Groundfish Subcommittee of the Scientific and Statistical Committee Accepted Practices Guidelines for Groundfish Stock Assessments Meeting

Pacific Fishery Management Council
Large Conference Room
7700 NE Ambassador Place Suite 101
Portland, OR 97220

December 2-3, 2024

The Groundfish Subcommittee (GFSC) of the Scientific and Statistical Committee (SSC) met on December 2 and 3, 2024 to review three topics: 1) current approaches used to address spatial closures in stock assessments, 2) methodologies and resulting estimates of abundance from the remotely operated vehicle (ROV) survey conducted along the California coast, and 3) accepted practices for groundfish stock assessments in 2025 and 2026. SSC participants are listed in Appendix A. Report sections below reference meeting agenda items.

B. Approaches for addressing spatial closures in groundfish stock assessments

Brian Langseth (Northwest Fisheries Science Center [NWFSC]) and Caren Barceló reviewed the available literature on methods to account for spatial closures in groundfish stock assessments. They noted that while this is not a “new” topic, that the combination of uncertainty in the potential impacts of MPA networks on stock assessments in many state (nearshore) waters, with the emergent potential for wind-energy exclusion areas for fisheries and surveys in offshore waters, has added to both the interest and urgency in considering alternative means of accounting for or modeling spatial dynamics within groundfish stock assessments. The “mini-review” described by the presenters generated 21 relevant peer-reviewed articles that were distinguished by two broad methodological categories of either data-based or model-based approaches of accounting for closed areas.

The papers that focused on model-based approaches explored modeling closed areas as either a) aggregated with open areas, b) separated from open areas as distinct models, or c) explicitly modeled open and closed areas within the same model. Data-based approaches involved sampling in closed areas to estimate a) model parameters, b) approximate stock status, or c) serve as empirical harvest controls rules. Some general findings among the review included modeling closed areas separately or within a spatial model performed better than ignoring closed areas, and that either allowing dome-shaped selectivity in years with closed areas or maintaining fleet structure that best matched open and closed areas were also reasonable approaches to account for spatial closures. Few examples were available in which closed areas were used as a proxy for estimating unfished conditions, and the only examples that did exist were for invertebrate fisheries. The importance of having data available in the closed areas was also a key finding, as was some knowledge of movement rates. Finally, the time since closed areas were implemented was important, as the viability of alternative approaches varied after more than 20 years, and larger areas increased the difference between approaches.

There are no explicit recommendations for addressing spatial closures in upcoming groundfish stock assessments at this time. Thus far, closed areas have been represented primarily through the use of index standardization when data for both open and closed areas exist (e.g., state MPA monitoring data) and selectivity time blocks along the US West Coast. Nearshore stocks may be most suitable for future explorations related to the treatment of spatial closures in stock assessments. Limited information about adult movement rates and complicated decisions related to recruitment allocation, however, present challenges to intensive modeling solutions. The GFSC did recommend that the review prepared for this meeting be referred to within the best practices document for reference and guidance on how best to account for large closed areas within assessments.

Members of the GFSC discussed the need to continue to explore or address natural refugia, distance from port, and other forms of de facto closures in addition to the impacts of more formal inaccessible or marine protected areas. Because details in the treatment of spatial closures can have considerable impacts on model results, the GFSC recommends evaluation and selection of specific methods on a case-by-case basis. One potential way forward is to estimate densities inside and outside spatial closures. Negligible differences in density could be used as justification for not explicitly addressing spatial closures in stock assessment models (and vice versa). Increased data collection in the form of fishery-independent monitoring both inside and outside marine reserves would decrease the need for highly complex models to account for spatial closures.

C. California ROV: overview of survey methodologies

C.1. 2020 methodology review report and recommendations

John Field provided a short review of the findings from the 2020 Methodology Review of ROV Survey Designs and Methodologies, noting that the SSC endorsed the potential use of the ROV surveys to inform stock assessments for the species explicitly listed in the report. For California, potential indices of abundance and estimates of absolute abundance (with expansion) were identified for brown, China, copper, gopher, quillback, and vermilion rockfishes and kelp greenling. Further analyses and/or auxiliary information are needed for yelloweye rockfish and lingcod given that their primary distribution extends beyond the sampled depths of the ROV.

