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Proceedings of the Pacific regional peer review on Stock assessment for Yellowtail Rockfish (*Sebastes flavidus*) in British Columbia

November 18-19, 2014
Nanaimo, British Columbia

Chairperson: Rowan Haigh
Editor: Rowan Haigh

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May 2015

Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings may include research recommendations, uncertainties, and the rationale for decisions made during the meeting. Proceedings may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

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SUMMARY

These Proceedings summarize the relevant discussions and key conclusions that resulted from a Fisheries and Oceans Canada (DFO) Canadian Science Advisory Secretariat (CSAS) Regional Peer Review meeting on November 18-19, 2014 at the Pacific Biological Station in Nanaimo, British Columbia (BC).

Yellowtail Rockfish (*Sebastes flavidus*) is a key species caught in the British Columbia multi-species integrated groundfish fishery. This species is intercepted by mid-water and bottom trawl gears directed at mixed rockfish (*Sebastes* sp.) and is also caught as a non-target species in the mid-water trawl fishery directed at Pacific Hake (*Merluccius productus*). Annual coastwide landings of Yellowtail Rockfish over the last 25 years are similar in magnitude to landings of Pacific Ocean Perch (*Sebastes alutus*), each of which accounts for about 25% of the total weight of rockfish landed by trawl.

The Fisheries Management Branch of Fisheries and Oceans Canada requested an assessment of the status of Yellowtail Rockfish coastwide and advice on harvests consistent with DFO policy.

Meeting participants included representatives of DFO Science, DFO Fisheries Management, the Fishery Resource Analysis and Monitoring Division of NOAA (USA), the Canadian Groundfish Research and Conservation Society, the Commercial Industry Caucus (trawl), the Sport Fishery Advisory Board, and the Canadian Parks and Wilderness Society.

The conclusions and advice resulting from this review will be provided in the form of a Research Document and a Science Advisory Report providing advice from Science to Managers and other clients. These documents will be publicly available on the DFO CSAS Science Advisory Schedule.

Compte rendu de la réunion d'examen régional Pacifique sur l'Évaluation du stock du sébaste à queue jaune (*Sebastes flavidus*) en Colombie-Britannique

SOMMAIRE

Le présent compte rendu résume les discussions pertinentes et les principales conclusions de la réunion d'examen régional par des pairs du Secrétariat canadien de consultation scientifique de Pêches et Océans Canada (MPO), qui a eu lieu les 18 et 19 novembre 2014 à la Station biologique du Pacifique de Nanaimo, en Colombie-Britannique.

Le sébaste à queue jaune (*Sebastes flavidus*) est l'une des principales espèces capturées dans le cadre de la pêche intégrée – et plurispécifique – du poisson de fond en Colombie-Britannique. Cette espèce est interceptée par les chaluts pélagiques et les chaluts de fond visant plusieurs espèces de scorpènes (*Sebastes* sp.) et également lors de la pêche dirigée au chalut pélagique ciblant le merlu du Chili (*Merluccius productus*). Depuis les 25 dernières années, les débarquements annuels de sébaste à queue jaune de l'ensemble de la côte sont similaires à ceux du sébaste à longue mâchoire (*Sebastes alutus*), chacun représentant environ 25 % du poids total des sébastes débarqués provenant de la pêche au chalut.

La Direction générale de la gestion des pêches du MPO a demandé une évaluation de l'état du sébaste à queue jaune sur l'ensemble de la côte et un avis sur les niveaux de prélèvement qui respectent la politique du MPO.

Les participants à la réunion regroupaient des représentants du Secteur des sciences du MPO, de la Gestion des pêches du MPO, de la Fishery Resource Analysis and Monitoring Division de la NOAA (États-Unis), la Canadian Groundfish Research and Conservation Society, le regroupement commercial du secteur industriel (pêche au chalut), le Conseil consultatif sur la pêche sportive et la Société pour la nature et les parcs du Canada.

Les conclusions et avis découlant de cet examen seront présentés sous la forme d'un document de recherche et d'un avis scientifique offrant des conseils des gestionnaires du Secteur des sciences et d'autres clients. Ces documents seront accessibles au public dans le calendrier des avis scientifiques du Secrétariat canadien de consultation scientifique du MPO.

INTRODUCTION

The conclusions and advice resulting from this review will be provided in the form of a CSAS Science Advisory Report to inform fishery management decisions. The Science Advisory Report and supporting Research Document will be made publicly available on the CSAS Science Advisory Schedule.

REGIONAL PEER REVIEW (RPR) MEETING

Working Paper:	Yellowtail Rockfish (*Sebastes flavidus*) Stock Assessment for the Coast of British Columbia, Canada. CSAP WP 2014-15/GF08.
Authors:	P.J. Starr, A.R. Kronlund, N. Olsen, and K. Rutherford
Reviewers	John Wallace, Fishery Resource Analysis and Monitoring Division, Northwest Fisheries Science Center, Seattle WA Aaron M. Berger, Fishery Resource Analysis and Monitoring Division, Northwest Fisheries Science Center, Newport OR
Chairperson:	Rowan Haigh (Groundfish, MEAD, PBS, DFO)
Rapporteur:	Sheena Majewski (Conservation Biology, MEAD, PBS, DFO)
Presenter(s):	A.R. Kronlund (Groundfish, MEAD, PBS, DFO) Paul Starr (Canadian Groundfish Research and Conservation Society)
Meeting:	Nov. 18-19, 2014, Seminar Room, Pacific Biological Station, Nanaimo BC

WRITTEN REVIEWS

Unless otherwise specified, text in non-italic font reflects the questions and comments from the reviewers. Italicised text reflects the responses and comments by the authors. Throughout the document, Yellowtail Rockfish (*Sebastes flavidus*) is denoted as “YTR” for brevity.

REVIEWER 1: JOHN WALLACE (NOAA)

The review by John Wallace appears in Appendix B. Here, responses by authors to reviewers are presented. John Wallace attended the meeting via teleconference.

1. US Triennial Survey data

The reviewer noted that there was no adjustment for water hauls (i.e., removal of tows that caught no fish or invertebrates of any species, taken as an indicator of no bottom contact, from the survey index calculations) nor for the diving behaviour of Yellowtail Rockfish (YTR) as discussed by Zimmerman et al. (2001).

The authors responded that calculations of relative biomass already included the influence of zero tows. The implied assumption in the calculation of the index was that the occurrence of water hauls was time invariant and was not likely to have a large effect on central tendency, but would cause larger within-year variation than if they were excluded. The plot of zero tows in Figure D23 of the assessment document indicated no obvious time trend for the proportion of tows that caught no fish with YTR in Canadian waters.

The point was raised that bottom contact sensors were deployed on trawl sets for the last two years of the US Triennial survey, which would allow scrutiny of whether the net was on-bottom or mid-water.

