SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON
ADOPT STOCK ASSESSMENTS

The Scientific and Statistical Committee (SSC) reviewed the new lingcod assessments and Stock Assessment Report (STAR) report, the new vermilion and sunset rockfishes assessments and STAR report, new catch-only projections, a new yelloweye catch report, and the Groundfish Subcommittee (GFSC) Report from their August 17 meeting (appended to this report) and offers the following recommendations.

Lingcod

The 2021 stock assessments for lingcod consisted of separate models for northern and southern stocks, with a dividing line at 40°10' N lat. near Cape Mendocino, California. The models estimate that the stock in the south declined below target levels from the late 1980s to early 2000s but increased since then due to a series of strong recruitment year-classes and was just above the management target with 41% depletion. In the north, the stock was estimated as having never been overfished, and currently at a depletion of 61% of unfished biomass.

Both assessments are technically sound and considered to be data-rich, with multiple fishery-dependent and -independent data sources, and depletion is well estimated. A notable improvement from the previous assessment is the revised boundary between the north and south regions, based on a recent population genetics study. However, the model estimates much higher natural mortality rates in the north than in the south. While this could reflect real differences in lingcod habitat and ecology, this divergence also reflects tension between data sources in the model.

Reflecting those challenges, the decision table for the south region uses natural mortality as the axis of uncertainty. In the north, an expert judgement approach was taken for the decision table, with high and low states of nature reflecting different combinations of data and sex-specific selectivity to produce higher or lower estimates of stock productivity.

The SSC supports the modeling approach and the basis for the decision tables and agrees that the models fit the data adequately. The SSC endorses the 2021 full assessments of northern and southern lingcod as providing the best scientific information available and suitable for informing management decisions. The SSC recommends that both assessments be designated as category 2 based on the uncertainty in model structure and competing fits to age and length data. Due to the issues noted above and in the STAR panel report, the next assessments should be a full benchmark assessment.

Vermilion and Sunset Rockfishes

The 2021 stock assessments for vermilion and sunset rockfishes consisted of separate models for Washington, Oregon, and northern and southern California, with the division between the latter at Point Conception. This spatial structure reflects the distribution of this cryptic species complex, with vermilion rockfish found throughout the region, most sunset rockfish found south of Point Conception, with a small but uncertain proportion of sunset rockfish north of Point Conception. The models for all regions estimated stocks as being above management targets in 2021, with

depletions of 56% of unfished biomass in Washington, 73% in Oregon, 42.7% in northern California, and 48.2% in southern California.

Assessments in all regions are technically sound and draw upon a wide range of data and result in robust estimates of depletion. The primary technical limitations of the assessments were an inability to fully represent changes in fishery availability due to shifting depth restrictions in recent decades, and an inability to distinguish between the two species without genetic analysis. In particular, there is an outstanding question of what proportion of the fished stock in the northern California region is sunset rockfish. The major uncertainty in the model is the estimation of natural mortality, and that quantity is the axis of uncertainty used in the decision tables.

The SSC supports the modeling approach and decision tables and agrees that the models fit the data adequately in all regions. The SSC endorses the 2021 full assessments of vermilion and sunset rockfishes as providing the best scientific information available and suitable for informing management decisions. The SSC recommends that the assessments be designated as category 2 in Washington, category 1 in Oregon and northern California, and category 2 in southern California. The category 2 designation in Washington reflects the data limitations and wider confidence bounds on the stock status estimates in that region. The category 2 designation in southern California reflects the mixed stock complex in that region. The category 1 designations in Oregon and northern California are because those regions are predominantly comprised of vermilion rockfish. The SSC recommends full assessments for all regions next time these species are assessed.

Spiny Dogfish

The SSC reviewed and discussed outcomes from the GFSC review of additional requests for analyses made by the Council at the June 2021 meeting for the 2021 benchmark stock assessment for spiny dogfish, which was endorsed by the SSC, and estimated a stock status of 35% of unfished biomass. Specifically, the Council requested the spiny dogfish STAT conduct additional analyses to further investigate the catchability coefficient (or survey q) for the West Coast Bottom Trawl Survey derived in the assessment, similar to those described in Agenda Item G.5.a Supplemental SSC Report 1, June 2021, prior to considering adoption of the assessment. These requests sought to gain insights into the fundamental questions of the magnitude of survey q and what informs survey q. The weight of the evidence suggests survey q is less than 1 and that changes in q from the last assessment are driven by the addition of new age data. Furthermore, the updated fecundity relationship decreases the estimated scale of the population, which directly impacts derived values for survey q.

The SSC supports the one additional request, investigating priors for survey q, made to the STAT by the GFSC, that will be reviewed at the September 2021 Mop-Up Review Panel. The result should provide an indication of the relative differences in catch rates of spiny dogfish by fisheries participants that will provide insight into how encounter and catch rates in the fisheries themselves appear to change seasonally, and thus the extent to which the model-estimated survey q is consistent with seasonal fluxes in catch rates. This request does not include an explicit request to develop such a prior, but rather will provide the SSC with a basis for considering whether such an approach might be feasible.

Copper Rockfish

The SSC reviewed and discussed outcomes from the GFSC review of additional requests for analyses made by the Council during June 2021 for the length-based data-moderate stock assessments for copper rockfish in northern and southern California. The SSC endorsed the assessments as the best scientific information available and suitable for informing management decisions. However, the Council delayed adoption of the California assessments pending some additional considerations regarding additional sources of length information, age and growth information, and assumptions about selectivity time blocking to address depth and spatial restrictions implemented beginning around 2001.

The addition of commercial passenger fishing vessel (CPFV) length data to the copper rockfish models resulted in little change compared to the base models and did not merit changes to the endorsed base models. The historical CPFV length data from the 1970s-1980s should be further explored in future assessments.

Otoliths the California Collaborative Fisheries Research Program (CCFRP), the California Department of Fish and Wildlife (CDFW), the Southwest Fisheries Science Center (SWFSC), and thesis research by Jeff Abrams at Humboldt State University (HSU) are being aged by the Northwest Fisheries Science Center (NWFSC) aging lab, but new ages were not available in time for the assessments provided to the GFSC review. All new age data for copper rockfish, available from the NWFSC, will be reviewed at the Mop-Up Review Panel. In the future, it would be preferable to estimate growth using ages determined from a single lab, if possible, rather than ages produced by separate studies, as is the case in the base model for copper rockfish south of Point Conception.

Exploration of model sensitivity to allow for selectivity changes due to depth closures impacting the availability of fish to the fishery starting around 2001 resulted in little change compared to the base model south of Point Conception and did not merit changes to the endorsed base model. North of Point Conception, the model with the 2001 time block was more optimistic (52.5% depletion) than the base model (39.3%), though there was a similar trend of increasing abundance in the base model. Though the fit of the model to composition data was improved, the additional time block was not implemented, in favor of parsimony in the base model given the similarity in upward trends in abundance.

The SSC discussed that using selectivity to approximate the impact of closed areas is not an ideal approach. Sampling in areas closed to fishing with a fishery-independent survey would be preferable to attempts to capture changes in copper rockfish availability to the fishery through domed selectivity after 2001. New data available in closed areas from remotely operated vehicles (ROVs) and the CCFRP could not be included in the assessment because data-moderate assessments are restricted to commonly used and well understood fishery-independent data sources. While the dome-shaped selectivity after 2001 provides a limited means of representing the change in availability after implementation of closed areas, additional sampling and representation of composition and abundance in closed areas should be a focus of future sampling

efforts. In addition, a two-area model can be pursued in future assessments to evaluate differences in coastal and offshore abundance at islands and banks south of Point Conception.

The SSC endorses the 2021 data moderate assessments for California copper rockfish as category 2 stock assessments for use in stock status determinations and recommends that full assessments be conducted next time. The SSC will reconsider the assessments for use in management if fits to the new age-length data reported to the Mop-Up Review Panel are substantially inconsistent with the existing growth curves.

Discussion of criteria for combining regional assessments for status determination led to the question of best practices for combining assessment results. A spatially stratified assessment does not necessarily imply stratified stock status determination. In the case of copper rockfish, there is limited direct evidence for distinct stocks. The use of deterministic recruitment could be driving the different trends between assessment areas. For copper rockfish there is uncertainty in the biological stock structure that requires further work. The SSC agreed that the rebuilding analysis for the Mop-Up Review Panel would include a table that lists the various sources of information that could lead to a decision on whether to pool northern and southern California stock assessments for status determination. This table would list each source, and the strengths and weaknesses of each information source. The rebuilding analysis will pertain to southern California but the document should report stock status if northern and southern California are pooled.

The SSC deferred a conclusion on pooling or splitting the California stock assessments to the Mop-Up Review Panel where two options will be evaluated: 1) a rebuilding analysis based on the SSC-endorsed southern California model, and 2) one based on the stock assessment guidance from combined California copper rockfish assessments.

Quillback Rockfish

The SSC reviewed and discussed outcomes from the GFSC review of additional requests for analyses made by the Council during June 2021 from the length-based data-moderate stock assessment for quillback rockfish in California. The SSC endorsed the assessment as the best scientific information available and suitable for informing management decisions. However, the Council delayed adoption of the assessment pending some additional considerations regarding additional sources of length information, age and growth information and estimation, outliers in the catch history, and selectivity blocking considerations to address depth restrictions implemented in 2001.

The addition of CPFV length data to the quillback rockfish models resulted in little change compared to the base models and did not merit changes to the endorsed base models. The historical CPFV length data from the 1970s-1980s should be further explored in future assessments.

