MINUTES

Scientific and Statistical Committee

Pacific Fishery Management Council
Doubletree by Hilton Sonoma
Chardonnay Room
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Rohnert Park, California 94928
Telephone: 707-584-5466

March 3-4, 2020

Members in Attendance

Dr. John Budrick, California Department of Fish and Wildlife, Belmont, CA
Mr. Alan Byrne, Idaho Department of Fish and Game, Boise, ID
Dr. John Field, SSC Chair, National Marine Fisheries Service Southwest Fisheries Science Center, Santa Cruz, CA
Dr. Marisol Garcia-Reyes, Farallon Institute, Petaluma, 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. Dan Holland, National Marine Fisheries Service Northwest Fisheries Science Center, Seattle, WA
Dr. Galen Johnson, Northwest Indian Fisheries Commission, Olympia, WA
Dr. André Punt, University of Washington, Seattle, WA
Dr. David Sampson, Oregon Department of Fish and Wildlife, Newport, OR
Dr. William Satterthwaite, National Marine Fisheries Service Southwest Fisheries Science Center, Santa Cruz, CA
Dr. Jason Schaffler, Muckelshoot Indian Tribe, Auburn, WA
Dr. Ole Shelton, National Marine Fisheries Service Northwest Fisheries Science Center, Seattle, WA
Dr. Cameron Speir, National Marine Fisheries Service Southwest Fisheries Science Center, Santa Cruz, CA
Dr. Tien-Shui Tsou, Washington Department of Fish and Wildlife, Olympia, WA

Members Absent

Dr. Michael Harte, Oregon State University, Corvallis, OR
Dr. Kristin Marshall, National Marine Fisheries Service Northwest Fisheries Science Center, Seattle, WA

SSC Recusals for the March 2020 Meeting		
SSC Member	**Issue**	**Reason**
Dr. Theresa Tsou	E.2 Willapa Bay Coho Forecast Methodology Review – Final	Kirt Hughes is Dr. Tsou's supervisor
Dr. Jason Schaffler	E.4 Review of 2019 Fisheries and Summary of 2020 Stock Forecasts	Dr. Schaffler contributed to the pre-1 Puget Sound Chinook forecasts

A. Call to Order

Dr. John Field called the meeting to order at 0800. Mr. Chuck Tracy briefed the SSC on the meeting and new events. The Council has a new web site and archived content is still being posted. One reason for the need for a new web site is to become 508-compliant. He then briefed the SSC on their meeting agenda. Dr. Field and others offered edits to the draft November meetings.

Dr. Galen Johnson was elected to be the next SSC chair and Dr. Dan Holland was elected as vice chair. Dr. Holland stepped down as Ecosystem Subcommittee chair and Dr. Kristin Marshall will be the next Ecosystem Subcommittee chair. Dr. Melissa Haltuch volunteered to serve on the Groundfish and Ecosystem Subcommittees.

Dr. André Punt provided a briefing on last week's Pacific sardine STAR panel. Dr. Owen Hamel briefed the SSC on the February nearshore ROV survey methodology review.

G. Ecosystem Management

1. California Current Ecosystem and Integrated Ecosystem Assessment (IEA) Report and Science Review Topics

The Scientific and Statistical Committee (SSC) received a presentation by Drs. Chris Harvey (Northwest Fisheries Science Center) and Toby Garfield (Southwest Fisheries Science Center) on the 2020 California Current Integrated Ecosystem Assessment (CCIEA) California Current Ecosystem Status Report (Agenda Item G.1.a, IEA Team Report 1, March 2020). The report provides important information on environmental, biological, social, and economic indicators and provides an ecosystem perspective on West Coast fish stocks, fisheries, and coastal communities for the Council process.

The SSC appreciates the CCIEA team's openness and responsiveness to the Council and SSC questions and recommendations, and their continuing efforts to improve the Status Report with additional information and improved figures and tables. The 2020 Status Report includes several new indicators and analyses including: an indicator-based outlook for natural origin fall Chinook salmon returns California's Central Valley (section 4.3), measures of port-specific commercial revenue as a proportion of total West Coast commercial revenue (section 6.3), and a habitat compression index describing the availability of cool upwelled water which can inform the impact of marine heatwaves (section 7.2).

