CIE independent review report on the 2013 STAR --- Rougheye Rockfish and Aurora Rockfish Stock Assessments

Yan Jiao

Prepared for

Center for Independent Experts

Department of Fish and Wildlife Conservation
Virginia Polytechnic Institute & State University
Blacksburg, VA
24061
Phone 540 2315749
Email: yjiao@vt.edu
http://www.fishwild.vt.edu/faculty/jiao.htm

Contents

Executive Summary

The 2013 assessments of stocks of rougheye (*Sebastes aleutianus*) and aurora (*Sebastes aurora*) rockfishes along the US Pacific Coast, were reviewed by a Stock Assessment Review (STAR) Panel. The STAR Panel met at the Northwest Fisheries Science Center (NWFSC), Seattle, WA, from July 8 - 12, 2013. The assessments of the stock done by the stock assessment team (STAT) (composed of stock assessment scientists from the NWFSC), were presented to the STAR Panel. The validity of the data (including abundance indices estimation, length composition compilation across spatial areas), biological and geographical characteristics, 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).

The review aims to evaluate the newly proposed stock assessment models illustrated in the draft reports, and to ensure that the Pacific Fishery Management Council (PFMC) bases its decisions on the best available information when managing these two "highly vulnerable species", including providing a scientific basis for setting OFLs and ABCs as mandated by the Magnuson-Stevens Act. The NWFSC provided all the necessary logistic support, background information, documents, and further data and model exploration that were requested by the review panel. The STAR Panel chair, Dr. David Sampson, led the STAR Panel report and communicated the draft report with the STAT panel members, the STAR Advisory Panel, and other attendees before the end of the meeting, to avoid possible confusion. The STAR Panel Report was then finalized after the meeting, which should be after the CIE report due date. CIE Members then prepared their individual reviews.

Rougheye rockfish assessment reviewed this year provided the first formal assessment. Although it is called rougheye stock assessment, the assessment is based on a mixture of both rougheye and blackspotted rockfish (*Sebastes melanostictus*), because these two species are difficult to be distinguished, and have widely overlapping geographic distribution areas. A benchmark assessment for this species with several sensitivity runs was presented by Dr. Allan Hicks, Chantell Wetzel, and John Harms on July 8. The new stock assessment presented divided the fisheries into three fleets. The types of observations used to calibrate the population dynamics include four survey abundance indices, three length compositions from surveys and three length compositions from the three fleets, three types of conditional age-at-length compositions, mean body weight for two fisheries and discards for two fisheries. The new benchmark assessment fixed stock-recruit steepness (0.779) at the mean of the prior based on Thorson (2013) and estimated the natural mortality with the priors developed based on Hamel (2013). The models included in the draft stock assessment report and those done during the review were solved using the Stock Synthesis platform version 3.24o.

The STAR panel requested a list of questions to explore the influence and rationale of using model ~ design based estimators and the random vessel effect assumptions.

Quite some time was spent in exploring the influence of using different length composition data weighting methods --- Francis (2011), McAllister and Ianelli (1997) and Stewart and Hamel (in review). The STAR panel also requested the likelihood profiles given different natural mortality and stock-recruitment steepness values to understand the influence of using the fixed value of h and the rationale of using which key parameter to develop the decision table. The concerns and questions on the relative abundance calculation, and data weighting methods are the same for both species, so there are some similarities for my comments on these two stock assessments.

The rougheye rockfish assessment was considered to be based on the best available data, and constitute the best available information on this species along the U.S. West Coast. Some key recommendations for rougheye rockfish assessment are summarized below:

- Continue the effort on the approaches in weighting length/age frequency. The STAR panel recommended the approach of Francis (2011). However, the influence of the weighting approach is very high on the results of the rougheye stock assessment. Further exploration on the appropriateness of this approach and the harmonic mean approach (Stewart and Hamel, in review) is needed.
- Weighting when both length and conditional age-at-length compositions are used, need to be explored further. Although it is generally agreed that conditional age-at-length does not double count on length compositions, the data points on compositions increases dramatically and influences the results dramatically. Detailed sensitivity analysis should be provided to validate the proposed approach. A simulation study should help explore the influence of using both of them, the appropriate weighting method to be used, and the advantages/disadvantages of using both given different weighting methods.
- Uncertainty of the historical catch was one of the major uncertainties discussed during the review because of mixture of the two species and questions on the WA historical catch reconstruction. In addition to continued effort on historical data reconstruction/synthesis, diagnostic or incorporating uncertainty of catch in the model should be explored in the next stock assessment.
- Investigate the practical application of Bayesian delta-GLMM with random vessel effect and ECE approach. Enough results may be provided for the review purposes to avoid too long a time on the discussion on this approach in the future. 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 and cross validation. Simulations and multiple model selection criteria can be considered in the situations when only using one criterion causes lack of credibility.
- Species identification and life history information such as maturity, fecundity and growth functions need to be compared across its distribution area in the future.
- Continue the effort on a full Bayesian analysis. The STAT panel provided a couple of slides based on the Bayesian MCMC results but did not recommend

reviewing these results. Since the computing speed becomes higher and higher, the effort on this approach is encouraged. The results from Bayesian and Likelihood approach (posterior likelihood) were different and reasons for these differences are encouraged to be explored in the future. The Bayesian results should be readily used in a decision table (Punt and Hilborn 1997), to avoid the difficulty in quantifying the state of nature in the decision table.

- Studies on catchability may be further developed from both the field experiment studies and modeling prior elicitations. The current biomass estimate is too sensitive to small changes in model structure and data weighting alternatives.
- A more detailed description of model equations, symbols used in the equations, submodels used in different scenarios, and the priors used should be provided in future reports. The current technical description of SS3 and the draft stock assessment did not provide the equation on conditional age at length.