In 2020, the SSC highlighted the need for an additional workshop to promote further development and harmonization of field and analytical methods among California, Oregon, and Washington and further recommendations made during the methodology review. When ROV indices are proposed for use in a stock assessment, assessment reports must include detailed information about how the analyses recommended in the methodology review were addressed. The SSC also recognized a need for detailed protocols related to the development of absolute estimates of abundance, including a definition of the area to which total abundance is expanded and how uncertainty is estimated and addressed. The decision about whether to include ROV indices or estimates of abundance in a pre-STAR panel assessment model will need to be made on a species-by-species basis and is ultimately up to the STAT.

C.2. Ongoing research and methodological improvements

John Budrick presented an overview of the sampling design, data collection methods, and recent improvements to the ROV survey. The ROV survey was designed to identify potential effects of marine protected areas (MPAs) and has intermittently taken place along the California coast since 2005. The greatest sampling effort (> 300 transects) occurred in two time periods that were treated as "super years", 2014 to 2016 and 2019 to 2021. Previous analyses involved 10 and 20 m segments. Although 10 m segment analyses were presented by John Budrick and Nick Perkins, transect-level analyses were identified by NMFS as the preferred scale for stock assessments and were the focus of CDFW presentations.

CDFW reported the development of a data user manual for the ROV survey. The GFSC recommends making this manual publicly available. The user manual should include relevant precautions and analytical guidelines (e.g., the spatial and temporal extent representing the sampling unit). To maximize transparency and reproducibility, the SSC-GFSC recommends existing analyses be translated into publicly available R scripts to the extent possible.

The GFSC identified several issues for consideration related to survey design. Of these were the identification of "super years", use of external length-weight relationships to estimate biomass, and potential confounding effects of time and space. Although pooling data may increase the ability to detect signals (e.g., when individual years yield relatively small sample sizes), it would be helpful to test for differences before combining groups for statistical analyses. This analysis would allow reviewers to assess whether interannual differences could affect statistical power or resulting ecological inferences. For instance, 2015 and 2016 were anomalously warm years but 2014 can be characterized as near the long-term mean temperature. Similarly, there was no information with which to evaluate the appropriateness of borrowing length-weight relationships from other surveys, locations, and time periods – all of which may introduce unidentified biases that can have considerable effects when individual estimates of weight are scaled to stock-level biomass (e.g., prediction error based on time, place, or population – Kimmerer et al. 2005; effects of location and sex - Jellyman et al. 2013; spatiotemporal variation in length-weight relationships – Nahdi et al. 2016).

To improve the utility for future stock assessments, the GFSC recommends that the ROV survey sample all regions in a single year whenever possible. This could be achieved by employing a stratified random sampling design that distributes effort from north to south each year (i.e., sampling a predefined number of randomly-selected sites in each region, each year). This would decrease the confoundedness of time and space (e.g., only sampling in the north and south regions in 2014 and only sampling in the central region in 2016) when extrapolating to state-wide indices. Representative sampling across time and space is necessary for developing absolute estimates of abundance.

C.3. 10-m segment indices of abundance and MPA applications

Nick Perkins presented on a study that relied on 10 m transect segments to generate indices of abundance for brown rockfish, California sheephead, copper rockfish, gopher rockfish, kelp greenling, lingcod, quillback rockfish, vermilion rockfish, and yelloweye rockfish (Perkins et al.

2024). The authors used a generalized linear model (GLM) with a negative binomial distribution to quantify density as a function of year, location, level of protection, and a suite of environmental covariates. Spatial autocorrelation was estimated from 2 to 6 km. Model-based estimates of abundance within the MPAs (relative to the reference sites outside the MPAs) increased between 2x (lingcod) and 16x (gopher rockfish) over the 17 yr timeframe.

The GFSC agreed that a model-based approach similar to the one used by Perkins et al. (2024) is suitable for developing indices of abundance from ROV data to inform MPA effectiveness, but may be less appropriate for developing indices for stock assessments. Specifically, this approach is helpful for evaluating the relative difference in abundance trends inside versus outside MPAs, noting that the reference sites have been subjected to increased fishing mortality, which inflates the perceived MPA effect. The GFSC also identified two areas of model improvement.

i. There is a high probability of pseudoreplication when relying on 10 m transect segments given their small size and proximity that can lead to a lack of statistical independence. Although subsampling transects can account for fine-scale habitat heterogeneity, 10 m segments resulted in 133,506 data points from 2,841 transects (119 replicates) - considerably inflating the number of zeros in the data. Additionally, 10 m segments are not well justified for quillback rockfish, which have home ranges from 30 m^2 (Matthews 1990) to 2500 m^2 (Tolimieri 2009) or 24 km^2 (Rankin et al. 2013) and may therefore benefit from a larger sampling frame.
ii. GLMs require assumptions of linearity. However, species-habitat associations and temporal trends in abundance are often nonlinear. Exploring GAMs or other non-linear options may be beneficial.

