

Scientific and Statistical Committee's
Groundfish Subcommittee
Report on the Additional Review of Quillback Rockfish in California

Pacific Fishery Management Council
Watertown Hotel and Online
Wallingford/Fremont Rooms
4242 Roosevelt Way NE
Seattle, WA 98105

January 26, 2024

1. Background

The Scientific and Statistical Committee's (SSC) Groundfish Subcommittee (GFSC) met on January 26, 2024 at the Watertown Hotel/Inn (Seattle) to review information provided in Public Comments to the Council during its November 2023 meeting by Drs. Mark Maunder and Ray Hilborn. The purpose of the review was to provide the Council with further guidance on using the existing 2021 quillback rockfish assessment and corresponding 2023 rebuilding analysis for decision-making. In particular, the GFSC was asked whether the information provided by Drs. Maunder and Hilborn should result in a different conclusion regarding the 2021 assessment. The Terms of Reference (TOR) for the meeting is attached as Appendix A, the meeting agenda as Appendix B, and the participants as Appendix C.

The review focused on matters raised in the Public Comments by Drs. Hilborn and Maunder related to how the assessment was conducted and how its results were used to conduct a rebuilding analysis. The review was restricted to issues pertinent to the assessment and rebuilding analysis, and was not a re-review of the assessment. In addition, the discussions were further restricted to data and analytical approaches available at the time the assessment and rebuilding analysis were conducted and reviewed. The context for the review was the Terms of Reference for Groundfish and Coastal Pelagic Species Stock Assessments ([GFTORA; Dec 2020](#)), the Terms of Reference for Groundfish Rebuilding Analyses ([GTORR; Jun 2022](#)), and the Accepted Practices Guidelines for Groundfish Stock Assessments ([APGSA; Feb 2021](#)). The standard of review was whether the assessment and rebuilding analysis was conducted consistent with the TOR and APGSA as they were applied to data-moderate stock assessments conducted by the PFMC in 2021 (assessment; Langseth et al., 2021) and 2023 (draft rebuilding analysis; Langseth, 2023).

In exploring the matters raised, the GFSC recognized that the issues could: (a) be out of scope for the review (e.g., related to policy matters), (b) be adequately covered by the existing assessment and rebuilding analysis and the previous reviews by the GFSC and SSC, (c) warrant additional sensitivity testing or analyses with a revised model that could be used in the current cycle, or (d) warrant not using the assessment for the current cycle and basing overfishing limits (OFLs) on the Category 3 Depletion-Based Stock Reduction Analysis (DB-SRA) (Dick and MacCall, 2010). Most of the discussion focused on the assessment, recognizing that changes to or rejection of the assessment would have implications for any subsequent rebuilding analysis.

Section 2 of the report summarizes the concerns raised by Drs. Hilborn and Maunder during the review meeting¹, and indicates whether and how the stock assessment team (STAT) explored them in 2021, and whether the GFSC and SSC considered the issues during their reviews of the assessment and rebuilding analysis in 2021 and 2023. It then summarizes the GFSC conclusions related to the issues and whether additional work could be conducted to refine the existing assessment or rebuilding analysis or as part of future research. Some of the issues raised should be included in the Council's Research and Data Needs document, and these are highlighted in Section 3 of the report. Section 4 provides an overall summary.

Table 1 provides a high level summary of the issues discussed during the meeting, including how the assessment and rebuilding analysis considered the issues, the consequences of the issues, and the GFSC conclusions regarding whether they were adequately considered or addressed during the assessment and the GFSC or SSC reviews.

