the exSSS estimated fishery status (F_{2012}/F_{msy}) and population status (SB_{2013}/SB_0) are robust to data and prior application but not for the abundance and OFL estimates. The STAR panel suggested that this model be used for fishery and population status determination but not for OFL recommendation.

4.9.4 ToR 4 – Decide through Panel discussions if the ToRs and goals of the peer review have been achieved and determine whether the science reviewed is considered to be the best scientific information available. If agreement cannot be reached, or if any ToR cannot be accomplished for any reason, then the nature of the disagreement or the reason for not meeting all the ToRs must be described in the Summary Panel Report and CIE Reviewer's report. Describe the strengths and weaknesses of the review process and Panel recommendations.

The ToRs and goals of the peer review for rex sole have been achieved. The science reviewed is considered to be the best scientific information available. However, both the STAT and STAR panel agreed that the work was done with limited time and further exploration model responses to priors and productivity patterns are needed in the future. The review time on this species was very short also. A further stock assessment update and careful technical review is suggested before the results are used for management purposes.

4.9.5 ToR 5 - Provide specific suggestions for future improvement in any relevant aspects of data collection and treatment, modeling approaches and technical issues.

My comments and suggestions on the CPUE standardization are the same as those for the sharpchin rockfish.

5. SUGGESTIONS FOR IMPROVEMENTS OF NMFS REVIEW PROCESS AND PRODUCTS

The current review process looks very well designed. I consider the review proceedings and discussions effective and I believe that they will improve the stock assessment in the future. It can be further improved if the presentations used in the review meeting can be distributed to the STAR panel a few days earlier before the meeting, the agenda can be enforced to a degree, and if a follow-up review can be conducted in the near future. A systematic sensitivity analysis will further help our understanding of this stock but full Bayesian analysis is time consuming and seems not appropriate to be required to finish in one to two nights. The STAR review and discussion should be implemented more effectively by this extra follow-up review.

6. Acknowledgements

I would like to thank all the Stock Assessment Team members contributing to the meeting for their informative presentations on the stock assessments of these nine data moderate species and for providing helpful and patient responses to the review panel's questions. Many thanks also to the Panel Advisors and observers at the meeting for their contribution to the discussions throughout the meeting. Special thanks also go to the other members of the review panel for productive discussions on the assessments.

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Appendix 1: List of Documents Provided as Background Material

Draft Stock Assessments:

- Cope, J., Dick, E.J., MacCall, A.D., Monk, M., Soper, B., and Wetzel, C. 2013a. Category 2 stock assessments for brown, China, copper, sharpchin, stripetail, vermilion and yellowtail rockfishes and English and rex sole in 2013. *Pre-STAR version*.
- Cope, J., Dick, E.J., MacCall, A.D., Monk, M., Soper, B., and Wetzel, C. 2013b. Data Moderate Assessment Addendum Sharpchin Rockfish. pre-STAR DRAFT.
- Chantell R. Wetzel and André E. Punt 2013. Management strategy evaluation of the performance of data-moderate assessment methods for U.S. west coast groundfish. Draft.

Presented Materials:

- Dick, E.J., and MacCall, A. 2013. Recreational abundance indices for data-moderate stocks.
- Hastie, J. 2013. A brief review of the evolution of data-limited assessment for Pacific coast groundfish species since 2007.
- Monk, M. and Dick, E.J. 2013. Determining trips with effective effort for target species.
- NWFSC and SWFSC STAT teams. 213. Data-moderate assessments for 9 groundfishes.
- Wetzel, C. 2013. MSE of the performance of data-moderate assessment methods for U.S. west coast groundfish.

Background Materials:

- Ana. 2013. Power plant impingement indices.
- Buonaccorsi, V.P., Kimbrell, C.A., Lynn, E.A. and Vetter, R.D. 2005. Limited realized dispersal and introgressive hybridization influence genetic structure and conservation strategies for brown rockfish, *Sebastes auriculatus*. *Conservation Genetics*. 6: 697-713.
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Appendix 2: Statement of Work for Dr. Yan Jiao

Pacific Coast Groundfish Assessment Review Panel for Data Moderate Assessments

BACKGROUND

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 Representative (COR), 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.

