DRAFT Minutes
Pacific Fishery Management Council and the National Marine Fisheries Service
Northwest and Southwest Fisheries Science Centers
Groundfish Stock Assessment Process Review Workshop

University of Washington
Fishery Sciences Building (FSH), Room 203
1122 NE Boat St.
Seattle, WA 98105

December 9-10, 2015

Wednesday, December 9

Attendees:

Dr. Lewis Barnett, NMFS Northwest Fisheries Science Center
Dr. Aaron Berger, NMFS Northwest Fisheries Science Center, SSC
Mr. Troy Buell, Oregon Department of Fish and Wildlife
Dr. Jason Cope, NMFS Northwest Fisheries Science Center
Mr. John DeVore, Pacific Fishery Management Council
Dr. E.J. Dick, NMFS Southwest Fisheries Science Center
Dr. Martin Dorn, NMFS Alaska Fisheries Science Center, SSC
Dr. John Field, NMFS Southwest Fisheries Science Center, SSC
Dr. Vladlena Gertseva, NMFS Northwest Fisheries Science Center
Dr. Melissa Haltuch, NMFS Northwest Fisheries Science Center
Dr. Owen Hamel, NMFS Northwest Fisheries Science Center
Dr. Jim Hastie, NMFS Northwest Fisheries Science Center
Dr. André Punt, University of Washington, SSC
Ms. Heather Reed, Washington Department of Fish and Wildlife, GMT
Dr. David Sampson, Oregon State University, SSC, Groundfish Subcommittee Chair
Dr. Andi Stephens, NMFS Northwest Fisheries Science Center
Dr. Jim Thorson, NMFS Northwest Fisheries Science Center
Mr. Dan Waldeck, Pacific Whiting Conservation Cooperative, GAP
Mr. John Wallace, NMFS Northwest Fisheries Science Center
Ms. Chantel Wetzel, NMFS Northwest Fisheries Science Center

Online Attendees:

Mr. John Budrick, California Department of Fish and Wildlife, SSC
Ms. Jessi Doerpinghaus, Washington Department of Fish and Wildlife, GMT
Mr. Dan Erickson, Oregon Department of Fish and Wildlife
Mr. Craig Good, Oregon Department of Fish and Wildlife
Dr. Xi He, NMFS Southwest Fisheries Science Center
Dr. Neil Klaer, Center of Independent Experts
Dr. Melissa Monk, NMFS Southwest Fisheries Science Center
Dr. Will Satterthwaite, NMFS Southwest Fisheries Science Center, SSC
Ms. Maggie Sommer, Oregon Department of Fish and Wildlife
Dr. Theresa Tsou, Washington Department of Fish and Wildlife, SSC

David Sampson called the meeting to order and there was a round of introductions of the participants. It was agreed that public comments from folks attending online would be accepted at any time.

Discuss Past Stock Assessment Process Review Reports

One point of discussion was the concept of convening data/modeling workshops prior to developing draft assessments, as occurred in the most recent cycle (the data workshop for nearshore stocks) and has sometimes occurred in past cycles. Because the assessment review process requires significant time and resources, it is important that evaluating assessment data and modeling approaches be done as efficiently as possible. One possibility is to convene a series of webinars to discuss and resolve data, and possibly model specification issues (e.g., stock boundaries). It will also be critical to have key persons develop indices, datasets, model documentation, etc. in advance of any meeting, workshop, or webinar. It might expedite the process if the "continuity" CIE reviewer (who participates in all the STAR Panels) was also a participant in any pre-assessment meetings. It would also be helpful to the process if there was a ten-year projection of assessment priorities to support planning for collecting data and developing promising indices and modeling approaches. There are other avenues for improving assessment input data. For instance, there is an effort by the RecFIN Technical Committee to improve recreational data for use in assessments. There also needs to be a review process of recommended indices – perhaps an SSC review. There was discussion of the Southeast Data and Assessment Review (SEDAR) process, which has separate steps for review of the input data and the assessment approach. SEDAR is not flawless and perhaps more complicated than would best fit our process. There needs to be some flexibility in developing assessment data to reflect species-specific data issues. Once the data issues are worked out through advance workshops and through other initiatives to improve source data, a meeting to review proposed indices attended by the SSC Groundfish Subcommittee and STAT leads would be beneficial. Guidance on index development and modeling approaches would be a review meeting objective. Also, it is recommended that Council staff compile and distribute past CIE reports if available on stocks proposed for assessment and that this process step be codified in the Terms of Reference for groundfish stock assessments.