2. Issues raised, and whether and how they were considered in the assessment and review process

2.1 The values for parameters that were pre-specified

The assessment pre-specified the values for many of the parameters of the population dynamics model (the parameters of the growth curve, specifically L_{∞} , K , and the CV of length-at-age, natural mortality (M), and stock-recruitment steepness (h)) owing to lack of information to estimate them within the stock assessment and guidance in the TOR for data-moderate stock assessments. Dr. Maunder highlighted that information from length-composition data is conditional on the values for some of these key stock assessment parameters. However, it is not uncommon to pre-specify parameters when conducting stock assessments, especially those based on limited data (and this was required under Appendix J of the GTORA). In such cases, the values for pre-specified parameters should be justified based on the available information as well as the guidelines reflected by the GTORA and the APGSA. Dr. Maunder presented results showing that likelihood profiles over a range of values for these fixed parameters suggest that the selected values did not lead to the best fit to the data and that adopting the best-fit values would have resulted in a less depleted stock in the terminal year of the assessment. Dr. Maunder noted that the most influential parameters for maximum depletion, which occurred during 1990, were K and L_{∞} , whereas M and h were most influential on the rate of rebuilding of the stock from those lows.

2.2.1 The growth curve

The GFSC and SSC previously considered the values assumed for the parameters of the growth curve. While it is sometimes possible to estimate a growth curve within a data-moderate assessment, the STAT expressed concern with estimating a growth curve in a model that does not include age data and the GFSC did not see sufficient evidence in the results of these analyses to reject the previously recommended base model SSC GFSC Report Sept 2021, appended to [Agenda Item C.6.a Supp SSC Rpt 1 Sept 2021](#)). Thus, the values for the growth curve were estimated

¹ Some of the issues raised in the public comments and in the TOR for this meeting were not raised in the presentations to the GFSC and thus are not discussed in this report.

outside the assessment model, which was required for data-moderate stock assessments under the 2020 GTORA (Appendix J of the GTORA). In contrast, the 2023 rex sole data-moderate assessment did estimate growth within the assessment model, as requested by the STAR Panel.

The growth curve in the base model is based on data from Oregon and Washington. Much of the length-at-age data for California were provided in summer 2021, following an effort to locate unaged otoliths identified during the June 2021 review after the assessment was reviewed and endorsed by the SSC as Best Scientific Information Available (BSIA). These new data appeared to be inconsistent with the data used in the growth curve in the base model (SSC GFSC Report Nov 2021, appended to [Agenda Item E.2.a Supp SSC Rpt 1 Nov 2021](#)), with the estimated value of K based on the data for California lower than that used in the base model. However, much of the age data from California were not available to the STAT or the GFSC until late in the process, which precluded their use directly in the assessment. Moreover, the additional California data reviewed in the fall of 2021 were sparse, were from a limited area off California, and included an insufficient number of samples for smaller and younger animals. The GFSC concurred with the STAT in November of 2021 that even with additional samples, the data were too sparse to estimate growth externally using California data, and both the STAT and the GFSC acknowledged the need to develop additional samples, particularly for smaller and larger fish, to better inform growth in future assessments.

It should be noted, that the GFSC also acknowledged in its November 2021 report (SSC GFSC Report Nov 2021, appended to [Agenda Item E.2.a Supp SSC Rpt 1 Nov 2021](#)) that overall, length-at-age in California appeared lower than the length-at-age for samples from Oregon and Washington, resulting in a fitted curve that was lower than the base model. This result was consistent with the growth curve estimated internally to the model, for which the stock was in the precautionary zone in sensitivity analyses. At the November 2021 GFSC meeting, the STAT noted that it would generally not put credence in internal estimates without age data in the model and evidence of strong age classes evident in the length data to overcome that deficit, thus growth was not estimated internally and the comparison serves only to illustrate that the fitted growth curve parameters are consistent with a more optimistic result than the base model. While this was the case, the STAT also stated that there is an insufficient number of samples of younger fish to robustly estimate a separate California growth curve at this time, noting as well that the curve resulting from estimating growth within the Oregon model was quite similar to that resulting from the same exercise for California, but in the former case it was clear that the estimated model did not match the robust age and length data for Oregon.

Overall, while the growth curve could have been based on data for California and/or estimated internally in the assessment, the approach taken by the STAT was appropriate and justified given the information available. The GFSC was informed that efforts are currently underway to collect additional age data in California, but there may still be few samples for younger fish.

