Center for Independent Experts (CIE) Independent Peer Review Report

Stock Assessment Review (STAR) Panel 2 for Bocaccio and China Rockfish

Santa Cruz, California. July 6-10, 2015

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Executive Summary

The stock assessment indicated that Bocaccio rockfish was at about 38% of its unexploited level in 2015. This is above the overfished threshold of SB25% but slightly below the management target of SB40% of unfished spawning output. The science reviewed is the best scientific information available at present and this new assessment constitutes the best available information on Bocaccio rockfish off the U.S. west coast.

The stock assessment indicated that China rockfish in Washington State Marine Catch Areas (MCAs) 1-4 was about 75% of its unexploited level in 2015, which is well above the management target of 40%. China rockfish in the central region from the Oregon-Washington border to 40°10′ N. latitude was about 62% of its unexploited level in 2015 which is well above the management target of 40%. China rockfish in the southern region from 40°10′ N. latitude to the U.S.-Mexico border was about 28% of its unexploited level in 2015, which is slightly above the overfished threshold of SB25% but below the management target of SB40% of unfished spawning output. The science reviewed is the best scientific information available at present and these new assessments constitute the best available information on China rockfish off the U.S. west coast.

Background

The Stock Assessment Review (STAR) Panel 2 for Bocaccio and China rockfish was held in Santa Cruz, California during July 6-10, 2015. This was the second of four panels scheduled for 2015 to evaluate and review benchmark assessments of Pacific coast groundfish stocks. The general goals and objectives of the groundfish STAR process are to:

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

The purpose of the meeting was to provide technical review of:

1) A full assessment conducted for Bocaccio rockfish in 2015, a species that has been declared overfished and has been managed under a rebuilding plan for more than a decade. The last full assessment of Boccaccio rockfish was conducted in 2009 and it was subsequently updated in 2011 and 2013. The 2013 update assessment estimated depletion at 31.4 percent; an improvement over that forecasted by the 2011 assessment (approximately 28 percent). Improvement in stock status is attributed to higher estimates of 2010 recruitment. Bocaccio was predicted in the last assessment to be rebuilt by 2015.

(2) A full assessment conducted for China rockfish in 2015. A data-moderate assessment, comprised by northern and southern models was conducted in 2013. The status of China rockfish had never been assessed before 2013. However, not all sources of abundance information were considered in the 2013 assessment, and considerable length data and some age structures are available that were not used in the data-moderate assessment.

The Panel was composed of two independently appointed Center for Independent Experts (CIE) reviewers (Dr. Noel Cadigan, Canada; Dr. Neil Klaer, Australia), an independent reviewer from the National Marine Fisheries Service, Northeast Fisheries Science Center (Dr. Paul Nitschke) and an independent chair, (Dr. Martin Dorn, USA) of the Pacific Fishery Management Council's (PFMC's) Scientific and Statistical Committee (SSC). The SARC was supported and assisted by Mr. J. DeVore (PFMC). Assessment documents were prepared by stock assessment teams (STAT's) and presented by Dr. John Field (SWFSC) for Bocaccio rockfish and by Dr. E.J. Dick (SWFSC), Dr. Ian Taylor (NWFSC) and Dr. Melissa Haltuch (NWFSC) for the three China rockfish stocks. The support of all of these scientists and staff to the STAR Panel process is gratefully acknowledged.

The CIE reviewers were tasked with conducting impartial and independent peer reviews in accordance with the SoW and ToRs herein. The reviewers were required to be active and engaged participants throughout panel discussions and to voice concerns, suggestions, and improvements while respectfully interacting with other review panel members, advisors, and stock assessment technical teams. The CIE reviewers were required to 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 could not exceed a maximum of 14 days to complete all work tasks of the peer review described herein.

Role of reviewer

All assessment documents and most supporting materials were made available to the Panel via an ftp server two weeks before the meeting. These documents are listed in Appendix 1. I reviewed the backgrounds documents I was provided. I attended the entire STAR Panel review meeting in

Santa Cruz, California, July 6-10, 2015. I reviewed presentations and reports and participated in the discussion of these documents, in accordance with the SoW and ToRs (see Appendix 2). This report is structured according to my interpretation of the required format and content described in Annex 1 of Appendix 2. After the meeting, I participated in email discussions dealing with the review panel summary report.

Summary of findings

A. **Bocaccio rockfish**

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.

A draft stock assessment document was provided, including:

- a detailed Executive Summary,
- some basic information on stock structure and distribution, basic life history information, and a little ecosystem information,
- a description of the history of Bocaccio management,
- a detailed description of fishery landings (directed and bycatch) and discards,
- fisheries standardized catch rates and information on the biological sampling of the catches (lengths, ages),
- fisheries independent survey information (catch rates, length and age compositions),
- other biological information (weight-length relationship, maturity schedule, fecundity, natural mortality, aging bias and precision),
- a detailed history of stock assessment modeling approaches and responses to the 2009 STAR panel recommendations,
- Assessment model description, including changes made from the last assessment, model specification (life-history, stock-recruit, fishery and survey selectivity),
- model selection and evaluation (key assumptions and structural choices, data weighting),
- base model results,
- uncertainty and sensitivity analyses,
- description of reference points,
- harvest projections and decision tables,
- text on regional management considerations,
- research needs,
- literature cited, and

- appendices describing: A) History of Management Measures Affecting the Bocaccio Fishery B) Reef delineation and Drift Selection Methodologies for analysis of California CPFV Recreational Data, and C) Input Files of the Base Model to the SS3 Program .

Previous stock assessment documents

The 2009 benchmark assessment document was provided as well as the 2009 STAR Panel Meeting Report. 2011 and 2013 update assessment reports were provided, along with the PFMC's SSC 2014 Stock Assessment and Fishery Evaluation (SAFE) report.

Data input documents

During the review meeting, documents were provided on 1) age determination criteria for Bocaccio, and 2) pre-recruit indices for select Sebastes species from SWFSC and NWFSC/PWCC midwater trawl surveys (2001-2014).

Documentation on analytical models

In addition to the information provided in the draft assessment report, documents were provided on 1) Technical Description of the Stock Synthesis assessment program, 2) User Manual for Stock Synthesis Model Version 3.24s, 3) Estimating a Bayesian prior for steepness in Pacific rockfishes (Sebastes spp.), 4) Use of the delta method to evaluate the precision of assessments that fix parameter values.

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

Input data – merits and deficiencies

Landings of Bocaccio rockfish were reconstructed back to 1892, and the assessment assumes a zero catch and equilibrium unfished biomass in 1982. It is meritorious to have such a long time-series of landings, but the uncertainty in the landings has not been quantified which is a common problem in fish stock assessment. However, no evidence of substantial mis-reporting of Bocaccio was presented. Discard estimates were provided in tables and they did not seem high, indicating that landings account for most of the fishery removals. Historically, Bocaccio rockfish landings have not been sampled at the species level. Landings prior to 1944 were estimated to be low and provide little information about population dynamics.

There appears to be two demographic clusters of Bocaccio, north and south of Cape Mendocino. This was supported by apparent differences in growth, maturity and longevity, although genetic evidence indicated a single West Coast population. This spatial structure was addressed through some separation of fleets and data. Landings were constructed for recreational and trawl fisheries north and south of Cape Mendocino. Landings were also constructed for setnet and hook and line commercial fisheries.

The same length-weight relationship estimated in the 2009 assessment was used in this 2015 assessment. The parametric relationship seemed reasonable overall; however, the log-linear relationship may under-estimate the weight of large fish. This should be re-examined in future assessments.