The SSC noted that figure 4.4.1 had a data error indicating that the greenstriped rockfish fishing rate exceeded the proxy F_{MSY}. It did not. This data point has been corrected and a revised version will be provided by the IEA team.

The CCIEA team has proposed three potential topics for review in September 2020: 1) An examination of California sea lion pup count and growth data used as indicators of forage conditions. This topic would focus on the interpretation of these metrics as sea lion populations approach or reach carrying capacity; 2) The proposed habitat compression index to describe the impact of marine heatwaves on oceanographic conditions and potentially inform whale entanglement risk; and 3) The development of port-specific commercial revenue indices to understand the distribution of revenue among West Coast ports through time. The SSC agrees with the importance of all three of these proposed topics, although the third topic would likely require a substantial amount of additional work to be ready for the methods review in September. The SSC also suggests that a review of the methods underlying the natural origin central valley fall Chinook stock indicator may be an appropriate topic for review if suitable analysts are available to present this topic.

SSC Notes:

Gliders will likely replace the fixed station reporting (Newport, CalCOFI) for oceanographic information in the next few years.

There was a suggestion to plot hypoxia as anomalies to improve readability of the hypoxia time series figure. This might emphasize period in which hypoxia may occur and avoid the seasonal pattern in the figure obscuring the periods of hypoxia.

Stream flow - are there better ways of plotting the 1-day and 7-day quad plots? The SSC was unclear about how to interpret the information that was presented in these plots particularly because the effects of high or low stream flow vary by basin and region.

JSCOPE predicts strong hypoxia event and acidic water for 2020. JSCOPE predictions were said to be relatively successful in 2019, but assessment of forecast skill is ongoing. No data on JSCOPE skill were presented to the SSC.

In the forage surveys, the dominant species are adult anchovy and adult sardine in the 2019 surveys with far fewer groundfish than recent years. There were some questions about whether it might be time to revisit the species included in this list. Is there value in rolling up the species into a single index of overall forage abundance? The general consensus was no. There was a discussion about improving the colors used to plot forage communities so that they were readable in grey-scale.

Stoplight for Central Valley fall Chinook. This item was not on the list of items for review but could be. It was noted that the Sacramento River Fall Chinook forecast is for composite (natural + hatchery) population, and the forecast for the composite predicts relatively large returns in 2020. The natural origin stoplight indicator says the forecast for 2020 is poor. The SSC is uncertain about the desire of the Council to see particular information about the natural origin CV fall stock.

There were a few questions about details of the pyrosome spatial distribution figures (what is the star?, what is the bar?). These plots need a few additional notes in the caption.

HABs – There is now data from all three states, which is a new addition to the report this year.

The new plots of total commercial revenue by port. Time-series of proportion of coastwide revenue for the 16 largest ports by revenue were presented. There were many questions about these plots.

It was suggested that using proportional revenue could obscure important patterns. In particular, the sum to one constraint is likely to produce confusing figures (an increase in one port necessitates a decline in some other port). This work is intended to apply to National Standard 8. Using aggregated port-groups rather than individual port was suggested as a good idea as was a greater exploration of currently available techniques for understanding diversity among ports.

Marine Heatwave Index - Do we need a measure for just the CA current rather than a general N. Pacific metric?

There was some confusion about the groundfish plots of stock status. In particular, for greenstriped rockfish, the fishing rate was classified as exceeding the proxy F_{MSY} when it did not. This issue should be resolved with relative ease in the future. This arose due to differences arising from using data from catch-only projections versus stock assessment projections (without adjusting for realized catches) and the catch attainment realized for each stock. The IEA team should consult with the NWFSC groundfish assessment team to consider whether there are better approaches to providing summary information on groundfish stock status for the IEA report, any changes in the approach could potentially be briefly discussed with the SSC at the September CCIEA topic review meeting. One approach discussed is to report total catches from the West Coast Groundfish Observer Program in their GEMM product relative to specified OFLs. This is the definition of overfishing on the Groundfish FMP.