A benchmark assessment was also conducted and presented for aurora rockfish by the STAT team, Drs. Owen Hamel and Jason Cope. Aurora rockfish was previously assessed as a category 3 species and this assessment provided the first formal assessment for a category 1 species. In addition to the benchmark assessment for this species, several sensitivity runs were presented by STAT on July 8 and 9. The new stock assessment was recommended to make revisions both on the fleet structure and data uses. The final base model agreed to by both STAR and STAT divided the fisheries into two fleets. The types of observations used to calibrate the population dynamics include four survey abundance indices, three length compositions from surveys and one length composition from trawl fisheries, two types of conditional age-at-length compositions, mean body weight and discard ratios observed for trawl fisheries. The new benchmark assessment fixed stock-recruit steepness (0.779) at the mean of the prior based on Thorson (2013) and fixed the natural mortality on the median of the prior developed based on Hamel (2013). The models included in the draft stock assessment report, and those done during the review were solved using the Stock Synthesis platform version 3.24o.

The STAR panel discussion and requests focused on better understanding the details of the length composition compilation, standardization of indices/CPUE, further model structure revision and data weighting strategy comparison. The final base model was recommended to use the Francis (2011) data weighting approach. The STAR panel also requested the likelihood profiles given different natural mortality, stock-recruitment steepness values to understand the rationale of using which key parameter to develop the decision table.

The aurora rockfish assessment done by STAT was considered to be the best scientific information and adequate for evaluating stock status. Some key recommendations for aurora rockfish assessment are summarized below:

- Continue the effort on the approaches in weighting length/age frequency. The STAR panel recommended the approach of Francis (2011). However, the influence of the weighting approach is very high on the results of this stock

assessment also. Further exploration on the appropriateness of this approach and the harmonic mean approach (Stewart and Hamel, in review) is needed.

- Biological data sampling, such as maturity, fecundity and growth may be updated and compared frequently given the concern of its possible variation across time and space.
- Further model complexity may be evaluated. For example, the growth curves of male and females are very close, so future exploration of a single sex model is still useful.
- Weighting of the data sources, especially when both length and conditional age-at-length compositions are used, may cause overweighting of length/age composition data, although I do not have a solid scientific strategy to provide. Detailed sensitivity analysis should be provided to validate the proposed approach. A simulation study should help explore the influence of using both of them, the appropriate weighting method to be used, and the advantages/disadvantages of using both given different weighting methods.
- Estimability of natural mortality, steepness, and catchability can be explored in at least three ways: model comparison based on goodness-of-fit; simulation study to explore whether selectivity and/or natural mortality of rougheye rockfish is estimable based on its data characteristics (Lee et al. 2011; Jiao et al. 2012); and data cloning (Lele et al. 2007; Lele 2010).
- Studies on catchability may be further developed from both the field experiment studies and modeling prior elicitations. The current biomass estimate is too sensitive to small changes in model structure and data weighting alternatives.
- Continue the effort to conduct a full Bayesian analysis. The results from a full Bayesian analysis should be readily used in a decision table, and uncertainty considered should be based on all sources of the uncertainty involved in the model instead of only on natural mortality or steepness.
- 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 rougheye rockfish and aurora rockfish, off the Pacific Coast under contract for 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. Extra documents were provided during the review upon request from the CIE peer review panel (Appendix 1).

The stock assessment models for both species provided are newly developed and have not been used for management purposes previously but are expected to provide the basis for the management of these two species off the Pacific Coast from now on.

The review committee was comprised of Drs. David Sampson (Chair), Chris Francis, John Field, and Yan Jiao. The review was assisted by Dr. Stacey Miller, Jim Hastie, and John DeVore. The rougheye rockfish stock assessment report was prepared and was presented at the meeting by Dr. Allan Hicks, Chantell Wetzel, and John Harms; the aurora rockfish stock assessment report was prepared and was presented at the meeting by Drs. Owen Hamel, Jason Cope, and Sean Matson.

2. REVIEW ACTIVITIES

The STAR Panel meeting took place at the Northwest Fisheries Science Center (NWFSC), Seattle, WA, from July 8 – 12, 2013. The meeting followed the "tentative agenda" of the STAR review (Appendix 4). The meeting was open to the 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 July 8 before the meeting, the assessment review committee met with the STAT team to discuss the meeting agenda, reporting requirements, and meeting logistics. Dr. David Sampson (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. During the STAR meeting, all documents, including extra documents requested during the review, were made available electronically through an ftp site (Appendix 1).

The draft assessments of these two species were presented by the STAT 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 to use 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 assessments of rougheye rockfish and aurora rockfish managed by the Pacific Fishery Management Council. 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 are presented in accordance with the ToRs.

4.1. Rougheye Rockfish

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

I reviewed reports and related documents provided by the STAR meeting coordinator before the review meeting, which mainly included the draft STAT stock assessment report, the ToRs and the supporting documents on data syntheses, prior elicitations, and the Stock Synthesis technical document and user manual.

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

When calculating abundance indices, the newly proposed methods should be further validated. The practical application of Bayesian delta-GLMM with random vessel effect and ECE approach should be explored in several aspects, such as whether the modelled random effect confounded with the “true” trend and whether the extra complexity of ECE is needed.

Uncertainty about the catch history was discussed in the draft document, but not quantified or incorporated into the final assessment model or decision table. For rougheye, because of the nature of two mixed species, the uncertainty of the catch history is more serious than for many other rockfish species. This may be a substantial source of uncertainty, and could require investigation of catch reconstructions with regard to uncertainty in order to better understand the plausible range for historical estimates. I would also recommend that uncertainty of catch be modelled if it is considerable.

Species identification and life history data collection on the two species are suggested to be based on a wider spatial coverage.

4.1.3 *ToR 3* – Evaluate model assumptions, estimates, and major sources of uncertainty.

The length/age frequency data weighting approaches influenced the results dramatically. The STAT team used a (Stewart and Hamel, in review), which is a modified approach from McAllister and Ianelli (1997) in the draft report. The STAR panel member Dr. Francis suggested his approach (Francis 2011). The STAR panel agreed with the application of Francis (2011) for this benchmark stock assessment because it intends to down-weight length/age composition data by accounting the autocorrelated signals in the residuals of length frequency or age frequency. However, the results are very sensitive to the weighting approaches. I considered this as one of the major sources of uncertainty in estimating the fishery and stock status.

The new benchmark assessment used a fixed stock-recruit steepness (0.779), which is the mean of the prior based on Thorson (2013); it estimated natural mortality rate with the prior developed from Hamel (2013). Different values of these two parameters have dramatic influence on the stock assessment results. I considered this as another major source of uncertainty in estimating the fishery and stock status.

