Scientific and Statistical Committee's Groundfish Subcommittee Report on 2023 Stock Assessments

Pacific Fishery Management Council
Online Meeting

August 14-15, 2023

Overview

The Groundfish Subcommittee (GFSC) of the Scientific and Statistical Committee (SSC) met via webinar on August 14-15, 2023 to review stock assessments from the first two of three stock assessment review (STAR) panels for 2023 and discuss the reports resulting from the Panels. The GFSC received presentations on the stock assessments and Panel report from STAR Panel 1 Chair Dr. Jason Schaffler including copper rockfish in California as well as length-based data-moderate assessments for rex sole and shortspine thornyhead. Dr. John Budrick, Chair of STAR Panel 2 provided presentations on the black rockfish assessments in Washington, Oregon and California. The stock assessment team (STAT) leads were available to answer questions from the GFSC. The GFSC commends the STATs and the STAR panel reviewers for their extensive and thorough work. An overview of the GFSC deliberations and recommendations are provided to help inform SSC discussions regarding endorsement of the stock assessments for use in management as the best scientific information available (BSIA), the appropriate stock assessment category and associated sigma value as well as as whether the next assessment should be a full benchmark assessment or an update of the current assessment.

Copper Rockfish in California

The 2023 full benchmark copper rockfish assessment in California included two sub-area assessment models split at Point Conception, California (34°27′ N. lat.). Length-based data-moderate assessments were conducted in 2021 for copper rockfish off the U.S. West Coast, with four separate population models for Washington, Oregon, and south and north of Point Conception in California. The recreational fishery in California is the primary source of mortality for copper rockfish. In recent years recreational removals north of Point Conception have been split between commercial passenger fishing vessels and private/rental vessels, while south of Point Conception commercial passenger fishing vessels are the primary source of mortality.

The stock of copper rockfish in waters off California was assessed in Stock Synthesis 3 (version 3.30.21.00) using two sub-area models that captured distinct dynamics north and south of Point Conception. The 2023 combined California spawning output relative to unfished equilibrium spawning output was at 36.6%, in the precautionary zone above the minimum stock size threshold of 25% and below the management target of 40%. The fishing mortality for each model area varied where the portion of the stock north of Point Conception has been below target in recent years and the fishing intensity south of Point Conception has been estimated to be above the target in recent years.

The GFSC was generally supportive of the modeling approach and satisfied with the model fits to data and resulting conclusions. Major points of GFSC discussion were:

- The model south of Point Conception reflected a low sensitivity to alternative parameterizations, indicating a level of "stubbornness" in the model's pessimistic perception of stock status. The reason for this was not readily apparent, although it is likely that recreational catch and length data from that fishery is driving the model, with a clear signal that the stock is depleted. A significant

fraction of the recreational fishing occurs close to port, particularly in the California Recreational Fishery Survey District 1 (including Los Angeles, Orange and San Diego Counties), which could be contributing to localized depletion in more heavily fished areas. However, some fishery independent data sources also indicate declines in both open and closed areas, indicating that the dynamics in the stock and the fishery are somewhat more complex.

- Research recommendation #2, which aims to move to an even finer scale for assessment, may not be feasible as it would require data at a finer spatial resolution than currently exists. The intent of the recommendation was focused on marine protected areas and cowcod conservation areas, and how the stock is behaving inside and outside of the protected areas. It is likely not feasible to assess the area at a finer scale, but should be possible to model the fishery to account for finer scale changes in effort and length distributions of fish across southern California. The GFSC emphasized the importance of maintaining and increasing the availability of spatially explicit data on abundance, size and age composition.

The GFSC recommends that the SSC endorse the 2023 full benchmark assessments of copper rockfish in California north and south of Point Conception as providing the best scientific information available and suitable for informing management decisions. The GFSC recommends that the copper rockfish stocks in California north and south of Point Conception be assigned to a category 1b, given the ability to estimate recruitment deviations, availability of fishery independent indices of abundance and is size/length structured but lacks a reliable estimation of the stock-recruitment relationship. The GFSC recommends that the next copper rockfish assessment in California be an update, and that a full assessment would be warranted with new data and once more research has been completed.