2.2.2 Natural mortality

Natural mortality, M , was set to 0.057 yr^{-1} in the base model based on the Hamel-Cope prior and a maximum age of 95 (Yamanaka and Lacko, 2001). Dr. Maunder noted that the maximum age was based on a single observation from a more northern region (southern British Columbia) and that the maximum age observed in the data was lower in other U.S. West Coast assessments

(values of 69, 70 and 73, all from fish caught off of Washington state). Use of these lower values for maximum age would imply higher values for M and terminal year depletion. Estimating M within the assessment also leads to higher estimates of terminal depletion. However, it was noted that the data available for the U.S. West Coast were very limited in number, and collected from a fished population, and hence may reflect total mortality (Z) rather than M . The GFSC agreed that it is not common practice to estimate M within a data-moderate assessment with no age data, or even within a full assessment with limited age data, owing, for example, to confounding between M and F . Indeed, estimating M within a data-moderate assessment is not expected under the 2020 GTORA. Additional studies supporting a higher maximum age were discussed during the review. Munk (2001) observed a maximum age of 90 in southeast Alaska, and Kerr et al. (2005) conducted an ageing validation study and supported maximum age estimates greater than 43, and up to 90.

The decision table, which forms part of the rebuilding analysis, used M as the axis of uncertainty, with the M values selected based on terminal year depletion being the upper and lower 12.5 percentiles of the distribution for depletion or 1.15 standard deviations (GTORA). However, while the upper value of M falls within the range of values based on maximum ages of 69, 70 and 73, there is no empirical evidence to support an M of 0.0464 yr^{-1} , which is the basis for the lower state of nature in the decision table. However, it was noted that the prior for M is wide (SD in log-space of 0.31) and would include 0.0464 yr^{-1} .

Thus, the GFSC concluded that the approach taken for the base model was appropriate and justified.

2.2.3 Stock-recruitment steepness

The value for h was set to 0.72 (median of the prior for h). Drs. Hilborn and Maunder noted that the prior for h was not updated recently because a 2019 review of an updated steepness meta-analysis resulted in a mean value of approximately 0.95, which was rejected by the SSC as being unrealistic. Although not part of his November 2023 testimony, nor available at the time of the 2021 assessment and review, at this meeting Dr. Maunder noted that Brooks (2024) supported a default steepness of 1 (recruitment independent of spawning stock biomass; the estimate when h is estimated within the assessment). The GFSC noted that estimation of h within an assessment is difficult even during full benchmark assessments because data are often contradictory, estimated values of h often go to the extremes of 0.2 and 1, sometimes for the same stock in different assessment years, and fixing h at the meta-analysis median of 0.72 remains the accepted practice for West Coast rockfish assessments.

2.3 *Spatial structure and time-blocking of selectivity*

Changes in management arrangements have taken place that may affect quillback rockfish, specifically closing areas to fishing, as was done within Rockfish Conservation Areas (RCAs) and Marine Protected Areas (MPAs), starting in 2001. The stock assessment assumes data from the open area, e.g., lengths and ages, are representative of the closed area, and hence the entire population. It would be expected that density would be higher in closed areas over time and that the mean size would also be higher in closed areas if quillback do not migrate extensively. Dr. Hilborn stated that catch rates are higher in closed areas. However, as of 2024, there is still no evidence indicating differences in catch rates or mean length inside or outside the closed areas

based on the California Collaborative Fisheries Research Program (CCFRP) data and California ROV data, although Perkins and Lauermaann (2022) indicate higher abundance in shallower water and a positive trend of quillback abundance². In principle, the assessment could have been based on a spatial model, but, in reality, the data are currently too sparse to support a spatial model. The GFSC had previously noted (GFSC Report Sept 2021, appended to [Agenda Item C.6.a Supp SSC Rpt 1 Sept 2021](#)) that it is uncertain what the effect of MPA closures off California is for quillback rockfish, in particular whether including MPAs in the assessment will lead to a substantial change in the estimates of biomass and stock depletion, and there is no new evidence to change this conclusion. Quillback were noted to occur nearshore, but available data (e.g., CCFRP) suggest low densities of quillback rockfish in nearshore MPAs.