It was agreed that the authors would not redo the current assessment but the exclusion of water hauls would be considered for the next assessment of YTR or other rockfishes after examination of the updated AFSC RACEBASE database.

2. WCVI Shrimp Trawl Survey index series

The reviewer raised the issue of net configuration changes and possible effects on rockfish catchability. The importance of net configuration vs. towing speed was discussed among the authors, the reviewer and an industry representative. The reviewer suggested that the authors ask shrimp fishers about the effects of changes in net design.

3. Decision tables

There was discussion about the current catches (average 4,333 t/y) being unsustainable, given that the decision tables suggest that a constant catch of 4,500 t/y in each of the next 10 years is forecast to result in a decline in spawning biomass.

The authors suggested that a 10-year projection horizon was unrealistic because a continued decline would most likely result in management intervention. The authors also suggested that a declining trend at high stock levels was not necessarily incompatible with sustainability objectives. However, such determinations should be done in the context of a management strategy evaluation (MSE) analysis.

4. Statistical catch-age model:

The reviewer suggested that the authors elaborate on the reasons for not including an ageing error correction matrix in the catch-at-age model formulation.

Ageing errors are unlikely to be the biggest problem for the assessment of YTR in BC. Changes in the estimated stock status or productivity of YTR that result from attempts to correct smearing of the apparent size of age classes due to reader misclassification are likely to be dwarfed by the lack of a reliable index of stock abundance. Similarly, the introduction of sex-specific parameterization of natural mortality may not address performance of the management system. The authors pointed out that the fit to the age composition data was acceptable and suggested that increasing model complexity without a clear need to address specific pathologies in model fit was unnecessary.

5. Retrospective analysis

The reviewer suggested that the most recent years of data be removed successively and the model re-run to see if the model exhibited retrospective bias. Retrospective plots have been important in other assessments such as Pacific Hake (*Merluccius productus*) and Pacific Halibut (*Hippoglossus stenolepis*) and could help to assess whether the model exhibited persistent lags in trend estimation.

The authors agreed that retrospective analyses could be done but did not think that the analyses would change the overall conclusions of the analysis.

The reviewer also discussed reconstructing catches and suggested looking at the Pacific Fishery Management Council website for examples. The reviewer also suggested that reconstructed catch methods can be presented as a separate document, as they do for the Oregon commercial fishery (Karnowski et al. 2014).

The authors mentioned that the reconstruction of catches is a project currently underway within the Groundfish Section.

REVIEWER 2: AARON BERGER (NOAA)

The review by Aaron Berger appears in Appendix B. Here, responses by authors to reviewers are presented. Aaron Berger attended the meeting via teleconference.

1. Shrimp bottom trawl survey

The reviewer agreed with the decision that the authors made to not include shrimp trawl survey data in the reference case, despite the possible advantage afforded by the length of the time series.

2. Ageing error

The reviewer agreed that ageing error is likely less important than other issues but noted his concern regarding potential imprecision/bias due to the longevity of the species. He also suggested that the apparent difference in natural mortality between the sexes would be worthy of investigation within the context of a feedback simulation analysis.

The authors noted that patterns in age residuals could be caused by correlations between parameters in the model. It is not clear how to distinguish which parameters have the largest influence on lack of fit in a data-fitting assessment but incorporation of ageing errors will be considered for the next assessment.

3. Sensitivity of results to possible under-reporting of YTR catch 1988 to 1994

Under-reporting of YTR catches during the period prior to implementation of the ITQ (individual transferable quota) management system may have occurred. However the magnitude and exact time period of under-reporting is unknown. The reviewer asked if it was better to assume no under-reporting or to include additional catch with uncertainty. The reviewer recommended that the authors provide clarification regarding under-reporting and subsequent issues with fitting the model and to clarify why catch adjustment was only applied to some years.

There was no means to objectively determine the level of under-reporting; therefore, the authors took advice from the Technical Working Group on the plausible amount of under-reporting during the period when misreporting was likely to be the greatest. The intent of the analysis was to examine whether large changes in the perception of stock status or harvest advice at that time would result from the effects of misreported historical catches. While this catch sensitivity test did change the relative estimate of spawning biomass during the period of suspected misreporting, it had minor effects on the estimates of stock status in the final 15 years. There were no data available to estimate the magnitude of misreporting; therefore, anecdotal reports were used to select the amount of catch added to that recorded for the sensitivity test.

The reviewer was satisfied with the rationale but recommended that the authors clarify why the decision was made to assume no catch under-reporting during some periods (editor: e.g., during the observer program years, 1996 on).

4. Age-specific natural mortality

Age-specific natural mortality *M* for females was specified in the previous Canadian and US assessments of YTR. However, the current Canadian assessment estimated age-invariant *M* for each sex. It is important to characterize the degree of uncertainty in *M* as it applies to management concerns and considerations. Why were alternative *M* hypotheses not considered as sensitivities in the analysis?

The authors were satisfied that the fits to the age-structured data were adequate. Residuals in female mortality were examined and no obvious pathology was noted. The choices of the age at which female mortality increased differed between the previous Canadian (age 10) and US *assessments (age 6), indicating the arbitrary nature of this parameter with no rationale provided for the specific choices. In the absence of feedback simulation analysis, it is not known whether a more complex formulation for natural mortality would improve the fits to the available age composition data beyond the current parsimonious approach (i.e., M independently estimated by sex).*

The reviewer would like to see alternative sex-specific formulations of natural mortality considered in future assessments.

5. Fixed survey stations

The reviewer asked how many survey stations were fixed but treated as random. Limited tagging information shows little movement for this species; therefore, local depletion might occur.

The only fixed-station surveys that were used in this stock assessment were the early surveys from the late 1960s-80s. The four most recent surveys were random stratified, so this should not be a concern. The possibility of hyperstability in the fixed-station surveys due to set locations possibly positioned in good habitat for YTR was not addressed. The authors also noted that the few tag-release recovery events for YTR showed potential for considerable movement. This movement is not of the magnitude seen in Pacific Halibut or Sablefish (Anoplopoma fimbria), but is substantial (i.e., across major PMFC areas and into the lower 48 United States from mid BC).

6. Iterative re-weightings

The reviewer asked how many re-weightings (Francis 2011) were required before results were stable?

The authors reported that two re-weightings were sufficient.

The reviewer recommended that a table be included to show the different weightings used for the different data sources, as this could provide information that would help to provide context for the results.

> *The authors noted that the plot in Appendix F (Fig. F.1) shows the process error added to each of the survey series; it was variable and reflected how well the model fit the data from each survey, with some surveys requiring more added process error. The additional coefficients of variation added as process errors are as follows: Hecate Strait Synoptic = 0.5, Queen Charlotte Sound Synoptic = 0.15, West Coast Vancouver Island Synoptic = 0.5, Historic GB Reed = 0.6, West Coast Haida Gwaii Synoptic = 0.6, and US Triennial = 0.6.*

7. Selectivity parameters

The reviewer questioned the adoption of selectivity parameters from the Pacific Ocean Perch (POP, *Sebastes alutus*) assessment rather than using those from previous YTR assessments.