The additional quillback rockfish otoliths from the CCFRP, the CDFW, the SWFSC and thesis research by Jeff Abrams at HSU, provided after the June Council meeting, are being aged by the NWFSC aging lab. All new age and growth information for quillback rockfish, available from the NWFSC, will be reviewed at the Mop-Up Review Panel. The model endorsed for management and reviewed in the STAR panel explored alternative options for growth estimation. The model is sensitive to parameterizations for growth. Thus, there is a continued need to investigate age and length data and growth estimation for quillback rockfish.

The sensitivity analysis conducted to evaluate the use of a lower catch scenario addressing outliers and methods used to fill gaps resulted in a more pessimistic stock status and a lower biomass estimate. Concerns remain regarding potential outliers in the catch history and methods used to inform periods when direct estimates are unavailable. Nearshore rockfish catch history reconstructions in California should be improved.

Exploration of model sensitivity to allow for selectivity changes due to depth closures impacting the availability of fish to the fishery beginning in 2001 was conducted. The analysis of a 2001 and a more recent 2017 time block for the commercial and recreational fisheries resulted in selectivity that was implausibly shifted to the right after 2017. Additional analysis of a time block in 2001 for the commercial and recreational fisheries provides a means to account for changes in availability due to implementation of depth restrictions. Considerations discussed regarding the representation of closed areas in stock assessments for copper rockfish are also pertinent to quillback rockfish.

The SSC endorses the 2021 data moderate assessment for California quillback rockfish as a category 2 stock assessment for use in stock status determination and recommends that the next assessment be a data-moderate assessment. The SSC will reconsider the assessments for use in management if fits to the new age-length data reported to the Mop-Up Review Panel are substantially inconsistent with the existing growth curves.

The SSC will review a rebuilding analysis based on the SSC-endorsed California model for quillback rockfish at the Mop-Up Review Panel and requests a rebuilding sensitivity analysis with abbreviated results using the model includes the 2001 time block for the recreational and commercial fleets. This sensitivity analysis will provide results from a model that recognizes changes in availability from the depth restrictions implemented in 2001, within the bounds of the TOR, for comparison to the results of a base model, which does not account for changes in availability because it assumes asymptotic selectivity for the entirety of the time series.

Squarespot Rockfish

The SSC reviewed and discussed outcomes from the GFSC review of additional requests for analyses made by the Council during June 2021 from the length-based data-moderate stock assessment for squarespot rockfish in California. The SSC endorsed the assessment as the best scientific information available and suitable for informing management decisions. However, the Council delayed adoption of the assessment pending some additional considerations regarding additional sources of length information, and selectivity blocking considerations to address depth restrictions implemented in 2001.

The addition of CPFV length data to the squarespot rockfish models resulted in the new data being poorly fit by the model. Therefore, no changes were made to the endorsed base model. The historical CPFV length data from the 1970s-1980s should be further explored in future assessments.

Exploration of model sensitivity to allow for selectivity changes due to depth closures impacting the availability of fish to the fishery beginning in 2001 resulted in more optimistic outcomes but

resulted in a less stable model. Thus, no changes were made to the endorsed base models. Considerations discussed regarding the representation of closed areas in stock assessments for copper rockfish are also pertinent to squarespot rockfish.

The SSC endorses the 2021 data-moderate assessment for California squarespot rockfish as category 2 stock assessment for use in stock status determination and recommends that the next assessment be a data-moderate assessment.

Catch-Only Projections

The SSC reviewed the historical catches and model results from catch-only projections for arrowtooth flounder, petrale sole, canary rockfish, and darkblotched rockfish. In each case, updated total catches were derived from Groundfish Expanded Mortality Multiyear reports and the estimated 2020 and projected 2021 and 2022 catches were provided by the Groundfish Management Team. For years 2023 through 2032, Acceptable Biological Catches were assumed for each catch-only projection.

The SSC noted that there was an error in the sigma value reported in the canary rockfish documentation (i.e., $\sigma = 1.0$ was reported in Attachment 11 rather than the correct $\sigma = 0.5$ which was used in the analyses), which should be corrected for the record. The Scientific Uncertainty Buffer Fractions were based upon a Category 1 assessment with $P^* = 0.45$ for petrale sole, canary rockfish, and darkblotched rockfish and a Category-2 assessment with $P^* = 0.40$ for arrowtooth flounder. The SSC endorses the catch-only projections for management purposes of arrowtooth flounder, petrale sole, canary rockfish and darkblotched rockfish.

Yelloweye Rockfish Catch Report

The SSC reviewed the Yelloweye Rockfish Catch Report for 2015-2020. The SSC notes that estimated total mortality (mt) from 2015 through 2020 (Table 1, Attachment 13) has been less than the annual catch limits, indicating adequate rebuilding progress for yelloweye rockfish.

SCIENTIFIC AND STATISTICAL COMMITTEE'S GROUNDFISH SUBCOMMITTEE REPORT ON ADOPT STOCK ASSESSMENTS

The Groundfish Subcommittee of the Scientific and Statistical Committee (GFSC) met via webinar on August 17, 2021 to review the California rockfish data-moderate assessments, the spiny dogfish assessment, and benchmark assessments reviewed under the two July STAR panels. The GFSC provides the following observations and recommendations.

Lingcod

The Scientific and Statistical Committee's Groundfish Subcommittee (GFSC) reviewed the 2021 north and south stock assessments for lingcod and the stock assessment review (STAR) report from the July 2021 review of the assessments. In terms of major changes from the 2017 assessment, a new boundary was selected for the north and south assessments based on new genetic results pointing to separate stocks diverging in the vicinity of Cape Mendocino (40°10' N lat.); length data were treated as male, female and unsexed; conditional age-at-length was used only for data with sex associated, unlike in the previous assessment where unsexed individuals were assigned 50:50 to sex regardless their size; and the prior natural mortality for the 2021 models used 99th percentile age as basis for the prior, rather than the maximum age observed. The final base models changed a lot from the draft models and documents provided to the STAR panel.

The following sources of data were used in these assessments which considered two different models, a northern and a southern model: 1) catch data begin in the late 1800s, and there was some improvements to historical catch estimates in these assessments; 2) commercial catches were separated by gear types (i.e., trawl vs fixed gear), recreational catches were state-specific (but not mode-specific i.e., Commercial Passenger Fishing Vessel (CPFV) vs. Private); 3) there is a lot of age data from fisheries in the northern model and much less in the southern model, which relied mainly on West Coast Groundfish Bottom Trawl Survey (WCGBTS) age data; 4) there is a lot of fisheries-dependent and fisheries-independent sources of information (i.e., length composition and indices in both models); 5) length data for males, females and unsexed individuals and the conditional age-at-length (CAAL) data were for males and females only; and 6) discard was modelled for commercial fisheries based on West Coast Groundfish Observer Program (WCGOP) data (there were some issues with that).

In terms of differences between northern and southern models, estimated natural mortality (M) rates were 0.42 $year^{-1}$ and 0.41 $year^{-1}$ for females and males in the northern model whereas M values for the southern model were 0.17 $year^{-1}$ and 0.22 $year^{-1}$ for females and males, respectively. Steepness was also estimated and varied between northern and southern models, with higher estimates in the northern model at 0.80. These differences in the estimates of natural mortality were discussed extensively during the STAR Panel. There was consensus that neither model was capturing the key aspects of the population dynamics.

In respect to indices, both models were very informative (i.e., using fishery-independent and fishery-dependent data). The gear was fixed to the main indices in the southern model which include trawl fishery catch per unit effort (CPUE) index, recreational indices from California (dockside index), Triennial trawl survey index, WCGBTS index, hook-and-line (H&L) survey index, and the recreational (DebWV) observer index from the late 1980s to late 1990s. In general, these indices provided robust information on trend and stock status. There were several other indices that were not used; such as the California Collaborative Fisheries Research Program (CCFRP) index in the southern model, which is a fishery-independent hook & line survey index that surveys both inside and outside the state MPA network. In the northern model, there were also a lot of indices: a commercial trawl fishery index; commercial fixed gear index (based on logbook data from Oregon and Washington); recreational OR index; recreational WA index; recreational CA index; Triennial survey index; and the WCGBTS index.

Both models exhibited tension among many data sources, particularly between age and length composition data. The STAR Panel discussed and explored evidence which might be related to this tension, including time-varying growth, Lorenzen natural mortality, and sex-specific selectivity patterns. These suggestions often improved the model fit and helped to explain some of the variance, as well as some issues with the scaling and tension among the data sources, though these explorations did not fully resolve the tension.

With respect to the sex-specific selectivity, the general pattern of the length-based selectivity for the northern model was that females were much less selected than males for the commercial fixed gear fishery. It was also lower for the commercial trawl fishery but not much as for the fixed gear. In the southern model, there was a similar pattern for the commercial fixed gear. Exploratory analyses confirmed that data supported some form of sex-dependent selectivity in the fisheries. There were some attempts to model that feature; however, further research is needed to find the best way to capture these dynamics within the model structure.

To understand the divergence in the natural mortality rates, a number of Panel request were made, such as tightening the prior on M, exploring sex-specific selectivity offsets, and doing both of those simultaneously. Using the sex-specific selectivity offsets led to a large scaling up of abundance in the model. It was also noted that using a more informative prior did not substantially change the model estimates of M, indicating that there were sources of information in the data that were leading to a higher estimate of M in the north relative to the south.