SSC Perspectives on the 2015 Stock Assessment Process and Recommendations for Improvement

There was discussion of the June review of the data-moderate update assessment for arrowtooth flounder, which did not result in an approved assessment. The basic data-moderate approach resulted in extremely high biomass estimates, and subsequent modelling to address this issue was too complex and different from the standard data-moderate approaches to expeditiously review the proposed update assessment in the time allotted. One possible solution for future reviews is to convene an initial data-moderate review with the STATs and the SSC Groundfish Subcommittee with sufficient lag time to address recommendations before a more formal review by the entire SSC. Also scheduling data-moderate stock assessments for stocks using similar data would enable a more efficient review. The arrowtooth example also underscores the critical nature of the compositional data in the assessment. Without the compositional data and the ability to estimate recruitment deviations in the arrowtooth assessment, biomass was increasing beyond what the model could handle or what was believed to be plausible. Criteria for stocks proposed for data-moderate assessment should be refined.

There was also discussion on how to deal with competing assessments from within a STAT (e.g., the 2015 Oregon black rockfish assessment). For stocks that are assessed with separate regional models, there should be consistent approaches to modeling productivity, data weighting, etc. across regions. For situations where one approach does not work well in all regions, it would be helpful if the SSC could provide guidelines on a process step that could be codified in the Terms of Reference for resolving such differences.

The SSC conflict of interest criteria were briefly discussed. During SSC reviews of assessments the supervisors of STATs and STAR panel chairs are encouraged to participate in SSC debates, but they are recused from voting on an assessment in the rare cases where the SSC votes. The conclusion from the discussion was that these criteria are still sound and should be maintained to keep SSC reviews as objective as possible and to avoid the perception of a conflict of interest.

STAT Perspectives on the 2015 Stock Assessment Process and Recommendations for Improvement

Jason Cope discussed practices for developing data-moderate assessments. One issue is how to develop a prior on depletion for a stock that has previously been assessed. Should results from a past full assessment be used? Another issue is whether an MLE approach should be allowed. Although the SSC has previously approved two Bayesian approaches (XDB-SRA and XSSS) for data-moderate assessments, an MLE approach may be acceptable in some circumstances. Also, there was some discussion of whether the median or the mode was the appropriate measure of central tendency for stock status in a Bayesian analysis. A set of best practices needs to be established. However, there are many technical complications that remain to be worked out, such as rules for determining the joint prior in a Bayesian model. Although STATs could be given more flexibility on reporting MLE vs. Bayesian results, as well as recommending the mode vs. median in a Bayesian result depending on the posterior distribution, with that flexibility, it will be important for the STAT to justify their approach. Otherwise there may be a lack of consistency in approaches for determining stock status between assessments and modeling platforms. More discussion on these topics will be needed before these issues are resolved.

Jim Hastie recommended that deadlines be established in the process for providing data to STATs. When new data are provided late in the process the assessment review will not be effective or efficient. This was a common problem during the 2015 assessment process and needs to be resolved. However, if a STAT is compelled to include data provided after the deadline (e.g., the original data were found to be incorrect), the STAT should be allowed to do so if it will not compromise the STAR panel process.

Advisors' Perspectives on the 2015 Stock Assessment Process and Recommendations for Improvement

Heather Reed compiled the GMT's perspectives and provided these in a brief written report and discussed them with the group. To avoid the need for last-minute changes to assessment input data, the GMT and states should be provided adequate opportunity in advance of the STAR panel to review and comment on input data. A set of best practices should be developed for modeling historical discard data. A standard protocol should be developed for deciding whether the triennial trawl survey data are used as a single series or split in two. The GMT wants to hear further discussion on best practices for data-moderate assessments. The GMT also strongly recommends convening a productivity workshop this year and sees merit in a webinar to educate the public regarding data, methods, and improved understanding of the values of steepness currently used for rockfish species. The GMT recommends a more consistent format in assessments for reporting discard rates used by year and more consistency between assessments in the assumptions underlying projections.