There were no applicable selectivity parameters available from the preceding 1997 Canadian assessment or from analogous YTR stock assessments conducted in the United States. The authors noted that while uniform priors were used to estimate the commercial selectivity, this was not possible for the survey selectivities due to scarcity of survey age composition data. In the end, the medians from the 5ABC Pacific Ocean Perch posterior distribution were used as priors for the current assessment because POP are a rockfish of similar size to YTR taken in the same surveys.

The reviewer suggested that various selectivities be used for sensitivity analyses due to the influence of surveys on biomass scale, which could potentially result in different estimates of stock status.

8. Steepness

The reviewer initiated a discussion about the biological plausibility of an estimated steepness h = 0.85. There have been similar studies on other groundfish/rockfish species that have had a lower steepness. The reviewer cited the need to clarify the use of the steepness prior and whether a lower value might be useful to include as a sensitivity case or incorporated into MSY-based management.

The authors noted that if steepness were fixed at 0.65, apparent productivity would be reduced relative to the estimated value and likely result in a larger estimate of unfished spawning biomass and a lower estimate of current depletion. The authors were reluctant to fix this parameter because it would essentially determine the stock-recruitment relationship and the MSY target reference points while underestimating the modelled uncertainty. The approach used in this stock assessment was based on a prior (beta distribution) developed by Forrest et al. (2010), which is consistent with all Sebastes stock assessments that have been conducted in BC since 2010. This prior was developed over a wide range of plausible values for this parameter, integrating information from a range of Sebastes stock assessments. The authors noted that the prior mean of h=0.674 is very close to the proposed fixed value suggested by the reviewer.

The authors also pointed out that the pairs plots (Figs. G.4-G.6) show that estimated selectivity parameters ($\mu_{g=1,2,3,7}$, $\log v_{g=1,2,3,7}$, $\Delta_{g=1,2,3,7}$) are well dispersed and not correlated.

9. Autocorrelation structure in the recruitment

The reviewer requested clarification of how recruitments were used for the projection period.

The authors responded that forecast recruitment was simulated from the stock-recruitment function with lognormal errors. Forecasts rely on recruitment deviations generated from average recruitment conditions using lognormal process error as the forecast period increases. The authors suggest using the 4-5 year time horizon for interpretation of the forecasts as this period is less affected by projection assumptions than the latter years in the 10 year projection period reported in the assessment.

The reviewer suggested that a longer projection period be examined to allow further interaction with the full population and potential stabilization of the population.

The authors pointed out the trade-off between reliance on assumptions about recruitment variation during the forecast period and the value of a longer projection period. They also expressed concerns about the validity of assumptions required for projecting even up to 10 years as the effects of age classes already observed and incorporated in the model diminish. Without a feedback approach for the projections, the authors suggest that there is little utility in projecting out to 20+ years. The authors did acknowledge that the auto-correlation in the recruitment deviation residual pattern was not addressed for the current assessment, as noted in the Working Paper.

10. Issues of depletion

Given the uncertainty of MSY-based reference points, the reviewer would like to see an overlay of fished biomass and unfished biomass through time to separate biomass trends in the absence of fishing (fishing vs. environmental effects on depletion).

The reviewer later sent an example of a plot used in tuna assessments (Harley et al. 2014) that helps researchers understand what is driving the population. The plot depicts the estimated spawning potential trajectory (lower solid black line) with the trajectory that would have occurred in the absence of fishing (upper dashed red lines) for a Bigeye Tuna (*Thunnus obesus*) stock in the Western Central Pacific Ocean (WCPO).

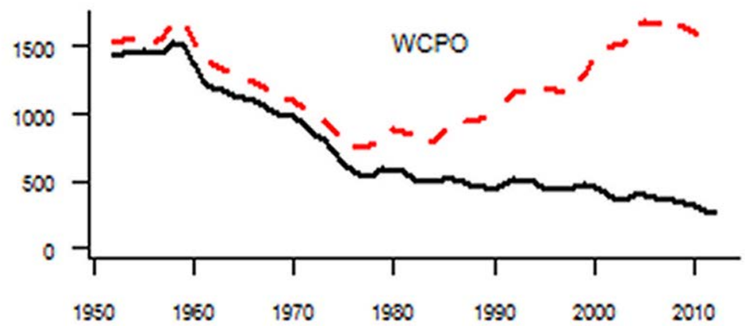

Figure 1. Estimated spawning potential trajectory (lower solid black line) with the trajectory that would have occurred in the absence of fishing (upper dashed red lines) for a Bigeye Tuna (Thunnus obesus) stock in the Western Central Pacific Ocean (WCPO)

GENERAL DISCUSSION

The RPR meeting participants (Appendix D) are collectively called "participants" herein. Unless otherwise specified, text in non-italic font reflects the questions and comments from the participants. Italicised text reflects the responses and comments by the authors. Sentences in **bold-face** and prefaced by a star (★) indicate important decision points reached during the discussion.

RESOLUTION OF TECHNICAL ISSUES

Retrospective analysis

The participants considered whether the inclusion of retrospective plots should be done as a revision to this document or included in future assessments. Regional Peer Review advice provided for Pacific Herring assessments (DFO 2015) recommended against retrospective analyses in the future with a preference for closed-loop simulations.

- Retrospective plots are considered to be a useful model diagnostic tool that can show the impact of each successive year of data on the advice given. Retrospective plots are used in both the Pacific Hake and Pacific Halibut assessments to identify influential data years and increase confidence in the consistency of the stock assessment model, i.e., the ability of the model to reproduce the same stock trend over time.
    - *The authors note that the approach is not universal, and one author thought these were of limited utility as there have been few situations where assessments have been modified or rejected due to poor retrospective performance.*
- One reviewer affirmed that retrospective analysis is considered to be a useful method for catching potential sources of model mis-specification and is a standard tool used in US analyses for model diagnostics. The concern is that if the retrospective analysis is performed by other scientists and a strong retrospective pattern is found, it can call into question the stock assessment. Therefore, it is better to be proactive and perform the analysis as a standard diagnostic.
- The same reviewer noted that software for the Stock Synthesis stock assessment package exists that automates taking out the last year of data then re-running the model (e.g., the r4ss R package on GitHub has functions SS_doRetro and SS_profile). Once

automation is set up, it will save effort in the future should retrospective analysis be requested frequently.

★ **Future assessments for groundfish/rockfish should consider using retrospective analysis as a tool for evaluating data influence (e.g., Legault 2009).**

Limitations of the WCVI shrimp survey index for rockfish

The participants initiated a discussion about the applicability of the West Coast Vancouver Island (WCVI) shrimp survey to indexing Yellowtail Rockfish.