Black Rockfish in Washington

The SSC GFSC reviewed the full benchmark assessment for black rockfish in Washington state, last assessed in 2015. The GFSC was supportive of the modeling approach, model fits to data and interpretation and conclusions by the assessment team. Major points of both review panel and GFSC discussion were:

- Proper attribution of historical commercial catches to the state level (between Oregon and Washington, for fish landed in Oregon) was somewhat difficult for this assessment. This is less of an issue for recent years, for which recreational fisheries account for nearly all removals.
- Age data drive a relatively narrow "window" of *R0* values in the likelihood profile (relative to other sources), with tension between trawl and recreational length data in particular. Fits to data were improved with higher values of steepness, primarily as informed by age and survey data, although length composition data were better fit by much lower steepness values.
- Natural mortality (*M*) was fixed at the point estimate of the prior, but would have been better fit with a lower value based on the data, with age and survey data supporting a higher *M* and length data supporting a lower value for *M*. These types of tensions, between age and length data in particular, are common for West Coast groundfish stock assessments.
- There was considerable discussion, including public comment, about the manner by which age data were treated (sexes combined or separate, as per "option 2" and "option 3" in Stock Synthesis) in both the Washington and Oregon assessments. Some sensitivity was explored during the panel that indicated very little influence on overall results. Recognition of the need to do additional exploration and/or receive guidance on the merits of the different alternatives for future assessment

work was acknowledged, particularly for species that appear to have skewed sex ratios in fisheries and survey data.

- There were no strong patterns in the retrospectives for the first five years of data "peels," but between 5 and 10 years of peels there was a general pattern towards more "optimistic" perceptions of stock status.
- The GFSC noted that several of the "technical deficiencies" in the STAR Panel report represent data deficiencies, not model deficiencies.

The stock was found to be at 45% of unfished spawning output in 2023, which is considered healthy (>40% target). The basis for the axis of uncertainty in the decision table was a search across fixed values of ln *R0* to attain the current year spawning output values provided by the base model mean plus or minus 1.15 standard deviations (e.g., the 12.5th and 87.5th percentiles). There was a suggestion to flip the order of the first two rows in the decision table to have the lowest catch stream as the top rather than middle row.

The GFSC endorses the 2023 full benchmark assessment of the black rockfish stock in Washington as providing the best scientific information available and suitable for informing management decisions. The GFSC recommends that this stock be assigned to a category 1b, given this is a full benchmark assessment with comprehensive age and length data, and estimates of recruitment. The GFSC recommends that unless there is a significant change in key model assumptions or data availability, the next Washington black rockfish assessment could be an update.

Black Rockfish in Oregon

The 2023 assessment models a single population within Oregon waters, separate from populations in Washington and California. The assessment uses data sources that include: catch data from two commercial fleets and two recreational fleets, six abundance indices, five sets of length composition data, and three sets of conditional age-at-length compositions. The assessment model is sex-specific, with natural mortality estimated externally, and growth and recruitment deviations estimated by the model. The model incorporates ageing error and a new approach to estimate functional maturity. Model estimates show the spawning output is 674 million eggs and relative spawning output is 43% of unfished levels in 2023, which is considered healthy (>40% target). The model suggests the stock has been above the management target since 2008, and fishing intensity has been near or above the target for the past ten years. Notable changes from the previous assessment in 2015 include an updated catch history and incorporation of a new acoustic-visual survey intended to provide an absolute measure of abundance (reviewed in a methodology review in 2022, November 2022 Agenda Item H.4.a Supplemental SSC Groundfish Subcommittee Report 2).

The GFSC reviewed the merits of the assessment, STAR panel requests, decision table treatment, sources of uncertainty, and sensitivities. Discussion focused on the explorations during the panel on the treatment of catchability (q) from the acoustic-visual survey, which was unrealistically high when estimated, and ultimately became the axis of uncertainty for the decision table. During the panel, multiple model configurations were explored to down-weight the length composition data, which suggest lower population size and status compared with the acoustic-visual survey and tag surveys. The GFSC also discussed the model's sensitivity to recruitment deviations, which were not estimated in the previous assessment. There was considerable discussion, including public comment, about the manner by which age data were treated (sexes combined or separate, as per "option 2" and "option 3" in Stock Synthesis) in both the Washington and Oregon assessments. Some sensitivity was explored during the

panel that indicated very little influence on overall results. Recognition of the need to do additional exploration and/or receive guidance on the merits of the different alternatives for future assessment work was acknowledged, particularly for species that appear to have skewed sex ratios in fisheries and survey data. More research is needed to resolve the tension between the data sources in the model and more generally to explore how to weight data sources that are viewed as most informative but have short durations, like the acoustic-visual survey.