SCOPE

Project Description: The requirement in the re-authorized Magnuson-Stevens Act (2007) to set annual catch limits (ACLs) based on science recommendations implies some kind of basic assessment is required for all stocks in Fishery Management Plans (FMPs). This mandate has led to an increased focus on assessing "data-poor" and data-moderate stocks. Many of these stocks are of minor economic importance and assessing all of them using size/age structured models would be difficult given data limitations as well as requiring substantial time and effort. Simple assessment methods that use historical catches and available trend or size-composition information could potentially be applied to many data-poor stocks. These methods could be used to set ACLs, and to identify stocks which may be at risk of depletion that would be elevated to high priority for more detailed assessments.

Data-moderate assessments for groundfish species represent extensions of previously adopted data-poor methods (i.e., Depletion-Corrected Average Catch (DCAC) and Depletion-Based Stock Reduction Analysis (DB-SRA)) that use only catch data to inform harvest specifications. The defining distinction between data-moderate and data-poor assessments is that former (data-moderate) include abundance trend information.

Two data-moderate assessment methods have been endorsed for determining stock status and trends in the 2013-14 assessment cycle: 1) extended DB-SRA (XDB-SRA) and 2) extended Simple Stock Synthesis (exSSS). In both cases, abundance trend information

(e.g., survey or fishery CPUE indices) is included in the assessment, but length and age composition data are excluded by design, in order to expedite development and review of the assessments.

ExSSS is a simplified stock synthesis model that assumes that recruitment is related deterministically to the stock-recruitment relationship and allows index and catch data to be used to fit a population model. Uncertainty is quantified using Markov chain Monte Carlo (MCMC) or other resampling algorithms. The other method, XDB-SRA is implemented within a Bayesian framework, with the priors for the parameters updated based on index data. The additional parameters in XDB-SRA compared with DB-SRA include the catchability coefficient (q), and the extent of observation variance additional to that inferred from sampling error (a). The priors for these parameters are a weakly informative log-normal and a uniform distribution, respectively.

While data-moderate assessments are less complicated than full assessments, and can potentially be reviewed more expeditiously than full assessments, this full STAR panel will be held to review data-moderate assessments because this is the first time that these methods have been used for stock assessment. Previous panel reviews focused on the methodology development and evaluation of model performance.

OBJECTIVES

Requirements for the reviewers: Two reviewers, with one of the reviewers participating in all stock assessment reviews (STAR) in 2013, shall conduct an impartial and independent peer review of the stock assessments that are provided, and this review should be in accordance with this SoW and stock assessment ToRs herein. The reviewers shall have working knowledge and recent experience in fish stock assessments. In general, the reviewers shall have working knowledge and recent experience in the application of expertise in fish population dynamics, with experience in quantitative stock assessment using a range of assessment techniques ranging from simple to complex, use of sampling algorithms such as MCMC to evaluate uncertainty, and use of Generalized Linear Models to develop abundance indices.

PERIOD OF PERFORMANCE

The reviewers shall conduct the tasks according to the schedule of milestones and deliverables as specified in this statement of work (SoW). Each reviewer's duties shall not exceed a maximum of 15 days to complete all work tasks of the peer review described herein. The tentative schedule of milestones and deliverables is provided herein.

PLACE OF PERFORMANCE AND TRAVEL

Each reviewer shall conduct an independent peer review during the panel review meeting scheduled during 22-26 April 2013 in Santa Cruz, California.

STATEMENT OF TASKS

Each reviewer shall complete the following tasks in accordance with the SoW and Schedule of Milestones and Deliverables herein.