- A participant asked if there was a point in time when methods used for the WCVI Shrimp survey had changed?
    - o *The authors responded that while there were fixed stations used throughout the time series, transect lengths could differ from year to year based on the distribution and abundance of shrimp, with the depth range explored varying from survey to survey.*
- Participants noted that rockfish have been recorded incidentally since 1975 in the WCVI shrimp survey, and that use of these data assumes that rockfish identification was reliable throughout the time series.
    - o *The authors responded that the reliability of groundfish identification in general improved once groundfish technicians collaborated on the WCVI shrimp survey in the early 2000s.*
- The participants asked if there is evidence that the change in net configuration implemented in 2006 caused a change in the relative catchability of the series.
    - o *Changes in shrimp survey design in the mid-2000s, as well as changes made to gear configuration in the early 2000s, suggest there have been incremental changes to gear and design over the years that compromise the consistency of the survey over time. For instance, there was a design change when the length of transects was fixed in the last 10 years, instead of the former practice of extending transects until encounters of shrimp ceased. These changes, and the possible implications for indexing groundfish species, are not currently documented.*
- The participants discussed whether shrimp surveys adequately index the abundance of YTR, particularly because most shrimp trawls are not optimized for catching finfish, especially highly-mobile rockfishes that tend to be off the bottom. Catches of pelagic rockfish are more likely to be incidental when employing gear that is specifically rigged for fishing on the soft bottom.
    - o *The authors noted that there was a lack of YTR catches in the shrimp survey over the last 4-5 years compared to a substantial catch of this species in the concurrent (in space and time) WCVI synoptic surveys, which is optimized for groundfish. This result suggests that there may be bias in the ability of the shrimp survey to reliably index YTR abundance, possibly due to changes in spatial distribution of YTR or to gear issues.*
- An industry participant cited the need to consider relationships between how the survey gear is configured (e.g. doors, nets, main warp), along with tow speeds as well as environmental factors in determining whether the survey is capable of indexing a specific species.

- Given the changes identified, the participants asked how much credibility should be given to model cases that use the WCVI shrimp survey? Is this index proportional to YTR abundance? Should there be a recommendation regarding a designated survey for YTR?
    - o *The estimates of stock status are sensitive to the inclusion or exclusion of the shrimp survey index for YTR. The authors concluded that this survey should be excluded based on how well it could be expected to reliably index YTR, and provided an extensive discussion of the possible shortcomings based on species biology and net design. The authors suggested that a dedicated YTR survey would be expensive and would require research on methods best suited to indexing schooling pelagic rockfish. However, the utility of such a survey should be evaluated in the context of a "closed-loop" feedback simulation to establish the feasibility of field experimentation.*
    - o *The authors also recommended that commercial vessels could be considered for monitoring YTR and related species. Given the lack of resources for a survey and technological limitations (e.g., an acoustic survey targeted at mixed species aggregations), it might be beneficial to have discussions with Industry about using data already collected by the commercial fleet to help design a commercially-based index. Science could define the steps that the commercial fleet carry out during operations to derive an index based on the results of simulation analyses.*
- One participant asked if the Working Paper needs additional documentation about the limitations of the WCVI shrimp trawl survey in this assessment.
    - o *The authors felt that the limitations of the shrimp trawl survey were documented adequately on p. 42-43 of the Working Paper. Additional points not identified in the assessment (if any) will be captured by the Proceedings Document.*
- The participants agreed to support the authors' selection of the reference case, which did not include the shrimp survey, and supported the inclusion of the sensitivity run that used the shrimp survey data.
- The participants recommended that if Science is going to review the use of the WCVI shrimp survey (e.g., evaluate gear behaviour), the QCS shrimp survey should also be reviewed. That is, evaluate the suitability of these data for use as abundance indices but also assess the data for use as general indicators of change in population distribution.

★ **Review the options for conducting future YTR surveys which make use of industry platforms (e.g., Ressler et al. 2009), keeping in mind that new funding for fishery independent surveys is unlikely. Research the existing databases to look at design questions before approaching Industry.**

★ **Document changes to the design and net gear for both the West Coast Vancouver Island and Queen Charlotte Sound Shrimp trawl surveys. Evaluate the suitability, along with possible limitations, of these surveys for each groundfish species that will be assessed in future.**

Sensitivity analyses

The participants identified concerns regarding the estimation of the selectivity and productivity parameters. For instance, the priors on *M* may be too precise. The authors noted a potential scale problem for the biomass estimate and a potential bias problem for the estimates of MSY parameters, both of which are discussed in the Working Paper.

- The participants requested that an additional sensitivity run be made which re-estimated the reference case with a CV on M set to 50% instead of the 25% used in the reference case.
    - o *This model run resulted in higher M estimates (median female M=0.16 and male M=0.13) compared to the reference case. This sensitivity case also produced an increase in stock status relative to the reference case, with the median estimate of B_{2015}/B_0 at 61% compared to 50% for the reference case. The authors suggested that a lower M is more consistent with literature estimates for YTR; this sensitivity case showed the implications of widening the priors on sex-specific but age-invariant natural mortality parameters.*

★ **Include sensitivity analyses with respect to natural mortality *M* and survey selectivity for the reference case as this could change the range of MSY estimates for the YTR stock assessment and better account for uncertainty. The authors will add additional justification for using the reference case (narrower *M* prior) and discuss why the lower estimate of *M* is more plausible based on information from the literature.**

Industry expressed concerns the catch data do not reflect population trends, as suggested by CPUE analyses (which were not used in the assessment). Participants from Industry state that avoiding rockfish in trawl tows had increased in the last five years.

- o *The authors pointed out that the stock reconstruction suggested that the YTR population most recently peaked in 2008, largely explained by good recruitment indicated by the observed proportions-at-age during a period of relatively constant catch. The estimated spawning biomass then decreased by approximately one third to the final year of the reconstruction as a result of lower recruitment in more recent years.*
- o *The authors also suggested that the survey information should be unbiased, although collected with considerable uncertainty, given that substantial effort was expended to make the surveys comparable between years.*

- Some participants suggested that model averaging could be used if there is a range of acceptable models and none can be accepted as a single reference case. Model averaging has been done in the US for hake and halibut and in BC for Pacific Cod (*Gadus macrocephalus*).
    - o *The authors agreed that the proceedings document could identify model averaging as a possible approach. However, as the authors and the participants agreed that the shrimp survey was not a reliable indicator of YTR abundance, model averaging would not be appropriate in this instance The authors will leave the alternative case (which uses the shrimp trawl survey) in the working paper as a sensitivity run.*

★ **Because the cases that included the WCVI shrimp survey were rejected, and the two-fishery model gave estimates that were similar to the one-fishery model, model averaging would not materially change the recommendations derived from this Yellowtail Rockfish stock assessment. Therefore, model averaging was not warranted for this assessment.**

REFERENCE POINTS

Participants discussed whether specific reference points and the associated decision tables could be identified as being preferred. The consensus of participants was that the potential shortcomings of specific reference points should be discussed, e.g., the reliability of estimates of MSY-based reference points, but that choosing a specific reference point implied selecting conservation or fishery objectives that required a broader process than that afforded at a CSAP meeting.