Maturity information was updated from three different sources: 1) CalCOM, 2) the NMFS Southwest Fisheries Science Center (SWFSC) Groundfish Ecology cruise conducted by the Fisheries Ecology Division, and 3) the NMFS SWFSC hook-and-line collections by the Early Life History team. This was modelled to estimate proportion mature by length for females. Sensitivity analyses were conducted to examine temporal expansion (sensitivity 1), exclusion of stage 2 ovaries (sensitivities 2 and 4), and exclusion of samples from the Southern California Bight (sensitivities 2 and 3). The treatment of this information was very thorough. However, analyses of inter-annual and regional changes in maturity at size were not conducted, and I agree with the STAT that there is a need for balanced data to effectively evaluate inter-annual and spatial variation in length at maturity.

The assessment was sex-based which seemed reasonable given the difference in size at age for males and females. The assessment assumed a 1:1 sex ratio, which also seemed reasonable.

Fecundity parameters were updated to reflect newly available data from ongoing reproductive ecology studies. Results indicated that the relationship of fecundity to the weight of fish had a lower slope than previously used, which indicates less reproductive value of larger older females. This could have implications on values for Fmsy. The STAT noted that Bocaccio is capable of producing multiple broods which complicates the estimates of annual fecundity. This issue was thoroughly addressed by the STAT, but I recommend further investigations of the reproductive biology of this species.

A variety of stock size indices were developed and used in this assessment. As is typical in west-coast assessments, the indices were standardized using delta-GLM models. There was insufficient time at the meeting to review the index standardizations; however, for the fishery-independent analyses it was not clear to me if there were changes in spatial distribution that may be evidences by significant year*space interactions. If so, some type of data weighting will be required to address this issue, and this should be considered in future assessments.

The indices were:

Fisheries independent

1. CalCOFI larval abundance data (1950-2014) from a delta-GLM with year, month, and line-station effects.
2. Triennial shelf survey (1980-2004). Same data as in the 2009 stock assessment. This survey did not catch much Bocaccio in some years (i.e. 1998, 2001) and there have been substantial changes in survey timing, which were adjusted for in the assessment model using a change in

selectivity. I am not sure if this is a good way to account for the timing change but the survey is fairly old now and does not seem to have much impact on the assessment.

3. NWFSC trawl survey (2003-2014). Vessel is included as a random effect. It is useful to provide plots of the vessel effects as a check that they are not confounded with year effects (see below).
4. NWFSC Southern California Bight hook-and-line survey (2004-2014).
5. Power plant recruitment index (Southern California; 1972-2013).
6. Pelagic juvenile trawl survey (2004-2014).

Fisheries dependent

7. Southern California trawl CPUE indices (1982-1996). Same data as in 2009 assessment.
8. Recreational fishery CPUE indices (1980-2002), southern and central regions. Same data as in 2009 assessment. Used MacCall's method to identify trips that targeted Bocaccio. It is useful to examine the proportion of trips deleted to examine if there is a time trend in zero-trips removed that could be confounded with changes in abundance.
9. California CPFV recreational fishery survey (2004-2014) with onboard observers, southern and central regions.

Index comparison plots did not show much consistency between indices. There seems to be substantial and high-frequency sources of variation in the various indices that makes their interpretation about stock status difficult.

Different vessels are used in the NWFSC shelf-slope survey and the delta-GLMM included a random effect for each vessel and year. Many survey groups advocate for comparative fishing experiments when a vessel changes, although my experience here is that unless vessels are really different then there is usually not much difference in catchability if no other survey protocol changes (i.e. same gear, speed, distance, etc.). I gather that for the NWFS shelf-slope survey, the vessel skipper is also an important factor affecting catch rates, and this is confounded with vessel/year, which is an important reason to include these random effects. This could be meritorious; however, these effects may be confounded with temporal changes in stock abundance and this could be a deficiency. For example, a decrease in abundance in e.g. year y could be accounted for in the model as all negative vessel effects for that year. If all the vessel effects in a year have the same sign then this could indicate a problem.

There was length composition information from landings for the period 1977-2014. Length data with sexes not identified were not used in the previous assessments but they were included in this assessment. These data were included in the SS3 model via a multinomial likelihood function with input sample sizes calculated using some formulae in Stewart (2008). SS3 also provides several methods for weighting compositional data in addition to these input sample size adjustments, so I am not sure how important the sample size calculations are. However, it does seem to me that the combination of setting input sample sizes and SS3 data weighting is

somewhat ad hoc and an area that requires much additional research. This is not a specific Bocaccio recommendation.

Raw length composition data were used; it was not expanded to the entire fleet. We did not spend time on this at the review meeting but this should not be a problem as long as the length samples are randomly selected. Sharpening of the length compositions was conducted in the past to adjust length compositions to reflect the length at the middle of the year, which is what SS3 assumes. This was not continued in this assessment, but the assessment document indicated that usually the differences in raw versus sharpened length compositions were negligible.

Considerable age data collected during 1977-2014 were used for the first time in this assessment. The lack of length and age composition information prior to 1977 is a deficiency in this assessment. However, the addition of 1,428 otoliths from various sources (fisheries and the NWFSC survey) is a substantial improvement. A presentation was given on the substantial work required to develop sufficiently reliable age estimates for Bocaccio, and I congratulate the age-readers for their perseverance and hope the age reading will continue in the future.

Analytical methods – merits and deficiencies

There were two main analytical methods/models used in this assessment: a delta-generalized linear model with mixed effects (delta-GLMM) to provide standardized stock size indices, and the SS3 stock assessment model (version 4.23U, 8/29/2014). I included some comments on index standardization methods in the previous section.

I am not an SS3 expert, but I conclude from the review meeting that the model was competently applied. The approach seems particularly well suited to dealing with irregularly collected age and length composition information. Treating compositional data separately from landings and indices seems like a good idea overall. I was impressed with the r4ss package that allowed the STAT to quickly produce relevant plots and other output based on requests for additional runs. This improved the efficacy of the review.

Growth was estimated within the model, which is appropriate given the various size limit regulations used in the recreational fisheries.

I find the evaluation of compositional fits difficult. I am never sure when fits are too bad to accept. Time-blocking of selectivity is also tedious but useful when there are important changes in management measures. However, I conclude that the blocking used for Bocaccio was appropriate. In other fora (e.g. Canada, ICES) this type of blocking is not commonly done. Selectivity is modelled annually but sometimes with smooth variations over time (e.g. random walk). Such an option may be useful for SS3, for diagnostic purposes at least.

The method of weighting the compositional data was in influential. This requires further and generic research.

The implementation of SS3 for Bocaccio did not include uncertainty in landings. Some consideration of this should be included in future assessments.

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

- Assumption: The population within the coastal waters of the western United States is bounded by the U.S.-Mexico border to Cape Blanco, Oregon is treated as a single coastwise stock because of the lack of data suggesting the presence of multiple stocks. Evaluation: This seemed like a reasonable approach; however, the preservation of sub-stock structure should be a management concern, particularly in light of the importance of maintaining spawning components on overall stock productivity.
- Assumption: Fishery removals were divided among six fleets (see above). Evaluation: The treatment of fleets seems reasonable.
- Assumption: A sex-specific model. Separate growth curves are estimated for females and males. Evaluation: the data suggest growth is sexually dimorphic and the model approach is appropriate.
- Assumption: M was assumed to be the same for males and females but estimated and not fixed. Evaluation: The estimation of M seemed justified. The likelihood profile for M was well defined and there was little conflict between the length and age composition information. The index data and prior favored a lower value than the estimate of 0.18. However, size at age for males was a little smaller than females so it may be expected that M could be a little larger for males than females. I do not think the difference is large and I suggest this as a sensitivity run in future assessments.
- Assumption: Recruitment dynamics are assumed to be governed by a Beverton-Holt stock-recruit function with steepness fixed. Evaluation: There was little evidence for a stock-recruit relationship and both steepness and M could not be reliably estimated at the same time, so fixing steepness was appropriate when combined with an uncertainty analysis of this choice in a decision table. There seemed to be some temporal dependence in recruitment deviations. In addition, Bocaccio are known to produce occasional large year classes. A future research recommendation is to consider using a mixture model with auto-correlated low recruitment regimes and occasional high recruitment regimes (e.g. Munch and Kottas, 1989), which seems like a more realistic recruitment process for this stock. This could be used to examine if status evaluations are sensitive to reasonable alternatives to Beverton-Holt density dependence dynamics, which was not addressed in this assessment.
- Assumption: Fixed the value of stock-recruit steepness at h=0.773. Evaluation: This seemed reasonable. Although profiles for steepness were fairly flat when M was estimated, there was more data conflict about steepness than M. Length compositions indicated low steepness whereas age compositions indicated high steepness. The fixed value was nonetheless fairly consistent with the total profile log-likelihood. The decision table includes a range of steepness values which was appropriate.