The catch is assumed to be deterministic without uncertainty but at the same time historical catch and the nature of two species mixed together is one of the major uncertainties discussed during the review. So, In addition to continued effort on historical data reconstruction/synthesis, measuring and incorporating uncertainty of catch in the model should probably to be explored.

The current axis on the decision table is based on natural mortality, which is assumed to be constant for females. Both natural mortality and steepness are of high uncertainty. The current decision analysis is not enough to indicate states of nature but the STAR panel cannot provide better suggestions given the current estimation algorithm (likelihood based). A full Bayesian analysis would make this step much easier and more scientific (Punt and Hilborn 1997).

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

Weighting approaches of the data sources, especially length and age compositions or conditional age-at-length compositions, need to be further explored. Three approaches (McAllister and Ianelli 1997; Francis 2011; Stewart and Hamel, in review) were discussed during the review week. Detailed sensitivity analysis should be provided to validate the proposed approach. A simulation study to evaluate the weighting strategies and their influence on the model results can be conducted for long-term exploration.

Weighting when both length and conditional age-at-length compositions are used, need to be further explored. Although it is generally agreed that conditional age-at-length does not double count length compositions, the data points on compositions increases dramatically and influences the results dramatically. Detailed sensitivity analysis should be provided to validate the proposed approach. A simulation study should help explore the influence of using both of them, the appropriate weighting method to be used, and the advantages/disadvantages of using both given different weighting methods.

When applying Bayesian delta-GLMM with random vessel effect and ECE approach, model comparison and selection is needed to find a biologically meaningful model and to avoid overfitting. Results that can be used to support the selected model by the STAT panel should be provided.

Uncertainty of the historical catch is one of the major uncertainties for many species along the Pacific Coast. For rougheye, some sensitivity runs with a reasonable level of uncertainty on historical catch may help. In addition to continued effort on historical data reconstruction/synthesis, incorporating uncertainty of catch in the model should probably be explored instead of assuming no error in the model.

I suggest that continued effort should be spent on the development of a full Bayesian analysis given my concerns in ToRs. The STAT team showed a few slides on Bayesian results but this method was not used for all model runs and the results were quite different from that of likelihood approach. The results from such an analysis should be readily used in a decision table and uncertainty considered is based on all sources of the uncertainty involved in the model instead of only on natural mortality or steepness. Informative priors on key life history or fishery related parameters can be incorporated in such an analysis also. Different MCMC algorithms may be explored in this case if the Metropolis-Hasting algorithm is not efficient. The computing speed becomes higher and higher, so continued effort on this approach should benefit future stock assessment.

4.1.5 *ToR 5* – Determine whether the science reviewed is considered to be the best scientific information available.

I consider the assessment represents the best scientific information available for the stock assessment of rougheye rockfish although improvements or adjustments in model structure development are possible. Because this is the first stock assessment for this species complex and the model results are very sensitive to the data weighting approaches, consideration of using this assessment to provide the basis for the management of this fishery need to be more precautionary.

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

Suggestions for short-term improvement include: 1) collect data to identify species composition across spatial areas; 2) collect new life history data across space and time (a couple of years here) if possible to validate the functions; 3) explore the real application of Bayesian GLMM with ECE for this species based on its biological and geographical characteristics, and based on appropriate model selection criteria; 4) continue the effort on catch data reconstruction and update; 5) continue age reading for existing datasets; and 6) add further modeling exploration to address the catch uncertainty.

Suggestions for long-term improvement include: 1) develop a simulation study to evaluate the weighting strategies on length/age composition data and their influence on parameter estimation and fishery/population status; 2) develop a simulation study to evaluate the weighting strategy and its influence when using both length compositions and conditional age-at-length; 3) develop a simulation study to explore the estimability of natural mortality and steepness including the possible confounding relationship between them and with other key parameters such as catchability and selectivity; and 4) develop a full Bayesian analysis and explore the differences of the results between maximum posterior likelihood estimation and the MCMC outputs for this species.

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

The STAR Panel meeting took place at the NWFSC, Seattle, WA, from July 8 – 12, 2013. The meeting followed the “tentative agenda” of the STAR review (Appendix 4) with some flexibility on the time for each species.

On the morning of July 8 before the meeting, the STAR panel met with the STAT team to discuss the meeting agenda, reporting requirements, and meeting logistics. Dr. David Sampson (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. Sampson also requested to post online all the presentations, the updated presentations, requests from the STAR panel and the responses from STAT teams. Dr. John DeVore and the STAT teams posted all the materials from both the STAT and the STAR panels.

The STAT team for rougheye rockfish stock assessment then started their presentations on the draft stock assessment. The presentation and discussion extended for most of the day. During their presentations, questions were asked from the STAR instead of waiting till the end of the presentation. The presentation was prepared according to biological and geographic characteristics of rougheye rockfish, data and model structures, base case and sensitivity runs, and then model results. Questions were asked throughout the presentations by the STAR panel. The request from the STAR panels and the responses from the STAT team are listed in Appendix 5. Detailed responses from STAT and summarized by STAR can be found from the STAR panel report. I list the major pertinent discussions and recommendations below.

Questions on the relative abundance index calculation:

> Does the random vessel effect confound with or alias the real trend of the stock? How should one explore it? Which evidence should be explored on whether it is needed or not? Is the estimated trend of the stock sensitive to CPUE standardizations models, here designed based index, GLMM with random vessel effect, and Bayesian GLMM with random vessel effect and with ECE.
>
> The discussion on this issue was very effective. The STAR panel found according to STAT team's response on July 9 and 10 that this "vessel effect" could be the random draw of survey sites or stations that may or may not have rougheye. The STAR panel further requested a short summary on these surveys especially the changes of the survey designs over time. On July 9, the STAR panel requested to further check the vessel ID and the meaning of the symbols used in the plots of the vessel effect. The panel recommended further exploration of the random vessel effect in GLMM estimates with different criteria for model selection and model diagnostics. This evaluation and the summary of the results used for assessment needs to be species specific.