- Participants asked if the authors could advise on which reference points were most appropriate for YTR.
  - *The authors noted their discussion of the potential shortcomings of MSY-based reference points and their choice to include alternative outcomes such as* B_{min} *or* B_{2015} *in decision tables.*
  - *The evaluation of the reliability of estimates for any given reference point should be conducted in the context of a feedback simulation.*
  - *However, the authors stated that the choice of an outcome (e.g., a reference point), along with a time horizon and the probability of achieving it, constituted formulating a measurable objective for the stock and fishery. This has not been done for YTR, nor is it the sole purview of Science, and requires a broader process as outlined in the working paper recommendations.*

★ **Recommend that re-assessment of YTR in 2019 coincides with the current groundfish assessment schedule. At that time, five more years of ageing data will be available to explore the concerns about low recruitment identified in this assessment.**

★ **Recommend that closed-loop simulation be used to look at reference points in the next scheduled assessment.**

ISSUES AND/OR REVISIONS IDENTIFIED

There was a summary discussion of the key issues identified in the meeting and general consensus was apparent.

  - *The authors will address reviewers' comments where appropriate. Other issues identified as potentially useful such as better treatment of possible water hauls (Zimmerman et al, 2001) and anomalous catches (Thorson 2011) will be considered in future groundfish assessments as appropriate.*
  - *The authors will add the additional sensitivity analysis using a widened prior on M, and revise the appendices and main text where relevant to discuss this new analysis.*

- The participants recommended the implementation of retrospective analysis as a potentially useful diagnostic test for future assessments.
- The participants suggested that a technical working group be constituted to prepare an overview of issues, historical and current, with shrimp trawl survey gear and methodologies for consideration in future groundfish stock assessments.
- The participants agreed that the US/CA Triennial survey dataset should be updated with AFSC RACEBASE data to reflect recent revisions regarding water hauls.

- The participants recommended the development of a methodology to treat zero-catch tows (e.g., Lecomte et al. 2013) in future groundfish assessments.

CONCLUSIONS

CONSENSUS ON PAPER ACCEPTABILITY

The working paper was accepted with revisions including the additional sensitivity analysis for *M*.

INSTRUCTIONS TO AUTHORS

Generally, the authors will address reviewers' comments where appropriate.

Specifically, the authors will present a new sensitivity analysis to the natural mortality parameter *M*, which uses a less precise prior (doubling the CV from 0.25 to 0.5). They are to add this new case to "Appendix H. Alternative Model Cases" and refer to it in the main document. Also, the authors will provide more justification for adopting the reference case prior on *M*.

GENERAL RECOMMENDATIONS FROM THE RPR PARTICIPANTS

1. Suggest forming a technical working group to identify all historical changes in the WCVI and QCS Shrimp trawl surveys, evaluate the gear behaviour, and make recommendations on the suitability of using either shrimp trawl survey for a full range of groundfish species (for use in stock assessments or as indicators of distributional changes).
2. Use model averaging in the future as a way to present assessment advice if the participants cannot agree on a single model for use as a reference case.
3. Where appropriate, present retrospective analyses to identify sensitivies to key model inputs in future stock assessments.
4. Identify water hauls in the US/CA Triennial survey dataset used in BC groundfish stock assessments.
5. Where appropriate, provide model runs with zero-catch to compare population trends between unfished and fished biomass.
6. Recommend that YTR be assessed in 2019 in keeping with the existing groundfish assessment schedule.

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APPENDIX A: TERMS OF REFERENCE

Stock assessment for Yellowtail Rockfish (*Sebastes flavidus*) in British Columbia

Regional Peer Review – Pacific Region

November 18-19, 2014
Nanaimo, British Columbia

Chairperson: Rowan Haigh

Context

Yellowtail Rockfish (*Sebastes flavidus*) is a key species caught in the British Columbia multi-species integrated groundfish fishery. This species is intercepted by mid-water and bottom trawl gear directed at mixed rockfish (*Sebastes* sp.) and is also caught as a non-target species in the mid-water trawl fishery directed at Pacific Hake (*Merluccius productus*). Annual coast wide landings of Yellowtail Rockfish over the last 25 years are similar in magnitude to landings of Pacific Ocean Perch (*Sebastes alutus*), each of which accounts for about 25% of the total weight of rockfish landed by trawl.

Conventional stock assessments typically use fishery time series data to estimate current stock size and productivity. Although good catch and biological data series are available for Yellowtail Rockfish in BC, the lack of a reliable, fishery-independent index of relative abundance has hampered stock reconstruction. Existing abundance indices derived from modern surveys conducted in collaboration with industry use bottom trawl gear, which is not ideal for species like Yellowtail Rockfish that exhibit pelagic behaviour. Consequently, indices of abundance derived from survey data are imprecise and likely biased. Changes in annual index values suggest survey catchability varies widely. Commercial catch rates are also unsuitable as a basis for indexing abundance because Yellowtail Rockfish are searched for acoustically before fishing. Thus, there has been little improvement in the available stock indexing information since this species was last assessed in 1999 (Stanley and Haist 1997, Stanley 1999).

The Fisheries Management Branch of Fisheries and Oceans Canada requested advice on (a) the status of Yellowtail Rockfish coastwide and (b) harvests consistent with DFO policy.

Objectives

Guided by the Fisheries and Oceans Canada (DFO) Sustainable Fisheries Framework, particularly the *Fishery Decision-making Framework Incorporating the Precautionary Approach* (DFO 2009), meeting participants will review the working paper:

Stock assessment for Yellowtail Rockfish (*Sebastes flavidus*) in British Columbia. (*author order TBD*) Kronlund, A.R., Starr, P.J., Olsen, N., Rutherford, K. CSAP Working Paper PAC_GF08_2014-15

The working paper will be used to provide advice with respect to the following objectives:

- Review and evaluate stock and fishery monitoring data available for assessment of stock status and harvest projections;
- Test the ability of available data to support conventional assessment model reconstruction of stock status;
- Provide the rationale for candidate status-based and/or fishing mortality-based reference points consistent with the DFO Precautionary Approach, including alternatives to reference points based on maximum sustainable yield;

- If possible, provide forecasts of the expected status of Yellowtail Rockfish relative to candidate reference points subject to a range of management actions (e.g., a range of proposed annual catches).

Expected publications

- CSAS Science Advisory Reports (1)
- CSAS Research Documents (1)
- CSAS Proceedings (1)

Participation

- DFO Science
- DFO Fisheries Management
- Aboriginal Communities
- Province of BC
- External Scientists
- External Reviewers
- Industry
- Non-governmental Organizations
- Other Stakeholders.