The GFSC supports the modeling approaches chosen by the STAT and reviewed by the STAR panel. The data fit the model adequately and the GFSC agrees with the conclusions of the 2023 black rockfish assessment in Oregon. The GFSC recommends the SSC endorse the 2023 assessment as the best scientific information available and suitable for informing management decisions. The STAR panel recommended the assessment be assigned to category 1b, but the GFSC recommends 1a because the acoustic-visual survey has only one year of observations and cannot be used to infer a trend. The GFSC recommends that the next black rockfish assessment in Oregon be a full assessment to address the tension between length composition and age data and reduce uncertainty in the catchability in the acoustic-visual survey, presuming additional acoustic-visual surveys are conducted.

Black Rockfish in California

The 2023 benchmark black rockfish assessment in California was split between two models at Point Arena, California (38°57′30” N. lat.). The central model assessed stock dynamics south of Point Arena to the California-Mexico border, though black rockfish are rare south of Point Conception, thus the assessment area is referred to as the central model. The northern model assessed stock dynamics from Point Arena to the California-Oregon border. Breaking the assessments at Point Arena is supported by differences in abundance trends, mean lengths in the fisheries and surveys as well as differences in exploitation histories between areas.

Data sources were generally similar between areas but with a few notable exceptions. The Deb-Wilson Vandenberg (DWV) survey and a California Department of Fish and Wildlife dataset (Lea et al. 1999) of otolith ages were limited to the central model, whereas another set of otoliths aged as a part of a Master’s thesis (Abrams 2014) was included in the northern model. The California Collaborative Fisheries Research Program (CCFRP) index of abundance was available from 2007 to 2022 off central California and 2017 to 2022 off northern California. The assessment models were similar between areas in California with the major exception that the northern model separated commercial non-trawl landings into live and dead components. There are few live landings in the central assessment area. The northern model also included time blocking to account for depth restrictions in the fisheries whereas the central model did not include time blocking because of fewer depth restrictions.

Maximum observed ages were similar between areas (age-35 female, central; age-33 male, north) resulting in an estimated female natural mortality rate of 0.21 and male natural mortality rate of 0.20 in the northern model. Natural mortality in the central model was fixed at the estimates from the northern model due to limited age observations. Steepness was fixed at 0.72 in both models. Growth was estimated internal to each model, with the exception of length at age 0 and the CV of length at age 0. Data show sexually dimorphic growth with females attaining larger sizes at age. Further data suggest sizes at age may be larger in the central area and earlier in the time series, but insufficient sample sizes prevented definitive conclusions. Length at functional maturity was estimated using a flexible spline to account for skipped spawning off Oregon (Rosemond and Head data). Functional maturity information was not available for central or northern California.

The central model fits commercial length compositions well. Recreational length compositions showed a large decline around 2010 which was also present in CCFRP length compositions, suggesting a recruitment event. Dropping the CCFRP index resulted in a much more pessimistic view of spawning output and fraction of unfished biomass whereas dropping the DWV survey index resulted in a much more optimistic view of spawning output and fraction of unfished biomass. Likelihood profiles over steepness indicated some tension between index data and other parameters where the index data fit a much lower steepness value. However, other parameters suggested a steepness of 0.72 was appropriate. Likelihood profiles across natural mortality indicate a larger value than the prior.

The northern model fits commercial length compositions well. Unlike the central model, recreational length compositions or survey length compositions did not indicate a recruitment event in the northern assessment area. Dropping trawl data from the northern model resulted in a much more pessimistic view of spawning output and fraction of unfished biomass. Dropping non-trawl dead landings resulted in a much more optimistic view of spawning output but not fraction of unfished biomass. No other data had a strong effect. Steepness was not well informed in the model but the prior value was reasonable. Age and recruitment deviations showed some tension with length data for natural mortality where length data suggested lower natural mortality. Natural mortality was used as the basis for the primary axis of uncertainty in decision tables.

When the central and northern subarea models are combined for status determination in California, the spawning output is estimated as 37.7% of unfished levels, in the precautionary zone between the management target of 40% and minimum stock size threshold of 25%. Relative spawning output trajectory was very similar to that estimated in 2015 and has shown continued increases.

The GFSC supports the modeling approach, agrees that the models fit the data, and agrees with the conclusions of the 2023 assessment of black rockfish in California. The GFSC recommends that the SSC endorse the assessment as providing the best scientific information available and suitable for informing management. The GFSC recommends the stock assessment be designated as a category 1b assessment with a default sigma of 0.5 given the ability to estimate recruitment deviations, availability of fishery independent indices of abundance, but the lack of ability to reliably estimate the stock-recruitment relationship. The GFSC recommends a full assessment next time to account for migration rates between the northern and central assessments and spatially-explicit life history data, if available.