- Assumption: No recruitment deviations were included prior to 1954. Evaluation: These surely occurred in practice. Other assessments have used additional 'early' deviations so that age-structure in the initial modeled year (1982) would deviate from the stable age-structure in a way that is consistent with estimated variability in recruitment. This allows recruitment variability to be included in uncertainty about B_o. I am not sure what the conventional wisdom on this is, but perhaps naively I feel it is a good option to consider in future assessments.
- Specification: Selectivity was modeled as a function of length, using 6 parameter double-normal selectivity curves. Evaluation: Good idea, and better than modeling selectivity as a function of age. Often it is desirable to have one fleet with fixed asymptotic selectivity but this seems to not be required for Bocaccio, perhaps because of the long CaCOFI index of SSB. This was tested during the review via fixing the NWFSC hook and line survey to be asymptotic. Results did not change much but the fits to the hook and line length compositions were substantially worse.
- Specification: A one-step method of re-weighting age and length compositions due to Francis was used in the pre-review base model. This approach resulted in little weight given to age compositions, which did not seem reasonable. The review panel recommended that age compositions be weighted using harmonic means (a common method used in many recent West Coast Groundfish assessments) and I agree that the resulting weightings seemed more reasonable with more weight given to age compositions.
- Estimates: Selectivity curves for most indices were estimated to be strongly dome-shaped. Evaluation: This would normally be a controversial result, but the more offshore distribution of older fish that are therefore less accessible to fisheries is a good reason for the dome in Bocaccio fisheries and indices.
- Estimates: Fits to survey indices were sometimes poor but the indices were not really consistent with each other anyway and had short-term trends that seem to not have indicated trends in the long-lived Bocaccio stock. Hence, it seems reasonable that the assessment model could not fit these indices well.
- Estimates: Fits to the various length compositions were OK and I did not see strong evidence of model mis-specification. However, there were occasional very large Pearson residuals, which raise concerns about robustness of model selection and estimation.
- Estimates: Similarly, fits to the various age and conditional age compositions seemed OK and I did not see strong evidence of model mis-specification, but there were occasional very large residuals which raise robustness concerns.
- Estimates of spawning depletion in the 2000's seemed to be fairly consistent with previous assessments. Tables of these outputs from the final model were not available so I estimated 2015 values from the figure that was provided.

	Assessment Year		
year	2011	2013	2015
2000	0.135	0.118	0.21

2005	0.203	0.179	0.32
2010	0.254	0.238	0.30
2013	-	0.314	0.31

- The pre-review base model had little retrospective pattern in stock depletion but there were substantial changes in the size of recent year classes and in particular the 2013 year class.
- Convergence diagnostics seemed OK (MGC < 0.0001). Jitter analyses - about 1/3 converged, others with similar outputs. Phase alternation runs seemed OK.

Many model sensitivity analyses were conducted before and during the review meeting. A partial list of sensitivity analyses examined during the review is provided as follows, with important sensitivities indicated with a *:

1. NWFSC hook and line survey selectivity forced to be asymptotic. *Conclusion*: resulted in a worse fit to length composition data for this survey. The change was not recommended.
2. Trawl fishery, north and south: explore alternative selectivity time blocks in 2000 (CCA and small footrope restrictions implemented) and 2003 (RCA implementation). Recreation fishery: explore alternative selectivity time block in 2003 (RCA implementation). *Conclusions*: The model was not sensitive to these changes in selectivity blocks. However, the length composition data were fit a little better. The new blocking is more consistent with regulatory changes, so the new blocking in 2003 was implemented by the STAT.
3. Use an age-specific pattern in natural mortality recommended in Brodziak et al. (2011). *Conclusion*: There was little impact on model results and no compelling reason to adopt higher juvenile M in this assessment.
4. *Explore alternative weighting for conditional age-at-length data. Alternatives include: 1) input sample size for length and age compositions, 2) using the Francis weighting method A, and 3) Francis weighting method B (report values of A & B) for the conditional age-at-length with the revised base case. For 2) and 3) use the Francis adjustment for the length compositions. *Conclusion*: Francis method A resulted in an apparently extreme down-weighting of age composition data. Francis method B was more moderate in down-weighting the age data and was similar to the harmonic mean weighting method. The impact of this change in model configuration was not large overall; however, it did make a big difference in the size of the 2013 year class. The panel recommended weighting the conditional age at length data using the harmonic mean, and length compositions using the Francis method for the proposed new base case.
5. *Provide model runs as follows: a) steepness (h) and M estimated using the current priors, b) h fixed and M estimated using current prior, and c) M fixed and h estimated using the current prior. *Conclusion*: M is better estimated than steepness in the model. As a result, the Panel considered it more appropriate to estimate M and use bracketing runs with different values of steepness to characterize uncertainty.

6. Provide model runs where the strength of the 2013 year class varies such that the lower value is at the 12.5 percentile of the uncertainty in estimating that year class and the upper value is at the 87.5 percentile of the uncertainty. Include 10-year forecasts. *Conclusion*: The approach of bracketing the 2013 year class captured uncertainty in stock projections, and could also form the basis for a decision table.
7. * Fix steepness at the mean of the prior (h = 0.773) and estimate M; tune the conditional age at length data using the harmonic mean, and length compositions using the Francis method for the proposed new base case. *Conclusion*: This model formulation should be the base configuration for management advice.

Likelihood profile analyses:

1. M with steepness fixed (0.773). M was reasonably well defined.
2. M with steepness fixed (0.773) and with/without NWFSC H&L selectivity fixed to be asymptotic. M was reasonably well defined but shifted to the right with the asymptotic selectivity constraint, as expected. Although there was less data conflict in the latter case the fits to H&L length compositions were worse and the estimate of M=0.2 was inconsistent with the prior.
3. Steepness with M fixed at 0.15 and with/without NWFSC H&L selectivity fixed to be asymptotic.
4. Steepness with M fixed at 0.15. Minimum around h=0.65 but the profile was fairly flat.
5. Profile for steepness and M. Flat for a broad range of values.
6. Profile for lnRo with M fixed and steepness estimated. lnRo fairly well defined.

Major sources of Uncertainty

The assessment model used a fixed value of steepness, and for this reason and others (e.g. constant M for all years and ages, no early recruitment deviations, no errors in catch, etc.) the assessment model under-estimates uncertainty. Steepness and the size of the 2013 year class were identified as major sources of unaccounted uncertainty to provide bracketing runs for fisheries management decisions.

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

The STAT responded to several Panel requests for additional analyses. This resulted in an improved stock assessment for Bocaccio rockfish, and I conclude that the stock assessment was based on the best available data. The new assessment estimates constitute the best available information on stock status, and are suitable to serve as the basis for fishery management decisions.

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

I concluded that the SS3 model was competently applied, and the model inputs were derived using best practices. SS3 model assumptions and formulation were appropriate. Depletion estimates during the 2000s were consistent with previous assessments. I conclude that the science reviewed is the best scientific information available at present.

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.

I have provided suggestions for improvements under ToR 2 and 3 and summarized these below.

Documentation - short term

1. Index comparison plots, and comparison plots of index model residuals.
2. It would be useful to provide some type of aggregate diagnostic plots for fits to the survey conditional age compositions to look for consistent patterns across years.
3. Some figures were references but not provided. In the draft assessment document: pf. 22 Fig. 3a,b, pg. 33 Fig.4, pg. 44 Fig. 30.