References

DFO. 2009. A fishery decision-making framework incorporating the Precautionary Approach.

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APPENDIX B: WORKING PAPER REVIEWS

REVIEW – JOHN WALLACE

Issues that reviewer wishes to discuss at the CSAP meeting

Main Issue 1 - Data

There is no mention of Mark Zimmermann's "water hauls" issue for the Triennial Trawl Survey index (appendix D.4). Since bottom contact sensors were not used in the Triennial survey until 1998, Mark used the presence or absence of benthic invertebrates to find bottom trawl hauls that were towed off the sea floor. Zimmermann's paper separates out Canadian Vancouver from US Vancouver and shows the percent change in biomass estimates with and without water hauls for key species, but not YTR. Even though YTR are often in the water column, the fact that YTR dive when fished by trawl (page 1 of main document) could imply that a net not tending bottom may catch less bottom dwelling YTR than one that is. See page 14 in Zimmermann's report for speculation about water haul net performance. Note that even though Mark published his report in 2001, the acceptance of the water hauls and inclusion of a "water haul" column in the AFSC RACEBASE database may not have happened right away. In either case the implication was slow to be realized and even though the YTR assessment of Wallace and Han (completed in 2005) mentions a "substantial number of zero-tows in the triennial survey" there is no mention of water hauls. However, for example, the canary assessment completed in 2007 by Ian Stewart does mention water hauls and it is now commonly accepted practice in the states to remove the water hauls from all years of the data.

Also appendix D.4 gives Mark Wilkins as the reference for the Triennial Trawl Survey data. I would recommend that data be downloaded from the AFSC RACEBASE database so any corrections made to the data are received along with the "water haul" column.

Main Issue 2 – WCVI shrimp index

- It would be nice to see Figure F.2 with the 6 relative index series in the base case repeated in the alternative model cases (appendix H) with the WCVI shrimp index included.
- I agree that the shrimp survey has issues, but on the flip side it has historically been shown to be able to catch rockfish and if the species identification isn't too bad, YTR in particular.
- When I initially read item 5 on page 40 of the main document about a change in the shrimp survey net, that seemed concerning, however on the bottom of page the 43 the change is said to be modest. Perhaps this change can be put to rest if experts (e.g. shrimp fishermen) are consulted and asked if the modest change in any way affects the catching of rockfish in the net. Figure 6 does show that the shrimp survey net was able to catch YTR at pre-2006 levels from 2006-2009.

  Wallace and Han (2005) give a quote from Dark et al. 1983 that addresses the fluctuation in surveys:

  "*The survey-to-survey fluctuation of estimated biomass suggests that the vulnerability of yellowtail rockfish to the survey may vary over time. During the 1980 survey, 43 stations were sampled twice two weeks apart and the CPUE changed from 1.0 to 16.8 kg/km. This may be indicative of a schooling mobile species that can change distribution (and availability to trawl gear) in a relatively short period of time (Dark et al. 198[3]).*"

(By doing a search on author, Dark et al. 1983 claims to available, but the listed URL comes back with “Server not found”.)

Main Issue 3 – Management

Comparing the base case with case 2 in Table H.3 and comparing Figure 14 with Figure H.5 shows that the base case and case 2 are quite similar in how productive they are. Also, both figures show that a catch strategy of 3,500 mt is sustainable whereas a catch of 4,500 mt is not. Figures 10 and 12 in the main document show that with no recent large recruitment events, the 4,333 mt average over the last 5 years is too high.

I agree that a management strategy evaluation (MSE) would be useful.

Main Issue 4 – SCA Model

Ageing errors identified on page 25 but no ageing error correction matrix was used (Table 10). Why? Adding an ageing error matrix in the future was discussed on page 54.

No intra-model retrospective plot (systematically removing the terminal years from the base case) or inter-model retrospective plot (current and past base case models), see e.g. Figures 68-70 in the Status of Pacific Hake (Whiting) stock in US and Canadian Waters in 2011.

Issues that authors can address without discussion

- I didn’t see any mention that there is no recreational data that needs to be considered.
- How does Awatea version of Coleraine compare to other SCA models? Allan Hicks personal communication would work well. Table 1 in the main document is very useful. For Table 1, is there an implicit assumption that the Awatea version of Coleraine is a good SCA model for YTR?
- Also in Table 1 under Life History Parameters there is an assumption of natural mortality larger for males than females, but it’s the old females that are missing.
- Figure 2 legend “…all **fishery** tows…”
- On page 13, “…size-at-age for **different** time periods..”
- Page 15 says states “reports that fishermen misreported the location of catches” this could be added to Table 1 for a reason why a single BC stock is assumed.
- Page 27, “YTR for BC (Stanley and Haist 1998, Stanley 1999) **and** the US west coast (Wallace and Lai 2005)”
- Page 33, give justification for two re-weighting iterations. Why not one or 3 or more? Were others tried? Is the justification given in Francis(2011)? No results are given as to how well the two re-weighting iterations preformed.
- Page 33: “Subsequently, relatively strong year classes that **appear** to originate over several years in the mid-1990s **~~and~~** still persist in the age samples.
- Page 33 (bottom): changes in size-at-age could be looked at.
- Page 34: “degree to **which** the surveys”
- Page 35: “given in Table 12~~Table 14~~.
- Figure 14 Legend: There is no boxplots in the figure.

- Page 41: emigration is talked about but not immigration
- Page 42: "CV of 0.459 (Figure 6, Appendix D)." wrong figure.
- Table 13: on the Healthy row: B >= $0.8B_{MSY}$
- Table 14: Year of maximum exploitation: how can a exploitation have a higher percentile than the maximum, which I assume is the 50% percentile. Likewise for Minimum spawning biomass: how can a minimum have a lower percentile than the minimum?
- Page 54: Would the fishery be willing to have a tax on landings for a better survey for increased catch, or is YTR catch already limited by other species?
- Page 55: "such as benthic structure **and marine mammals**."
- Page B-14: "landings in 1975 and 1975" ?
- Page C-1: Is there a specific study which shows restricting the fishing "footprint" will help the fishery with refugia in non-fishing areas? Is this an assumption, or was it political pressure?
- Page C-15: "YTR (**Error! Reference source not found.**cfh)."
- Figure E.6: A warning that the axes are not equal would be good. Would be nice to see the age axes equal, the non-equal residual ones are fine with a warning.

The five questions

1. Is the purpose of the working paper clearly stated?

   Yes

2. Are the data and methods adequate to support the conclusions?

   The Triennial survey is only one of two surveys prior to 1998, so it seems that if water hauls were not already dealt with and just not mentioned, this does need to be looked at.