Questions on the bimodal pattern of the survey (Triennial and the NWFSC slope/shelf) length compositions and the paucity of the 35-40 cm fish, and materials explored:

The discussion on this issue was very useful but the problem was not solved. The STAR panel and the STAT explored the fish size distribution across depth and latitude, and the number of tows across depth and latitude. The STAR panel also requested to look into the length expansion algorithm. However, these explorations did not provide a good explanation of the observed bimodal patterns of the length frequency.

Questions on unusual catch history:

Are the unusual historical catches in some places real, such as where fixed gear catches drop to nearly zero in the 1960s-70s, then increase again sharply?

The discussion on this issue was very useful. The STAR panel suggested alternative sensitivity runs, and requested to explore the catch history of Pacific halibut and sable fish. On July 10, the STAT provided "new" runs with sensitivity runs but none of them showed dramatic differences in the depletion rate. The exploration on the halibut and sable fish history did not provide an explanation for near-zero catches of rougheye in the 1960-70s. Both STAR and STAT panels recommended that these sensitivity runs and alternatives on possible high and low catch regimes be incorporated into sensitivity runs to explore the influence of historical catch uncertainty.

Questions on the approaches to weight length-at-age and other data sources:

The discussion on this issue was very useful. On July 8, STAR panel member Chris Francis recommended his approach (Francis 2011), and his recommendation was supported by the panel although there were intensive discussions on whether it should be used in the base model or as a sensitivity run. STAT provided two more sensitivity runs in the following two days. Both STAR and STAT panels recommended this revision be incorporated into the base case model scenario. However, both STAT and STAR panel realized that this revision changed the results dramatically and future research on the appropriate weighting strategy is needed.

Extra explorations and discussions on model fitting and results include Pearson residual plot for conditional age-at-length, ageing error validation by comparing ageing error of this species with other long-lived species. The exploration and discussion went very well and I found them to be efficient and to contribute to the overall successfulness of the stock assessment review.

There were two runs of requests on the approaches to quantify the uncertain state of nature in the decision table from July 11 and 12. Because the model output was based on a likelihood paradigm, both natural mortality and steepness were examined as to their likelihood profiles. The STAT and the STAR agreed on using 12.5% and 87.5% quantiles of 2013 spawning output confidence

intervals found in the "new" base run, and then use these two values to find the corresponding M values. The natural mortalities used to bracket low and high states of nature were 0.037 and 0.047, respectively. I, personally, am not that comfortable to recommend values to bracket uncertainty based on the likelihood profile. I strongly recommend future effort on a full Bayesian analysis to address the state of nature in the decision table.

4.2. Aurora Rockfish

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

I reviewed reports and related documents provided by the STAR meeting coordinator before the review meeting, which mainly included the draft STAT stock assessment report, the ToRs and the supporting documents on data syntheses or prior elicitations, and the Stock Synthesis technical document and user manual.

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

The STAR panel discussion and requests focused primarily on better understanding the details of the survey GLMM, the uncertainty of the historical catch, and the approaches used to compile age and/or length compositions in both the fishery and the surveys.

When calculating relative abundance indices, the newly proposed methods should be further validated with some details on the stratification, factors considered, and factors and error distributions recommended in the final model.

Age and/or length composition compilation should use a number-based (rather than weight based) expansion factor since the length-frequencies are numbers based, and there are differences in size composition among states and strata. Differences of length compositions among states and strata may be provided in the future to facilitate efficient discussion and better understanding on the expansion approach.

4.2.3 *ToR 3* – Evaluate model assumptions, estimates, and major sources of uncertainty.

The STAR panel's questions or concerns on model assumptions, model estimates and major sources of uncertainty were mainly focused on alternative effective sample size algorithms (Francis 2011; McAllister and Ianelli 1997; Stewart and Hamel, in review), the appropriateness (including the model

complexity) of the model structure, and on the axis of uncertainty for the decision table. The changes made to the base model during the review were considerable. These changes include using the Francis (2011) weighting algorithm, using a 2 fleets model instead of 3. Both the STAT and STAR panel members agreed that these changes improved the assessment.

The length/age frequency data weighting approaches influenced the results dramatically. The STAT team used Stewart and Hamel (in review) in the draft report. STAR panel member Dr. Francis suggested his approach (Francis 2011) and the STAR panel agreed with the application of Francis (2011) for this benchmark stock assessment because it intends to down-weight length/age composition data by accounting the autocorrelated signals in the residuals of length frequency or age frequency. However, the stock assessment results are very sensitive to the weighting approaches. I considered this as one of the major sources of uncertainty in estimating the fishery and stock status.

The new benchmark assessment used a fixed stock-recruit steepness (0.779), which is the mean of the prior based on Thorson (2013); it used a fixed natural mortality rate (0.0405), which is the median of the prior developed from Hamel (2013). Different values of these two parameters have dramatic influence on the stock assessment results, e.g., the estimated SSBs are dramatically different when median or mean of the prior of M is used according the STAT presentations. I considered this as another major source of uncertainty in estimating the fishery and stock status.

The current axis on the decision table is based on natural mortality, which is fixed as median of the prior in the model. Both natural mortality and steepness are of high uncertainty. The current decision analysis is not enough to indicate states of nature but the STAR panel cannot provide better suggestions given the current estimation algorithm (likelihood based). A full Bayesian analysis would make this step much easier and more scientific.

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

Weighting approaches of the data sources, especially length and age compositions or conditional age-at-length compositions, need to be further explored. Three approaches (McAllister and Ianelli 1997; Francis 2011; Stewart and Hamel, in review) were discussed during the review week. A simulation study to evaluate the weighting strategies and their influence on the model results can be conducted for long-term exploration.

Weighting when both length compositions and conditional age-at-length compositions are used, need to be further explored. Detailed sensitivity analysis should be provided to validate the proposed approach. A simulation study should help explore the influence of using both of them, the appropriate

weighting method to be used, and the advantages/disadvantages of using both given different weighting methods.

Both of the above two suggestions are for rougheye rockfish together. So the two teams may work together for such a further exploration.

I suggest that continued effort should be spent on the development of a full Bayesian analysis given my concerns in ToRs. The current axis on the decision table is suggested to be based on natural mortality likelihood profile. A full Bayesian analysis would make the decision table easier to be constructed and more scientific.

4.2.5 *ToR 5* – Determine whether the science reviewed is considered to be the best scientific information available.