Comparison of Trends Among Black Rockfish Assessments

The GFSC reviewed and discussed a table of comparisons between the black rockfish assessments in all the regions from the STAR panel report Table 1. It was noted that the gradient in natural mortality is consistent with other species with longer-lived individuals in more northern waters. However, patterns in growth between the areas were opposite the expectation that warmer southern waters would lead to faster growth and smaller fish. All areas had evidence of large, but not old, females. More research is needed to better understand growth variation across the range of black rockfish and explanations for underrepresented older females in the population.

Rex Sole Data-Moderate

The 2023 rex sole assessment was a length-based data-moderate assessment. Rex sole was last assessed using an index-based data-moderate approach using only removal and index data (Cope et al. 2015). The current assessment was structured into a single area with two fleets for the current and historical fleets based on availability of discard data from WCGOP. Fishery-independent data from the triennial trawl and West Coast Bottom Trawl Survey (WCGBTS) provide data for assessment.

Growth data from the Gulf of Alaska was used as a proxy in the previous assessment, while data from the WCGBTS was used to provide separate growth for males and females to inform growth/conditional age-at-length in the current assessment. Age-at-maturity and fecundity were updated to reflect research by Hosie and Horton (1977). Natural mortality was fixed at the median of the prior based on longevity of 29 years resulting in an M of 0.186 using methods from Hamel and Cope (2022). A new commercial catch reconstruction for Washington was also added.

Indices were derived using sdmTMB for two fleets, WCGBTS and Triennial (early and late) surveys, that are sex specific. The 2023 base model includes many changes from the previous assessment including updated biological parameters, internally estimated growth parameters, fishery and survey length compositions, conditional age-at-length (CAAL) data, a two fleet structure (historical 1916-2001 vs. current 2002-2022), discard rates for the current fishery, discard average weight, sex specific selectivity (with males as an offset), no extra standard deviation applied to the WCGBTS, fixed steepness, estimated recruitment deviations, fixed natural mortality, data weighting, and block design for current fishery retention. The total mortality and fishing intensity was higher than the Fmsy in the 1980s, but is now trending lower. The current model estimates the stock is 76% of unfished spawning output in 2023 indicating the stock is healthy, as was the result of 80% from the 2013 assessment. Recruitment deviations were estimated but showed no trend.

Decision tables used natural mortality as the primary axis of uncertainty with an M of 0.175 and 0.210 bracketing uncertainty. Model evaluation and diagnostics included estimating dome-shaped selectivity for the fishery, rather than the fixed asymptotic selectivity that was used in the base model. Fits to the WCGBTS CAAL were poor in the early years due to low sample sizes. Attempts were made to better fit indices, though they remained poor. As age data is removed in retrospectives, the pattern deteriorates. Likelihood profiles across M, h, R_0 and q were examined. The M and h were fixed, but likelihood profiles supported lower values of M that were inconsistent with expectations for productivity for flatfish. Profiles for steepness and $R0$ were relatively flat. The profiles for the WCGBTS q provided a q of 6, which is higher than reasonable, but when ages were included, it decreased to 3.97 in the base model supporting a higher stock status and scale.

Major uncertainties included natural mortality, growth and WCGBTS q. The model was sensitive to changes in natural mortality, which was fixed at the median of the prior. Data to inform growth resulted in unreasonable growth curves due to bias introduced by length stratified sampling and were deemed unreliable. The internally estimated growth curves provided better fits but were based on very limited amounts of age data and resulted in q estimates that were not plausible. The WCGBTS catchability was estimated in the base model, but resulted in a q of 3.97, which was still high relative to the q estimated for similar flatfish due to herding from the warps of the trawl gear. A study by Bryan et al. (2014) resulted in an expectation of between 1 and 3.

Research and data needs include additional age data to inform growth and longevity along with ageing error. There is a need to better understand catchability for WCGBTS and update biological information for West Coast rex sole, particularly maturity and fecundity. Ageing of fishery structures including the 900+ per year from Oregon would help bolster the sample size for ages in future assessments to better inform growth.