3. Are the data and methods explained in sufficient detail to properly evaluate the conclusions?

   Yes, excellent and complete work with the data and analysis. I would suggest the historical data reconstruction get published separately, so that there is an independent review, a paper or report to cite, and authorship for those that did the reconstruction work. Oregon has done this with their reconstruction work. (http://www.dfw.state.or.us/MRP/publications/docs/ODFW_Info_Rpt%202014-02_Historic_Reconstruction_Oregon_Commercial_Fish_Landings.pdf)

4. If the document presents advice to decision-makers, are the recommendations provided in a useable form, and does the advice reflect the uncertainty in the data, analysis or process?

   Yes

5. Can you suggest additional areas of research that are needed to improve our assessment abilities?

   As mentioned in the main document, there is a need for a survey that more directly targets YTR. A fisherman was recently awarded an exempted fishing permit (EFP) by the PFMC "to evaluate the effectiveness of a species-selective commercial hook and line gear; it fishes jig gear designed to target abundant yellowtail rockfish and avoid overfished *species". Another fisherman (who is in a wheelchair) and his wife did the actually fishing; they caught 15,000lbs of yellowtail and only a handful of canary. This type of fishing could be adapted to a directed survey of YTR in the midwater.*

REVIEW – AARON BERGER

Date: November 16, 2014

Reviewer: Aaron M. Berger (NOAA-NMFS NWFSC)

CSAS Working Paper: 2014/GF08

Working Paper Title: Yellowtail Rockfish (*Sebastes flavidus*) Stock Assessment for the Coast of British Columbia, Canada

General statement of the stock assessment and the accompanying working document

Overall, assessor decisions for the 2014 YTR stock assessment appear to be defensible given the situation of individual data sources; what is known about YTR behavior and life history; what is known about the historic and current fishery(ies); and the state of knowledge about conducting statistical catch-at-age assessments in general. The assessment authors should be commended for their thorough documentation and explanations of analytical decisions. The advice provided to managers via decision tables, posterior distributions of management quantities, a phase plot, and seemingly appropriately devised cautionary statements in the text concerning the interaction between potential assessment issues and outcomes/advice for management was adequate. I do have some concerns/questions that are specifically addressed below that I would like to get feedback on from the assessment authors. I've also highlighted a few minor issues for consideration.

General issues/ concerns/ agreements that warrant discussion/ consideration/ acknowledgement at the CSAP review meeting

- Agree – the exclusion of the shrimp bottom trawl survey in the formulation of a reference case. The assessors put forth considerable evidence (mainly inconsistency, inadequacy, and aggregate reporting) against using this index for YTR. The fact that directed groundfish surveys in the 3C and 3D areas are in contrast to the shrimp survey in recent years (2010-2014) raises extra caution.
- Issue – why wasn't aging error incorporated when estimates were readily available (albeit dated)? I understand that it may be small compared to survey index errors, but errors in aging could (and often do) cause bias (inaccuracy in addition to imprecision). Of course, valid age proportions are important when fitting age structured models and misinformation could be a source for lack of model fit.
- Concern – non-inclusion of suspected under-reporting of catch during 1988-1994 in base case. It seems like the working group had good reason to believe that this occurred and thus the catch should be accounted for in the model. Also, I note the persistent presence of negative residuals in the fitted age proportion data from 1987-1996, which could be due to under-reporting of fish of a given size (or discarding smaller/younger individuals) during this time before observers came in 1997.
- Concern – omission of age-specific M, particularly for females. Seems like it would be a logical sensitivity (at least) given it was a prominent feature in the last CAN and US assessments of YTR and a plausible (perhaps most parsimonious) explanation for the

observations of relatively few older females. I suggest that time-invariant and time-variant female M be included as a key axes of uncertainty.

- Issue – how many survey stations were fixed and treated as random? Depending on local habitat structure and movement, there could be local depletion effects from the survey itself at fixed location survey sites given some evidence from tagging that a high proportion of tagged YTR were recaptured less than 25km of release site.
- Issue – did the second of the two-stage re-weightings of Francis (2011) only require two iterations for each model (or was that a cut-off decision a priori for a particular reason)? How were you sure your iterative re-weightings became stable? A summary table showing the relative weights for each data source would be useful for understanding the relative influence of each source for deciphering/linking model output to input data.
- Issue – assumed selectivity parameters for those surveys with no age information based on recent ocean perch assessment from the same area. I think that the median selectivity from YTR surveys in current (or past) assessments would be more applicable.
- Concern – is the estimated steepness of 0.85 biologically plausible given the life history and reproductive potential of YTR? Given the well documented difficulties with estimating h (and often presence of positive bias as shown using simulation analyses; Lee et al. 2012 Fish Res 125-126: 254-261), I would suggest considering a lower value for steepness at least as part of a critical [necessary] axis of uncertainty. Many other similar rockfish species have lower estimated/assumed steepness values (though admittedly all over the place). Alternative [lower] values for steepness will affect the [plausible, in my opinion] range of uncertainty for derived management quantities. I would suggest a value near the prior (~0.65).
- Concern – was the autocorrelation structure in the estimated recruitment deviations preserved during the projection period? More generally, how was recruitment during the projection period calculated (from the S/R relationship with no error or autocorrelation, from the S/R relationship with and independent residual draw, other?). I'm wondering the implication on management advice (or more directly, projection uncertainty) that ensues from the projections. It would be beneficial to clarify the approach in the document.
- Issue – Definition of B0 and depletion statistics given that the stock was reduced by 20% (80%B0) before catches became significant (i.e., stock reduction resulting from environmental conditions and likely not fishing mortality). I'd like to see a trace plot of estimated fished biomass through time overlaid with estimated unfished biomass.
- Concern – It appears to me that the forecast period is too short for some of the alternative constant catch scenarios to fully interact ('equilibrate') with the population. As is, managers get an idea of the direction a particular catch level will have on expected biomass trajectory, but not where that trajectory 'stabilizes'. Consider extended forecast period out to 20 or 25 years.

Minor issues/considerations/suggestions

- Haigh and Yamanaka (2011) not in literature cited.
- Why was the definition for the number of commercial catch-at-age samples required to be representative different depending on fleet structure (5 for combined and 3 when disaggregated)? I suspect it is for convenience of usable sample sizes, but is that appropriate when thinking about the underlying characterization of being representative.

- Why have asymmetric bounds on priors with symmetric distributional assumptions (e.g., M prior N(0.08,0.02) with bounds at 0.01 and 0.2)?
- Could aggregation detection rate (~standardized effort) be a possible relative abundance index for the commercial fishery? Obviously, one would have to consider aggregation size and other variables as a covariate in the standardization procedure.
- Page 32: "Selectivity parameters…. uniformed prior, given the considerable amount of available age composition data." So much data that there is no information (?), or considerable variability in age data?
- Why have discards increased in the past 5 or so years? Better reporting?
- How was commercial age proportion samples obtained? A brief description of how fish were sampled by on-board observers would be beneficial.
- There appears to be some evidence for latitudinal variation in vonB k and Linf parameters (Figure E.7).
- Is parameter q5 on a bound (estimated at 0 across distribution; Table G.1)?