Tasks prior to the meeting: The contractor shall independently select qualified reviewers that do not have conflicts of interest to conduct an independent scientific peer review in accordance with the tasks and ToRs within the SoW. Upon completion of the independent reviewer selection by the contractor's technical team, the contractor shall provide the reviewer information (full name, title, affiliation, country, address, email, and FAX number) to the contractor officer's representative (COR), who will forward this information to the NMFS Project Contact no later than the date specified in the Schedule of Milestones and Deliverables. The contractor shall be responsible for providing the SoW and stock assessment ToRs to each reviewer. The NMFS Project Contact will be responsible for providing the reviewers with the background documents, reports, foreign national security clearance, and other information concerning pertinent meeting arrangements. The NMFS Project Contact will also be 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 COR prior to the commencement of the peer review.

Foreign National Security Clearance: The reviewers shall participate during a panel review meeting at a government facility, and the NMFS Project Contact will be responsible for obtaining the Foreign National Security Clearance approval for the reviewers who are non-US citizens. For this reason, the reviewers shall provide by FAX (not by email) the 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/>.

Pre-review Background Documents: Approximately two weeks before the peer review, the NMFS Project Contact will send (by electronic mail or make available at an FTP site) to the COR the necessary background information and reports (i.e., working papers) for the reviewers to conduct the peer review, and the COR will forward these to the contractor. In the case where the documents need to be mailed, the NMFS Project Contact will consult with the COR on where to send documents. The reviewers are responsible only for the pre-review documents that are delivered to the contractor in accordance to the SoW scheduled deadlines specified herein. The reviewers shall read all documents deemed as necessary in preparation for the peer review.

Tasks during the panel review meeting: Each reviewer shall conduct the independent peer review in accordance with the SoW and stock assessment ToRs, and shall not serve in any other role unless specified herein. **Modifications to the SoW and ToRs shall not be**

made during the peer review, and any SoW or ToRs modifications prior to the peer review shall be approved by the COR and contractor. Each 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 stock assessment ToRs as specified herein. The NMFS Project Contact will be responsible for any facility arrangements (e.g., conference room for panel review meetings or teleconference arrangements). The NMFS Project Contact will also be responsible for ensuring that the Chair understands the contractual role of the reviewers as specified herein. The contractor can contact the COR and NMFS Project Contact to confirm any peer review arrangements, including the meeting facility arrangements.

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 scheduled in Santa Cruz, California during April 22-26, 2013
- 3) During the panel review, conduct an independent peer review in accordance with the ToRs (**Annex 2**).
- 4) No later than 10 May 2013, 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 CIE Regional Coordinator, via email to Dr. David Die 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**.

DELIVERY

Each reviewer shall complete an independent peer review report in accordance with the SoW. Each reviewer shall complete the independent peer review according to required format and content as described in **Annex 1**. Each reviewer shall complete the independent peer review addressing each stock assessment ToR listed in **Annex 2**.

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

March 25, 2013	Contractor sends reviewer contact information to the COR, who then sends this to the NMFS Project Contact
April 2, 2013	NMFS Project Contact provides reviewers the pre-review documents

April 22 – 26, 2013	Each reviewer participates and conducts an independent peer review during the panel review meeting in Santa Cruz, California
May 10, 2013	Reviewers submit draft independent peer review reports to the contractor’s technical team for independent review
May 24, 2013	Contractor submits independent peer review reports to the COR who reviews for compliance with the contract requirements
May 31, 2013	The COR distributes the final 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 COR within 10 working days after receipt of all required information of the decision on substitutions. The COR 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 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: The deliverables shall be the final peer review report from each reviewer that satisfies the requirements and terms of reference of this SoW. The contract shall be successfully completed upon the acceptance of the contract deliverables by the COR based on three performance standards:

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

Upon the acceptance of each independent peer review report by the COR, the reports will be distributed to the NMFS Project Contact and pertinent NMFS science director, at which time the reports will be made publicly available through the government’s website.