In terms of the assessments results, the southern model suggested stock declines below the target levels and spawning potential ratio (SPR) above, from the late 1980s through the early 2000s when catches were greatest, with recent increase in abundance associated with a series of strong year classes which included 2008, 2010, and 2013. There was a poor recruitment in general from 2014 onwards, which led to declines in the forecast near-term, and resulted in a model slightly below the management target. There was a brief decline below the management target in the northern model in late 1980s; however, the base model result suggests that harvest rates were never above the target levels. The current status reflects recent strong recruitment in 2013 and 2018, though there was a reasonably stable population trend in the forecast which depended more on removals than recruitment trends.

The likelihood profiles on the natural mortality rate in both the southern and northern models, revealed considerable tension between the length composition and age composition (note that in the southern model the WCGBTS was the only source of age data). In the southern model it was noted the contradictory nature of data where length data search for lower estimates of M, whereas age data higher estimates of M. The pattern observed in the northern model differed, where the age composition data searched for very high M estimates, and the length composition data also tended towards very high M. The survey indices in the northern model were primarily driven by a single survey (Rec_WA).

The posterior estimates of model parameters were very different between the northern and southern models. In terms of the nature of scaling indicated by retrospective analyses, in the southern model it scales up and down when recent data was removed. There was a considerable level of uncertainty in scaling for this model. It was also pointed out that the model was not tuned (e.g., using time blocks for selectivity), which would probably make the fits more sensitive when removed recent years of data. The retrospective for the northern model was more sensitive when recent data was removed and the relative change in fraction of unfished spawning biomass was considerably more stable relative to scaling the spawning biomass.

The 2021 models changed considerably in comparison to 2017 models. Some of the differences in scaling between the 2017 and 2021 models could be explained by the boundary change where part of the catches from California were considered in the northern models instead of the southern model. The cumulative equilibrium MSY values were also very comparable to the 2017 models.

For the decision tables, the natural mortality rate was chosen as the appropriate axis of uncertainty in the southern model, with the high and low states of natures based on the high (0.22) and low (0.11) quantiles of female natural mortality. The catch stream advice was provided by the GMT. Based on estimates of poor recruitment between 2014 and recent years, most of the model trajectories indicated a stable or a slightly declining trend for all three scenarios. All trajectories led to depletion estimates within the precautionary zone over the next decade. For the northern model, the "expert judgement approach" was used to address the key uncertainties in the model. The ‘high’ state of nature was created by excluding the fishery-dependent age data, whereas the ‘low’ state of nature consisted of a model with sex-specific selectivity; both choices reflected uncertainty in model structure. The depletion estimates were considerably comparable across all three states of nature. The objective was to develop alternative states of nature that reflect the uncertainty in the model and the risk of the resource. For the low state of nature, fishing based on harvest policy rates ($P^* = 0.40$ or 0.45), will trigger risk to the resource in the longer term. Therefore, it was recognized that indices used in the model were very informative relative to the stock status.

In terms of merits of the assessment, there were considerable improvements made since the 2017 assessment, which included the new boundary between the northern and southern model based on genetic analysis. Both assessments were relatively data-rich with a considerable amount of fishery-dependent and fishery-independent time series data, length composition, and age data (all of which were modeled as CAAL). The models estimated key productivity parameters as recommended in the 2017 assessment and indices generally appear to provide robust and timely information on stock status.

The main deficiencies were the tension between age and length/index data in the northern model, and especially the lack of fishery-dependent age data in the southern model. There were very large differences in the estimates of natural mortality, which could be related to differences in stock structure and genetics or potentially habitat-driven differences related to life history types. There were some non-intuitive differences which included fishery selectivities (e.g., WCGBTS) between the northern and southern model. There was also lack of consistency between biological and fishery parameters which is an indication of a poorly informed growth model.

Several issues were raised by the GMT and GAP regarding data quality and fit. The fits to discard data were very poor, there was difficulty in disentangling retained (dead) vs. discarded dead catches in California, there was a disconnection between some age data, and there is variation in how sampling takes place within the states.

The challenges that were faced in these current assessments were also present in the 2017 model. The considerable tension among data sources appeared to suggest two divergent life history types, one high and one low productivity, which led to some discomfort with the results. There were many research recommendations to improve future assessments, including exploration of different ways to model sex-specific selectivity, investigating some differences in ecology and fishing strategy throughout the fixed gear fishery, additional exploration of natural mortality rates, the inclusion of the CCFRP dataset as data source, and additional and expanded age structure collection for the southern model for both fishery dependent and fishery independent sources.

The GFSC recommends the stock be assigned to category 2 considering the scaling issues observed in model results and the tension between age and length data, particularly in the northern model, which remains to be resolved. The GFSC recommends that the next assessment of lingcod should be a full assessment due to the technical issues discussed in the assessment and STAR panel report.

Vermilion and Sunset

Full assessments for vermilion and sunset rockfishes in southern California, northern California, Oregon, and Washington were reviewed at a STAR panel meeting during the last week of July. The geographic area designations were made due to sunset rockfish being found almost entirely south of Point Conception, and due to the separation of habitat in Washington vs. Oregon, as well as differences in exploitation history and data availability. Previous attempts at a full assessment in 2005 and a data-moderate assessment in 2013 for portions of the west coast had not been endorsed for use in management.

Drs. E.J. Dick and Melissa Monk of the Southwest Fisheries Science Center (SWFSC) presented assessments of the areas south and north of Point Conception within California, respectively. Dr. Jason Cope of Northwest Fisheries Science Center (NWFSC) presented the Oregon and Washington assessments.

Model complexity decreased from south to north as fewer data sources were available and sample sizes declined with distance from the center of the species' primary distribution in central/southern

California. This is also consistent with the diminishing relative abundance of sunset rockfish from central California.

All area models had data on catch, length, age, and conditional age-at length, estimate growth and recruitment deviations, and use Francis weighting.

Natural mortality is estimated separately for males and females using the Hamel prior with a median of 0.1, though fixed to be the same for both genders in the southern California model.

Steepness was fixed at 0.72 in all model areas except for southern California, where it is estimated at 0.73.

Washington area: There was no index available in this area, and generally low sample sizes, yet the model was found to be relatively robust to alternative assumptions despite a paucity of data. There was a minor retrospective pattern. There remains substantial uncertainty in stock scale given the amount of data, especially toward a larger population. The decision table is based upon alternative natural mortality rates.

Oregon area: There was a single fishery-dependent index for this area, a recreational dockside index for 2001-2020. There was a minor retrospective pattern and lack of data on small fish to estimate the last four recruitment deviations. The decision table is based upon alternative natural mortality rates.

Northern California area: While the northern California area has far more vermilion rockfish than sunset rockfish, there is clear evidence of some sunset rockfish in the areas north of Point Conception, and therefore this assessment includes both species. There were four fishery-independent and four fishery-dependent indices for this area. The onboard Commercial Passenger Fishery Vessel data in particular provided representative information for this stock. The portion of the complex in this area that is sunset rockfish is low but uncertain. The decision table is based upon alternative natural mortality rates.

Southern California area: There was a single fishery-independent index and three fishery-dependent indices used in the southern California model. The Southern California Hook and Line survey and the onboard CPFV data in particular provided representative information for this stock. Natural mortality is estimated to be more than 50% higher than in areas to the north. Uncertainties include that this is a two-species complex and the unknown degree of connectivity to stocks in Mexico. The decision table is bivariate, being based upon both alternative natural mortality rates and stock-recruitment steepness values.

For all models, natural mortality was estimated using the Hamel prior with a median of 0.1, separately for males and females, except in the Southern California model where a single value was estimated.

For decision tables using a catch stream based upon a buffered long-term equilibrium yield, there was some discussion as to whether this should be a time-varying buffer or if the constant category

3 buffer should be applied given the constant long-term equilibrium value replacing the dynamic OFL.

All four model-area assessments estimate stock levels above the target levels in 2021, ranging from 42.7% in northern California to 73.0% in Oregon. However, the asymptotic uncertainty intervals for Washington and for northern California do include levels below the minimum stock size threshold.

The SSC GFSC endorses all four models as best scientific information available for use in management. The Washington assessment is recommended as a category 2 assessment due to the paucity of data and resultant uncertainty; the Oregon assessment as a category 1 assessment; and the Southern California assessment as a category 2 assessment due to being a complex of two species. While the STAR panel suggested category 2 for the Northern California assessment, the GFSC did not reach a recommendation whether this assessment should be category 1 or 2 as the proportion of sunset vs. vermilion rockfish in that area is quite small and may not be large enough to justify a category 2 designation.

Because this is the first adopted set of assessments for vermilion and sunset rockfishes and there is more to explore and analyze, including population breaks, the GFSC recommends that the next assessments should be full.

Spiny Dogfish

The GFSC reviewed additional requests for analyses made by the Council at the June 2021 meeting for the new benchmark stock assessment for spiny dogfish. Specifically, the Council requested the spiny dogfish STAT conduct additional analyses to further investigate the WCBTS catchability coefficient (q) derived in the assessment, similar to those described in Agenda Item G.5.a Supplemental SSC Report 1, June 2021, prior to considering adoption of the assessment. Responses to these requests were presented by Drs. Vlada Gertseva and Ian Taylor (Northwest Fisheries Science Center; NWFSC).

Request 1: Conduct an analysis (accounting for spatial and year effects) of the difference in catch-rates in the WCGOP (and potentially Pikitch et al. 1988 and At Sea Hake Observer data) seasonally to assess the component of q attributable to seasonal differences.

Rationale: The relative catch-rates may provide information on the relative availability of the stock, possibly representing the relative amount of the stock in U.S. waters, at different times of the year, which will inform, in part, catchability, or a prior for that parameter.