The effects of closures can be modeled as changes in selectivity. The STAT conducted a thorough exploration of the effects of different time blocks in selectivity for commercial and recreational fisheries (see Table 15 of the 2021 assessment). For example, the imposition of inshore closures would be expected to lead to lower selectivity on small animals and the selectivity ogive shifts right when allowance is made for a time block in selectivity around 2017. However, the STAT had previously concluded, and the GFSC had agreed, that the improvements to the fits to the data were very modest in response to the freeing up of additional parameters, and the overall model results generally led to very similar estimates of terminal year depletion (i.e., the effects of changing selectivity are less than those of changing M).

2.4 The time-trends in fishing mortality

Dr. Hilborn highlighted recent increasing trends in exploitation rate for California quillback rockfish, which differ from those other inshore rockfishes (e.g., copper north, vermilion and sunset, gopher, blue/deacon). The GFSC noted that the last two years of estimates of exploitation rate presented by Dr. Hilborn were forecasts but agreed that the trend in exploitation rate, though variable, was high on average, and increasing in recent years. The SSC concluded in November 2023 that the estimates of recent exploitation rates are high, but not implausible or unprecedented for historical West Coast rockfish stock assessments (SSC notes from Agenda Item E.2.a Supp SSC Rpt 1 Nov 2023). The GFSC noted that the recent catches mimic these changes in exploitation rate. Dr. Hilborn stated that if fishing effort was consistent then the increasing catch implies an increase in biomass, but Dr. Hilborn and the GFSC agreed that it was unlikely that the catch series reflected quantitatively the change in biomass for this long-lived species and that some of the trend could reflect opening of closed areas. Moreover, Dr. Hilborn and the GFSC also agreed that it is not straightforward to interpret recreational fishing effort and this needs to be a focus of future work (assuming that sufficient spatial information is available³). During the discussion of time trends and high mortality rates, the potential value of using complementary data (e.g., less uncertain [Category 1] rates for species encountered in the same fishery) to corroborate results for first-ever-assessed units was also discussed.

² The GFSC was not provided with the recent CCFRP data nor the report by Perkins and Lauermaann (2022) but includes this information as it was raised during the meeting; this information could be reviewed by the SSC at some future time.

³ CDFW has precise spatial information for CPFV trips, as well as coarser info for skiff trips.

2.5 The time-trends in recruitment deviations

Dr. Maunder highlighted Figure 15 of the assessment report which showed higher recruitment deviations up to ~2000 and a declining trend thereafter. This pattern was noted at the June 2021 GFSC review of the assessment, but the SSC could not identify a reason for it (GFSC notes from Agenda Item G.5.a Supp SSC GFSC Rpt 1 June 2021). Dr. Hilborn noted that this trend may be an artifact of there being little trend in mean length and that lower estimates of recent recruitment are “selected when the model is fit” so that mean length remains high even though smaller animals are increasingly not available to the fishery due to closures. The GFSC agreed that this was a plausible interpretation of the data, but noted that the trend did not disappear when allowance was made for time-varying selectivity (in one block).

Overall, the trend in recruitment deviations is unexpected, but there was no evidence presented that could be used to modify the model to remove it – and it may be real; for example, a very high recruitment event seen in 1999 in many groundfish species also appeared in the estimates for quillback.

3. Future work

The discussions of the technical comments support the continued use of the base model and the associated rebuilding analysis given the GTORA and APGSA. However, these discussions raised several broader issues that should be considered by the SSC as it refines the GTORA for the next assessment cycle and when the Council’s Research and Data Needs document is updated.