The workshop participants recommended adding an appendix to the Terms of Reference for groundfish assessments with SSC-recommended best practices on data and modeling approaches.

Dan Waldeck agreed that working out data issues during a STAR panel is inefficient and that there should be earlier open communication between the STAT, industry representatives, and data managers to properly review input data. A deadline for providing data to the STATs is needed. A webinar with PacFIN database managers and STATs could be convened to understand the best way to access these data. The same process is recommended for the RecFIN database.

John DeVore addressed the issue of missing deadlines for submitting draft assessments for internal review, which was a problem this past cycle. John also recommended a convention of providing all the input and r4SS files be provided in the process so that the STAR panel members have full access.

CIE Perspective on the 2015 Stock Assessment Process and Recommendations for Improvement

Neil Klaer, who was the CIE reviewer for all the 2015 STAR Panels, provided a composite report of the recommendations he made for the STAR Panels. He underscored John DeVore's recommendation to provide all the input, control, and r4SS files to STAR panel members. Neil commented that the STAR Terms of Reference worked fairly well but suggested we reconsider the idea that a STAR panel should not become a workshop. A STAR panel can evolve into a productive workshop if the STAT agrees and assessment problems can be resolved that way. The STAR process of collectively capturing requests and rationale for requests worked well. There is a need to have an advanced evaluation of data before it comes to a STAR panel. Standardizing assessment methodologies is a good idea. More work should be done on establishing best practices for projection methodologies. We should consider better ways to develop decision tables. Most assessment uncertainty is multi-dimensional and a single decision table is overly simplistic. MSEs and other risk assessments should become more standard in the process. Work should be done to improve some of the Stock Synthess problems encountered during this year's STAR panel process (e.g. implausible trends in early recruitment deviations, lower limit on data-weighting).

Martin Dorn asked about the Australian process and Neil and André Punt explained that process. David Sampson asked how the STAR process compares to SEDAR and Neil commented that the SEDAR process did a better job of vetting data and modeling issues prior to the formal assessment review. This is done in a three-meeting process with separate evaluations of data, modeling and methodologies, and then the formal review. Martin asked for more information on Appendix 3 of Neil's document with respect to "breakout rules". Neil explained the Australian process of tracking CPUE and survey trends to understand whether the stock is likely trending the way the assessment projection trajectory predicts. This helps decide whether a stock needs to be reassessed. The other useful application of this process is recognizing whether an assessment has strong retrospective patterns. In such a case an assessment should not rely on longer term projections and such stocks need to be assessed more frequently. Jim Hastie added it may be helpful to include other metrics in such an evaluation. Changes in expectation of mean lengths in the fishery, for instance, may also be needed, especially for a stock not well sampled in surveys.

David Sampson asked whether the CAPAM data-weighting workshop was useful in determining best practices. The overall recommendation is that Francis and harmonic mean weighting works, although the latter approach weights age data too much. Francis weighting is a better approach for weighting age data provided the model is correctly specified. The group recommended a default data weighting approach be decided.

EJ Dick asked if new versions of approved software (e.g. Stock Synthesis, XDB-SRA, XSSS) need a formal methodology review. Perhaps the beta testing report of new versions could be part of an SSC methodology review. At the least, there should be clear guidance from the SSC on how much change from a previously reviewed methodology would trigger a new methodology review.

Recommended Improvements for the Stock Assessment Process and Reviews

Recommendations:

- Explore a series of webinars or a data/modeling workshop to critically review proposed data and methods for index development that will be used in assessments. Bring the SSC Groundfish Subcommittee in when there are proposed indices available for evaluation. This would occur after the STATs and data experts agree on the appropriate data to be used (e.g., data filtering, interpretation of the historical data, etc.).
- Develop a 10-year stock assessment prioritization to allow state agencies and science centers to better plan data collection and analysis (e.g., ageing priorities, etc.).
- Facilitate training webinars with PacFIN and RecFIN database managers and STATs to learn how to best access these data. PacFIN webinars could happen now, but such a training webinar for accessing RecFIN data will have to wait for the database to be migrated to the new SQL framework.