Response: Maps of monthly CPUE from WCGOP data, including the bottom trawl and midwater trawl fisheries, show that there is no indication that fish are absent from the survey region during the survey months and that the spatial stock dynamics appear to be more complex latitudinally rather than seasonally. Specifically, the data indicate that spiny dogfish are a transboundary stock with higher catch rates near the Canadian border. The sample sizes in the midwater trawl fishery are limited compared to those in the bottom trawl fishery. Maps of survey data by pass also show

dogfish throughout the survey area, with higher catch rates in the north. Movement rates of spiny dogfish over the U.S.-Canada border are not known.

The stock assessment team (STAT) also provided a line graph showing CPUE (kg/hr) by month for both the survey and fishery data (averages of data, not generalized linear model (GLM) output) that shows that WCGBTS catch rates are higher than the fishery data during the months when both are operating. These plots illustrate that the behavior of survey and the fishery are different, likely due to fishery avoidance of high spiny dogfish bycatch areas and targeting of hake.

Given the targeting of hake by the fishery and the apparent avoidance of spiny dogfish bycatch resulting in summer survey catch rates that are higher than those in fishery, it is not clear how survey q could be informed by fishery CPUE. The fishery appears to be observing a smaller fraction of the spiny dogfish stock than the survey. This suggests that future analyses need to focus on the spatial scale of this transboundary stock, particularly since both U.S. and Canadian waters have observed declining stock trends, and it is not clear if these declines are stock-wide or due to movement of fish out of survey/management areas.

Discussion: The SSC requests that a table of the line graph showing CPUE (kg/hr) by month for both the survey and fishery data be provided for the report. Additionally, if possible, the SSC would like to see month effects from a GLM using these data. The STAT notes that changes in fishery behavior are likely to hinder modeling and that it is not clear how an improved value for q would be derived from this analysis given that there are other considerations for informing q that are not informed by currently available data. Specifically, the fishery catch rates vary latitudinally across time, which suggests that any analysis will require both temporal and spatial components. Also, this analysis should include collaboration with Canadian scientists and Canadian data given the transboundary nature of the stock. The STAT requested that further requests specify how these requests would be applied in the 2021 assessment.

The GFSC discussed the importance of investigating any available transboundary survey data that can inform dogfish distribution changes over time, specifically the proportion of fish in US waters. The International Pacific Halibut Commission longline survey data was noted as one possible avenue of investigation. The STAT noted ongoing work with Canadian researchers evaluating the ability to produce an analysis of all survey data across regions to investigate movement and environmental drivers of movement, and that this work addresses research recommendations.

Request 2: Provide “Piner” plots for the profile over catchability in the base model.

Rationale: Figure 129 in the assessment provides the likelihood contributions of each type of data but not for the individual data sources. These would help inform what is driving the estimation of q.

Response: Piner plots for survey q show that there is no conflict with regard to q within the survey indices and length data sources. The likelihood profile for survey q provided in the original assessment shows a conflict between the length data and indices such that the index data suggest higher q values and the length data suggest lower q values.

Discussion: The SSC notes that the likelihood profile suggests a wide range of plausible values of survey q, given the data and model, with the likelihood profile showing a range between approximately 0.14 and 1.22.

Request 3: Conduct additional bridging (and/or retrospectives) and profiles over catchability for intermediate changes to the data and assumptions of the model to better understand the reason(s) in the data for the change in the best estimate of q (hence the scale and depletion of the model outcomes).

Rationale: The value of q changed markedly between the last and current assessment. This analysis should help inform what is driving the estimate of q.

Response: The STAT illustrated that the change in survey q is being driven by the addition of new data, including new age data prepared for the 2021 assessment and an updated fecundity relationship that more accurately accounts for the 2-year gestation period. Model tuning did not result in large changes to q given the inclusion of all of the new data. Changes in the estimate of virgin biomass are due to accounting for the gestation period of spiny dogfish, which is an improvement over assumptions used in the 2011 assessment.

These requests sought to gain insights into the fundamental questions of the magnitude of survey q and what informs survey q. The weight of the evidence suggests survey q is less than 1 and that changes in q are driven by the addition of new age data. Furthermore, the updated fecundity relationship decreases the estimated scale of the population, which directly impacts derived values for survey q. The GFSC supports the future research recommendations provided during the June 2021 SSC meeting.

The GFSC and NWFSC staff discussed the time constraints within the PFMC process and limited NWFSC staff availability prior to September meetings. The NWFSC noted a willingness to seek resources to try to address any possible requests for further analyses prior to September meetings if these analyses have a clear path to informing SSC discussions in September. Any requests will need explicit guidance from the GFSC regarding what is to be done and how the analysis will be used in the stock assessment.

Request for additional analysis: The GFSC suggests that an analysis of the seasonality of bycatch rates of spiny dogfish from WCGOP and other available data sources (e.g., ASHOP, Pikitch et al. 1988 bycatch study) should be conducted to evaluate whether the data indicate a strong seasonal availability of spiny dogfish as bycatch to fisheries. A reasonable way to do this would be to examine haul-specific catch rates in a GLM or delta-GLM (depending on the frequency of occurrence of spiny dogfish in a given dataset), with the primary factor of interest being month (or some other seasonal variable, such as Julian day bins, two month periods, etc. as appropriate given the data) as a factor, along with appropriate covariates that were determined by the analyst. These might include year, depth, latitude/state or region, vessel size or power, gear type, stated fishing strategy, or comparable information. Alternatively, it may be feasible to explore the use of modeling frameworks such as VAST or 'sdmTMB' (see https://pbs-assess.github.io/sdmTMB/index.html) to develop this analysis. It may also be appropriate to do separate analyses by region (e.g., Washington coast, Oregon coast, Northern California coast), in

addition, depending on data availability, in order to facilitate interpretation of model results. As with any such model an exploration of available information and relevant covariates will require some exploratory work, but GLMs and delta-GLMs are standard tools for any assessment analyst and the precise approach should be at the analyst's discretion.

Rationale: The results should provide an indication – albeit imperfect as there will certainly be challenges associated with developing a conclusive result from these data sources – of the relative differences in catch rates of spiny dogfish by fisheries participants. This alone should provide some insights to the SSC and to the PFMC (who made the formal request) with respect to how encounter and catch rates in the fisheries themselves appear to change seasonally, and thus the extent to which the model-estimated q was consistent with seasonal fluxes in catch rates. For example, if catch rates were on average 10x greater between November and March than those between April and October, then a survey estimated q greater than 0.5 for a survey that exclusively takes place between April and October may be a questionable model result. In such a scenario, there may be the potential to develop a weakly informative "upper bound" prior for catchability based on the ratio of bycatch rates during the months during which the survey takes place relative to the months in which spiny dogfish are likely to be more abundant. This request does not include an explicit request to develop such a prior, but rather will provide the SSC with a basis for considering whether such an approach might be feasible and worthwhile in light of the limited time remaining in this stock assessment cycle.

Copper Rockfish

Length-based data-moderate stock assessments for copper rockfish in southern California, northern California, Oregon, and Washington were reviewed by the GFSC on June 21, 2021 and by the full SSC on June 23, 2021. The SSC endorsed the assessments as the best scientific information available and suitable for informing management decisions; however, the Council delayed adoption of the California assessments pending some additional considerations regarding additional sources of length information, growth information and selectivity time blocking considerations to address depth restrictions implemented in 2001. Although the discussion did not follow the numerical sequence of requests, we have maintained that format for purposes of reporting the requests, responses, and discussion points.

Request 1: Evaluate alternative selectivity time blocking given the timing of depth restrictions north of Point Conception, California. In particular, add a time block starting in the early 2000s, and allow dome-shaped selectivity, and consider additional time blocks.

Rationale 1: Input from the GAP and GMT indicate that asymptotic selectivity for the recreational fishery may not be a realistic assumption, although this assumption was made based on the 2021 stock assessment Terms of Reference (pg 36) requiring evaluation of asymptotic selectivity for at least one fleet. It may be more realistic to consider blocking the period before regulations that restrict fishing to shallower areas in the early 2000s (asymptotic or domed), then consider domed shape assumptions thereafter, perhaps with a separate dome shape after 2016 when regulations were implemented that allowed some access to deeper depths.

STAT Response: Note that these runs were conducted with the models that included the additional length information provided in request 3. The STAT conducted a detailed exploration of both a simple and a complex suite of options for implementing time-varying selectivity for the copper rockfish assessment model. The "simple" approach was to add a 2001-2020 time block to the recreational fishery, and a 2001-2008 time block (complimenting the existing 2009-2020 time block) to the commercial fishery, for a total of two time periods for the recreational fishery and three for the commercial fishery (for which the recent blocks could be dome-shaped). The most complex model tracked the table of "% area open" provided by CDFW to develop four distinct time blocks (for a total of five selectivity blocks) for both the commercial and recreational fleets (1916-2000, 2001-2002, 2003-2007, 2008-2016, and 2017-2020), with all but the earliest blocks allowed to be dome-shaped.

The STAT found that the "simple" approach led only minimal changes in selectivity for the commercial fleet (e.g., the 2001 - 2007 block), with a sharp decline in selectivity for only the largest size classes. The recreational selectivity for the recent time period was estimated to be strongly dome-shaped. Results were comparable with the more complex time-blocking, with strong doming in the post-2008 time period for commercial, only modest changes for the time blocks prior to 2008, and very comparable dome-shaped selectivity functions for all of the time periods (in which selectivity drops to low levels between ~45 and 60 cm size) for the recreational fisheries. Both explorations indicated that the model does fit the data better with some level of doming in many of these time periods, although the results tend to be highly comparable between the smaller number and the larger number of time periods. Specifically, the simple blocking improved fit by 28 negative log likelihood (NLL) units (at cost of 8 additional parameters), while the complex improved fit by 39 NLL units (at cost of 23 parameters). Both alternative models resulted in a moderately more optimistic perception of stock status (to 52.5 and 46.4% of unfished biomass, respectively, from 43.6% with new length data only).