- Many of the decisions taken when constructing the base model were constrained by the TOR for data-moderate assessments (Appendix J of the GTORA). The recent data-moderate assessment for rex sole included age data in the assessment and estimated growth, an option not available to the STAT for California quillback rockfish. The SSC should consider whether there should be more “flexibility” in which data can be included in data-moderate assessments and which parameters can be estimated.
- The GTORA should be updated to include that assessments should report results of sensitivity tests where parameters that have informative priors (e.g., M and steepness) are estimated (with the prior).
- The prior for h should be revisited given the results of recent assessments and recent advancements in methods for constructing h priors, such as the approach developed by Marc Mangel (e.g., Mangel et al., 2010).
- The next assessment of quillback rockfish in California should explore the development of a recreational and/or CCFRP-based index of abundance, comparable to those developed in recent assessments for vermilion, copper, and other nearshore rockfish species.
- The meeting noted that rejecting the 2021 assessment of quillback rockfish would mean that OFLs for quillback would be based on DB-SRA, a “catch-only” method of stock assessment, which is known to be very inaccurate (Free et al., 2020). Research should be conducted to assess what constitutes “too uncertain” given the default of returning to the last assessment, especially in the context of assessments for which there are no previous full or data-moderate assessments.
- Dr. Maunder noted that turning off the sum-to-zero constraint on penalty in Stock Synthesis increases the value of terminal year depletion. This issue was not raised in the earlier Public

Comment, and the SSC should consider this matter when revising the GTORA and APGSA.

- Dr. Maunder noted that the estimated variances for some recruitment deviations exceeded the value of σ_R , which is unusual (though has occasionally been seen in other assessments) and unexpected, and may indicate model misspecification. This issue was not raised in the earlier Public Comment and should form the basis for further exploration and could be a diagnostic for future data-moderate assessments.

4. Conclusions

The assessment of quillback rockfish off California is uncertain owing to the limited data, in particular, the lack of an index of abundance, which is consistent with its Category 2 designation. The stock was assessed using a data-moderate method of stock assessment that cannot make use of any index data and pre-specified many of the parameters of the population dynamics model. The information provided in the Public Comment by Drs. Maunder and Hilborn highlighted areas of concern, many of which were identified by the STAT and were considered by the GFSC and SSC during their reviews of the assessment and associated rebuilding analysis. The discussions based on the presentations by Drs. Maunder and Hilborn did not raise new information that had either not been considered by the GFSC and SSC during its past reviews, or for which the approach taken by STAT did not follow the GTORA, GTORR, and APGSA, or for which there are data that could have been included in the assessment at the time it was conducted. However, the discussions did identify several areas where the GTORA could be modified for future assessments and where additional research is needed.

References

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Table 1. Summary of the issues considered during the review meeting and how they have been considered in the assessment / rebuilding analyses and GFSC and SSC reviews. RH and MM denote whether the issue was raised by Dr. Ray Hilborn or Dr. Mark Maunder. TOR and AP reference to the Terms of Reference for Groundfish Stock Assessments and the Accepted Practices Guidelines for Groundfish Stock Assessments, while M and h refer to natural mortality and stock-recruitment steepness, respectively.