There were a range of general comments about the value and interpretation of the status and trend quad plots for salmon stocks. There were repeated questions about what were the correct reference levels (past 5 years, 10, 20?) and if the quad plots were providing information that was particularly illuminating. There was not a consensus about what to do with these plots.

There were some questions about updating landings through 2019 rather than 2018. It will not be possible to update data for all species. Is there value in putting in the work to getting as much as information possible? General consensus in the room seems to lean toward including information about landings if at all possible. Not really an option for human dimensions components other than landings (e.g., diversity, revenue).

There was a desire to see information about progress on the threshold work that was presented to the SSC several years ago. There should be increased communication with the IEA team to decide whether there was any progress worth revisiting on the use of thresholds in the IEA report for the 2021 or 2022 report.

3. Climate and Communities Initiative Workshop Report

The Scientific and Statistical Committee (SSC) received a presentation from Mr. Jonathan Star on the results of the Climate and Communities Initiative workshop held January 22-23, 2020 in Garden Grove, CA. Mr. Star reviewed the purpose of the scenario planning exercise, presented the four scenarios that emerged from the workshop, and asked for feedback on the scenarios and next steps.

The workshop report proposes four scenarios that define sets of biophysical and social conditions that may be present in the future. An important consideration should be the effect of future conditions on Council and/or management partners' decision-making. This should include specific strategies. The next stage should also include consideration of institutional changes that may be required as biophysical, social, and economic conditions change. If the Council identifies

legal or other constraints in how they can respond, then it may be useful to consider what would happen if these constraints changed. Mr. Star indicated that the range of possible decisions and decision-making processes will be a primary focus of the next stage of the scenario planning process.

In general, the proposed scenarios seemed appropriate and useful. The SSC provided some feedback for the Initiative Core Team to consider. The economic and social factors described in each of those scenarios do not vary in a systematic way and in some cases only amplify the effects, either good or bad, of biophysical characteristics. It would be useful to consider a fuller set of interactions. Also, as the scenarios are developed in more detail, it may also be useful to have expert review to validate plausible future conditions.

SSC Notes:

A lot of discussion revolved around the "infrastructure for decision making": what can the Council do about any of this? This is almost as important as the scenarios themselves. More of this should be in the report and in the process.

Should consider how Council's set of possible actions can or should change over time.

Workshop participants seemed to think that the Council/management partners needed more flexibility in timelines and processes. Consider what this means specifically, and how the Council would use additional flexibility if they had it.

Comments on Scenario Definitions:

- *Economic and social factors were an important point of discussion in defining the scenarios, but the full range of these is not incorporated.*
- *The economic and social factors described in each of those scenarios do not vary in a systematic way and in some cases only amplify the effects, either good or bad, of biophysical characteristics. Specifically, Scenario I combines "good" biophysical conditions with "good" economic conditions and Scenario II combines "bad" with "bad". It would be informative to consider a more complex set of interactions between the two systems. For example, "good-bad" interactions.*
- *Scenario III uses some value-laden language. "Hollowing out" of the fishing industry may describe a condition that other observers describe as "efficient" or "streamlined". It would be better to define scenarios in a more objective manner.*
- *Scenario II includes greater investment in and use of data monitoring technologies. This is better described as a choice that the Council or industry can make in response to changing conditions, rather than an external factor beyond our control.*

E. Salmon Management

2. Willapa Bay Coho Forecast Methodology Review – Final

The Scientific and Statistical Committee (SSC) received a report from the SSC Salmon Subcommittee (SSCSS, subcommittee report appended to the end of this statement) regarding the February 26, 2020 joint webinar of the SSCSS and the Salmon Technical Team (STT), and reviewed an earlier draft of "Willapa Bay Coho – Supporting Documentation of Abundance Forecasting Approach" (Agenda Item E.2, Supplemental Attachment 1). The SSC did not have sufficient time to review the changes between the draft document and the supplemental briefing book version.