Pseudoreplication and/or incorrect model assumptions may have artificially increased the magnitude of positive trends and/or decreased estimates of uncertainty in abundance. Future work should explore the use of transect scale data and involve an exploration of more flexible models that allow for nonlinear trends through time, especially when compared to stock assessment models.

C.4. Transect level indices for the Quillback Rockfish Assessment

John Budrick presented transect-level indices of abundance for quillback rockfish from Point Conception to the California-Oregon border. The generalized linear mixed model (GLMM) included a negative binomial distribution, scaled environmental covariates, an interaction of super year and protection status, site as a random effect, and log-transformed area surveyed as an offset. Future model configurations should consider including along coast distance as a spline or latitude and longitude as a bivariate term in place of average latitude as the spatial covariate. Reporting percent deviance explained would better capture how well the model describes variation in the data. Any estimate of relationships or summary statistics (e.g., percent change between open and closed areas) should include associated estimates of uncertainty. The GFSC recommends that CDFW check to make sure that Q-Q plots present correct information regarding the fit of the model and consider examining alternative measures of fit.

Given that several data filtering processes were conducted, the GFSC highly recommends the development of a table that depicts the number of transects removed in addition to the justifications for each step.

D. California ROV: design-based estimates for use in groundfish stock assessments

D.1. Overview of design-based estimates of abundance

John Budrick presented an overview of design-based estimates of abundance for quillback rockfish based on ROV survey data. The goal of this analysis was to expand the estimates of density stratified over depth, latitude, and level of protection (inside or outside a no take MPA) using length and density estimates (number of fish per square meter), weight-length relationships, and estimates of total habitat area based on seafloor mapping to provide absolute abundance estimates for stock assessment models.

D.2. Stratification for length and density estimates

Rob Silva presented the methods for stratifying length and density estimates. The goal of this analysis was to describe latitudinal and depth-related patterns to inform stratifications for abundance estimates. Length frequency distributions significantly differed among most of the five latitudinal strata and 10 m depth bins. ROV data were compared to California Recreational Fisheries Survey (CRFS) observations of quillback rockfish. The ROV survey detects smaller fish in the coastal areas between Point Arena and Pigeon Point. Several hypotheses were presented as potential explanations for latitudinal and depth-related patterns observed in quillback rockfish lengths and densities. These included ontogenetic movements, spatial differences in fishing pressure, and the depth distribution of sampling. When the Farallon Islands were combined with other areas in similar latitudes, CRFS and ROV data were much more comparable, suggesting that coastal sampling may represent shallower depths in that region. In addition, few small fish were observed at the Farallon Islands, suggesting migration to deeper depths from coastal sites.

The GFSC and meeting participants discussed differences in depth sampling between the CRFS and ROV survey and potential concerns about the representativeness of the ROV survey to the total habitat available to quillback rockfish, particularly from Pigeon Point to Point Conception. Accordingly, the GFSC recommends the following analyses:

i. Investigate relationships between distance to port and length distributions to provide support for or against the high fishing pressure hypothesis.
ii. Compare length distributions across latitudes after subsetting the data to only include the same depth regions (i.e., filter out deeper depths in the northern regions).
iii. Compare habitat depths sampled by the ROV survey to total habitat available to quillback rockfish by depth, both statewide and by latitudinal stratum.
iv. For the density analysis, group depths more coarsely to increase the sample size in each respective depth bin, to be able to compare inside and outside MPAs.

v. Summarize the data by both the number of transects and the sample sizes of quillback rockfish, by year, latitude and course depth bins, to provide reviewers with a better sense of the overall dataset.

D.3. Seafloor mapping and area-specific estimates

Mike Patton presented an overview of the seafloor mapping data and area-specific estimates of rocky habitat inside and outside MPAs. Two sources of data were used: 1) California Seafloor Mapping Project (CSMP) predicted substrate and 2) West Coast USA Nearshore Coastal and Marine Ecological Classification Standard (CMECS) substrate. CSMP represents a systematic effort to collect bathymetric and backscatter data, covering over 90 percent of state waters north of Point Conception and delineating hard and soft habitats within state waters. CMECS data cover regions outside state waters. San Francisco Bay is not included in these maps and therefore not included in the expansion.