Issue	Treatment in the assessment/ rebuilding analysis	Section of this report	Potential impact on the assessment	Conclusion
All the likelihood profiles suggest a less depleted stock than under the base assumptions, much related to the commercial length-composition data (MM, RH).	All of the key biomass parameters (growth, M and h) are pre-specified.	2.1	Setting these parameters at their maximum likelihood estimates or using growth and age data from California leads to a less depleted stock.	Growth, M and steepness can be pre-specified within a data-moderate assessment and the approaches taken are consistent with the TOR and AP. Trying to estimate these in a data-limited context is unreliable/inadvisable.
It is not clear if the maximum age used represents the California component of the population (MM).	The maximum age (95) used to determine the value of M was from British Columbia.	2.2.2	A lower (assumed) value for maximum age (i.e. higher M) will lead to a less depleted stock.	The maximum ages observed for California are lower than those used in the assessment but may not reflect maximum age owing to past fishing and low sample size.
It may also be appropriate to make natural mortality a function of length (MM).	Natural mortality is independent of length.	2.2.2	Unclear because the fishery takes larger animals, which may not be subject to higher natural mortality.	No change needed to the assessment.
An alternative model run with different selectivity and time blocking estimated a value for natural mortality with a better fit to the data and a much less depleted stock (MM).	The value of M is pre-specified at 0.057 yr^{-1} .	2.2.2	A higher (assumed) value for M will lead to a less depleted stock.	Most assessments for data-moderate U.S. West Coast groundfish pre-specify M , which is appropriate in the absence of age data.
The growth model does not appear to fit the age-length data well (RH).	The growth model does not fit the California age-length data very well.	2.2.1	Estimating the growth model leads to less depleted stock.	The GFSC considered the fit, noting the fit is relatively poor but considers it adequate for this assessment.
The decline in abundance appears to be driven by the estimated decline in recruitment deviates from 1990-2010, some of which may be compensating for unmodelled changes in selectivity (MM).	The trend in estimated recruitment deviations does show a declining trend.	2.5	Unclear, as no alternative model formulations have been able to remove this pattern and it may be real.	This issue remains an uncertainty for the assessment.

<p>The assessment does not take into account the fact that large portions of the habitat have been closed to fishing and more areas are remote enough that they are not fished. The length frequency data come exclusively from the areas that are fished (RH).</p>	<p>The assessment assumed a single area and hence that the length data are representative of the total population size.</p>	<p>2.3</p>	<p>There could be an effect on estimated terminal year depletion if the areas closed to fishing are less depleted than the open areas.</p>	<p>The data provided to the meeting did not suggest that mean length is higher in the closed than open areas.</p>
<p>The current assessment suggests that the current exploitation rate is very high, and this seems inconsistent for a stock with a significant area of its habitat closed to fishing or unfished (RH).</p>	<p>The assessment did not explicitly compare time-trends in exploitation rate among species.</p>	<p>2.4</p>	<p>This could suggest substantial model misspecification.</p>	<p>The trend in F is consistent with that in the recent catches and further work is needed to better understand the spatial distribution of effort.</p>

Appendix A: Terms of Reference for the Additional Review of Quillback Rockfish in California

(January 2024)

Goals and Objectives

The Scientific and Statistical Committee's (SSC) Groundfish Subcommittee (GFSC) is requested to review issues raised by two public comments provided during the November 2023 Pacific Fishery Management Council (PFMC) meeting by Dr. Mark Maunder (via a letter submitted by J. Timothy Hobbs) and Dr. Ray Hilborn (public oral testimony).

The purpose of reviewing this information is to provide the Council with further guidance on using the existing quillback rockfish assessment and corresponding rebuilding analysis. In particular, the GFSC is being asked whether the information provided by Drs. Maunder and Hilborn should result in a different conclusion regarding the 2021 assessment. Specific questions to be considered by the GFSC:

- To what extent were the issues raised by Drs. Maunder and Hilborn previously considered in the 2021 assessment? For any issues that were not explicitly considered, would consideration of such issues been likely to have changed the conclusion that the 2021 assessment meets the scientific quality standard necessary for use in management?
- If greater consideration of these issues could have led to a different outcome, are there changes that could be made to the current (2021) assessment or most recent (2023) rebuilding analysis that would allow it to achieve this standard?
- If the current assessment and associated rebuilding analysis should still be considered appropriate for use by the Council, are there any new considerations the Council should be aware of when it is used?

Process related to this review

The GFSC is only tasked with reviewing matters brought forth by Dr. Hilborn and Dr. Maunder in November 2023 (see section below). Questions and issues that were not raised by Drs. Hilborn and Maunder in November of 2023 will not be considered.

A full re-review of the 2021 stock assessment itself will not be part of the GFSC meeting.

This review will be hosted by the Pacific Fishery Management Council at the Watertown Hotel (4242 Roosevelt Way NE), in Seattle WA. The review will occur in late January 2024 as an in-person meeting with an option for remote participation. The meeting will be open to public attendance, with an opportunity for public comment.