I consider the assessment represents the best scientific information available for the stock assessment of aurora rockfish although I suggest that, for example, the data weighting method needs to be further explored and a full Bayesian analysis be developed in the future. The panel endorsed the base case model agreed upon by the STAT and the STAR as the best available science for use in determining stock status and management decisions.

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

Suggestions for short-term improvement include: 1) collect biological sampling data across space and time, such as maturity, fecundity and growth more frequently given the concern on its possible variation across time and space; 2) continue the effort on age reading for existing datasets and ageing error validation; 3) add further modeling exploration to address the catch uncertainty; 4) explore differences of length frequencies among strata, states or other sampling unit, and compare them with the compiled length frequencies to represent the population; and 5) further explore model complexity, e.g., is a two-sex model really needed?

Suggestions for long-term improvement include: 1) develop a simulation study to evaluate the weighting strategies on length/age composition data and their influence on parameter estimation and fishery/population status; 2) develop a simulation study to evaluate the weighting strategy and its influence when using both length compositions and conditional age-at-length; 3) develop a simulation study to explore the estimability of natural mortality and steepness including the possible confounding relationship between them and with other key parameters such as catchability and selectivity; 4) develop a full Bayesian analysis and explore the differences of the results between maximum posterior likelihood

estimation and the MCMC outputs for this species; and 5) develop some field experiments to further validate catchabilities which seem needed given the reality that the scale of the SSB changes dramatically with limited changes in model structure and data weighting.

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

The STAT team for aurora rockfish stock assessment, Drs. Owen Hamel and Jason Cope, started their presentations on the draft stock assessment on Monday afternoon, July 8. The presentation and discussion extended to the next day. During their presentations, questions were asked from the STAR panel instead of waiting until the end of the presentation. The presentations were prepared according to biological and geographic characteristics of aurora rockfish, developed base stock assessment model and alternative sensitivity runs, and then model results. Questions were asked throughout the presentations by the STAR panel. The request from the STAR panel and the responses from the STAT team are listed in Appendix 5. Overall the discussions were mainly on the details of the data, use of survey indices, use of length frequency and conditional age-at-length, fleet structure and data weighting, and the appropriate axis of uncertainty for the decision table. The STAR recommended quite some changes to STAT's proposed base model in the draft stock assessment. Below, I list the major pertinent discussions and recommendations.

Questions on the relative abundance index calculation:

Does the random vessel effect confound with the real trend of the stock? How to explore it?

The discussion on this issue was short for this species. The STAR panel requested report on additional diagnostics from the GLMMs, including predictions for model covariates. The vessel effect request was not done pending better understanding of how the GLMM data set is constructed and whether one could adequately examine a vessel effect without a more extensive analysis of these data. Because the design-based and GLMM model-based estimates for aurora rockfish were almost the same, model selection in relative abundance index calculation is considered less important.

Questions on dealing with data weighting or alternative effective sample size iteration methods based on Francis (2011) approach:

The discussion on this issue was very useful. Because this question came out for the rougheye species first, it was accepted by both the STAR and STAT on this suggestion. STAT provided two more sensitivity runs in the following two days. Both STAR and STAT panels recommended the Francis

(2011) approach be incorporated into the base case model scenario. However, both STAT and STAR panels realized that this revision changed the results dramatically and future research on the appropriate weighting strategy is needed.

Questions on model complexity or model structure:

The discussion focused on three aspects of the model structure: 1) are 3 fleets needed given the reality that historical catch from non-trawl fishery was always low; 2) is the two-sex model needed given the reality that the estimated growth differences between male and females were so small; 3) is recruitment deviation needed to begin from 1916 given the reality that catch before 1960s was so limited?

The discussion on this issue went very well. Multiple sensitivity runs were explored because of the requests from STAR. These sensitivity runs provided solid evidence/support to construct the new base model by the end of the review week.

Extra explorations and discussions on further clarification of the work included the following: Compare the size and age compositions in northern and southern regions (California/Oregon-Washington)? Recalculate length composition with a numbers-based (rather than weight-based) expansion factor? Provide detailed algorithms on the length composition expansion? These explorations and discussions went very well and I found them to be efficient and to contribute to the overall successfulness of the stock assessment review.

There were two runs of requests on the approaches to quantify the uncertain state of nature in the decision table from July 11 and 12. The decision table bounds were decided based on a weighted distribution of M, i.e., the estimated distribution of M (which is fixed in the base model) weighted by the prior distribution of M. I personally am not that comfortable to recommend values to bracket uncertainty based on the likelihood profile of one parameter. I strongly recommend future effort on a full Bayesian analysis to address the state of nature in the decision table.

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. The review 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, if the agenda can be enforced to a degree, and if a follow-up review can be conducted in the near future.

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 two 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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Punt, A., and Hilborn, R. 1997. Fisheries stock assessment and decision analysis: the Bayesian approach. Reviews in Fish Biology and Fisheries. 7: 35-63.

Stewart, I.J. and Hamel O.S.. 2013. Bootstrapping to inform effective sample sizes for length- or age-composition data used in stock assessments. DRAFT.

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

Appendix 1: Bibliography of Materials Provided for Review

Draft Stock Assessment Documents:

Hicks, A. Wetzel, C. and Harms, J. 2013. The status of rougheye rockfish (*Sebastes aleutianus*) and blackspotted rockfish (*S. melanostictus*) as a complex along the U.S. West Coast in 2013 . DRAFT (Pre-STAR) version.

Hamel, O.S., Cope, J.M., and Matson, S. 2013. Stock Assessment of Aurora Rockfish in 2013. DRAFT (Pre-STAR) version.