The GFSC discussed the mapping data and agrees with the conclusion that CSMP is the best data source for habitat expansions if the aim is to provide an estimate for state waters within three miles of shore, whereas CMECS provides more uncertain habitat estimates, but for the full depth distribution of quillback rockfish in state and federal waters. Variable resolution and missing coverage in both data sources introduce extra uncertainty in the abundance extrapolation in the CMECS data set. Collecting additional high resolution seafloor data in the areas outside of the CSMP sampling, where only low resolution data are found from CMECS, would provide a more accurate representation of all habitat available to quillback rockfish off California. It would be helpful to compare the two seafloor mapping data sources in the areas that they overlap as a validation.

The GFSC notes that Table C3-3 provides a helpful summary of stratification, hard area, and MPA area. This would be a helpful way to structure the ROV summary data as well. Meeting participants discussed the potential for bias to be introduced in biomass expansions due to imperfect characterizations of hard and soft habitats at different resolutions. Densities estimated from the ROV survey include hard and soft habitats in the transect but are extrapolated only to the hard habitat area from the seafloor map.

D.4. Estimates of abundance

John Budrick presented the estimates of abundance that were produced by the expansion. Five latitudinal stratification schemes were explored. Stratification by depth was not included in these estimates. The decision not to stratify by depth highlights the need to confirm that the reefs surveyed by ROVs are representative of the areas of interest. Abundance was expanded using length distributions within each defined strata. Biomass was then estimated by multiplying the number of fish by the average weight for each stratum using length-weight relationships from the 2021 stock assessment for quillback rockfish. A bootstrapping method was applied at the transect level. The resulting estimates of abundance were described under alternative spatial stratification schemes and the scale compared to the quillback rockfish assessments. Recommendations about how to incorporate these estimates of absolute abundance into the stock assessment or as a stand-alone application were provided.

The GFSC discussed results from the alternative stratifications and suggests that schemes 4 and 5, which combined areas south of Pigeon Point and the Farallon Islands with the area further south, were most promising. Other schemes involved problematic borrowing assumptions to address data gaps. Although visual patterns in the resulting abundance and biomass estimates suggest differences between the two super years, the confidence intervals are overlapping.

The design-based method for estimating abundance assumes that estimates of fish density at surveyed reefs are representative of densities among all reefs within a particular stratum. The validity of this assumption requires that surveyed reefs are similar to unsurveyed reefs in factors influencing density, such as depth, latitude, and/or distance from shore, especially if these factors are not used to specify the stratification scheme. The GFSC recommends evaluating whether the surveyed reefs are representative of unsurveyed reefs statewide and within spatial strata. In particular, the GFSC recommends confirming that the depth distributions of surveyed and unsurveyed reefs within latitudinal strata are similar.

The GFSC and meeting participants discussed the assumptions and implications for the analysis and made the following suggestions:

i. Continue exploring potential sources of bias that could be introduced in the expansions.
ii. Consider course depth stratifications, at least in the areas of greater density to capture variability in density or length (e.g., northern regions, where data may be sufficiently informative to inform a small number of depth strata).
iii. Abundance estimates presented in the report tables appear overly precise and should be further explored to ensure they accurately represent the uncertainty.
iv. Explore bootstrapping at the site level in addition to the transect level. If there is greater variability among sites than transects, bootstrapping at the transect level could lead to underestimates of uncertainty.
v. Ensure reproducibility in the workflow to estimate abundance by producing R code to do the calculations and expansions that could be shared with assessment analysts.
vi. Clarify documentation on length expansions to make it clear that the length data were expanded within a strata and not across the entire region.

The GFSC and meeting participants discussed that the ROV survey was designed for MPA monitoring with sites inside and outside of MPAs across the state, not coastwide abundance estimation. If the ROV survey is intended to be used for abundance estimation moving forward, changes may be needed in survey design or planning. Tradeoffs exist with sampling the entire area (leading to the need for super years) versus annual representation. Moving toward standardization of spatiotemporal abundance estimation (e.g., using methods such as sdmTMB) could help alleviate some of the assumptions needed to make design-based estimates of abundance that rely on stratifications. This could also inform future survey planning.