Discussion: The STAT and the GFSC discussed the extent to which general guidance that assessment models should include fleet that had asymptotic selectivity should specify such selectivity over all time or just over some time periods. Concerns were raised by both the STAT and the GFSC regarding how best to balance model complexity and parsimony in the data moderate assessments. The STAT noted that they did initially explore making the pre-2000 recreational fishery domed, but at that time there was no substantive improvement in the fits to those data with dome-shaped selectivity for that fishery and time period. Neither the STAT nor the GFSC considered that the base model should be changed to reflect this alternative model structure.

Concerns were expressed by the CDFW representative about the base model not acknowledging the depth restriction changes enacted in 2001 given their likely effects on availability of size classes and representation of only areas open to fishing in the fishery independent data sources in the assessment despite implementation of expansive RCAs (closing up to 41% of habitat the last 20 years) and MPAs (closing up to 20% of the habitat for 8-13 years).

Request 2: Evaluate estimation of a separate dome-shaped selectivity curve for recreational and commercial fisheries after 2001 south of Point Conception. In particular, add a time block starting in 2001 to each of recreational and commercial selectivities.

Rationale: Given the large percentage of habitat area closed to fishing in the Cowcod Conservation Area, marine protected areas, and Rockfish Conservation Areas, additional grounds were closed to fishing post-2001, making more of the offshore adult biomass inaccessible, which can be reflected by a stronger dome shape to the selectivity after implementation of closures that cover almost 50% of the grounds predominantly in deeper waters where larger adults are expected to be found. The assumption of dome shaped selectivity prior to 2001 is reasonable given the distance of offshore banks and islands up to 100 miles offshore (i.e., Cortez bank).

STAT Response: For this model, both commercial and recreational fleets were allowed to be domed, while the NWFSC hook and line survey selectivity remained asymptotic. The STAT developed a similar approach as done for the northern model, in which increasingly complex options for time blocking were enabled. As with the northern model, the more complex time blocking led to similar results as those for the simpler blocking. The "simple" results led to improvement of 10 NLL units with the addition of 6 parameters, while the more complex time blocking led to an improvement of 19 NLL with 18 parameters. Results suggested a slight reduction in initial spawning output relative to the June base model, and the ending year fraction of unfished biomass was slightly more optimistic than the model with additional early length data alone. However, the results were virtually unchanged from the June base when all changes were made together.

Discussion: The hook and line survey allowed evaluation of domed selectivity for the recreational and commercial sectors for the entire time series, unlike north of Point Conception where no fishery independent survey was available. The block allowed the change in regulations in 2001 to be captured despite being domed in both time periods in attempts to capture the change in availability of fish in the CCA, RCAs and MPAs making up nearly 50% of the habitat south of Point Conception. Despite the potential changes in availability, the stock status proved to be robust to the choice of time blocking or selectivity. Neither the STAT nor the GFSC considered that the base model should be changed to reflect this alternative model structure.

Request 3: Add the length data from the historical onboard CPFV surveys from the 1970s and 1980s from Crooke and Alley south of Point Conception and 1980s and 1990s northern California survey north of Point Conception noted in Table 2 of the SSC Report. If time and data allow, explore differences between CPFV and private vessel mode length data to help inform whether adding the CPFV-only length data to a pooled fleet would be appropriate.

Rationale: While the CRFS and MRFSS data may provide consistent sampling over time and space, the sample sizes from the MRFSS era are low due to sampling 30 anglers per day. Addition of these supplementary data sources will help increase the sample size providing more insight on the effects of the low sample size.

STAT Response: The length data provided by CDFW were added to the models. For the south model, this included a large number of length observations in 1978, a small number in 1975 and 1977, and a large number between 1986 and 1989. For the north model, this included a large number of observations between 1987 and 1998. In general, the STAT reported that the lengths tended to be consistent with length observations from the existing data in the model. However, the STAT also reported that it was not possible to easily disentangle the CPFV length data from

the private vessel mode length data in the recreational fleet, in order to evaluate whether including years or additional data from strictly one recreational mode would be appropriate.

The result of adding the new data in the southern model was a slight reduction in starting and ending spawning output, and a slightly more pessimistic model result regarding stock status. For the northern model there was a slight downward shift in early spawning output but similar end result, resulting in a slightly more optimistic estimate of relative stock status. There were modest changes to recruitment estimates in both models. There were modest changes in recruitment estimates when adding early data.

Discussion: Given uncertainties associated with including lengths from only one of the two primary recreational sectors, neither the STAT nor the GFSC considered that the base model should be changed to reflect this alternative model structure. It was also noted that the unpublished technical memo associated with the southern 1975-1978 sampling documented a larger number of length data for copper rockfish in that study. Upon some investigation it was noted that many of those data were coded with the species code for "whitebelly rockfish" (2347), rather than "copper rockfish" (2308), which should be accounted for in future uses of this data source.

Request 4: Age otoliths and use corresponding lengths from samples collected in Northern California and compare results to the growth curve from samples collected in Oregon and Washington. Otoliths should be provided as requested in the NMFS Report 1 (Agenda Item C.10, Supplemental NMFS Report 1, June 2021).

Rationale: Comparison of ages and lengths of fish sampled in northern California to the growth curve derived from samples collected in Oregon and Washington will provide a means of examining whether the growth curve provided by them are representative of growth in California.

Request 5: Age the remaining copper rockfish samples collected by the Hook and Line survey and compare them to the growth curve in the range currently represented by samples collected and aged by Love et al. informing the growth curve south of Point Conception in addition to other samples from the survey.

Rationale: The growth curve was derived by combining sampling and ageing from two separate studies (Love 1999 vs. WCBTS/Hook and Line Surveys aged by CAP) over differing parts of the growth curve. This is a source of uncertainty in the growth estimates south of Point Conception. Comparison of ages and lengths from samples collected over the remainder of the growth curve from the hook and line survey would better inform whether the combined sources currently informing the growth curve are consistent in terms of age determination potentially affecting the shape of the growth curve.

STAT Response to Requests 4 and 5: Additional age structures not available to original assessment have been provided to the NWFSC aging lab. However, age estimates are not yet available and will take some time to develop, results should be available for a "mop-up" panel review, if necessary. This includes 87 age structures provided by CDFW, 38 from the California Cooperative Fisheries Research Program (CCFRP) MPA monitoring survey, 430 from SWFSC research efforts and surveys, and 200 from the West Coast Groundfish Bottom Trawl Survey.

Overall, there are limited samples (~32) from small fish to inform the lower part of the growth curve. The STAT noted that the northern model would be more optimistic with a lower length at Amax. For the south, it was also noted that the small fish used to simulate observations for the growth curve were from Lea et al. 1999 not Love et al., and that the WCGBT and hook and line survey provide a considerable number of age estimates to inform that growth curve. Results shown by the STAT indicated that the south model is relatively insensitive to the estimate of Length at Amax or the von Bertalanffy growth coefficient (K), based on profiles across Linf and K with respect to changes in derived quantities.

Discussion: The STAT suggested and the GFSC agreed that unless the age data from the additional otoliths indicate considerable differences between the current base model growth curve and a revised growth curve informed by additional data, neither base model is likely to change substantially.

Request 6: Evaluate the appropriateness of a statewide assessment for copper rockfish vs. stratification at Point Conception and provide a statewide assessment for comparison to stratification at Point Conception if appropriate and if technically feasible with the limited time available.

Rationale: The assessment was stratified at Point Conception in part due to interest in comparison to previous assessment results as well as interest in evaluating finer spatial stratification given historical exploitation patterns. Population structure was weak in genetic studies (Sivasundar 2010) and potential for demographic connectivity between regions provides an impetus to examine the state-wide model. Evaluation of considerations related to stock structure and modeling considerations/limitations will inform the most representative stratification. If a statewide model is conducted, the stratification of fleets should be given careful consideration, particularly as to whether separate fleets should be designated for either (or both) commercial and recreational fisheries north and south of Point Conception.

STAT Response: The STAT noted that the proposed stratification was presented at the pre-assessment data webinar held October 26 and 27, 2020, and no comments or concerns around the proposed split north and south of Point Conception were made at that time. The STAT also noted that the 2013 stratification had little to no bearing on the stratification selected for this assessment cycle, and that model bridging is not a factor that is considered when selecting the appropriate model stratification. The STAT noted that in the literature there is little to no evidence of genetic differences, but some suggestion of possible isolation by distance. The STAT also noted potential growth differences south of Point Conceptions, as well as the limited adult movement, differences in exploitation history and differences in patterns in the data. The STAT documented a minor difference in the shape of the maturity function north and south of Point Conception, and minor differences in length at age north and south of Conception. The STAT also noted that model population trajectories are very contrary between the two models.

Discussion: The GFSC noted that Point Conception is a common boundary for either assessment models or fleets (particularly recreational fleets) in models that do span that boundary. There was some acknowledgement that having separate models does not necessarily mean that stock status must or should be determined independently for each modeled region, with the example that stock

status determination for lingcod was historically made on a coastwide basis, by pooling the results of separate models in the northern and southern regions of the U.S. West Coast.