Input data and analytical methods

Short-term

1. The same length-weight relationship estimated in the 2009 assessment was used in this 2015 assessment. The parametric relationship seemed reasonable overall; however, the log-linear relationship may under-estimate the weight of large fish. This potential lack of fit should be examined using, for example, a GAM.
2. Delta-GLM's were used for index standardizations. These usually involved additive year and spatial effects, and other effects specific to the data sources. It was not clear to me if year*space interactions were significant, which sometimes occurs and complicates calculations of indices. Some type of weighted average of spatial effects within years is required when interactions are significant. This requires additional consideration in future assessments.
3. In some of the survey standardization models (i.e. delta-GLMM), vessel effects may be confounded with temporal changes in stock abundance. For example, a decrease in abundance in e.g. year y could be accounted for in the delta-GLMM model as all negative vessel effects for that year. I recommend that the predicted vessel effects be examined each time the model is run to make sure that the effects make sense. I would prefer that the vessel effects add to zero each year, unless there is specific evidence to indicate otherwise.

4. CPUE standardizations when there are no onboard observers to determine if trips were targeting the species of interest used an approach published by MacCall to determine which trips were targeted. It is useful to examine the proportion of trips deleted to examine if there is a time trend in zero-trips removed that could be confounded with changes in abundance.

Long-term

1. There is a need for balanced data to effectively evaluate inter-annual and spatial variation in length at maturity.
2. Fecundity parameters were updated to reflect newly available data from ongoing reproductive ecology studies. Results indicated that the relationship of fecundity to the weight of fish had a lower slope than previously used, which indicates less reproductive value of larger older females. This could have implications on values for Fmsy. Bocaccio are capable of producing multiple broods which complicates the estimates of annual fecundity. This issue was thoroughly addressed by the STAT, but I recommend further investigations of the reproductive biology of this species.
3. Rockfish tend to be found in areas not accessible to survey trawls. Continued development of a rockfish focused survey such as the NWFSC hook and line will improve the assessment.
4. There may be spatial clines in growth and maturation rates, and studies of these possibilities should be encouraged. If there are spatial clines in growth rates and maturities, then samples should be appropriately weighted so they represent the stock as a whole.

Model assumptions, estimates, and major sources of uncertainty

Short term

1. Size at age for males was a little smaller than females so it may be expected that M could be a little larger for males than females. I do not think the difference is large and I suggest this as a sensitivity run in future assessments.

Long term

1. The combination of setting input sample sizes and SS3 data weighting is somewhat ad hoc and an area that requires additional research.
2. Bocaccio are known to produce occasional large year classes. Consider using a mixture model with auto-correlated low recruitment regimes and occasional high recruitment regimes (e.g. Munch and Kottas, 1989), which seems like a more realistic recruitment process for this stock. This could be used to examine if status evaluations are sensitive to reasonable alternatives to Beverton-Holt density dependence dynamics, which was not addressed in this assessment.
3. Rather than time-blocking selectivity patterns, consider annual time-varying selectivity functions using a random walk or some other auto-correlated process.
4. Consider uncertainty in landings estimates.

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

An overview was provided by the STAT that described the data used in the assessment, the assessment history, and significant changes made in this assessment compared to the 2011 and 2013 assessments. The panel summary report contains a detailed list of additional analyses requested by the Panel with rationale, responses from the STAT, and conclusions by the panel. Discussion by the Panel focused on the interpretation of stock size indices and how well the model fit those indices, and also fits to age and length compositions. The internal weighting methods in SS3 for these data were discussed substantially by the panel and STAT. The panel focused on determining the major axes of uncertainty in the assessment.

The recommended base model after discussion with the STAT was similar to the model in the draft document with the following exceptions: breaks in fishery selectivity occurred in 2003 rather than 2001; steepness was fixed at the mean of the prior and natural mortality was estimated (rather than the reverse), and the conditional age-at-length data were re-weighted using the harmonic mean method rather than Frances method A.

The STAR panel concluded that the Bocaccio rockfish assessment was based on the best available data, and that this new assessment constitutes the best available information on Bocaccio rockfish off the U.S. west coast. Steepness and the size of the 2013 year class were used to bracket the uncertainty in the state of nature.

There was insufficient time at the meeting to review the index standardizations.

B. **China Rockfish**

China rockfish off the US west coast were modelled as three independent stock assessments to account for spatial variation in exploitation history as well as regional differences in growth and size composition of the catch. The northern area model is defined as Washington State Marine Catch Areas (MCAs) 1-4. The central area model spans from the Oregon-Washington border to 40˚10′ N. latitude. The southern area model spans 40˚10′ N. latitude to the U.S.-Mexico border. These will be referred to as the southern, central, and northern stocks.

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.

A draft stock assessment document was provided, including:

- a detailed Executive Summary,
- some basic information on stock structure and distribution, basic life history information, and a some ecosystem information,
- a description of the history of China rockfish management,
- a detailed description of fishery landings (directed and bycatch) and discards,
- fisheries standardized catch rates and information on the biological sampling of the catches (lengths, ages),
- biological information (weight-length relationship, maturity schedule, fecundity, natural mortality, aging bias and precision),
- a description of the 2013 stock assessment modeling approach,
- assessment model description,
- model selection and evaluation (key assumptions and structural choices, data weighting),
- base model results,
- uncertainty and sensitivity analyses,
- description of reference points,
- harvest projections and decision tables,
- text on regional management considerations,
- research needs,
- literature cited, and
- appendices describing: A) Input Files of the Base Model to the SS3 Program, B) SS3 control file, C) SS3 starter file, D) SS3 forecast file, E) Observed Angler Prediction, F), Reef Delineation and Drift Selection Methodologies, G) Commercial Regulations Histories, H) Recreational Regulations Histories.

Previous stock assessment documents

The 2013 data moderate stock assessment document which included China rockfish was provided as well as the 2013 STAR Panel Meeting Report and the PFMC's SSC 2014 Stock Assessment and Fishery Evaluation (SAFE) report.

Data input documents

No additional documents were provided.

Documentation on analytical models

In addition to the information provided in the draft assessment report, documents were provided on 1) Technical Description of the Stock Synthesis assessment program, 2) User Manual for Stock Synthesis Model Version 3.24s, 3) Estimating a Bayesian prior for steepness in Pacific rockfishes (Sebastes spp.), 4) Use of the delta method to evaluate the precision of assessments that fix parameter values.

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

Input data – merits and deficiencies

There are no commercial fisheries that report catch of China rockfish in the northern stock area. Discards of China rockfish likely occurred before the closure of nearshore commercial fisheries in 1995 for non-trawl gears and in 1999 for trawl gears, but there is no information available to quantify this. Catches are only from recreational fisheries and have been estimated for 1967-2014. Catches since 1990 have been based on dockside interviews expanded to total effort (trips). Prior to 1990, the estimates were obtained from the sport catch report series published by Washington Department of Fisheries during 1967 and 1975-1989, with linear interpolations used to fill in adjacent years. China rockfish tend not to be targeted by recreational anglers and since 2011 more than 50% of the China rockfish caught were released by anglers. Surface release mortalities were applied to estimate discard mortalities.

China rockfish landings from Oregon commercial fisheries in the central stock area were minor until twenty years ago. There is a relatively high degree of confidence in the accuracy of these landings because comprehensive sampling of commercial landings began before the fishery for China rockfish developed. Prior to 1992, the catches were reconstructed using market category sampling and some species composition information. There seems to be considerable uncertainty in these historic estimates. Discard estimates were usually very low, as a percent of landings. Discards were included in the assessment by simply raising the landings by the discard percent. Landings and discard mortalities from recreational fisheries were produced by the Oregon Recreational Boat Survey.