Outcomes and a post-meeting summary will be presented to the full SSC in March 2024:

- Any GFSC recommendations will be considered by the full SSC at that time, after which the full SSC will advise the Council.
- Assessment authors may provide any written response to GFSC recommendations or comments, including additional model runs or sensitivity analyses, if desired.

- If the GFSC review requests modifications, the assessment authors will need to:
 - Provide revised assessment outputs to the full SSC in March 2024,
 - Provide revised rebuilding analysis to the full SSC in March 2024.

Roles and Responsibilities of Process Participants

Drs. Maunder and Hilborn will be asked to provide written reports to the SSC GFSC two weeks or more prior to the GFSC meeting. The documents should include the basis for conclusions regarding the assessment and rebuilding analysis within the public comments provided during the November 2023 PFMC meeting by Dr. Mark Maunder (via a letter submitted by J. Timothy Hobbs; Exhibit A) that deviate from those of the existing base model. In addition, all Stock Synthesis files associated with any alternative model runs for results provided in the Hobbs letter should be provided to the SSC GFSC.

Similarly, Dr. Hilborn will be asked to provide a written copy of the issues presented in his oral public comments two weeks or more prior to the GFSC meeting.

Preferably, both Dr. Maunder and Dr. Hilborn, and the stock assessment author(s) would be available to participate in the review meeting. However, priority will be given to a date and time that works for members of the GFSC.

When conducting the meeting, GFSC members follow regular SSC operational guidelines, advisory body ground rules, and Council Operating Procedures.

GFSC members with conflicts of interest would be permitted to participate in GFSC discussions and would recuse themselves from voting, should a voting protocol occur. Any others with conflicts of interest, including stock assessment authors, should be required to recuse from voting as well.

A designated SSC GFSC member will serve as Chair of the meeting, with additional designated discussion leads and rapporteurs.

PFMC staff will provide assistance in coordinating logistics, providing support for a hybrid meeting format, provide an invitation authorizing funding for SSC GFSC member travel, facilitate distribution of review materials and post-meeting reporting.

Specific issues raised by Dr. Hilborn and Dr. Maunder

Dr. Maunder specific issues raised:

- The assessment relies on length-composition data to inform estimates of absolute abundance and depletion levels. Using length-composition data to inform these estimates has several issues and its informational content is conditional on other key parameters.
- All the likelihood profiles suggest a less depleted stock than under the base assumptions, much related to the commercial length-composition data. It does not appear that sensitivity runs were conducted to evaluate selectivity before and after 2003, with before being dome shaped.
- The sensitivity runs were mainly conducted one at a time and therefore some issues or

sensitivities in the assessment may have been hidden.

- Different years of data for each gear type could be evaluated independently.
- The maximum age values used for the basis of natural mortality can make large differences in the estimated natural mortality. It is not clear if the maximum age used represents the California component of the population.
- It may also be appropriate to make natural mortality a function of length.
- An alternative model run with different selectivity and time blocking estimated a value for natural mortality with a better fit to the data and a much less depleted stock.
- The growth model does not appear to fit the age-length data well.
- A dynamic spawning biomass reference point may be more appropriate to estimate the unfished abundance so that it is based on recent recruitment, adjusted by the stock-recruitment relationship.
- The decline in abundance appears to be driven by the estimated decline in recruitment deviates from 1990-2010, some of which may be compensating for unmodelled changes in selectivity.