D.5. Data gaps and future research efforts

Mike Prall discussed data gaps, available funding, and research needs for the California ROV survey. The survey was designed for monitoring MPAs (and reference sites) and not specifically designed for assessment purposes. The last statewide ROV survey was in 2021 (which was incorporated into the “2020 super year”, representing 2019 to 2021). In 2024, limited ROV survey work was undertaken, with reduced coverage in central and northern areas of California. Meeting participants agreed that additional sampling may be necessary if a more comprehensive sampling design is desired.

In 2022, California had a decadal management review of their MPA network and monitoring programs. Among the research priorities was a durable and robust approach to mid-depth (30-100 m) monitoring. In 2024, an expert panel met to discuss how best to address this need. California has now put out a Request for Proposals (RFP) for mid-depth surveys, which closes December 16, 2024. This RFP is backed by $1.2 million for surveys in 2025-2026 and an additional $300,000 for sampling design refinement. While this funding may enable continued sampling in state waters, sampling in federal waters is not funded under this program nor is supplemental sampling in state waters to increase representation of fished areas.

One goal of the California state RFP is to improve representation of the mid-depth rocky reef habitat within California waters, as well as to better understand factors such as edge effects. For stock assessment and fisheries management needs, this may mean increased sampling in federal waters, deeper depths (for more data on shelf species), more complete spatial coverage to represent areas between MPAs, and considerations of temporal coverage (should sampling every three to five years seem too long), as well as improved mapping and resolution of habitat in federal waters statewide and state waters off southern California. One meeting participant noted that looking at how well the ROV sampling aligns with the distributions of habitat also applies to MPA projects goals.

D.6. Discussion

The GFSC and others discussed the data and analyses leading to the indices and absolute estimates of abundance and associated uncertainties. To what degree the data require spatial stratification will have to be explored further. The Farallon Islands appear to have different densities of quillback rockfish than coastal areas in similar latitudes. Length data are not available due to stereo camera malfunction for the first super year (2014-2016) for the Farallon Islands. The GFSC supports these products being considered for use in the quillback rockfish assessment, but additional analyses are needed prior to implementation. To that end, the GFSC focused on what could be done in time for review at the March 2025 Council meeting along with longer-term goals.

Shorter-term recommendations:

i. Evaluate the availability of length and density data across latitude and depth for each super year in a matrix to identify where data are available for further stratification or where sample sizes are low and aggregation is necessary. This will help inform the ability to develop estimates that include stratification by both depth and latitude in design-based methods.
ii. For super year estimates, discussion and analysis of what is included in the uncertainty estimates presented, or improvements to how uncertainty was measured.

iii. Consider unaccounted for sources of variability and bias for estimates of abundance, including habitat classification or spatial uncertainty, swath width, which fish lengths are estimated, site selection, spatiotemporal variation in weight at length using MRFSS and CRFS sampling data, etc.
iv. Develop absolute abundance and associated uncertainty estimates for another stock/species for which we have a more robust stock assessment for comparison, such as copper, gopher or China rockfishes.
v. Develop absolute abundance associated uncertainty estimates within MPAs alone, with discussion of survey coverage, potential biases, etc.
vi. Discuss potential bias in the selection of reference sites outside of MPAs and issues of coverage to help inform uncertainty.
vii. Provide annotated script/code so that others can replicate and investigate.
viii. Plot histograms of depth for reef habitat in state waters and compare them to histograms of mean depth for ROV transects. Explore estimating the degree of overlap between distributions (*sensu* Pastore 2018; Pastore and Calcagní 2019).

Long-Term recommendations:

ix. Analyzing the data using alternative transect lengths (longer than 10 m, but shorter than 500 m full transects).
x. Explore other model-based approaches for abundance estimation, such as a negative binomial model with the following categorical covariates (number of factor levels in parentheses):
    a) Super year (2)
    b) Region (5; same as before, with Farallon Islands separate)
    c) Depth (4; e.g., <30, 30-50, 50-70, >70)
    d) Protection status (2)
    e) Interaction between super year and protection status
    f) Site as random effect
    g) Test other 2-way interactions, if possible
  2. Use model selection to identify important sources of variability.
  3. Use model predictions of density with habitat areas to produce estimates of numerical abundance
  4. Use estimates of numerical abundance by stratum to expand length composition data. Derive mean weights from those expansions and derive biomass estimates from the expanded length compositions.