Catches were estimated in California during 1969-2014 using the CALCOM database. Trawl caught fish were removed from the landings estimates in the current assessment because of a likely species mis-classification. Commercial landings of China rockfish in California from 1916-1968 were obtained from historical reconstructions. Catches from 1900 to 1916 were interpolated with a linear ramp from 0 mt in 1900 to 6.1 mt in 1916. Discard rates are higher and are primarily fish below the 12 inch size limit. Discards were treated as a fleet in the assessment, and discard mortality is estimated as a function of the fishing depth which varies by year. Recreational fishing has accounted for over 70% of cumulative removals in California (1900-2014, landings and discard). These catches were estimated during 2004-2014 from the California Recreational Fisheries Survey information. Catches during 1980-2003 were estimated from the Marine Recreational Fisheries Statistics Survey information. Estimates of recreational removals (catch and discard) from 1928-1979 were reconstructed.

There does not seem to be reasons to expect catch estimates are biased. It is meritorious to have such a long time-series of landings, but the estimation procedures outlined above suggest there is uncertainty in the estimates that has not been quantified. This should be investigated for future assessments, and methods to account for uncertain catches in SS3 need to be developed.

Biological information on the weight-at-length, maturity-at-length, and fecundity relationships were derived from published documents. I was not able to review these documents and offer no opinion on the reliability of this information. However, there is a need to collect better biological information, particularly for maturity and fecundity, to determine if there is spatial or temporal variation that is important for stock assessment.

Sex ratios were estimated to be close to 1:1 in the three stock regions. The assessment was sex-aggregated. Analyses of differences in growth rates were inconclusive, and the STAT assumed growth was the same for males and females. However, these analyses did not seem to account for changes in size limits and included only data from the southern Oregon commercial fleet. There is a need for a more comprehensive analysis of the growth data to determine if growth is sexually dimorphic for China rockfish, as is common for rockfish species.

China rockfish can be a long-lived species. The maximum age of China rockfish on the West Coast is now 83 years, which gives a natural mortality of 0.056 when calculated from Hoeing's method.

A variety of fisheries-dependent stock size indices were developed and used in this assessment. China rockfish is a nearshore species, and consequently no fishery-independent data are available for the assessment. The indices were standardized using delta-GLM models which is a common approach in west-coast assessments. There was insufficient time at the meeting to review the index standardizations; however, it was not clear to me if there were changes in spatial distribution that may be evidenced by significant year*space interactions. If so, some type

of data weighting will be required to address this issue, and this should be considered in future assessments.

The indices were:

Northern stock

1. Washington Department of Fish and Wildlife recreational dockside recreational index (1981 to 2014);

Central stock

2. MRFSS Dockside Charter Boat CPUE for California North of 40◦10′ and Oregon (1980-2003);
3. Oregon Recreational Boat Survey (ORBS) Dockside Charter Boat CPUE (2001-2014);
4. Recreational Onboard Observer Surveys (2001-2014);
5. Oregon commercial logbook index (2004-2013);

Southern stock

6. MRFSS dockside recreational index (party/charter; 1980-2003);
7. Onboard observer index (1988-1999);
8. Onboard observer index (2000-2014).

Index comparison plots for the southern and central stocks (there is only one index for the northern stock) showed some consistency between indices. There seems to be substantial and high-frequency sources of variation in the various indices that makes their interpretation about stock status difficult.

A variety of factors were used in the index standardizations. This can be good, but not always so. If a factor is correlated with year then it is possible that the CPUE year effects (what we want) may be confounded with the factor effects (what we don't want). In this case the CPUE year effects may not be reliable. For example, if two different vessels are used, one in the first half of the series and the other in the second half, then trends in abundance will be partially confounded with vessels effects. In this case most assessment scientists will split the series if there is no other information on the fishing efficiency of both vessels. As a check against this confounding problem, it is helpful to provide time-series plots of the annual distributions of each factor. This is not a specific China recommendation.

SS3 provides several methods for weighting compositional data in addition to input sample size adjustments. The combination of setting input sample sizes and SS3 data weighting is somewhat ad hoc and an area that requires much additional research. This is not a specific China recommendation.

Age-at-length data, and age and length compositions of landed and discarded catch were used for the first time in this assessment. This is highly meritorious!

Analytical methods – merits and deficiencies

There were two main analytical methods/models used in this assessment: a delta-generalized linear model with mixed effects (delta-GLMM) to provide standardized stock size indices, and the SS3 stock assessment model (version 4.23U, 8/29/2014). I included some comments on index standardization methods in the previous section.

I am not an SS3 expert, but I concluded from the review meeting that the model was competently applied. The approach seems particularly well suited to dealing with irregularly collected age and length composition information. Treating compositional data separately from landings and indices seems like a good idea overall. I was impressed with the r4ss package that allowed the STAT to quickly produce relevant plots and other output based on requests for additional runs. This improved the efficacy of the review.

Growth was estimated within the model which is appropriate given the size limits of the fishery.

I find the evaluation of compositional fits difficult. I am never sure when fits are too bad to accept. Time-blocking of selectivity is also tedious but useful when there are important changes in management measures. I conclude that the blocking used for China rockfish was appropriate. In other fora (e.g. Canada, ICES) this type of blocking is not commonly done. Selectivity is modelled annually but sometimes with smooth variations over time (e.g. random walk). Such an option may be useful for SS3, perhaps for diagnostic purposes at least.

The method of weighting the compositional data was influential. This requires further and generic research.

The implementation of SS3 for China rockfish did not include uncertainty in landings. Some consideration of this should be included in future assessments.

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

- Assumption: China rockfish were treated as three separate stocks based on latitudinal patterns in the length composition and fits to size at age data. Evaluation: An important issue when deciding stock structure for sustainable fisheries management is whether stock components are reproductively isolated over time periods relevant to fisheries management (e.g. decades). The STAT reported that there is limited information available on either stock structure or life history. However, both juvenile and adult rockfish tend to be solitary and exhibit high site fidelity, which suggests the potential for substantial stock structure. It was also discussed at the review meeting that the near-shore environment tends to retain eggs and larvae, and dispersal is not extensive. This also suggests the potential for substantial stock structure. Hence, China rockfish seem like a species that may require substantial spatial

management – perhaps more than the three region division in this assessment. The preservation of sub-stock structure should be a management concern, particularly in light of the importance of maintaining spawning components on overall stock productivity.

- Assumption: Fishery removals were divided among commercial (dead or alive) and recreational (private and charter) fleets, and spatially (north and south) as well even within assessment regions. Evaluation: The treatment of fleets seemed reasonable, although some selectivities were mirrored and others were not significantly different suggesting the potential of combining fleets in future assessments.
- Assumption: A sex-aggregated model with a combined growth curve for females and males. Evaluation: the data did not suggest growth is sexually dimorphic and the model approach is appropriate. However, a more complete analysis of growth data should be conducted for the next assessment.
- Assumption: M was assumed to be the same for males and females, but estimated for the northern and southern stocks, and then fixed (at the average of these two estimates) for all three stocks. Evaluation: The estimation of M seemed justified for the northern model. Data sources were fairly consistent that M = 0.07 provided the best fit. For the southern model M was fairly well identified but there was substantial conflict between length (M ~ 0.05) and age (M > 0.1) compositions. Fixing M at 0.07 for the base assessment formulation was a reasonable compromise.
- Assumption: Recruitment dynamics are assumed to be governed by a Beverton-Holt stock-recruit function with steepness fixed at h=0.773 (the mean of the prior distribution) and with no recruitment deviations. Evaluation: The 'no deviations" assumption is clearly not true but the available data did not allow more realistic recruitment models to be reliably estimated. However, this constraint means that uncertainty in model results is greatly underestimated.
- Specification: Selectivity was modeled as a function of length, using 6 parameter double-normal selectivity curves. Evaluation: Good idea, and better than modeling selectivity as a function of age. The flexible selectivity functions w usually constrained to be asymptotic. This made sense to me. All sizes of the near-shore China Rockfish should be readily available to commercial and recreational fisheries. This suggests fisheries will have asymptotic selectivity.
- Specification: A one-step method of re-weighting age and length compositions due to Francis was used in the pre-review base model. This approach resulted in little weight given to age compositions which did not seem reasonable. The review panel recommended that age compositions be weighted using harmonic means (a common method used in many recent West Coast Groundfish assessments), and I agree that the resulting weightings seemed more reasonable with more weight given to age compositions.
- Length compositions:
    - Fits were OK for the Northern model, and I did not see strong evidence of model mis-specification. However, there were occasional very large Pearson residuals which raise concerns about robustness of model selection and estimation.