- Once assessment priorities are decided, Council staff should compile past CIE reports and post them on the web site. SSC reports on their assessment reviews should also be housed on the Council assessment web pages.
- Data-moderate assessments are appropriate for improving a data-poor assessment of a stock, but may not be appropriate for a stock previously assessed using a full assessment. A STAR Panel should be dedicated for reviewing data-moderate assessments.
- A simple comparison of historical catches relative to estimated biomass should be done to decide whether any new stock assessment should be prioritized. For example, it was probably not worth conducting an assessment for stripetail rockfish, where the historical catch was a very small percentage of the estimated OFL.
- Refine the language in the Terms of Reference on how best to resolve competing models in an assessment.
- More clearly describe the nature of the STAR panel in the Terms of Reference as primarily a review body, with a limited capacity to investigate identified and agreed (STAR panel and STAT) major problems. If agreed solutions to major problems can be readily identified, sufficient time must still be allowed for full review of the resulting model(s) if they substantially differ from the original drafts presented.
- Establish a deadline (e.g., at least one month prior to the internal document review deadline) for providing data to STATs. This should be consistent with any data review process and codified in the Terms of Reference.
- Establish best practices for modeling and reporting discard data in an assessment. John Wallace has analyzed historical discard data using standardize approaches. This analysis should be evaluated by the SSC and the GMT to formalize best practices.

Thursday, December 10

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Dr. Lewis Barnett, NMFS Northwest Fisheries Science Center
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Modeling Productivity / Productivity Workshop Planning

The question of whether, and when, a workshop on productivity could be scheduled was discussed, including consideration of the extent to which participants could reliably be expected to conduct background work and present results at the workshop. It was acknowledged that best practices for modeling

steepness are still a somewhat open question, and that improvements could be made to current methods. Another topic of discussion was the idea of using a three-parameter Spawner-Recruit (S/R) curve in Stock Synthesis to provide more flexibility in the relationship between F_{MSY} and the ratio B_{MSY}/B_0. This relationship is determined by the value of the steepness parameter in the standard Synthesis model setup with a Beverton-Holt S/R curve.

A primary motivation for these concerns is that steepness is often estimated to be very high for many rockfish and other groundfish stocks, often approaching or hitting the parameter boundary at 1. This could potentially be a consequence of mis-specified S/R relationships. The drawback of using a three parameter S/R function is that there are rarely sufficient data to estimate two parameter S/R relationships, let alone more complex ones. The trade-offs associated with adopting more complex S/R functions should be considered carefully. An evaluation of how the results of a generalized Ricker or Shepherd relationship would map to the more traditional Beverton-Holt relationship would be a helpful simulation for a workshop, in which additional relationships among derived parameters (such as F/F_{MSY} against B/B_{MSY}) could be evaluated. André Punt and Jason Cope have already done some work on this topic. Other studies that would be relevant to explore and/or expand on during a workshop include studies of B_{MSY}/B_0 initiated by Thorson, F_{MSY}/M developed by Zhou et al. (2012), and advantages of 3-parameter S/R functions by Mangel et al. (2013). Of high importance in any consideration of simulation studies to evaluate production functions is to ensure that a wide and appropriate range of functions is represented in any operating models (e.g., assuming a Beverton-Holt for simulating data is not likely to indicate that a generalized Ricker function is optimal in a simulation model). Thus, any good study will consider such factors carefully.

Also mentioned with respect to a productivity workshop was the need to address conflicts among proxy reference points. For example, if the best estimates of steepness for many rockfish are values at or approaching 1, then the current proxies for target spawning output levels could be overly constraining. However, it was also noted that any change in the current proxy reference points should have a robust rationale, and that many evaluations have indicated that the relative difference in potential yield across a moderate range of stock sizes and productivity functions is modest (e.g., Hilborn 2010). Additional MSE studies could integrate various harvest control rules and thresholds currently used by management with simulation studies of alternative S/R relationships or productivity functions within assessment models, to best evaluate the potential trade-offs between yield and the risk of overfishing.