The GFSC recommends an update and additional review of new analyses at the March 2025 Council meeting. In general, there was conditional support for using the ROV survey to develop relative indices of abundance, but many concerns remained with respect to the inclusion of absolute abundance estimates. The decision of whether and how to use these data is largely up to the STAT, thus a key GFSC recommendation is that the proponents work closely with the STAT to prioritize their concerns over how best to analyze the data in the near term.

E. Recommendations for the development of risk tables for 2025 assessments

E.1. Review of September 2024 risk table discussion and recommendations

Kiva Oken and Kristin Marshall presented information on risk tables for groundfish stock assessments. The risk tables will consist of three columns that describe the quality of ecosystem and environmental conditions, data inputs, and model assumptions and performance. This approach is based on previous work on compiling and linking a diversity of information to provide simple performance metrics. Risk table metrics are to be used to fine tune scientific uncertainty (sigma) for Category 1 (and eventually Category 2) stocks. The SSC proposed three new sigma levels of 0.25, 0.5 (base Category 1), and 0.75, and requested these be developed for all benchmark assessments (even if ecosystem columns are not fillable in all cases). The Council asked that these be developed but as a pilot project rather than for use in this cycle (Agenda Item H.1, September 2024; see also Decision Summary Document).

The risk tables will be produced by the Northwest and Southwest Fisheries Science Centers. The data and assessment columns will be filled out by the STAT for each assessment. The NWFSC will produce ecosystem and environment columns for sablefish and yellowtail rockfish (north), and will identify whether there is adequate information to do so for rougheye/blackspotted rockfish. The SWFSC will produce ecosystem and environment columns for chilipepper rockfish, and will identify whether there is adequate information to do so for quillback rockfish off California. A NOAA affiliate is working on approaches for developing this column for species without extensive ecosystem data and research, including borrowing information from other species based on functional groups and using basin-scale ocean conditions from the ecosystem status report.

The column describing ecosystem and environmental conditions will include information on direction, strength, and evidence of each effect. Other risk table columns will describe the quality and uncertainty of the data and modeling choices. The GFSC discussed the evaluation rubric for the risk tables (see Agenda Item H.1.a CCIEA Team Report 1 September 2024), including factors to consider and how to determine the level (1, 2, or 3) for each column; the timeline, including review at STAR panels and review and recommendation of the overall level by the GFSC and SSC; and how and where to include risk tables in assessment documents.

The SSC noted that the rubric requires many qualitative judgments and that some items evaluated in each of the three columns are more important for estimating the strength and quality of information than others. The SSC also noted that these tables should be relatively brief, comprising a single paragraph for each column.

The anticipated timeline is as follows. At least one month prior to the pre-STAR document deadline, there will be a facilitated conversation between ecosystem and assessment scientists (both of whom will have been working on this previously). The STAR panels will review the content of tables, but not recommend levels from each column or overall. The GFSC will review all the risk tables for consistent approaches in development and judgement across assessments and recommend sigma to the full SSC.

The draft and final risk tables will be included in the executive summary of each version (i.e., drafts and final) of the stock assessment report, even if they are not used for management. If the recommended sigma from the risk table is other than 0.5 (for a Category 1 assessment), a second table of harvest specification values should be produced to reflect that sigma.

F. Accepted practices for groundfish stock assessments in 2025 and 2026

F.1. Revisions to existing accepted practices language; input from GFSC or STATs

Biomass indices for bottom trawl survey data all account for spatial autocorrelation. The text on page 4 was updated to reflect the current status quo. Priors on steepness were carried over from 2021. The section on including extra variability on parameters within an index has been modified to reflect that model tuning is part of current best practices, but that analysts should add extra variability thoughtfully and with some level of caution. The section on jittering explains the procedure rather than providing guidance. Adding a warning in r4SS that jittering may not be converging would be helpful. Default assumptions for removals were modified to be consistent with the TOR.

F.2.a. Recommended revisions: Approaches for addressing spatial closures

There were extensive discussions on updating the section on spatial considerations. The Goethel et al citation was updated and a reference to Langseth and Barceló (in prep) was added. This section is unlikely to change until Langseth and Barceló (in prep) is completed.