    - Fits in the central model troubled me. There seemed to be a systematic pattern of under-estimating mean length since about 2005 for most data series which may suggest lower mortality rates than the model has estimated. This requires further investigation.
    - Annual fits in the southern model were good when the sample sizes were relatively large. There were no really big residuals.
- Age and conditional age compositions:
    - Fits seemed OK in the northern model, and I did not see strong evidence of model mis-specification, but there were occasional very large residuals which raise robustness concerns.
    - There was lack of fit in the central model OR North recreational age compositions. The mean age of the SouthernOR_Rec_PC was also under-estimated by the model in all but one year. This requires further investigation.
    - Little age composition data was used in the southern model.
- Indices:
    - In the northern model the index was not fit well. Observed and predicted log indices are hardly correlated.
    - The same conclusion holds with the central model, but in this case the indices are short in time and have only high frequency variations that the model and stock are not expected to produce.
    - Fits in the southern model are OK.
- The pre-review southern base model had little retrospective pattern in SSB. The northern and central models had some retrospective variability in scale, but I suspect little variability in terms of depletion, although those results were not provided.
- Jitter analyses (100 of them): Northern model – 100% returned to same base case solution. Central model – 94% returned to base case solution. Southern model – majority returned to base case solution.

Many model sensitivity analyses were conducted before and during the review meeting. A partial list of sensitivity analyses examined during the review is provided as follows, with important sensitivities indicated with a *:

1. Provide a southern model run where historical discards for the live-fish fishery are modeled as a separate fleet. For the discard fleet, estimate actual tonnage of catch: apply the discard fraction for the earliest four years to estimate discards back to 2000 with a ramp from 1990 to 2000 (selectivity for this fleet is then determined from the discard length comps).
   Conclusion: Fits generally improved and the estimated selectivity pattern for the discard fleet appeared reasonable. The STAR Panel and the STAT all agreed that the base model should incorporate this new approach.

2. Provide a central model run where the northern California size composition data are added to the model, estimate two selectivity parameters (i.e. the simpler selectivity function), and estimate M to understand how this affects fits to the length composition data. *Conclusions*: The selectivity pattern improved but estimates a very high M (0.12) and produces an implausible estimate of biomass (>1000 times the base model). The panel concluded that model is not supportable as a change to the base model, which I support.
3. In the central model, exclude the MRFSS index in Oregon to define a new base case for the central model. *Conclusion*: Excluding this index had a minor effect on model results.
4. Provide a central model run where the northern California size composition data are added to the model. *Conclusions*: Adding these data had a minor effect on model results.
5. For the central model, attempt to estimate the selectivity patterns for each fishery and determine which of the selectivity patterns provides plausible estimates. Take the mean of those estimates (peak and/or spread parameters) and use the mean as a prior for the poorly estimated selectivity's. Consider using the mode of the observed length distribution as a prior for the peak parameter. *Conclusions*: Alternative procedures resulted in models with small difference to the base case depletion, though scale is dependent on the choice of peak value for selectivity for parameters that were required to be fixed (highest estimated value that didn't hit the bound of 45 cm). The Panel all agreed that the original procedure used for the base case was simple and more supportable from a methodological viewpoint.
6. For the central area model, repeat 5 using a two parameter ascending logistic curve for selectivity. *Conclusions*: Logistic curves did not improve model results, and all the same issues remain.
7. Turn on estimation of recruitment deviations for all models, and iteratively increase σ_R from a low value until the residual pattern stabilizes. *Conclusions*: All models estimated extremely large recruitments in the 1980s and early 1990s that seem implausible and are not obvious in size composition data. The Panel all agreed that there was insufficient information to estimate recruitment deviations for all models.
8. * For all models, explore alternative methods of reweighting the conditional age-at-length data, but do not increase the weight on any data set. Alternatives to evaluate are: the unmodified sample size (the method used for the base case), and Francis weighting method A and B (report the values of A and B). *Conclusion*: For the southern area model, the weights for both the Francis A and B methods were above one, so no reweighting was applied. For both the central and the northern area models, Francis method A for the most part strongly down-weighted the conditional age-at-length data. Weighting is highly influential on both absolute biomass and relative depletion. The Panel recommended that the harmonic mean should be used for now as it provides a compromise between no weighting and the Francis A method.
9. * A set of revised base models should be brought forward with following recommended changes:
    - Use weight specific fecundity relationships from Dick (2009) for all models.

- Update 2011 and 2012 data in the onboard observer CPUE index (southern model).
- Change the years in the Abrams dataset to 2010-2011; remove observations N of 40°10' N latitude (southern model).
- Model discards as a separate fleet (southern model).
- Remove Oregon MRFSS index (central model).
- Add northern California length composition data (central model).
- Fix any selectivity parameters hitting upper bounds (central model).
- Tune all models using the harmonic mean method for the conditional age-at-length composition and marginal age composition data.

10. * Estimate M in the revised base models for southern and northern models, and use the average of those estimates as a fixed value for all models. *Conclusion*: The estimates of M for the northern and central area models are reasonable, but the estimate for the central area M (0.116) is difficult to support. The Panel's proposed approach is to use the average of the estimated M values for the southern and northern area models (0.07) as a fixed value for all assessments, which I support.
11. * Provide bracketing model runs varying M (high and low Ms should be equidistant from the base M (high M =0.09; base M = 0.07; low M = 0.05 (set to mode of the prior)) for potential decision tables. *Conclusion*: These results seemed useful for a potential decision table.
12. Provide runs of for the central model treating all age compositions as marginal (fix growth parameters, and alternatively fix and estimate M). *Conclusion*: Results were only very slightly different to the base model, so no additional information was provided for the assessment.
13. * Provide two runs from the base for the southern area model that bracket uncertainty in steepness. Use values of 0.6 and 0.9 which are close to the 12.5 and 87.5 percentiles from the Thorson prior. Provide projected biomass to compare with current bracketing models with M. *Conclusion*: The bracketing model runs for steepness and M produced remarkably similar results, allowing the Panel to agree to use only M to bracket uncertainty for management advice for the southern area model, and to do the same for the northern and central area models.

Likelihood profile analyses:

1. M with steepness fixed (0.773). M was reasonably well defined for the northern and southern models, but not for the central model, because the likelihood profile indicated an unreasonably high value of M.

Major sources of Uncertainty

The assessment models used a fixed value of M and steepness, and for this reason and others (e.g. no early recruitment deviations, no errors in catch, etc.) the assessment models under-

estimate uncertainty. M was identified as the major source of unaccounted uncertainty to provide bracketing runs for fisheries management decisions.

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

The STAT responded to many Panel requests for additional analyses. This resulted in improved stock assessments for the China rockfish stocks. The Panel concluded that the stock assessments were based on the best available data; the new assessment estimates constitute the best available information on stock status, and are suitable to serve as the basis for fishery management decisions.

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

I concluded that the SS3 models were competently applied, and the model inputs were derived using best practice. SS3 model assumptions and formulation were appropriate. I conclude that the science reviewed is the best scientific information available at present.

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.

I have provided suggestions for improvements under ToR 2 and 3 and summarized these below.

Documentation - short term

1. Index comparison plots, and comparison plots of index model residuals.
2. It would be useful to provide some type of aggregate diagnostic plots for fits to the survey conditional age compositions to look for consistent patterns across years.