The SSC agrees with the SSCSS's finding that the Willapa Bay natural coho forecast is much more thoroughly documented now than it has been in the past. Clarification is needed in the draft documentation on how outliers are identified and how their exclusion is justified. A clearer description of how competing models are chosen among when model evaluation metrics disagree is needed. The SSC supports attempts to quantify uncertainty and appreciates progress toward quantifying and reporting uncertainty in the models used for salmon management.

The SSC recommends using the output of the forecast model as presented for this year. Caution may be warranted in applying the 2020 forecast due to the unprecedented low value of maximum summer flow, as well as lower marine survival forecasted by a competing model with higher support according to some model evaluation metrics. The unprecedented flow value is worrisome both because it suggests extreme environmental conditions and because the smolt production forecast depends on extrapolating a linear regression beyond the range of the input data, which leads to greatly increased uncertainty.

The SSC agrees with the SSCSS that the proposed forecast model likely outperforms naïve models based on short- or long-term mean returns, and that no clearly superior basis for forecasting abundance or specifying acceptable biological catch (ABC) for this stock is currently available. The SSC also agrees that there are several places where the theoretical basis of the forecast could be improved, including less ad hoc methods of scaling smolt densities between watersheds, alternative treatments of putative "outliers," and more robust model selection or model averaging. There was not sufficient time to properly evaluate these alternative approaches. The SSC recommends further analysis of these alternatives in the future, potentially this year, following the standard methodology review timeline.

SSC Salmon Subcommittee Report on

Joint SSCSS/STT webinar reviewing Willapa Bay natural coho forecast

The SSC Salmon Subcommittee (SSCSS) and Salmon Technical Team (STT) held a webinar on February 26, 2020 to discuss the Willapa Bay coho natural forecast methodology. Dr. Marisa Litz (Washington Department of Fish and Wildlife, WDFW) presented the forecast methods, and WDFW staff answered questions about local data collection. The review was based on the document "2_Willapa Bay Natural Forecast_FINAL 2.10.2020.pdf" (hereafter "the document"). The document was circulated to the SSCSS on February 11, 2020 and distributed to the full SSC via email by John DeVore dated 2/18/20 with subject line "Willapa Bay coho forecasting material." The document is an earlier draft of Agenda Item E.2, Supplemental Attachment 1 in the March 2020 Briefing book. WDFW submitted the supplemental briefing book version based on inputs received during the February 26 webinar. The SSCSS did not receive the supplemental briefing book version in time to review it.

The natural-origin component of the Willapa Bay coho run size forecast was calculated by multiplying forecasts of natural-origin smolt production and natural-origin marine survival. The performance of the run size forecast was evaluated in a hindcasting exercise. The run size forecast method used for 2020 is planned for use in future years. The webinar addressed each component of the run-size forecast and its evaluation.

Smolt forecast

Natural-origin smolt production is not measured for Willapa Bay coho, rather a proxy based on the Chehalis River (the major river basin of the neighboring Grays Harbor management unit) was used. Direct measures of smolt abundance cannot be used for the forecast as smolt abundances in the Chehalis basin are not estimated until adults return. Instead, multiple linear regressions were fitted to historical estimates of smolt abundance. Potential covariates based on various metrics of flow were considered. Each year a single model was selected via AICc and used to forecast the current year's smolt production. The forecasted Chehalis smolt abundance is converted to a forecasted smolt density (smolts per square mile of watershed). The Chehalis smolt density is converted to a (usually lower) Willapa Bay smolt density using a stair-step relationship (Table 2 of the document). The forecasted Willapa Bay smolt density is then multiplied by the watershed area to forecast the Willapa Bay natural coho smolt production.

The SSCSS found the description of the smolt forecast methods clear and near complete, and raised the following concerns about the methods:

For the multiple regression model, four out of nineteen ocean entry years potentially informing the smolt forecast were dropped as outliers identified "by observing residual plots and evaluating Cook's distances." Instead of excluding 21 percent of the dataset as outliers, it may be appropriate to consider nonlinear models or robust regression techniques. The four ocean entry years that were dropped also had the four lowest smolt abundance observations, creating concern that a positive bias was being introduced.