The contractor shall send the final reports in PDF format to the COR, designated to be William Michaels, via email William.Michaels@noaa.gov

Support Personnel:

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Annex 1: Format and Contents of Independent Peer Review Report

1. The independent peer review report shall be prefaced with an Executive Summary providing a concise summary of whether they accept or reject the work that they reviewed, with an explanation of their decision (strengths, weaknesses of the analyses, etc.).
2. The main body of the report shall consist of a Background, Description of the Individual Reviewer's Role in the Review Activities, Findings of whether they accept or reject the work that they reviewed, and an explanation of their decisions (strengths, weaknesses of the analyses, etc.) for each ToR, and Conclusions and Recommendations in accordance with the ToRs. For each assessment reviewed, the report should address whether each ToR of the SAW was completed successfully. For each ToR, the Independent Review Report should state why that ToR was or was not completed successfully. To make this determination, the SARC chair and reviewers should consider whether the work provides a scientifically credible basis for developing fishery management advice.
 - a. Reviewers should describe in their own words the review activities completed during the panel review meeting, including a concise summary of whether they accept or reject the work that they reviewed, and explain their decisions (strengths, weaknesses of the analyses, etc.), conclusions, and recommendations.
 - b. Reviewers should discuss their independent views on each ToR even if these were consistent with those of other panelists, and especially where there were divergent views.
 - c. Reviewers should elaborate on any points raised in the SARC Summary Report that they feel might require further clarification.
 - d. Reviewers shall provide a critique of the NMFS review process, including suggestions for improvements of both process and products.
 - e. The independent report shall be a stand-alone document for others to understand the proceedings and findings of the meeting, regardless of whether or not others read the SARC Summary Report. The independent report shall be an independent peer review of each ToR, 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 this Statement of Work
 - Appendix 3: Panel Membership or other pertinent information from the panel review meeting.

Annex 2: Tentative Terms of Reference

Pacific Coast Groundfish Assessment Review Panel for Data Moderate Assessments

The reviewers will participate in the Panel review meeting to conduct independent peer reviews of the data-moderate assessments of groundfish stocks managed by the Pacific Fishery Management Council. The review solely concerns technical aspects of the methods, and addresses the following ToR:

ToR 1 – Review documents detailing data-moderate methodologies according to the PFMC’s ToR for the Methodology Review Process for Groundfish and Coastal Pelagic Species and draft data-moderate assessments. Evaluate if the documented and presented information is sufficiently complete. Document the meeting discussions and contribute to a summary panel report.

ToR 2 – Evaluate the technical merits and deficiencies of the proposed method(s) taking into consideration the data requirements of each method, the conditions under which the method is applicable, the assumptions of each method, and the robustness of model results to departures from model assumptions and atypical data inputs. Recommend alternative methods or modifications to the proposed methods, or both, during the panel meeting. Recommendations and requests for additional or revised analyses during the panel meeting must be clear, explicit, and in writing. Comment on the degree to which the methods describe and quantify the sources of uncertainty in the results.

ToR 3 – Evaluate technical merits and deficiencies of the application of data-moderate methodologies to each stock assessment and for their ability to monitor trends at the population level. The STAR panel can make requests of the stock assessment teams (STATs) for additional runs, but should not impose an alternative method if STATs consider this is not appropriate for the stock concerned. In the event that more than one model is presented, the review panel should recommend adoption of a preferred model, if one can be identified, for use in management.

ToR 4 – Decide through Panel discussions if the ToRs and goals of the peer review have been achieved and determine whether the science reviewed is considered to be the best scientific information available. If agreement cannot be reached, or if any ToR cannot be accomplished for any reason, then the nature of the disagreement or the reason for not meeting all the ToRs must be described in the Summary Panel Report and CIE Reviewer's report. Describe the strengths and weaknesses of the review process and Panel recommendations.

ToR 5 - Provide specific suggestions for future improvement in any relevant aspects of data collection and treatment, modeling approaches and technical issues.