The GFSC notes that strictly speaking, the model estimates growth internally, which may be beyond the scope of a data-moderate assessment as described in the Terms of Reference. Without using age data in the model at the outset, but during the review, some latitude was afforded since it improved fits to data and resulted in q values that were more reasonable than external estimation (q = 15). The GFSC agreed that the change was made from necessity and similar latitude was also afforded for spiny dogfish in an

analogous circumstance creating a precedent. Such considerations regarding length-based data-moderate assessments and exceeding the limitations of the Terms of Reference (TOR) can be discussed as a process consideration at the post-mortem review as the workload was more consistent with a full assessment supporting broader latitude. This discussion can also consider the throughput tradeoffs of additional workload needed in such circumstances vs. the intent to use data-moderate methods to limit analytical workload compared to full assessments.

The panel recommended, and the GFSC concurs, that the assessment should be designated as a category 2 assessment with a default sigma value of 1 given the data-moderate nature of the assessment and outstanding uncertainties. The next assessment should be a full assessment assuming additional age data is available to inform growth and improved methods are developed for estimating the WCGBTS q. The GFSC endorses the assessment as the best scientific information available to inform management. The assessment was well done and exceeded expectations for length-based data-moderate assessments.

Shortspine Thornyhead Data-Moderate

The 2023 shortspine thornyhead assessment was a length-based data-moderate stock assessment that covered the entire U.S. West Coast, from the Canada-US to US-Mexico borders. Changes from the most recent assessment in 2013 included reducing the number of fishing fleets to three (North: Oregon/Washington, South: California, Non-trawl: coastwide). Fishery-dependent length compositions and discard data were modeled along with length compositions and indices of abundance from two standardized surveys (Triennial and West Coast Groundfish Bottom Trawl). New estimates of catchability, growth, maturity, fecundity, and natural mortality were also included in the 2023 model. Steepness (h) was fixed at 0.72, which represents an increase from the previous value of 0.60. Decision tables were based on estimates of natural mortality (M), with the low state of nature being $M = 0.03$ and high state of nature being $M = 0.05$. Alternative values for P* analyzed were 0.4 and 0.45.

Bridging analysis showed that changes to biological parameters resulted in decreased spawning biomass, though confidence intervals were large and fully overlapping. Updated biological parameters also resulted in a lower fraction of unfished biomass in the 2023 assessment. There were no strong patterns from the retrospective analysis. Likelihood profiles were moderately sensitive to R_0 and M but insensitive to h. Stock scale and status were insensitive to maturity, landings, and indices of abundance but sensitive to growth. Stock scale (but not status) was sensitive to fecundity. Although recruitment has been relatively stable, spawning output declined considerably from the 1970s to the late 2010s. The relative spawning output of the stock decreased to just below the management target of 40% of unfished levels in 2020 at 39.9% and was 39.4% in 2023.

Major uncertainties in the stock assessment were related to insufficient age composition data and a lack of reliable ageing methods, both of which reduce confidence in estimates of growth, maturity, and natural mortality. There was also a lack of concurrence among model-based and design-based indices in the latter portion of the time series (2021 and 2022). Information about habitat associations, movement, and stock structure is lacking.

The GFSC endorses the 2023 stock assessment as reflecting the best scientific information available, supports a category 2 designation for shortspine thornyhead (with default sigma of 1.0), and recommends that the next assessment be an update assessment unless new ageing information becomes available.

Discussion of Process Considerations

The GFSC discussed the process of scheduling stock assessment reviews, GFSC reviews and SSC reviews during assessment years. Currently, the National Marine Fisheries Service (NMFS) proposes a schedule to the Pacific Fishery Management Council (PFMC) for conducting and reviewing stock assessments, which seeks to balance scheduling conflicts, the data deadlines and other needs of assessment teams with timelines related to the review process. In this year, as in others, it was noted that greater separation between STAR panels would have been beneficial, as would other opportunities to enable greater time between various deadlines for draft and final assessments. Specifically, having only a week between the second and third panels made for insufficient time for review and report writing for the Center of Independent Experts (CIE) reviewer who participated in all panels given the timelines in the Terms of Reference, as well as some of the other participants. The burden on others in the Council process to have all of the assessments reviewed and adopted at a single meeting was also recognized as an excessive workload, noting that historically there was often at least one "round" of benchmarks (often with several update assessments) that were ready for SSC review and Council adoption by the June meeting.