Responses to the five general questions

1. Is the purpose of the working paper clearly stated?

   Yes

2. Are the data and methods adequate to support the conclusions?

   There are lots of issues with the data (e.g., survey temporal/spatial representativeness) and choices to make regarding parameterization of the assessment model (e.g., natural mortality). Such issues are well documented by the assessment authors and I am of the opinion that they have done an adequate job describing the conclusions given these difficulties, uncertainties and a restricted amount of time to complete the technically complex and computationally intensive assessment. A few suggestions are noted above that would broaden the scope of uncertainty characterization.

3. Are the data and methods explained in sufficient detail to properly evaluate the conclusions?

   Yes, the authors should be commended for their efforts in describing the methodological approach and parameterization decisions in sufficient detail to properly evaluate the conclusions, enable repeatability, and provide guidance for subsequent assessments.

4. If the document presents advice to decision-makers, are the recommendations provided in a useable form, and does the advice reflect the uncertainty in the data, analysis or process?

   Yes, the document provides usable summary graphics/tables, decision tables, and a phase plot of which span the most likely relevant management decision making parameters given the DFO SFF and DMF general guiding framework. Uncertainty is modestly captured and incorporated into the decision tables. Five alternative models (model/structural uncertainty) were considered which incorporated alternative hypotheses about usable data (fishery-independent surveys; catch reconstruction via misreporting) and fishery characterization (emphasise on bottom trawl and mid-water trawl fleet varying selectivity). Marginal posterior distributions of estimated parameters and derived management quantities (e.g., MSY-based) provided an adequate representation of parameter/derived quantity uncertainty. There are several alternative model formulations *(sensitivities) that I would like to see (as mentioned above) to more fully evaluate the range of plausible uncertainty. However, I appreciate the trade-off between fitting alternative model scenarios and running full MCMC evaluations on a select few models and understand the choices made by the assessment scientists. The main data-related uncertainties seem to be covered adequately and many of the alternative model/parameter formulations are highlighted in the document as areas for further research.*

5. Can you suggest additional areas of research that are needed to improve our assessment abilities?

   There are several areas of research that could be conducted from which the results would be likely to improve the assessments. Many of the topics stated below were also identified by the assessors as areas for future research.

   1. Standardize survey indices to account for individual vessel and spatial/temporal effects.
   2. Evaluate whether finer scale assessment regions that better overlap with survey area regions, latitudinal variation in growth, etc., improves assessment via simulations.
   3. Conduct a joint DFO/NMFS stock assessment that utilizes YTR distribution/stock boundaries, not political boundaries.
   4. Standardize commercial CPUE series while accounting for targeting, clustering, and other general catchability trends (such as vessel and spatial/temporal effects).
   5. Develop a simulation framework to evaluate the applicability of time-varying parameters (e.g., selectivity and growth) and its effect on improving model fit (e.g., auto-correlated recruitment deviations).
   6. Attempt to better understand what is happening to older females (aging error, redistribution, selectivity, M increasing) including diel/seasonal movement and aggregation/schooling behaviour.
   7. Develop and implement an aging error matrix and simulation test to better understand any bias associated with assuming perfect aging for YTR.

APPENDIX C: AGENDA

Canadian Science Advisory Secretariat, Centre for Science Advice Pacific

Regional Peer Review Meeting (RPR)

Yellowtail Rockfish (*Sebastes flavidus*) Stock Assessment for the Coast of British Columbia, Canada

Nov 18-19, 2014
Pacific Biological Station, Nanaimo BC

Chair: Rowan Haigh

AGENDA		
DAY 1	**Tuesday, November 18**	
0900	Introductions Review Agenda & Housekeeping CSAS Overview and Procedures	Chair
0915	Review Terms of Reference	Chair
0930	Presentation of Working Paper	Authors
1030	***Break***	
1050	Overview Written Reviews	Reviewers+Authors
12:00	***Lunch Break***	
1300	Identification of Key Issues for Group Discussion	Group
1330	Discussion & Resolution of Technical Issues	RPR Participants
1445	***Break***	
1500	Discussion & Resolution of Results & Conclusions	RPR Participants
1630	Develop Consensus on Paper Acceptability & Agreed-upon Revisions	RPR Participants
1700	Adjourn for the Day	
DAY 2	**Wednesday, November 19**	
0830	Introductions Review Agenda & Housekeeping Review Status of Day 1	Chair
0845	*(As Necessary)* Carry forward outstanding issues from Day 1	RPR Participants
1000	Develop Consensus on Paper Acceptability & Agreed-upon Revisions	RPR Participants
1030	***Break***	
1050	<u>Science Advisory Report (SAR)</u> Develop consensus on the following for inclusion: • Sources of Uncertainty • Results & Conclusions • Additional advice to Management (as warranted)	RPR Participants
1200	***Lunch Break***	
1300	Science Advisory Report (SAR)…continued	RPR Participants
1445	***Break***	
1500	Next Steps – Chair to review	Chair

AGENDA		
	• SAR review/approval process and timelines • Research Document & Proceedings timelines • Other follow-up or commitments (*as necessary)*	
1545	Other business arising from the review	Chair + Participants
1600	***Adjourn meeting***	

APPENDIX D: PARTICIPANTS

Last Name	First Name	Affiliation
DFO		
Edwards	Andrew	Science, Groundfish Section
Forrest	Robyn	Science, Groundfish Section
Grandin	Chris	Science, Groundfish Section
Haigh	Rowan	Science, Groundfish Section
Holt	Kendra	Science, Groundfish Section
King	Jackie	Science, Groundfish Section
Krishka	Brian	Science, Groundfish Section
Kronlund	Rob	Science, Groundfish Section
Lacko	Lisa	Science, Groundfish Section
MacDougall	Lesley	CSAP
Majewski	Sheena	Science, Conservation Biology
Olsen	Norm	Science, Groundfish Section
Rutherford	Kate	Science, Groundfish Section
Williams	Daniel	Science, Groundfish Section
Workman	Greg	Science, Groundfish Section
Wyeth	Malcolm	Science, Groundfish Section
Yamanaka	Lynne	Science, Groundfish Section
EXTERNAL		
Ackerman	Barry	FAM GROUNDFISH Management
Berger	Aaron	Northwest Fisheries Science Centre, NMFS NOAA
Govender	Rhona	Canadian Parks and Wilderness Society
Harling	Wayne	Sport Fishing Advisory Board (SFAB)
Lecomte	Jean-Baptiste	NSERC Visiting Fellowship
Mose	Brian	CIC Trawl
Starr	Paul	Canadian Groundfish Conservation Society & External Expert
Turris	Bruce	BC Groundfish Conservation Society