More tractable questions to be addressed at the productivity workshop include best practices for developing steepness priors. Specifically highlighted was the need to revisit how the current steepness priors have been developed with respect to the question of whether steepness estimates (distributions) from previous assessments should be included in a meta-analysis that informs the same species in a future assessment. It is generally (but perhaps not entirely) acknowledged that this practice (including the distribution from the previous assessment) is acceptable if the parameter is included in the assessment as "fixed," but not if the parameter is being estimated with an informative prior from the meta-analysis. In extreme cases, the consequences are nontrivial, as stocks that are inferred by their profiles on steepness to have the lowest productivity would end up with priors that counterintuitively inferred a higher productivity. Another technical issue that could be addressed at the productivity workshop is incorporating autocorrelation in the methodology used to generate the prior on steepness.

To conclude the discussion of a potential productivity workshop, numerous questions regarding both the focus and the organization were discussed. The group was not entirely clear whether the SSC had explicitly been asked to take the lead on organizing a workshop, nor were there obvious volunteers to organize or host a workshop. It was noted that a catch reconstruction workshop had tentatively been planned for July of 2016, and that there is a pending request for a CIE reviewer from the NWFSC for a productivity workshop. Moreover, there could be disadvantages in scheduling a productivity workshop too early because analysts will need time to develop and run simulations, but there is also a need to hold a workshop early enough that the results could be informative to the next stock assessment cycle. This is particularly true if the intent of the workshop is to include documentation of best practices for modeling productivity or deriving productivity parameters and priors. The larger, overarching question regarding whether there was

sufficient human capital (analytical power) and financial (travel, other) support to hold two workshops in 2016 was discussed but not entirely resolved. Suggestions to streamline costs and reduce travel obligations included holding a productivity workshop before the September PFMC meeting in Boise. Three days was discussed as a necessary length of time to effectively complete a workshop that included a formal process to develop recommendations for best practices (which could potentially be added to the Terms of Reference for stock assessments).

Updating the Stock Assessment and Rebuilding Analysis Terms of Reference

During discussion of how to revise the Terms of Reference for stock assessments the following points were raised:

- If a stock was previously assessed and CIE reviewer reports for that assessment are available, the Council staff should provide those CIE reports to the STAT and the STAR as part of the background material.
- The language about competing assessments should be written in a more general way, to indicate that the STAR will accommodate competing models that may arise. There are likely to be many different mechanisms that could result in competing models within and among STATs.
- The Terms of Reference should include an appendix with any SSC recommended "best practices", to the extent that best practices have been developed and agreed.
- The STATs should be instructed to provide all SS files as separate, stand-alone csv files in the package that goes to a STAR panel for review so that reviewers can both examine and run draft/final models. These files do not also need to be incorporated into the actual assessment document. The "numbers at age" table (required under the 2015 Terms of Reference and in previous versions) should be provided as a stand-alone csv file, but does not need to be in the final assessment document.
- It is important that all of the assessment materials be archived, including all input files, different SS executable versions and R4SS code, model outputs, and assessment document word files plus pdf versions. NMFS has been doing this for many years. Currently the Council keeps pdf versions of final assessment documents on the Council website, plus the corresponding STAR Panel reports. Should other pieces of the assessment package also be included on the Council website? Should the Council website include standard sets of figures and tables in an output package (such as the pdf or html viewer)?
- The Terms of Reference should specify a standard format for citing assessment documents, which will be included as boiler plate in the Executive Summary of each assessment document (e.g., "please cite this document as …".
- The text in the Terms of Reference describing the process for referring an assessment to the mop-up panel needs to be revised to allow enough time for public notice of the mop-up panel meeting. One possibility is to include a webinar following the last round of assessments to recommend referral to the mop-up. The recommended process needs to be explicit in the next Terms of Reference.
- The list of responsibilities for the GMT should include providing the STATs with the information needed to conduct default projections, including the default harvest control rules, sigma and p-star values for default forward projections, as well as additional GMT projection requests. If done in coordination with Council staff and early in the process it should lead to more consistent treatment across assessments regarding what is assumed about removals.
- The Terms of Reference should include examples or explicit templates of the information needed for projection runs (removals, spawning biomass and depletion projections as well as OFL and ACL values for the current and next year). The projections start in the current year; not the year in the future that the management based on this assessment will go into effect. Also, the text needs to be very clear that for non-overfished stocks, the OFL and ACL values for the current and next year are from the last assessment, whereas for overfished stocks, the projections for the current and next year are from the rebuilding analysis.