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

Participants for the Review Panel of Data-Moderate Stock Assessments

NMFS Southwest Fisheries Science Center
Santa Cruz Lab
110 Shaffer Road
Santa Cruz, CA 95060
April 22-26, 2013

Technical Reviewers

Martin Dorn, Scientific and Statistical Committee (SSC), Panel Chair
Yan Jiao, Center for Independent Experts (CIE)
Vivian Haist, Center for Independent Experts (CIE)
Andre Punt, Scientific and Statistical Committee (SSC)
Selina Heppell, Scientific and Statistical Committee (SSC)

Panel Advisors

John DeVore, Pacific Fishery Management Council (PFMC), Staff Officer
John Budrick, PFMC Groundfish Management Team (GMT)
Gerry Richter, PFMC Groundfish Advisory Subpanel (GAP)

Stock Assessment (STAT) Team

Jason Cope, Northwest Fisheries Science Center
E.J. Dick, Southwest Fisheries Science Center
Alec MacCall, Southwest Fisheries Science Center
Melissa Monk, Southwest Fisheries Science Center
Braden Soper, Southwest Fisheries Science Center
Chantel Wetzel, Northwest Fisheries Science Center

Appendix 4: Agenda - Pacific Coast Groundfish Stock Assessment Review (STAR) Panel for Data-Moderate Assessments

April 22-26, 2013
NMFS, Southwest Fisheries Science Center
110 Shaffer Road
Santa Cruz, CA 95060

Monday, April 22, 2013

- 8:30 a.m. Welcome, Introductions and Review of Logistics (J. Field and M. Dorn)
- 8:45 a.m. Review the Draft Agenda and Discussion of Meeting Format (M. Dorn)
- Review Terms of Reference for Assessment and Review Panel
 - Assignment of reporting duties
- 9:00 a.m. Presentation of Data and Abundance Indices
- Catch data (J. Cope and E. Dick)
 - Fishery-independent abundance indices
 - o AFSC Triennial Shelf Survey approaches (J. Cope)
 - o NWFSC Annual Slope-Shelf Survey (J. Cope)
 - o S. California Hook and Line Survey (J. Cope)
 - o Integrated survey approaches (A. MacCall)
 - Fishery dependent abundance indices
 - o RecFIN trip-based CPUE (E. Dick)
 - o Observer-based Recreational CPUE from CPFVs (E. Dick)
 - Development of analytical requests concerning abundance indices
- 12:00 p.m. Lunch (Boxed lunches onsite)
- 1:00 a.m. General discussion on criteria for evaluating performance of data-moderate assessments
- 1:30 p.m. Presentation of assessments using fishery independent indices of abundance (provide side-by-side results of both exSSS and XDB-SRA for each stock)
- English sole
 - Rex sole
 - Sharpchin rockfish
 - Stripetail rockfish
- 5:00 p.m. Panel discussion and prioritization of topics for further review
- 5:30 p.m. Adjourn for the day

Tuesday, April 23, 2013

- 8:30 a.m. Presentation of assessments using fishery-dependent indices of abundance (provide side-by-side results of both exSSS and XDB-SRA for each stock)
- Brown rockfish
 - China rockfish
 - Copper rockfish
 - Vermillion rockfish
 - Yellowtail rockfish (uses both fishery-independent and fishery-dependent)
- 11:30 p.m. Panel discussion and prioritization of topics for further review
- 12:00 p.m. Lunch (Boxed lunches onsite)
- 1:00 p.m. Review work assignments / Further requests to technical team
- 5:30 p.m. Adjourn for day

Wednesday, April 24, 2013

- 8:30 a.m. Review work assignments / Further requests to technical team
- 12:00 p.m. Lunch (Lunch on your own)
- 1:15 p.m. Comparison of data-moderate assessment methods using Management Strategy Evaluation (C. Wetzel)
- 3:15 p.m. Review work assignments / Further requests to technical team
- 5:30 p.m. Adjourn for day

Thursday, April 25, 2013

- 8:30 a.m. Review work assignments / Further requests to technical team
- 12:00 p.m. Lunch (Lunch on your own)
- 1:15 p.m. Begin drafting panel report as appropriate
- 5:30 p.m. Adjourn for day

Friday, April 26, 2013

- 8:30 a.m. Process for completing final STAR report by Council's June meeting Briefing Book deadline (May 29)
- Characterization of uncertainty
 - Format for the final assessment document
 - Consideration of any remaining Issues
- 12:00 p.m. Lunch (on your own)
- 1:15 p.m. Continue drafting review panel summary report
- 5:30 p.m. Review panel adjourns

Appendix 5: list of requests from STAR panel and the STAT responses.