Quillback rockfish

Length-based data-moderate stock assessments for quillback rockfish in California, Oregon and Washington were reviewed by the GFSC on June 21, 2021 and by the full SSC on June 23, 2021. The proposed assessments estimated 2020 depletions of 14%, 47%, and 39% for the stocks in California, Oregon, and Washington, respectively. Though the SSC endorsed the assessments as the best scientific information available and suitable for informing management decisions, the Council delayed adoption of the California assessment. This delay was due to potential errors in point estimates of annual catch in the catch data streams, among other concerns including use of growth from OR/WA samples as a proxy for California due to a lack of available age data, lack of accounting for regulation changes in selectivities through time blocks in the base model or sensitivities, and lack of exploration of additional historical length composition data streams in preference for the consistent collection of California Recreational Fisheries Survey (CRFS) and Marine Recreational Fisheries Statistical Survey (MRFSS) data. Chief among them, the lack of representation of length composition in areas closed to fishing in RCAs the last 20 years and areas in MPAs the last 8 to 13 years, which can only partially be addressed through selectivity considerations. The Council tasked the STAT to check the catch streams and address other requests from a CDFW supplemental Report and the GFSC to re-review the revision. The GFSC formalized the requests and also made requests to CDFW to provide data.

There were a total of five requests to the STAT, three related to input data and two related to model assumption. The requests are re-ordered out of numerical order here to reflect that split.

Dr. Brian Langseth briefed the GFSC on the results of these additional model runs which do not suggest an alternative conclusion from the base model adopted by the SSC in June.

Request 1: Reevaluate the catch history taking into account input from the CDFW Report 1 and Report 2 as well as input from the California STAT member to address apparent outlier estimates and methods for filling blanks between 1990 and 1992 for the MRFSS era.

Response: No revised catch stream was provided by CDFW. Alternative catch values for 1991 (commercial) and 1983, 1993 (recreational) were evaluated in the proposed assessment.

Discussion: The CDFW representative provided proxy catch estimates through averaging of proximate years for all values in question prior to review by the GFSC in June 2021. Further evaluation by CDFW was noted during the meeting as having found small sample sizes, expansion and data borrowing between strata in the 1991 commercial estimate that raised concern about representativeness. These values originate from species composition and expansion methods in CalCOM and PacFIN neither of which are produced by CDFW. The STAT can consider whether to use the alternative time series used in the sensitivity analysis (see report document), provided by the CDFW STAT in May or some variation based on input provided by CDFW at the June Council meeting and further considerations provided in September.

The CDFW representative noted that the 1983 recreational estimate early in the survey's history and 1993 estimate from when sampling by PSMFC resumed after a three year hiatus, were the two highest in the time series. Examination of the values for catch per unit effort and effort estimates (from coastal county phone surveys) were at the high end of the range of values and happened to both be high for many strata resulting in a very high cumulative estimate for the year, which could be considered an outlier or the high end of variability in these estimates. The effort estimates from the coastal county phone survey are notoriously variable and subject to potential avidity bias, thus the estimates are inherently very uncertain and variable.

The CDFW representative noted that application of 1993 recreational estimate as an end point in ramping catch estimates between 1989 and 1993 to fill in blanks in 1990-1992 from cessation of sampling due to funding is not justified given the lack of a cline in values other than 1993 and results in inflated values during the intervening years. An average three years before and after the missing years (1987, 1988, 1989, 1993, 1994 and 1996) is the preferred method of addressing the blanks. Alternative catch values for 1991 (commercial) and 1983, 1993 (recreational), as well as methods to account for missing values from 1990-1992 were evaluated in the proposed assessment as a sensitivity analysis. The CDFW representative expressed concerns with these historical catch estimates.

Request 2: Add the length data from the historical onboard CPFV surveys from the 1980s and 1990s northern California survey conducted by CDFW noted in Table 2 of the SSC Report.

Response: New length data produces similar results.

Request 3: Age otoliths and use corresponding lengths from samples collected in California and compare results to the growth curve from samples collected in Oregon and Washington. Otoliths should be provided as requested in the NMFS Report 1.

Response: New age data available now have low representation of small fish and do not support a plausible CA specific growth curve on their own. There are more otoliths to be aged for use in future assessments.

Discussion: Of the more than 245 additional quillback rockfish otoliths from CCFRP, CDFW and SWFSC provided after the June Council meeting, only 74 had been aged in time for review at this meeting. The new age data available now only include three individuals less than 200 mm to inform the left hand side of the growth curve and do not support a plausible California specific growth curve. A research and data needs subject was identified to conduct onboard CPFV sampling to add samples from smaller individuals. Remaining ages of fish over 200 mm were slightly smaller at age than the remainder of the samples from Oregon/Washington. The fit to the original California data (low sample size of ~20) did reflect a lower L_∞ than the result from the Oregon/Washington samples, which would result in a more optimistic model outcome, however with the addition of the new data from California (n=74 samples), the right hand side of the curve at L_∞ was closer to the result from the Oregon/Washington data than observed previously, though the inflection in the curves still differed. The additional 171 samples available may provide more information on whether the growth curve from samples collected in Oregon and Washington are representative of the stock off of California and can be examined further at the mop-up.

Request 4: Further evaluate the ability of the model to estimate growth. In particular, run one model while estimating L-infinity and another while estimating both L-infinity and k.

Response: Estimating one or both of the growth parameters changed the estimate of stock scale and led to more optimistic estimates of stock status than the base model.

Request 5: Evaluate alternative selectivity time blocking based on the timing of depth restrictions from 2001-present north of Pigeon Point, California where they are commonly encountered. In particular, add a time block (allowing for dome-shaped selectivity) starting in 2001 and consider additional time blocks.

Response: Alternative selectivity blocks and forms on recreational and commercial fleets improved model fits. However, the right shifted peaks in recreational and commercial selectivity in recent time-period (in the block after 2017) are unexplained. Adding selectivity blocks (in 2001 and 2017) also produced higher catch at SPR50% and a more depleted stock.

Discussion: Additional selectivity blocks allowing for dome-shaped selectivity on recreational and commercial fleets improved model fits. There was a lack of clarity as to whether the request was specific to recreational selectivities, as it appeared from the rationale, or to both recreational and commercial fisheries. The CDFW representative provided clarification, a few days prior to the meeting, that it was intended to address both sectors, given that both fisheries were subject to extreme depth restrictions since 2001, being constrained to 20 fm or less north of Pigeon Point. The STAT had analyzed a number of alternatives for the recreational fishery alone and added an analysis of time blocking for both fisheries in 2001 and 2017, as the request was to provide a time block at 2001, and consider other time blocks as appropriate. The time blocking at 2001 and 2017 resulted in right-shifted peaks in recreational and commercial selectivity after the 2017 time-period (Figure 5). While minor additional access to deeper depths has been allowed since 2017, the shift was more extreme than reasonable and appeared anomalous, and the added selectivity blocks produced higher catch at SPR50% and a more depleted stock which was counter intuitive given the portion of the biomass still inaccessible to the fishery.

The CDFW representative noted the importance of evaluating the 2001 time block to capture the change in depth restrictions for both sectors, even if the model proves robust given input received from stakeholders and the regulation history itself. The current base model assuming selectivity is asymptotic for both sectors does not acknowledge the lack of data from the substantial areas (up to 50% of habitat for the stock) that have been closed to fishing since 2001. The representative suggested that the outstanding request for selectivity blocked in 2001 would be needed to fully evaluate alternatives that represent the regulatory history. The subcommittee also discussed use of likelihoods, AIC scores, improvements in fit, and realism given the regulatory history, and evaluation of the robustness of stock status compared to the results from the base model in determining whether the base model should stand. While selectivity cannot completely address the lack of composition data from the areas closed to fishing, the representative argued that it can at least be acknowledged through application of parsimonious time blocking in a reasoned year.
Based on these responses, the GFSC does not recommend revising the base model adopted by SSC in June.

Squarespot rockfish

The first length-based data-moderate stock assessment for squarespot rockfish in California was reviewed by the GFSC on June 21, 2021 and by the full SSC on June 23, 2021. The proposed assessment estimated a 2021 depletion of 37%, which is below the management target of 40%. The SSC endorsed the assessments as the best scientific information available and suitable for informing management decisions, however the Council delayed adoption of the California assessment pending some additional considerations regarding additional sources of length data information and evaluation of selectivity considerations.

Dr. Jason Cope as the STAT lead briefed the GFSC on the results of these additional model runs. There were two requests to the STAT, and these are very similar to both quillback rockfish and copper rockfish, related to input new data, and particularly to selectivity model assumption. The difference from these other species is that squarespot rockfish is a much smaller species and the fisheries are essentially only fishing for the spawning stock.

Request 1: Evaluate estimation of separate dome-shaped selectivity curves for recreational and commercial fisheries after 2001 south of Point Conception. In particular, add a time block starting in 2001 to each of recreational and commercial selectivities.

Rationale: Given the large percentage of habitat area closed to fishing in the CCA, MPAs and RCAs, additional grounds were closed to fishing, making more of the offshore adult biomass inaccessible, which can be reflected by a stronger dome shape to the selectivity after implementation of closures that cover almost 50% of the grounds predominantly in deeper waters where larger adults are expected to be found. The assumption of dome shaped selectivity prior to 2001 is reasonable given the distance of offshore banks and islands up to 100 miles offshore (i.e., Cortes bank).