F.2.b. Recommended revisions: California ROV, design-based estimates

The general consensus of the meeting was that ROV indices could be used in stock assessments, at the discretion of the STAT, based on some level of satisfaction by the STAT and the review panel that concerns raised in the 2020 methodology review and 2024 workshop were adequately addressed.   (and subject to considerations raised by the review panel). Given the expectation that for the 2025 assessment cycle, the CA quillback model was the only model likely to have a potential ROV index available, no additional explicit guidance regarding ROV indices were added to the 2025 accepted practices document.

F.3. Recommended revisions: FEP 4 risk table guidance from Council

At the September 2024 Council meeting, the SSC reviewed the Fishery Ecosystem Plan (FEP) Initiative 4 for incorporating risk tables into 2025 groundfish stock assessments. The SSC agreed with the California Current Integrated Ecosystem Assessment (CCIEA) team to focus on using risk tables to inform the choice of sigma and recommended applying the approach to all full assessments scheduled for 2025. The SSC also proposed assigning sigmas of 0.25, 0.5, 0.75 to Category 1 assessments for favorable, neutral, and unfavorable conditions. For 10-year projections in the decision table, the same rate of increase in sigma as used currently for ageing assessments will be applied to the risk-adjusted sigma value.

Draft risk tables should be included in the executive summary under a “risk table” subsection rather than as an appendix. Risk table descriptions should be no more than one paragraph per column. The SSC-GFS recommends that harvest specification values be included in the aforementioned “risk table” subsection along with updated sigmas. The SSC-GFS encourages the STAT to work with the CCIEA team to develop risk tables for upcoming stock assessments.

References

Jellyman PG, DJ Booker, SK Crow, ML Bonnett, and DJ Jellyman. 2013. Does one size fit all? An evaluation of length-weight relationships for New Zealand’s freshwater fish species. New Zealand Journal of Marine and Freshwater Research. 47(4):450–468.

Kimmerer W, SR Avent, SM Bollens, F Feyrer, LF Gramaldo, PB Moyle, M Nobriga, and T Visintainer. 2005. Variability in length-weight relationships used to estimate biomass of estuarine fish from survey data. Transactions of the American Fisheries Society. 134(2):481–495.

Matthews KR. 1990. An experimental study of the habitat preferences and movement patterns of copper, quillback, and brown rockfishes (*Sebastes* spp.). Environmental Biology of Fishes. 29:161–178.

Nahdi AA, C Garcia de Leaniz, and AJ King. 2016. Spatio-temporal variation in length-weight relationships and condition of ribbonfish Trichiurus lepturus (Linneaus, 1758): implications for fisheries management. PLOS One. 11(8):e0161989.

Pastore M. 2018. Overlapping: a R package for estimating overlapping in empirical distributions. Journal of Open Source Software. 3:1023.

Pastore M and A Calcagní. 2019. Measuring distribution similarities between samples: a distribution-free overlapping index. Frontiers in Psychology. 10:1089.

Perkins NR, A Lauermann, M Prall, GR Hosack, and SD Foster. 2024. Diving deep into the network: quantifying protection effects across California's marine protected area network using a remotely operated vehicle. Conservation Science and Practice. 6(9):e13190.

Rankin PS, Hannah RW, Blume MTO (2013) Effect of hypoxia on rockfish movements: implications for understanding the roles of temperature, toxins and site fidelity. Marine Ecology Progress Series. 492:223–234.

Tolimieri N, Andrews K, Williams G, Katz S, and Levin PS. 2009. Home range size and patterns of space use by lingcod, copper rockfish and quillback rockfish in relation to diel and tidal cycles. Marine Ecology Progress Series. 380:229–243.

Appendix A. SSC Meeting Participants

Cheryl Barnes (SSC GFSC Vice-Chair), Oregon State University & Oregon Dep. Fish and Wildlife, Newport, OR
John Budrick, California Dep. Fish and Wildlife, San Carlos, CA
John Field (SSC GFSC Chair), NMFS Southwest Fisheries Science Center, Santa Cruz, CA
Chris Free, University of California, Santa Barbara, Santa Barbara, CA
Owen Hamel, NMFS Northwest Fisheries Science Center, Seattle, WA
Kristin Marshall, NMFS Northwest Fisheries Science Center, Seattle, WA

William Satterthwaite, NMFS Southwest Fisheries Science Center, Santa Cruz, CA
Jason Schaffler, Muckleshoot Indian Tribe, Auburn, WA
Tien-Shui Tsou, Washington Dep. Fish and Wildlife, Olympia, WA