Input data requests

- A. **Request:** Explain how the pre-1981 recreational catches for Oregon were specified.
Rationale: The document does not include this information.
Response: This request was not completed before the end of the Panel meeting. It will be specified in the final assessment document.
- B. **Request:** Create a set of tables (one table for each species) of the historical catches, with columns for each data source. Plot the data by source.
Rationale: The catches are only provided in plots by area, which makes evaluating the uncertainty associated with the catch data difficult. The Panel wished to understand which data sources were most influential on total removals.
Response: This request was not completed before the end of the Panel meeting. The tables will be provided in the final assessment document.
- C. **Request:** Plot the time-series of discard rates by species.
Rationale: The Panel wished to determine how historical discard rates were created.
Response: This request was not completed before the end of the Panel meeting. The plot will be provided in the final assessment document.
- D. **Request:** For the GLMM-based indices, show Q-Q plots comparing models which include components for ECEs and those that do not. Plot histograms of deviance for each of the four GLMM analyses for each species.
Rationale: The Panel wished to examine the basis for selecting models with ECEs, which was based on the Q-Q plots.
Response: The plots were provided. As expected, the differences in the Q-Q plots for models with and without ECE components was larger for rockfish (e.g. sharpchin) than for flatfish. However, the basis for selecting models with ECE components over those without such components using the Q-Q plots was not obvious. It was noted that the Q-Q plots for some of the “rejected” models would have been “acceptable” had they been provided for, for example, a CPUE standardization.
- E. **Request:** Plot the distribution of the positive catches.
Rationale: The Panel wished to see whether ECEs are evident in the data, especially for species (such as English sole) which do not aggregate.
Response: The plots were provided, but they were not in log-space so were not very informative.
- F. **Request:** Plot the four GLMM indices (ECE vs non-ECE; lognormal and gamma), along with the design-based index, with associated confidence intervals by species.

Rationale: The Panel wished to more fully understand how different the outcomes from the GLMM are given various assumptions regarding inclusion (or not) of model components for ECEs, as well as the choice of error model.

Response: The plots were provided. In general, the log-normal (no ECE component) result differed the most from the remaining indices.

- G. **Request:** Create time-series of GLMM-based indices for the Triennial survey which (a) include the data for 1977, and (b) analyzes all of the data to form a single time-series.

Rationale: The SWFSC analysts include the Triennial data in assessments as single time-series in their preliminary results, but used the design-based estimates rather than the GLMM estimates which made comparisons very difficult.

Response: The time-series were created. It was noted that the GLMM indices for the entire time-series mimicked those when the data were analysed separately for 1986-1992 and 1995 onwards for some species (English sole and Rex Sole), but differed quite markedly for others (e.g. yellowtail north).

- H. **Request:** Compare the standardized indices from the proposed method with indices constructed by applying the Stephens-MacCall approach to the data aggregated by trip.

Rationale: The Stephens-MacCall approach has been the standard way to analyse the recreational CPUE data.

Response: There was insufficient time to conduct this analysis during the meeting

- I. **Request:** Repeat the analysis of the CPFV data for brown rockfish in the central California region based on the final model, changing the buffer to 0.03.

Rationale: The Panel wished to understand how sensitive the outcomes from the proposed method are to changing its assumptions. The size of the buffer determines how many zeros will be included in the analysis, making it an appropriate factor to vary. Brown rockfish in the central California region was selected because this is a species the index for which is based on the historical as well as the recent observer data.

Response: The results were insensitive to the changing the buffer.

- J. **Request:** Provide the graphs for the RecFIN indices for brown rockfish.

Rationale: These graphs were omitted from the document provided to the Panel.

Response: The graphs were provided when the results for brown rockfish were shown to the Panel.