Background Materials

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

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

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

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

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Stock Synthesis Model-Related Documents

Methot, R.D. 2012. User Manual for Stock Synthesis Model Version 3.24f. Updated October 3, 2012. NOAA Fisheries, Seattle, Washington.
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Additional Materials Provided During the Panel meeting:

Francis, R.J.C.C. 2011. Data weighting in statistical fisheries stock assessment models. Can. J. Fish. Aquat. Sci. 68: 1124–1138.
Helser, T.E., I.J. Stewart, C.E. Whitmire, and B.H. Horness. 2007. Model-based estimates of abundance for 11 species from the NMFS slope surveys. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-82, 145 p.
Orr, J.W., and Hawkins, S. 2008. Species of the rougheye rockfish complex: resurrection of Sebastes melanostictus (Matsubara, 1934) and a redescription of Sebastes aleutianus (Jordan and Evermann, 1898) (Teleostei: Scorpaeniformes). Fish. Bull. 106:111−134.
Rogers, J.B. 2003. Species allocation of Sebastes and Sebastolobus sp. caught by foreign countries from 1965 through 1976 off Washington, Oregon, and California, USA. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-57, 117 p.
Helser, T.E., Punt, A.E., Methot, R.D. 2004. A generalized linear mixed model analysis of a multi-vessel fishery resource survey. Fisheries Research 251–264.
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Appendix 2: Statement of Work for Dr. Yan Jiao

External Independent Peer Review by the Center for Independent Experts

Stock Assessment Review (STAR) Panel for Rougheye Rockfish and Aurora Rockfish

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

Project Description: New assessments will be conducted for rougheye and aurora rockfishes, which are both considered to be "highly vulnerable species" with vulnerability scores of 2.27 and 2.10, respectively (http://www.pcouncil.org/wp-content/uploads/E2b_GMT_RPT_MARCH_2010_BB.pdf). Assessments for these two stocks will provide the basis for the management of the groundfish fisheries off the West Coast of the U.S. and provide the scientific basis for setting OFLs and ABCs as mandated by the Magnuson-Stevens Act. The technical review will take place during a formal, public, multiple-day meeting of fishery stock assessment experts. Participation of external, independent reviewer is an essential part of the review process. The Terms of Reference (ToRs) of the peer review are attached in **Annex 2**. The tentative agenda of the panel review meeting is attached in **Annex 3**.

Requirements for CIE Reviewers: Two CIE reviewers shall conduct an impartial and independent peer review in accordance with the SoW and ToRs herein. One of the CIE reviewers will participate in all STAR panels held in 2013 to provide a level of consistency between the STAR panels. The CIE reviewers shall be active and engaged participants throughout panel discussions and able to voice concerns, suggestions, and improvements while respectfully interacting with other review panel members, advisors, and stock assessment technical teams. The CIE reviewers shall have excellent communication skills in addition to working knowledge and recent experience in fish population dynamics, with experience in the integrated analysis modeling approach, using age-and size-structured models, use of MCMC to develop confidence intervals,

and use of Generalized Linear Models in stock assessment models. Each CIE reviewer's duties shall not exceed a maximum of 14 days to complete all work tasks of the peer review described herein.

Location of Peer Review: Each CIE reviewer shall conduct an independent peer review during the panel review meeting scheduled in Seattle, Washington during the dates of 8-12 July 2013.

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

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

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

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

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

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

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

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

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

1) Conduct necessary pre-review preparations, including the review of background material and reports provided by the NMFS Project Contact in advance of the peer review.
2) Participate during the panel review meeting in Seattle, Washington during the dates of 8-12 July, 2013 as specified herein, and conduct an independent peer review in accordance with the ToRs (**Annex 2**).

3) No later than 26 July 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 to Dr. David Die, CIE Regional Coordinator, via email to ddie@rsmas.miami.edu. Each CIE report shall be written using the format and content requirements specified in Annex 1, and address each ToR in **Annex 2**.

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

June 3, 2013	CIE sends reviewer contact information to the COR, who then sends this to the NMFS Project Contact
June 24, 2013	NMFS Project Contact sends the CIE Reviewers the pre-review documents
July 8-12, 2013	Each reviewer participates and conducts an independent peer review during the panel review meeting
July 26, 2013	CIE reviewers submit draft CIE independent peer review reports to the CIE Lead Coordinator and CIE Regional Coordinator
August 2, 2013	CIE submits CIE independent peer review reports to the COR
August 9, 2013	The COR distributes the final CIE reports to the NMFS Project Contact and regional Center Director

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

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

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

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

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

Support Personnel:

William Michaels, Program Manager, COTR
NMFS Office of Science and Technology
1315 East West Hwy, SSMC3, F/ST4, Silver Spring, MD 20910
William.Michaels@noaa.gov Phone: 301-713-2363 ext 136

Manoj Shivlani, CIE Lead Coordinator
Northern Taiga Ventures, Inc.
10600 SW 131st Court, Miami, FL 33186
shivlanim@bellsouth.net Phone: 305-383-4229

Roger W. Peretti, Executive Vice President
Northern Taiga Ventures, Inc. (NTVI)
22375 Broderick Drive, Suite 215, Sterling, VA 20166
RPerretti@ntvifederal.com Phone: 571-223-7717

Key Personnel:

Stacey Miller, NMFS Project Contact
National Marine Fisheries Service,
2032 SE OSU Drive,
Newport OR 97365
Stacey.Miller@noaa.gov
Phone: 541-867-0562

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

Jim Hastie
National Marine Fisheries Service,

2725 Montlake Blvd. E,
Seattle WA 98112
Jim.Hastie@noaa.gov
Phone: 541-867-3412

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

1. The CIE independent report shall be prefaced with an Executive Summary providing a concise summary of the findings and recommendations, and specify whether the science reviewed is the best scientific information available.

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

   a. Reviewers should describe in their own words the review activities completed during the panel review meeting, including providing a brief summary of findings, of the science, conclusions, and recommendations.

   b. Reviewers should discuss their independent views on each ToR even if these were consistent with those of other panelists, and especially where there were divergent views.

   c. Reviewers should elaborate on any points raised in the Summary Report that they feel might require further clarification.

   d. Reviewers shall provide a critique of the NMFS review process, including suggestions for improvements of both process and products.

   e. The CIE independent report shall be a stand-alone document for others to understand the weaknesses and strengths of the science reviewed, regardless of whether or not they read the summary report. The CIE independent report shall be an independent peer review of each ToRs, and shall not simply repeat the contents of the summary report.

3. The reviewer report shall include the following appendices:

   Appendix 1: Bibliography of materials provided for review
   Appendix 2: A copy of the CIE Statement of Work
   Appendix 3: Panel Membership or other pertinent information from the panel review meeting.