Dr. Hilborn specific issues raised:

- The assessment does not take into account the fact that large portions of the habitat have been closed to fishing and more areas are remote enough they are not fished. The length frequency data come exclusively from the areas that are fished.
- Sensitivities to parameters such as natural mortality, spawner recruitment steepness, L_{∞} , growth k , all show minimum negative log likelihood (best fit to the data) values for these parameters that indicate the stock in better condition, yet in every case the assessment chose, as its base case, a parameter that leads to the stock being assessed as overfished.
- The current assessment suggests that the current exploitation rate is very high, and this seems inconsistent for a stock with a significant area of its habitat closed to fishing or unfished.
- The yield curve that results from the assessment shows the long-term yield at current stock size roughly equivalent to the long-term yield at the rebuilding target, so there does not appear to be benefit to yield from rebuilding the stock.
- Fits to the recent commercial length composition data are quite poor (Figures 18 and 63 of the assessment).

Appendix B: Agenda

Groundfish Subcommittee of the Scientific and Statistical Committee

Pacific Fishery Management Council
Watertown Hotel
Wallingford/Fremont Rooms
4242 Roosevelt Way NE
Seattle, WA 98105
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January 26, 2024

Friday, January 26, 2024 – 8:30 AM

- A. Call to Order-GFSC Administrative Matters
- a. Introductions, Announcements, etc. André Punt
 - b. Approve Agenda
 - c. Rapporteur Assignments
 - d. [Terms of Reference \(TOR\) for the Additional Review of Quillback Rockfish in California](#)
- B. November 2023 Public Comment Presentation Ray Hilborn
- a. Review Materials
 - b. Question of clarification
(9:00 a.m.; **Marshall**)
- BREAK (10:00 – 10:15 a.m.)
- C. November 2023 Public Comment Presentation Mark Maunder
- a. Review Materials
 - b. Question of clarification
(10:15 a.m.; **Schaffler**)
- D. SSC Groundfish Subcommittee Discussion
- a. Ray Hilborn Public Comment
 - b. Mark Maunder Public Comment
 - c. General Discussion of Public Comments/Specific Issues Raised
(11:15 a.m.; **Tsou**)
- LUNCH (12:00 – 1:00 p.m.)
- D. SSC Groundfish Subcommittee Discussion (*Continued*)
- a. General Discussion of Public Comments/Specific Issues Raised
(1:00 p.m.; **Tsou**)

PUBLIC COMMENT PERIOD

2:30 p.m. (or immediately following Agenda Item D)

Public comments, including comments on issues not on the agenda, are accepted at this time.

E. SSC GFSC Administrative Matters

a. Reporting Discussion and Planning
(3:00 p.m.)

ADJOURN

Appendix C: Participants

GFSC Members in Attendance

Dr. Cheryl Barnes, Oregon State University, Newport, OR
Dr. John Field (Interim SSC GFSC Chair), National Marine Fisheries Service Southwest Fisheries Science Center, Santa Cruz, CA
Dr. Chris Free, University of California Santa Barbara, Santa Barbara, CA
Dr. Owen Hamel, National Marine Fisheries Service Northwest Fisheries Science Center, Seattle, WA
Dr. Peter McHugh, California Department of Fish and Wildlife (Alternate), Bay Delta Region
Dr. Kristin Marshall, National Marine Fisheries Service Northwest Fisheries Science Center, Seattle, WA
Dr. Tommy Moore, Northwest Indian Fisheries Commission, Forks, WA
Dr. André Punt (Meeting Chair), University of Washington, Seattle, WA
Dr. Jason Schaffler (SSC Vice-Chair), Muckleshoot Indian Tribe, Auburn, WA
Dr. Tien-Shui Tsou, Washington Department of Fish and Wildlife, Olympia, WA

SSC Members in Attendance

Dr. Dan Holland (SSC Chair), National Marine Fisheries Service Northwest Fisheries Science Center, Seattle, WA
Dr. Will Satterthwaite, National Marine Fisheries Service Southwest Fisheries Science Center, Santa Cruz, CA

Presenters

Dr. Ray Hilborn, University of Washington
Dr. Mark Maunder, No affiliation

Pacific Fishery Management Council Staff

Marlene A. Bellman
Merrick Burden (Executive Director)

Stock Assessment Team (STAT) in Attendance

Dr. Brian Langseth, National Marine Fisheries Service Northwest Fisheries Science Center, Seattle, WA