STAT Response: There was not a south of Point Conception model. There was a squarespot model, most of them were probably south of Point Conception, and the commercial and recreational fisheries were only one fishery since there was basically no commercial fishery. Allowing the model to estimate dome-shaped selectivity results in selectivity dropping dramatically before females reached L_{∞}. The STAT pointed out a couple of attributes that led to this: 1) post-2001, the population size that was being selected for was well below L_{∞}, although there was a portion of fish that were around L_{∞}; 2) the L_{50} value (around 14 cm) leads to selecting only the mature female spawning biomass. The estimated dome-shaped selectivity also moves the initial selectivity to the right, leaving an extraordinarily small amount of fish available to the fishery, and creating cryptic biomass for the entire stock post-2001.

In terms of the fits to the mean length data, the reference model did not have the ability to break into two different time periods (i.e., pre-2001 and post-2001), differently from the dome-shaped selectivity which was able to break the two periods. However, both fits were very similar even though the reference model dropped more across 2013-2020. The composite fit to the length data across all years provided a better fit in the dome-shaped model, however, it was hard to distinguish looking at the individual years.

There were essentially two states of nature and selectivity was the only source of uncertainty: 1) state of nature that exists when you have a logistic selectivity or assume a dome-shaped pre-2001. On both, for the entire time period, the result was an estimation of the population dynamics with very narrow error bounds because all other parameters were fixed in the model; 2) state of nature that exists when you have a couple of combinations of a dome-shaped post-2001. The most extreme model (i.e., dome-shaped pre and post-2001) led to cryptic biomass in both time periods. The dome-shaped post-2001 option estimated a much higher population size, hid a lot of the population away from the fishery, and was highly uncertain. Overall, the logistic selectivity option was more constrained, and also offered a more certain estimate of the population trajectory. However, once uncertainty was allowed in both the scale and also the stock status the model became unstable, producing larger confidence bounds. The bottom line was more uncertainty and much more hidden cryptic biomass when freely estimating a separate dome-shaped selectivity post-2001; therefore, the reference model remains the most conservative of these explored models.

Request 2: Add the length data from the historical onboard CDFW CPFV surveys from the 1970s and 1980s from Crooke and Alley noted in Table 2 of the SSC Report.

Rationale: While the CRFS and MRFSS data may provide consistent sampling over time and space, the sample sizes for lengths from the MRFSS era are relatively low due to low sampling frequency and only sampling 30 anglers per day. Addition of these supplementary data sources will help increase the sample size providing more insight on the effects of the low sample size.

STAT Response: Although the three new length data sources were added to the models runs, the focus for this request was mostly on the addition of the 1970s and 80s data, because the addition of depths of CPFV Central California data (1987-1998) did not change the model. The composite fits of the length composition data using the new data (i.e., historical length composition 1970s and 80s) shows that the new data were poorly fit by the model. The issue with the new data was there are some larger individuals (30 - 40 cm) which would be out of the expected maximum length for squarespot rockfish considering the L_∞ of 27 - 28 cm. Looking at the sensitivity scenarios, the model was most sensitive to the inclusion of the following years of data: 1977-1978 (scenario e); and 1986, 1989 (scenario l). Those were influential years that cause differences in model outputs, compared to the reference model, and have relatively high sample sizes. There is a table in the document that compares the sample sizes used in the new historical data, which are number of fish, with the reference model. The high sample sizes observed in the new historical data come from low sampled trips and are likely upweighted relative to the MRFSS data. There were two to three times as many samples in the new data (e.g., 1977 and 1978) than in any of the other years sampled. Also, the trips in the new data were fewer than the sampled fish, however, if starting with the sample sizes as trips, and not number of fish, those would look like RecFIN numbers and did not change the base model. This means the new historical data was heavily weighting these years using a different metric, numbers of fish, relative to the MRFSS data. There were a lot more sampled individual fish in this new data which was not fitting and caused issues in terms of reconciling these new data.

Discussion: The STAT and the GFSC discussed the presence of larger individuals in these early years of the historical data may be due to species misidentification which could potentially led to the contamination of the sample. Consistently larger samples, both in the size and the number of

individuals, overrides the assessment and does not fit the data, which led to the levels that were very similar to those observed for dome-shaped selectivity. Thus, it was noted a secondary state of nature with a lot more uncertainty, not as much as observed with the dome-shaped selectivity, but with much more uncertainty than observed with the base model. It was speculated that speckled rockfish could be the misidentified species and that could be a potential issue to consider. It was also asked if these larger fish are entering the model as landings or another estimate. In terms of the nature of sampling, Dr. John Budrick (CDFW) recognized that some of the fish are large enough that they may be misidentified speckled rockfish and probably could have been dropped out using a maximum length filter, as has been done for other similar species like gopher rockfish and copper rockfish in the past. Also, differences from the onboard sampling are a consideration but it did not connect to an estimate, as well as the length composition. It was also pointed out, for instance, that inconsistency in the sampling over space and time as well as the potential for difference in sampling protocols, were part of the reason CDFW provided MRFSS as opposed to incorporating all the historical data from the outset. It was also discussed that if some larger fish would have been fished out over time, which could be the reason for not catching larger fish anymore, due to the combination of both fishing mortality and the natural mortality. That said, the 400 mm class fish are very unlikely to be squarespot rockfish. The STAT pointed out that unless L_∞ and growth curves were not correct, the CVs on L_∞ would have to be 30-40% to justify some of the sizes seen in these samples. The bottom line in this discussion was that there are many questions to explore about how squarespot rockfish data in this particular data set may be useful and it would be worthwhile to have more critical examination before putting the additional lengths in the squarespot assessment.

Bonus Request: Putting together the selectivity block and new data.

Bonus STAT Response: The bonus analysis considered the exploration of the new data together with the supposition that there was also a dome-shaped selectivity pre and post-2001. If it's not assumed dome-shaped post-2001, the result is the reference model that has low uncertainty, though the uncertainty is likely underestimated considering that essentially all the parameters were fixed except selectivity. On the other hand, if a dome-shaped selectivity with a very small amount of selected fish for length classes is assumed, that leads to higher uncertainty. The result of using poorly fit data was the high stock status estimate, which could indicate that there's an unstable point for multiple reasons, reflecting uncertainty in both the scale and the depletion. Although the assumption of dome-shaped selectivity was the preferred option and fits the data significantly better based on AIC, resulting uncertainty should be considered. The model was very sensitive to that result, invoking a lot of uncertainty in the model to justify those parameter values.

STAT Conclusion: Overall, there are some issues with the new data that was poorly fit with dome-shaped selectivity post-2001 resulting in a large cryptic biomass, which the model was very sensitive to, and led to a lot of uncertainty to justify the required parameters values. Given that is a fishery that fishes only spawning biomass and that the model is less stable when using a dome-shaped selectivity adding more parameters, there is no strong justification for changing the accepted reference model. However, there is definitely a future research recommendation to validate historical data and evaluate strong assumptions that come with the dome-shaped selectivity.

Discussion: In terms of using selectivity assumptions as states of nature for a decision table, the uncertainty bounds were so great they are not useful as an alternate state. It also was noted that there is actually a larger proportion of the habitat that was in RCA's historically which could protect a large proportion of the biomass. The large proportion of the biomass that hasn't been available to the fisheries in the last 20 years or so when the Cowcod Conservation Areas, Rockfish Conservation Areas and Marine Protected Areas were implemented, needs to be considered. Therefore, some cryptic biomass would make sense; however, further consideration and future research is needed.

Catch-Only Projections

The GFSC received a presentation from Dr. Owen Hamel of the NWFSC providing catch streams and model results from catch-only projections for arrowtooth flounder, canary rockfish, darkblotched rockfish and petrale sole, as well as a catch report for yelloweye rockfish. The catch-only projections were conducted by graduate students participating in a modeling course at the University of Washington under the supervision of NWFSC staff. For each catch-only projection, comparisons were made between the projected catches from the last assessment and the catch streams used in the new catch-only projection, which were from the GEMM database from the West Coast Groundfish Observer Program (WCGOP) or were projections provided by the GMT. Projected biomass from the last assessment and projected biomass from the new catch-only projection were compared to examine differences between projected and realized catches. Any large differences between the catch streams or unexpected biomass values were noted below. No concerns with the catch-only projections were identified by the GFSC. The results were endorsed for use in management by the GFSC as representing the best scientific information available.

Arrowtooth Flounder Catch-Only Projection

This catch-only projection was provided by Mr. Giancarlo Correa of Oregon State University (OSU) and Drs. Chantel Wetzel and Owen Hamel of NWFSC. The arrowtooth flounder catch-only projection based on the 2017 assessment update used total removals for 2017-2019 from the GEMM reports, while catches for 2000-2022 were provided by the GMT and catches for 2023-2032 were assumed equal to ABC values. Actualized catch from the GEMM and values provided by the GMT were around 10% or less of the assumed catch. Scientific uncertainty buffer fractions were based on this being a category 2 assessment ($\sigma = 1.0$) and $P^* = 0.40$ was applied. Given the large magnitude of differences in catch, the projected depletion in 2023 went from 35.6% to 108.2% with the updated values, and the ABC increased from 8305 mt to 18632 mt. Note that the 2032 Scientific Uncertainty is below the buffer for category 3, which may be worth considering relative to prioritization for assessment before then.

Canary Rockfish Catch-Only Projection

This catch-only projection was provided by Mr. Giancarlo Correa of OSU and Dr. Chantel Wetzel of the NWFSC. The canary rockfish catch-only projection based on the 2015 assessment and catch-only projections in 2017 and 2019 used total removals for 2015-2019 from the GEMM reports, while catches for 2020-2022 were provided by the GMT and catches for 2023-2032 were assumed equal to ABC values. Actualized catches for 2015-2019 were consistent with the values assumed in the 2019 catch-only projection. The updated value for 2020 was appreciably lower than previously assumed, presumably due to the COVID-19 pandemic. Projected impacts provided by the GMT were approximately 60% of the full attainment assumed for 2021-2022 in the 2019 catch-only projection. Scientific uncertainty buffer fractions were based on this being a category 1 assessment ($\sigma = 0.5$) and $P^* = 0.45$ was applied. Given the moderate differences in catch assumptions, projected depletion in 2023 increased from 53.7% to 55.5% with the updated values, and the ABC increased from 1285 mt to 1338 mt.