Input data and analytical methods

Short-term

3. Conduct more comprehensive analysis of the growth data to determine if growth is sexually dimorphic for China rockfish, as is common for rockfish species.
4. Delta-GLM's were used for index standardizations. These usually involved additive year and spatial effects, and other effects specific to the data sources. It was not clear to me if year*space interactions were significant, which sometimes occurs and complicates

calculations of indices. Some type of weighted average of spatial effects within years is required when interactions are significant. This requires additional consideration in future assessments.

5. Similarly, a variety of factors were used in the index standardizations. This can be good, but not always so. If a factor is correlated with year then it is possible that the CPUE year effects (what we want) may be confounded with the other factor effects (what we don't want). As a check against this problem, it is helpful to provide time-series plots of the annual distributions of each factor. If the factors do not change in a systematic way with "year" then there should not be confounding.
6. CPUE standardizations when there are no onboard observers to determine if trips were targeting the species of interest used an approach published by MacCall to determine which trips were targeted. It is useful to examine the proportion of trips deleted to examine if there is a time trend in zero-trips removed that could be confounded with changes in abundance.

Long-term

7. Collect better biological information, particularly for maturity and fecundity, to determine if there is spatial or temporal variation that is important for stock assessment.
8. Rockfish tend to be found in areas not accessible to survey trawls. Continued development of a rockfish focused survey such as the NWFSC hook and line will improve the assessment.

Model assumptions, estimates, and major sources of uncertainty

Short term

9. Some selectivity's were mirrored and others were not significantly different suggesting the potential of combining fleets in future assessments.
10. Examine length and age composition data for the central model to sort out why the model fits these sources poorly.

Long term

11. The combination of setting input sample sizes and SS3 data weighting is somewhat ad hoc and an area that requires additional research.
12. Rather than time-blocking selectivity patterns, consider annual time-varying selectivity functions using a random walk or some other auto-correlated process.
13. There is uncertainty in the catch estimates that has not been quantified, especially the historic catch reconstructions. This needs to be evaluated and quantified somehow, and methods to account for uncertain catches in SS3 need to be developed.

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

An overview was provided by the STAT that described the data used in the assessment, the assessment history, and significant changes (incl. adding length and age data) made in this assessment compared to the 2013 data moderate assessment. The panel summary report contains a detailed list of additional analyses requested by the Panel with rationale, responses from the STAT, and conclusions by the panel. Discussion by the Panel focused on the interpretation of stock size indices and how well the model fit those indices, and also fits to age and length compositions. The internal weighting methods in SS3 for these data were discussed substantially by the panel and STAT. The panel focused on determining the major axes of uncertainty in the assessment.

Recommended base models after discussion with the STAT were revised in comparison to the pre-STAR models as follows:

Northern area model: M = 0.07; conditional age-at-length data reweighted using the harmonic mean method; use the weight-specific fecundity relationship from Dick (2009).

Central area model: M = 0.07; conditional age-at-length data reweighted using the harmonic mean method; use the weight-specific fecundity relationship from Dick (2009); remove the Oregon MRFSS index; add the northern California length composition data.

Southern area model: M = 0.07; conditional age-at-length data reweighted using the harmonic mean method; use the weight-specific fecundity relationship from Dick (2009); model discards as a separate fleet; use updated 2011 and 2012 data in the onboard observer CPUE index; and change the years in the Abrams (2014) dataset to 2010-2011 and remove observations N of 40°10' N latitude.

The STAR panel concluded that the China rockfish assessments were based on the best available data, and that these new assessments constitute the best available information on China rockfish off the U.S. west coast. Natural mortality was used to bracket the uncertainty in the states of nature.

There was insufficient time at the meeting to review the index standardizations.

Conclusions and Recommendations

Recommendations are provided under ToR 6.

A. **Bocaccio rockfish**

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 found overall that the documentation of the stock assessment inputs, methods, and results were very helpful. As usual for US stock assessments, I found the description of rockfish fisheries and their management, including implications for stock assessments, to be very good. The Executive Summary section and sections that described the implications of changes made from the last assessment and sensitivity analyses were very helpful.

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

I concluded that the SS3 model was competently applied, and the model inputs were derived using best practice.

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

SS3 model assumptions and formulation were appropriate. Depletion estimates during the 2000's were consistent with previous assessments.

I agree with the stock assessment that Bocaccio rockfish was at about 38% of its unexploited level in 2015. This is above the overfished threshold of SB25%, but below the management target of SB40% of unfished spawning output.

The assessment model used a fixed value of steepness, and for this reason and others (e.g. constant M for all years and ages, no early recruitment deviations, no errors in catch, etc.) the assessment model under-estimates uncertainty. Steepness and the size of the 2013 year class were identified as major sources of unaccounted uncertainty to provide bracketing runs for fisheries management decisions.

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

I have summarized suggestions for improvements under ToR 6.

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

The science reviewed is the best scientific information available at present and that this new assessment constitutes the best available information on Bocaccio rockfish off the U.S. west coast.

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.

I have summarized suggestions for improvements under ToR 6.

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

The panel summary report contains a detailed list of additional analyses requested by the Panel with rationale, responses from the STAT, and conclusions by the panel. Discussion by the Panel focused on the interpretation of stock size indices, how well the model fit those indices, and also fits to age and length compositions. The internal weighting methods in SS3 for these data were discussed substantially by the panel and STAT. The panel focused on determining the major axes of uncertainty in the assessment.

B. **China Rockfish**

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 found overall that the documentation of the stock assessment inputs, methods, and results were very helpful. As usual for US stock assessments, I found the description of rockfish fisheries and their management, including implications for stock assessments, to be very good. The Executive Summary section and sections that described the implications of changes made from the last assessment and sensitivity analyses were very helpful.

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

I concluded that the SS3 model was competently applied, and the model inputs were derived using best practice.

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

SS3 model assumptions and formulation were appropriate. Depletion estimates during the 2000s were consistent with previous assessments.

I agree with the stock assessments that China rockfish in Washington State Marine Catch Areas (MCAs) 1-4 was at about 75% of its unexploited level in 2015 which is well above the management target of 40%. China rockfish in the central region from the Oregon-Washington

border to 40°10′ N. latitude was at about 62% of its unexploited level in 2015 which is well above the management target of 40%. China rockfish in the southern region from 40°10′ N. latitude to the U.S.-Mexico border was at about 28% of its unexploited level in 2015, which is slightly above the overfished threshold of SB25% but below the management target of SB40% of unfished spawning output.

The assessment model used a fixed value of steepness and M, and for this reason and others (e.g. no early recruitment deviations, no errors in catch, etc.) the assessment model under-estimates uncertainty. Natural mortality was used to bracket the uncertainty in the states of nature.

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

I have summarized suggestions for improvements under ToR 6.

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

The science reviewed is the best scientific information available at present, and that this new assessment constitutes the best available information on China rockfish stocks off the U.S. west coast.

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.

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

The panel summary report contains a detailed list of additional analyses requested by the Panel with rationale, responses from the STAT, and conclusions by the panel. Discussion by the Panel focused on the interpretation of stock size indices, how well the model fit those indices, and also fits to age and length compositions. The internal weighting methods in SS3 for these data were discussed substantially by the panel and STAT. The panel focused on determining the major axes of uncertainty in the assessment.

Appendix 1: Bibliography of materials provided for review

Draft and Background Documents
Stock Assessment Review (STAR) Panel 2 for Bocaccio and China rockfish

Meeting Materials:

STAR Panel Meeting Proposed Agenda

Terms of Reference for the Groundfish and Coastal Pelagic Species Stock Assessment and Review Process for 2015-2016. Pacific Fishery Management Council. September, 2014.

Draft Stock Assessment Documents

DRAFT Status of Bocaccio, *Sebastes paucispinis*, in the Conception, Monterey and Eureka INPFC areas for 2015. Xi He, John C. Field, Donald E. Pearson, Lyndsey Lefebvre, and Steve Lindley. June 2015.