Annex 2: Terms of Reference for the Peer Review

Stock Assessment Review (STAR) Panel for Aurora and Rougheye Rockfishes

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

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

Participants
Stock Assessment Review Panel for
Rougheye Rockfish and Aurora Rockfish

NOAA Fisheries, Northwest Fisheries Science Center
Auditorium
2725 Montlake Blvd. E
Seattle, Washington 98112
July 8th-12th, 2013

Technical Reviewers

David Sampson, Scientific and Statistical Committee (SSC), Panel Chair
Yan Jiao, Center for Independent Experts (CIE)
Chris Francis, Center for Independent Experts (CIE)
John Field, Southwest Fisheries Science Center (SWFSC)

Panel Advisors

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

Stock Assessment Teams (STATs)

Rougheye Rockfish STAT
Allan Hicks, Northwest Fisheries Science Center (NWFSC)
Chantell Wetzel, Northwest Fisheries Science Center (NWFSC)
John Harms, Northwest Fisheries Science Center (NWFSC)

Aurora Rockfish STAT
Owen Hamel, Northwest Fisheries Science Center (NWFSC)
Jason Cope, Northwest Fisheries Science Center (NWFSC)
Sean Matson, Northwest Regional Office (NWRO)

Appendix 4: Agenda - Stock Assessment Review (STAR) Panel for Rougheye Rockfish and Aurora Rockfish

NOAA Fisheries, Northwest Fisheries Science Center
Auditorium
2725 Montlake Blvd. E
Seattle, Washington 98112

July 8th-12th, 2013

Monday, July 8, 2013

8:30 a.m. Welcome and Introductions

9:15 a.m. Review the Draft Agenda & Discuss Meeting Format (D. Sampson, Chair)
- Review Terms of Reference (TOR) for assessments and STAR panel
- Assign reporting duties
- Discuss and agree to format for the final assessment document and STAR Panel report
- Agree on time and method for accepting public comments

9:30 a.m. Presentation of Rougheye Rockfish Assessment (A. Hicks)
- Overview of data and modeling

12:30 p.m. Lunch (On Your Own)

1:30 p.m. Q&A session with Rougheye Rockfish STAT

STAR Panel discussion
- Panel develops written request for additional model runs / analyses

3:30 p.m. Presentation of Aurora Rockfish Assessment (O. Hamel) (if time allows)
- Overview of data and modeling

5:30 p.m. Adjourn for Day.

Tuesday, July 9, 2013

8:30 a.m. Continue Presentation of Aurora Rockfish Assessment (O. Hamel)
- Overview of data and modeling

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

1:30 p.m. Q&A Session with Aurora Rockfish -STAT

Panel Discussion
- Panel develops written request for additional model runs / analyses

4:30 p.m. Check in with Rougheye Rockfish -STAT

5:30 p.m. Adjourn for Day.

Wednesday, July 10 2013

8:30 a.m. Presentation of First Set of Model Runs for Rougheye (A. Hicks)
- Q&A session with the Rougheye-STAT & Panel discussion
- Panel develops written request for second round of model runs / analyses for Rougheye-STAT

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

1:30 p.m. Presentation of First Set of Model Runs for Aurora (O. Hamel)

- Q&A session with Aurora-STAT & Panel discussion
- Panel develops written request for second round of model runs / analyses for Aurora-STAT.

5:30 p.m. Adjourn for day.

Thursday, July 11, 2013

8:30 a.m. Presentation of Second Set of Model Runs for Rougheye (A. Hicks)
- Q&A session with the Rougheye -STAT & Panel discussion
- Agreement of preferred model and model runs for decision table
- Panel continues drafting STAR report.

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

1:00 p.m. Presentation of Second Set of Model Runs for Aurora (O. Hamel)
- Q&A session with the Aurora -STAT & Panel discussion
- Agreement of preferred model and model runs for decision table
- Panel continues drafting STAR report.

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

5:30 p.m. Adjourn for day.

Friday, July 12, 2013

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

10:00 a.m. Panel Report Drafting Session

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

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

4:00 p.m. Panel Agrees to Process for Completing Final STAR Report by Council's September Meeting Briefing Book Deadline (Date TBD)

5:30 p.m. Review Panel Adjourn.

Appendix 5: list of requests from STAR panel

Requests by the STAR Panel for the rougheye rockfish stock assessment

Note: Results of the responses from the STAT can be found from the final STAR panel report

Request 1: Report additional diagnostics from the GLMMs, including predictions for model covariates. We would also like to see indices and CVs from the design and final model outputs in tabular form, as well as summarizing model predictions of the distinct GLM components (positive model and binomial model).

Rationale: The potential for trends in the random vessel effects over time, it is important to feel confident that the estimated effects are plausible, strong effects may also have implications with respect to how length expansions are developed.

Request 2: If data are available, report the number of tows per square km of habitat (north of 42) in 50 meter depth bins from 100 through 450 meters (include total # tows as well as total habitat area). Provide documentation on survey design (or point to where this exists in background material).

Rationale: To see if there is an apparent explanation for the paucity of 35-45 cm fish from the combined trawl survey.

Request 3: Patterns of historical catches are unusual in some places, particularly where fixed gear catches drop to nearly zero in the 1960s-70s, then increase again sharply. Two catch scenarios that would be useful would be to 1) remove all hook and line catches prior to 1970, and 2) halve the Washington hook and line catches during the pre-1970 time period (keep OR catches as reported). Summarize the impact on equilibrium yield as well as depletion. If possible, report on trends in hook and line fisheries for other target species (Pacific halibut and sablefish) that may be associated with these trends.

Rationale: To provide a way of evaluating the effect on the assessment of uncertainty in the catch history and to seek an explanation for the reduction in hook and line catches in the 1960s-70s (see Figure 20 in the draft assessment report) .

Request 4: Explore alternative effective sample size iteration methods based on Francis (2011) approach, a new set of effective sample sizes can be jointly developed by STAR Panel (Francis) and STAT Team. Do new runs with these re-weighted compositional data (as sensitivity to current base model).

Rationale: The observation that that there is strong autocorrelation in residuals, indication of correlations in data that are not accounted for in estimates of effective sample size. This may need to be done separately for the discard data.