Darkblotched Rockfish Catch-Only Projection

This catch-only projection was provided by Ms. Qi Lee of the University of Washington (UW) and Dr. Chantel Wetzel of the NWFSC. The darkblotched rockfish catch-only projection based on the 2017 assessment update and catch-only projections in 2019 used total removals for 2017-2019 from the GEMM reports, while catches for 2020-2022 were provided by the GMT and catches for 2023-2032 were assumed equal to ABC values. Actual catch for 2017-2020 were consistent with the values assumed in the 2019 catch-only projection. Projected impacts provided by the GMT were approximately 55% of the full attainment assumed for 2021-2022 in the 2019 catch-only projection. Scientific uncertainty buffer fractions were based on this being a category 1 assessment ($\sigma = 0.5$) and $P^* = 0.45$ were applied. Given the differences in catch assumptions in the later portion of the time catch time series, projected depletion in 2023 increased from 52.5% to 54.1% with the updated values, and the ABC increased from 786 mt to 820 mt.

Petrale Sole

This catch-only projection was provided by Ms. Qi Lee of the UW. The petrale sole catch-only projection based on the 2019 assessment update used total catch for 2013-2018 from the GEMM reports to address changes, while catches for 2020-2022 were provided by the GMT and catches for 2023-2032 were assumed equal to ABC values. Actualized catch for 2019 was 70% of the previously assumed values in the 2019 catch-only projection, while 2018 and 2020 were largely consistent with the values assumed previously. Projected impacts provided the GMT for 2021-2022 were equal to those used in the 2019 catch-only projection assuming full attainment. Scientific uncertainty buffer fractions were based on this being a category 1 assessment ($\sigma = 0.5$) and $P^* = 0.45$ were applied. The projected depletion in 2023 increased from 30.0% to 31.2% with the updated values, and the ACL increased from 3365 mt to 3485 mt.

Yelloweye Rockfish Catch Report

The catch report was provided by Mr. John Wallace of the NWFSC, based on the 2015 assessment and catch-only projections in 2017 and 2019, using the catch for 2015-2019 based on GEMM

reports. The 2020 catches are from GMT scorecard with adjustments for bycatch and discard estimates based on catch and allocation of target species. The recent catches in all years have been below the respective ACLs.

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Sivasundar, Arjun, and Stephen R. Palumbi. 2010. "Life History, Ecology and the Biogeography of Strong Genetic Breaks Among 15 Species of Pacific Rockfish, Sebastes." *Marine Biology* 157 (7): 1433–52. https://doi.org/10.1007/s00227-010-1419-3.

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Subcommittee Members Present

Dr. John Budrick, California Department of Fish and Wildlife, San Carlos, CA
Dr. Fabio Caltabellotta, Oregon State University, Corvallis, OR
Dr. John Field, National Marine Fisheries Service Southwest Fisheries Science Center, Santa Cruz, CA
Dr. Melissa Haltuch, National Marine Fisheries Service Northwest Fisheries Science Center, Seattle, WA
Dr. Owen Hamel, National Marine Fisheries Service Northwest Fisheries Science Center, Seattle, WA
Dr. Jason Schaffler, Muckleshoot Tribe, Auburn, WA (Co-Chair for this meeting)
Dr. Tien-Shui Tsou, Washington Department of Fish and Wildlife, Olympia, WA
Dr. Will White, Oregon State University, Corvallis, OR (Co-Chair for this meeting)

Stock Assessment Teams

Dr. Jason Cope; Copper, Quillback, Squarespot Rockfish, and Vermilion and Sunset Rockfishes; National Marine Fisheries Service Northwest Fisheries Science Center, Seattle, WA
Dr. E.J. Dick; Vermilion and Sunset Rockfishes; National Marine Fisheries Service Southwest Fisheries Science Center, Santa Cruz, CA
Dr. Vladlena Gertseva; Spiny Dogfish; National Marine Fisheries Service Northwest Fisheries Science Center, Seattle, WA
Dr. Kelli Johnson; Lingcod; National Marine Fisheries Service Northwest Fisheries Science Center, Seattle, WA
Dr. Brian Langseth; Copper Rockfish, Quillback Rockfish, and Squarespot Rockfish; National Marine Fisheries Service Northwest Fisheries Science Center, Seattle, WA
Dr. Melissa Monk; Vermilion and Sunset Rockfishes; National Marine Fisheries Service Southwest Fisheries Science Center, Santa Cruz, CA
Dr. Ian Taylor; Spiny Dogfish; National Marine Fisheries Service Northwest Fisheries Science Center, Seattle, WA
Dr. Chantel Wetzel; Copper Rockfish, Quillback Rockfish, and Squarespot Rockfish; National Marine Fisheries Service Northwest Fisheries Science Center, Seattle, WA
Ms. Alison Whitman; Copper, Quillback, and Vermilion and Sunset Rockfishes; Oregon Department of Fish and Wildlife, Newport, OR

Other Attendees

Ms. Camille Ayrea, Oregon Department of Fish and Wildlife, Brookings, OR
Ms. Susan Chambers, West Coast Seafood Processors Association, GAP, Charleston, OR
Mr. John DeVore, Pacific Fishery Management Council, Portland, OR
Mr. Bob Dooley, Pacific Fishery Management Council, Half Moon Bay, CA
Mr. Ben Enticknap, Oceana, Portland, OR
Ms. Heather Hall, Washington Department of Fish and Wildlife, Pacific Fishery Management Council, Olympia, WA
Ms. Gretchen Hanshew, National Marine Fisheries Service West Coast Region, Seattle, WA
Dr. Jim Hastie, National Marine Fisheries Service Northwest Fisheries Science Center, Seattle, WA
Mr. Christian Heath, Oregon Department of Fish and Wildlife, Newport, OR
Mr. Kenyon Hensel, Crescent City, CA
Dr. Allan Hicks, International Pacific Halibut Commission, Seattle, WA
Ms. Melanie Howey, Pacific States Marine Fisheries Commission, Brookings, OR
Mr. Harrison Ibach, GAP, McKinleyville, CA
Mr. Bill James, Salem, OR
Mr. Will Jasper, Makah Tribe, Neah Bay, WA
Dr. Galen Johnson, Northwest Indian Fisheries Commission, SSC, Olympia, WA
Mr. Galeeb Kachra, National Marine Fisheries Service West Coast Region, Seattle, WA
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Ms. Mel Mandrup, California Department of Fish and Wildlife, GMT, West Sacramento, CA
Ms. Heather Mann, Midwater Trawlers Cooperative, Newport, OR
Ms. Lynn Mattes, Oregon Department of Fish and Wildlife, GMT, Newport, OR
Ms. Valerie Miranda, Oregon Department of Fish and Wildlife, Astoria, OR

Ms. Abby Moyer, National Marine Fisheries Service West Coast Region, GMT, Lacey, WA
Mr. Corey Niles, Washington Department of Fish and Wildlife, Pacific Fishery Management Council, Olympia, WA
Mr. Mike Okoniewski, Pacific Seafoods, CPSAS, Woodland, WA
Mr. Brad Pettinger, Brookings, OR
Mr. Todd Phillips, Pacific Fishery Management Council, Portland, OR
Mr. Joe Petersen, Northwest Indian Fisheries Commission, GMT, Forks, WA
Ms. Katie Pierson, Oregon Department of Fish and Wildlife, GMT, Newport, OR
Mr. Dan Platt, Salmon Trollers Marketing Association, GAP, Fort Bragg, CA
Mr. Gerry Richter, B & G Seafoods, Inc., GAP, Santa Barbara, CA
Ms. Corey Ridings, Ocean Conservancy, Pacific Fishery Management Council, Santa Cruz, CA
Ms. Whitney Roberts, Washington Department of Fish and Wildlife, GMT, Olympia, WA
Ms. Michele Robinson, Oceanbeat Consulting, LLC, Olympia, WA
Dr. Will Satterthwaite, National Marine Fisheries Service Southwest Fisheries Science Center, SSC, Santa Cruz, CA
Dr. Kayleigh Somers, National Marine Fisheries Service Northwest Fisheries Science Center, GMT, Seattle, WA
Ms. Maggie Sommer, Oregon Department of Fish and Wildlife, Pacific Fishery Management Council, Newport, OR
Mr. Daniel Studt, National Marine Fisheries Service West Coast Region, GMT, Long Beach, CA
Mr. Dan Waldeck, Pacific Whiting Conservation Cooperative, GAP, Portland, OR
Mr. Dan Yoakum, Fort Bragg, CA
Mr. Louis Zimm, Sportfishing Association of California, San Diego, CA

SSC Recusals for this Meeting		
SSC Member	**Issue**	**Reason**
Dr. John Budrick	Lingcod, Copper Rockfish, Quillback Rockfish and Squarespot Rockfish	Dr. Budrick was on the STAT for these assessments.
Dr. Owen Hamel	All assessments	Dr. Hamel supervises STAT members on these assessments.
Dr. Tien-Shui Tsou	Copper Rockfish and Quillback Rockfish	Dr. Tsou was on the STAT for these assessments.

PFMC
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