DRAFT Status of China rockfish off the U.S. Pacific Coast in 2015 E.J. Dick, Melissa Monk, Ian Taylor, Melissa Haltuch, Tien-Shui Tsou, Patrick Mirick. June 22, 2015.

Background Materials

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Richard D. Methot Jr. User Manual for Stock Synthesis. Model Version 3.24s. Updated February 11, 2015.

James Thorson. 2015. Estimating a Bayesian prior for steepness in Pacific rockfishes (Sebastes spp.) off the U.S. West Coast for the 2015 assessment cycle.

Status of The Pacific Coast Groundfish Fishery. Stock Assessment and Fishery Evaluation. PFMC, December 2014. December 2014.

Status of bocaccio, Sebastes paucispinis, in the Conception, Monterey and Eureka INPFC areas for 2009. John C. Field, E.J. Dick, Don Pearson and Alec D. MacCall.

Status of bocaccio, *Sebastes paucispinis*, in the Conception, Monterey and Eureka INPFC areas as evaluated for 2011. John C. Field.

Status of bocaccio, Sebastes paucispinis, in the Conception, Monterey and Eureka INPFC areas as evaluated for 2013. John C. Field.

Bocaccio Rockfish. STAR Panel Report. July 13-17, 2009.

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Pacific Fishery Management Council. 2013. Pacific Coast Fishery Ecosystem Plan for the U.S. Portion of the California Current Large Marine Ecosystem. Pacific Fishery Management Council, 7700 NE Ambassador Place, Suite 101, Portland, Oregon 97220-1384.

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Sivasundar, Arjun, and Stephen R. Palumbi. "Life history, ecology and the biogeography of strong genetic breaks among 15 species of Pacific rockfish, Sebastes." Marine Biology 157.7 (2010): 1433-1452.

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Appendix 2: CIE Statement of Work

Stock Assessment Review (STAR) Panel 2

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

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

Benchmark stock assessments will be conducted and reviewed for bocaccio and china rockfish. Bocaccio is a species that has been declared overfished and is has been managed under a rebuilding plan for more than a decade. The last full assessment of bocaccio rockfish was conducted in 2009 and it was subsequently updated in 2011 and 2013. The 2013 update assessment estimated depletion at 31.4 percent; an improvement over that forecasted by the 2011 assessment (approximately 28 percent). Improvement in stock status is attributed to higher estimates of 2010 recruitment. Bocaccio was predicted in the last assessment to be rebuilt by 2015; however, the SSC recommends that this be confirmed with a full assessment during 2015.

China rockfish is a valuable groundfish species to both commercial and recreational hook-and-line fishermen, but its status had never been assessed before 2013. A data-moderate assessment, comprised by northern and southern models, was conducted for China rockfish in 2013. As per the Terms of Reference for such assessments, no length or age data were included in that assessment, even though considerable length data and some age structures were available. Following the assessment review, concern was expressed that not all possible sources of abundance index information had been considered for inclusion in the models, and that indices from one area had been inappropriately used to represent trends in another. In order to facilitate a thorough review of the available data and the development of the best possible models to characterize the range of the stock, the SSC recommends that a benchmark assessment be conducted in 2015.

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

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

Location of Peer Review: For the **STAR panel 2** review, each CIE reviewer shall conduct an independent peer review during the panel review meeting **scheduled in Santa Cruz, California during the dates of July 6-10, 2015.**

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

Prior to the Peer Review: Upon completion of the CIE reviewer selection by the CIE Steering Committee, the CIE shall provide the CIE reviewer information (full name, title, affiliation, country, address, email) to the COTR, who forwards this information to the NMFS Project Contact no later than the date specified in the Schedule of Milestones and Deliverables. The CIE is responsible for providing the SoW and ToRs to the CIE reviewers. The NMFS Project

Contact is responsible for providing the CIE reviewers with the background documents, reports, foreign national security clearance, and other information concerning pertinent meeting arrangements. The NMFS Project Contact is also responsible for providing the Chair a copy of the SoW in advance of the panel review meeting. Any changes to the SoW or ToRs must be made through the COTR prior to the commencement of the peer review.

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

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

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

Panel Review Meeting: Each CIE reviewer shall conduct the independent peer review in accordance with the SoW and ToRs, and shall not serve in any other role unless specified herein. **Modifications to the SoW and ToRs 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

	CIE sends reviewer contact information to the COR, who then sends this to the NMFS Project Contact
	NMFS Project Contact sends the CIE Reviewers the pre-review documents
July 6-10, 2015	Each reviewer participates and conducts an independent peer review during the panel review meeting
July 24, 2015	CIE reviewers submit draft CIE independent peer review reports to the CIE Lead Coordinator and CIE Regional Coordinator
August 7, 2015	CIE submits CIE independent peer review reports to the COR
August 14, 2015	The COR distributes the final CIE reports to the NMFS Project Contact and regional Center Director

shall complete the independent peer review according to required format and content as described in Annex 1. Each CIE reviewer shall complete the independent peer review addressing each ToR as described in Annex 2.

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

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

1) Conduct necessary pre-review preparations, including the review of background material and reports provided by the NMFS Project Contact in advance of the peer review.
2) Participate during the STAR Panel 1 review meeting in **scheduled in Santa Cruz, California during the dates of July 6-10** as specified herein, and conduct an independent peer review in accordance with the ToRs (**Annex 2**).
3) No later than **July 24, 2015**, 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**.

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

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, COTR
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National Marine Fisheries Service,
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Gloucester, MA 01930
Phone: 978-281-9203
Stacey.Miller@noaa.gov

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

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

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

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

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

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

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

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

3. The reviewer report shall include the following appendices:

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

Annex 2: Terms of Reference for the Peer Review

Stock Assessment Review (STAR) Panel 2

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.

Annex 3: Tentative Agenda

Proposed Agenda
Stock Assessment Review (STAR) Panel
For China Rockfish and Bocaccio

NMFS, Southwest Fisheries Science Center
110 Shaffer Road
Santa Cruz, CA 95060

July 6-10, 2015

Monday, July 6

8:30 a.m.	Welcome and Introductions Martin Dorn
8:45 am	Review the Draft Agenda and Discuss Meeting Format - Review the Terms of Reference (TOR) for assessments and STAR panel responsibilities - Assign reporting duties - Discuss and agree to format for the final assessment document - Agree on time and method for accepting public comments
9:00 a.m.	Presentation of the China Rockfish Assessment - Overview of data and modeling
12:30 p.m.	Lunch
1:30 p.m.	Q&A session with China Rockfish Stock Assessment Team (STAT) STAR Panel discussion - Panel develops written request for additional model runs / analyses
3:30 p.m.	Presentation of the Bocaccio Assessment (if time allows) - Overview of data and modeling
5:30 p.m.	Adjourn for Day.

Tuesday, July 7

8:30 a.m.	Continue Presentation of the Bocaccio Assessment - Overview of data and modeling
12:00 p.m.	Lunch
1:30 p.m.	Q&A Session with the Bocaccio STAT Panel Discussion

- Panel develops written request for additional model runs / analyses

4:30 p.m. Check in with the China STAT

5:30 p.m. Adjourn for Day.

Wednesday, July 8

8:30 a.m. Presentation of the First Set of Requested Model Runs by the China STAT
- Q&A session with the China STAT & Panel discussion
- Panel develops request for second round of model runs / analyses for the China STAT

12:00 p.m. Lunch

1:30 p.m. Presentation of the First Set of Model Runs by the Bocaccio STAT
- Q&A session with the Bocaccio STAT & panel discussion
- Panel develops request for second round of model runs / analyses for the Bocaccio STAT.

5:30 p.m. Adjourn for day.

Thursday, July 9

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

12:00 p.m. Lunch

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

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

5:30 p.m. Adjourn for day.

Friday, July 10

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

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

4:00 p.m. Panel Agrees to Process for Completing the Final STAR Report by the Council's September Meeting Briefing Book Deadline (August 14)

5:30 p.m. Review Panel Adjourns

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
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