Request 5: Report on the differences between OR and WA length frequency data over the 1995-2012 time period, including pre-2004 and post-2004 period. Also look at separation of Astoria (port complex, inclusive of Warrenton) length frequencies,

which may reflect WA catches, other possible exploration of port-specific sample distribution to be conducted at discretion of STAT.

Rationale: The differences in available length frequency data between OR and WA may be driving unusual residual patterns in fits to LF data.

Request 6: Report on how survey length compositional data are expanded.

Rationale: Not entirely clear to STAR Panel, and depending on how vessel-specific catchabilities (random effects) scale, might be appropriate to consider this in making expansions.

Request 7: Look at aging error from other long-lived rockfish species relative to the estimated error for this species.

Rationale: The Panel wanted to know whether the ageing error used in this assessment was consistent with what has been used in other rockfishes.

Request 8: Also report the marginal age composition plots (traditional view), with axes scaled in an easily interpretable manner.

Rationale: The original plot was hard to interpret because of the scaling of the y axis.

Request 9: With respect to effective sample size reweighting, the STAT is encouraged to consider the results and subsequent discussion of the round 1 request (related to alternative means of sample size reweighting), and provide a model run that incorporates a reasonable approach to conducting the reweighting (for example, doing reweighting in one encompassing round, rather than dataset by dataset). If time allows, include likelihood profiles and residual patterns (and other appropriate diagnostics). Additionally, if possible, investigate why the reweighting appears to result in an effective reduction in model uncertainty.

Rationale: The model is very sensitive to how effective sample sizes are reweighted, and the diagnostic plots of mean length (with error bars) suggest that the effective sample sizes are inconsistent with year to year variation in mean length.

Request 10: Prepare a plot of ratio of effective vs. Input N over time from the original base model.

Rationale: To ensure that the calculation of the input N's is consistent over time.

Request 11: With respect to plots of vessel effects in the GLMM, a secondary request is to identify which symbols correspond with which vessels (or confirm that the symbols correspond with the same vessels over time). Additionally, provide the vessel effects in arithmetic (or other interpretable) scale

Rationale: There is confusion regarding what the symbols correspond to, including some concern that the GLMM may be aliasing year effects with vessel effects.

Request 12: Run the GLMM without vessel effects.

Rationale: To evaluate the relative influence of vessel effects in the index.

Request 13: Plot the mean number of rougheye caught per positive tow in the deep stratum .

Rationale: To better understand trends observed in the different components of GLMM.

Request 14: If feasible, find or develop simple plots of length composition by depth (similar to figure 13 in draft assessment) for other (ideally northern slope) species.

Rationale: To understand the apparent lack of positive catches in 200-300 meter depths in the triennial and combined trawl surveys.

Request 15: If feasible, plot the percent positive and positive average biomass by depth, stratum and pass, including the plot of length versus depth by pass (and any other diagnostics the STAT finds informative).

Rationale: To evaluate whether there are seasonal issues related to the vulnerability of rougheye rockfish to survey gear.

Requests by the STAR Panel for the aurora rockfish stock assessment

Request 1: Report additional diagnostics from the GLMMs, including predictions for model covariates. We would also like to see summarized model predictions of the distinct GLMM components (positive model and binomial model).

Rationale: The potential for trends in the random vessel effects over time, it is important to feel confident that the estimated effects are plausible, strong effects may also have implications with respect to how length expansions are developed.

Request 2: Explore alternative effective sample size iteration methods. Based on Francis (2011) approach, a new set of effective sample sizes can be jointly developed by STAR Panel (Francis) and STAT Team. Do new runs with these re-weighted compositional data (as sensitivity to current base model).

Rationale: The observation that that there is strong autocorrelation in residuals, indication of correlations in data that are not accounted for in estimates of effective sample size. This may need to be done separately for the discard data.

Request 3: Report the temporal trend in the ratio between input and effective sample sizes for each compositional data set.

Rationale: To see whether the calculation of the input N's is consistent over time.

Request 4: Develop a single-sex model.

Rationale: In the interest of parsimony (minimizing the number of parameters), based largely on observation that growth and natural mortality are very similar between the two sexes.

Request 5: Develop a two (trawl+non-trawl, full retention) fishery model, in which the non-trawl length frequency data are removed.

Rationale: In the interest of parsimony, and noting that non-trawl catches are very small, and length frequency data for the non-trawl fishery are very noisy.

Request 6: Develop models that begin around 1970. Start one model without recruitment deviations but with an equilibrium catch for the pre-1970 period, the other with recruitment deviations (estimated numbers at age in 1970) but without an equilibrium catch. Produce a plot of the age structure in 1970 from the base model and from the model that starts in 1970 (estimating age structure in that year).

Rationale: In the interest of parsimony, and noting that catches prior to 1970 are minor.

Request 7: Run the model both with no recruitment deviations (deterministic recruitment) as well as with recruitment deviations beginning later in the model (e.g., start main devs in 1970, 1980, 1990).

Rationale: The recruitment deviation patterns are somewhat unusual, with above average recruitment in the first 40 years of the model, followed by below average recruitment for ~25 years. The panel would like to better understand how these patterns improve the fit to data, as well as how they affect model results.

Request 8: Compare the size and age compositions in northern and southern regions (CA/OR-WA).

Rationale: To better understand whether there are important geographical differences in size and age composition not accounted for in the model.

Request 9: If possible, recalculate fishery length comps with a numbers-based (rather than weight based) expansion factor, and use these comp data in the two-fleet model from request # 5. Include a comparison of the two runs.

Rationale: Given that length-frequencies are numbers based, and there are differences in size composition among states (noted in the response to request #8), this is an appropriate change for the base model (noting that numbers-weighting are how survey data are combined).

Request 10: Provide a comparison of the two-fleet model with tuning as done in the base model, and tuning consistent with request #2.

Rationale: The same as that for request #2.

Request 11: Evaluate the differences in likelihoods of the year-specific compositional data (either, or both, age and length compositional data) in the two fleet model (from request #5) with full rec devs (as in the original base model) versus a two fleet model in which rec devs begin in 1970.

Rationale: To better understand the differences in likelihood components in alternative recruitment scenarios (e.g., when rec devs start in 1970, there is a comparable result in both likelihood and biomass trajectories, but very different results with respect to equilibrium recruitment).