Balancing those concerns however, is the recognition of data availability and processing needs, including age determination schedules to provide data for the assessments. Specifically, with the current data deadline schedule, an early June review panel would have an early February data deadline, and often landings and length or age data from the previous year are not available by early February. Regardless, for future assessment cycles, there is an interest in having the GFSC submit or comment on its own preferred timelines and schedule for the next assessment cycle. There was general recognition that there are no easy fixes to such scheduling concerns, but further efforts are necessary. Concerns regarding timelines for all aspects of the biennial groundfish management and assessment cycle may reflect the need for it to be longer than two years to better balance timeliness/responsiveness (that can also be addressed through inseason actions) with the need for more time for data processing, analysis, review and logistics of the implementation process.

There is general recognition that "code of conduct" discussions for STAR Panels should be undertaken, particularly the need to be respectful in review panel/assessment team interactions. Codifying some of the behavioral expectations in the TOR would be beneficial.

There continues to be broad recognition that movement toward more routine assessment updates and less benchmark assessments is generally preferred by all participants in this process. There was also recognition that historically a NMFS stock assessment coordinator was available to support the assessment review process, and such assistance would continue to be quite helpful in the current process.

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Appendix 1.

SSC Subcommittee Members in Attendance

Dr. John Budrick (Chair), California Department of Fish and Wildlife, San Carlos, CA
Dr. Jason Schaffler, Muckleshoot Indian Tribe, Auburn, WA
Dr. John Field, National Marine Fisheries Service Southwest Fisheries Science Center, Santa Cruz, CA
Dr. Owen Hamel, National Marine Fisheries Service Northwest Fisheries Science Center, Seattle, WA
Dr. Kristin Marshall, National Marine Fisheries Service Northwest Fisheries Science Center, Seattle, WA
Dr. Tien-Shui Tsou, Washington Department of Fish and Wildlife, Olympia, WA
Dr. Tommy Moore, Northwest Indian Fisheries Commission, Forks, WA
Dr. Cheryl Barnes, Oregon State University/ODFW, Newport, OR

Stock Assessment Team Members in Attendance

Dr. Cheryl Barnes (CA Black Rockfish), Oregon State University/ODFW, Newport, OR
Dr. Aaron Berger (OR Black Rockfish), National Marine Fisheries Service Northwest Fisheries Science Center, Seattle, WA
Sabrina G. Beyer (Rex Sole and Shortspine Thornyhead), University of Washington, Seattle, WA
Dr. Fabio P. Caltabellotta (WA Black Rockfish), Washington Department of Fish and Wildlife, Olympia, WA.
Dr. Jason Cope (WA and OR Black Rockfish), National Marine Fisheries Service, Northwest Fisheries Science Center, Seattle, WA
Dr. E.J. Dick (CA Black Rockfish), Southwest Fisheries Science Center, Santa Cruz, CA
Nick Grunloh (CA Black Rockfish), Southwest Fisheries Science Center, Santa Cruz, CA
Adam L. Hayes (Shortspine Thornyhead), University of Washington, Seattle, WA
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Lisa Hillier (WA Black Rockfish), Washington Department of Fish and Wildlife, Olympia, WA
Kristen Hinton (WA Black Rockfish), Washington Department of Fish and Wildlife, Montesano, WA
Markus Min (Rex Sole), University of Washington, Seattle, WA
Dr. Melissa Monk (CA Copper Rockfish and CA Black Rockfish), Southwest Fisheries Science Center, Santa Cruz, CA
Cory B. Niles (WA Black Rockfish), Washington Department of Fish and Wildlife.
Dr. Kiva L. Oken (Rex Sole and Shortspine Thornyhead), National Marine Fisheries Service Northwest Fisheries Science Center, Seattle, WA
Dr. Leif R. Rasmuson (OR Black Rockfish), Oregon Department of Fish and Wildlife, Newport, OR
Dr. Tanya Rogers (CA Black Rockfish), Southwest Fisheries Science Center, Santa Cruz, CA

Alberto Rovellini (Rex Sole), University of Washington, Seattle, WA
Emily Sellinger (Rex Sole), University of Washington, Seattle, WA
Dr. Tien-Shui Tsou (WA Black Rockfish), Washington Department of Fish and Wildlife, Olympia, WA
Matthieu Véron (Rex Sole and Shortspine Thornyhead), University of Washington/National Marine Fisheries Service Alaska Fisheries Science Center, Seattle, WA
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Dr. Chantel Wetzel (CA Copper Rockfish), National Marine Fisheries Service Northwest Fisheries Science Center, Seattle, WA
Alison Whitman (OR Black Rockfish), Oregon Department of Fish and Wildlife, Newport, OR
Joshua A. Zahner (Shortspine Thornyhead), University of Washington, Seattle, WA