Request pertaining to model structure and assumptions

- K. **Request:** For the brown rockfish coastwide assessment, compute a function of the ratio on the prior for F_{MSY}/M for exSSS to that from exDB-SRA. Use this function to re-weight each point in the posterior from the application of exDB-SRA in which the $F_{MSY}/M - B_{MSY}/B_0$ space is constrained to that for exSSS. Then sample points with probability to the weights assigned to each point.

Rationale: Eliminate the model structure as an issue in the comparison

Response: Results were provided for pre-data distributions? We didn't get what we asked for.

- L. **Request:** Set maturity at age 1 for brown rockfish for XDB-SRA and compare to base run where age at maturity is age 4.

Rationale: To understand the differences between XDB-SRA and exSSS.

Response: There is no great change in biomass trends due to the time lag. Stock can go slightly lower at when age at maturity is set at age one. This is because of a greater number of pre-model rejections when the stock goes below zero when a time lag is included (not possible when there isn't a time lag.)

- M. **Request:** Use knife-edge maturity and selective at age 4 for brown rockfish exSSS and compare FMSY/M ratios for both exSSS and XDBSRA.

Rationale: To understand the differences between XDB-SRA and exSSS.

Response: The pre-data and post-model distribution of FMSY/M were nearly identical for brown rockfish exSSS. This doesn't seem to be accounting for the difference.

- N. **Request:** Provide separate tables for all west coast rockfish and all west coast flatfish with the following information from the most recent stock assessment/update: a) year of the assessment/update, b) value of steepness estimated/used in the base model, c) FMSY, d) %SPR at FMSY, e) natural mortality (use female if different than male, use average for mature fish if age-specific), f) FMSY/M ratio (c/e).

Example	Year	Steepness	FMSY	%SPR@MSY	M	FMSY/M
Dover Sole	2011	0.8	0.131	0.291	0.117	1.1

Rationale: The panel wanted to learn if the high FMSY/M ratios from exSSS were consistent with other west coast assessments.

Response. The table was provided. Most estimates of FMSY/M for west coast assessments range in 0.8 to 1.0 when the information is available. Assumptions for steepness are variable (but are not higher than 0.8). No very high estimates FMSY/M were found even when Beverton-Holt is assumed (as is always the case). There are quite a few missing values for FMSY.

Base model development requests

- O. **Request:** Develop separate assessments for Brown Rockfish for south and central areas by splitting the RecFIN CPUE time series appropriately.

Response: Done

- P. **Request:** For copper rockfish fish, include Oregon index for northern stock assessment and compare the differences with /without it.

Response: Done. There were very minor changes in model result. Panel concluded that it was appropriate to include this index in the model.

- Q. Request:** For rex sole, run the full exSSS AIS using a single triennial CPUE index (excluding 1977).
Rationale: This will be the base model run (assuming no surprises, relative to the equivalent MLE run).
Response: Done
- R. Request:** For sharpchin rockfish, run the exSSS AIS using a single triennial CPUE index (excluding 1977).
Rationale: Results from this to be compared with an (almost) equivalent XDB-SRA and a base run selected based on q estimates.
Response: Done
- S. Request:** For yellowtail rockfish (north), do a XDB-SRA run that excludes the fishery-dependent indices (triennial series w/o 1977).
Rationale: Investigate sensitivity to inclusion of this CPUE index because the recreational fishery targets smaller fish. and other fishery dependent indices have not been updated.
Response:
- T. Request:** For yellowtail rockfish (north), do an exSSS (AIS) run that excludes all fishery-dependent CPUE indices (triennial survey as single series w/o 1977).
Rationale: Investigate sensitivity to inclusion of this CPUE index because the recreational fishery targets smaller fish, and other fishery dependent indices have not been updated.
Response: Biomass trends are broadly similar.
- U. Request:** Do a likelihood profile on $\log(q)$ from -1.5 to 1.5 in increments of 0.5 for stripetail rockfish XDB-SRA
Rationale: To evaluate the likelihood that the stock is above the target.
Response: Most of the profile was completed including the endpoints by the close of the meeting. Estimates of stock depletion are above B40% for all models.