- The Terms of Reference should include examples or explicit templates of the information needed for the Species Information System (SIS)

There was discussion of how to provide better guidance in the Terms of Reference on constructing decision tables, but with recognition that there is no single, best approach for representing multiple dimensions of uncertainty in a single table. The revised Terms of Reference could point to examples of assessments that have used different approaches for constructing decisions tables, such as the 2015 assessment for canary rockfish, which provided two sets of decision tables, or the assessment for widow rockfish, which incorporated three aspects of uncertainty into a single decision table. It was noted that the 2015 Pacific hake assessment, conducted in a Bayesian framework using MCMC, provided useful metrics related to the probability of biomass falling below a prescribed threshold. However, analyses based on MCMC are not feasible for most of the Council's full assessments because they take too long to run. The potential for ensemble modeling was also discussed. Such an approach would provide a mechanism for considering model structure uncertainty, whereas current decision tables mostly consider parameter uncertainty.

There is a need to formalize the process of updating projections from old assessments given that management is based on a number of assessments that do not provide projections beyond the current management cycle. A closely related issue is how old an assessment can be before it no longer can be used to provide projections for management. Adjustments to the current ten-year projection rule may be appropriate for some stocks, depending on the stock's dynamics and the level of removals. The issue could be considered as part of the Council's stock assessment prioritization process.

A substantive topic of discussion was with respect to data weighting, and the question of whether there should be a recommended best practice. Even if the recommendation is only guidance, it was noted that the term "best practice" implies that the SSC had thoroughly evaluated the issue. In reality, research is ongoing and there is not yet broad consensus.

David Sampson and Martin Dorn have volunteered to implement these changes to the Terms of Reference in advance of the April meeting; John DeVore will offer some additional suggestions.

Data weighting

There was discussion of results presented at the recent workshop on data weighting hosted by the Center for the Advancement of Population Assessment Methodology (CAPAM) in La Jolla, CA in October of 2015. Some general consensus was that considerable progress was made at the workshop, but that an overall set of "best practices" for data weighting remained somewhat elusive and context dependent. For example, one participant noted that data weighting problems are minimal if the likelihood functions and model structure are correctly specified. It was noted that if a model is correctly specified, the harmonic mean weighting method works well for marginal age- and length-composition data. If the model is not correctly specified (diagnostics should indicate this), the Francis weighting method is likely more appropriate, as this method takes into account the autocorrelation among the compositional data. However, it was noted that the Francis approach is unlikely to address all the problems that a mis-specified model might create. Similar general rules may apply to conditional age-at-length composition data. The need to improve diagnostic plots in order to evaluate these factors was highlighted.

There was some discussion whether the best practices guide should recommend conducting sensitivity runs that contrast the Francis weighting versus harmonic mean weighting approaches, but it was not clear if there was consensus on this point. Jim Thorson noted that the Dirichlet multinomial has similar properties to the harmonic mean weighting (Thorson 2014), and if this distribution could be implemented in Stock Synthesis for the next assessment cycle, using the Dirichlet multinomial likelihood for compositional data might resolve many of these issues. This new approach will also merit discussion and likely review. With respect to changes to Stock Synthesis, there was discussion of the issue of minimum compositional sample sizes

reverting to 1 during iterative weighting exercises. Apparently this problem will be addressed in the next version of Stock Synthesis. Additionally, the appropriateness of applying a single scalar to an entire time series of compositional data was questioned given that the fisheries and sampling procedures may have changed. It was agreed that this remains an important area of investigation that does not appear to be the focus of much research effort. Finally, issues regarding recreational fisheries and sample sizes were recognized, such as the challenges of identifying what constitutes a "trip" in the data.

Stock assessment prioritization

Jim Hastie addressed the group regarding ongoing efforts to develop a formal stock assessment prioritization approach. The current plan is to assemble prioritization information between Nov.-Jan. and distribute this information to the Council and Advisory Bodies in February for discussion at the March Council meeting. Currently, landings are the primary metric for recreational groundfish; there is a need to consider metrics that might be more appropriate. Information on subsistence value to the tribes would also be helpful, and some information may be available. The overarching goal is to strike a balance between the overall contributions of a stock to the fishery as a whole as well as to ensure that reasonable consideration is given to stocks that may be particularly important to specific elements of the fishery.

Literature Cited

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