The general approach of adjusting Chehalis smolt densities downward to predict Willapa Bay smolt densities seemed sensible to local experts from WDFW. However, when evaluated in the context of relative adult returns to the two systems, the SSCSS finds this inconsistent with the

assumption of equivalent marine survival. Willapa Bay has approximately 40 percent the area of the Chehalis basin, so given equivalent marine survivals this would lead to adult returns approximately 40 percent of the Chehalis return if smolt densities were equal. In fact, adult returns to Willapa Bay were on average 72 percent of returns to the Chehalis basin and very rarely less than 40 percent (Table 3 of document 2). The basis for assuming lower smolt densities in Willapa Bay is therefore unclear, and the downward adjustment to smolt densities may introduce a negative bias. The staircase form of the assumed relationship (Table 2 of the document) has an undesirable consequence that sometimes small changes in the input (Chehalis smolt density) can cause a relatively large change in the forecasted output (Willapa Bay smolt density), while at other times moderate changes in the inputs cause no change in the forecasted output.

The maximum summer flow (one of the covariates retained in the final smolt forecast model) informing the 2020 forecast is the lowest on record (Figure 2c of the document.). It is generally not best practice to extrapolate predictions from a linear regression outside the range of the input data and doing so can create highly uncertain predictions. A model using average incubation flow instead of maximum summer flow received very nearly equivalent support (AICc=0.18, Table 5 of document), and would not require extrapolating outside the range of the input data. However, the relative support for different covariates would be different if the "outlier" years were retained.

The SSCSS requested a report on what the smolt forecast would be using average incubation flow rather than maximum summer flow as a predictor, and what the smolt forecast would have been for the chosen model if the four "outliers" had not been excluded. The SSCSS realized that time constraints would preclude full evaluation (e.g., looking at hindcast performance of the revised models, or repeating model comparison with outliers included) for these alternatives.

Marine survival forecast

Although survival estimates for hatchery-origin Willapa Bay coho are made, they are not used in forecasting (and would not be available in time for current-year forecasts). Instead, a marine survival forecast based on CWT-tagged Bingham Creek wild coho (part of the Chehalis River basin) is used. Bingham Creek survival estimates are not available for the year being forecasted; hence, marine survival is forecasted based on a model relating environmental covariates to past survival estimates.

Numerous environmental covariates (Appendix A of document 2) were considered in multiple linear regressions modeling marine survival. Preliminary model comparison involved a backwards stepwise regression approach from different candidate starting points that excluded highly correlated variables. Remaining candidate models after the backwards stepwise regressions, along with a model based on PC1 of a principal component analysis of salmon ocean indicators produced by the NWFSC, were compared using leave-one-out cross validation and evaluated based on mean raw error (MRE), mean absolute error (MAE), root mean square error (RMSE), mean percent error (MPE), and mean absolute percent error (MAPE). The highlighted model in Table 7 of the document was chosen over the second model in the table, despite similar performance metrics, based on a likelihood ratio test. The chosen model predicts higher marine survival for the current forecast year than the similarly-performing alternative model.

The SSCSS expressed concern that repeating the model selection process every year may result in chasing noise. Model averaging may be more robust than picking a single model. This could apply to the smolt forecast as well.

The SSCSS notes that there are marine survival estimates available for Willapa Bay hatchery coho, and they are not well correlated with Bingham Creek wild coho marine survival estimates. Concerns were expressed during the webinar about the precision of Willapa Bay hatchery coho survival estimates due to low tag recoveries and sampling challenges.

Hindcast performance of run size forecast

Performance of the model that was chosen for the 2020 run size forecast was evaluated in a leave-one-out hindcasting exercise. This may provide an overly optimistic assessment of model performance since it uses more data than would have been available to parameterize the forecast model in earlier years and does not repeat the covariate selection process each year. The hindcasted model outperformed alternative methods of basing the run size forecast on a 3- or 10-year recent average mean of observed returns, when evaluated over the past nine years.

The SSCSS noted that hindcast model performance was notably worse in particular years (2011 and 2015, Figure 4A of the document), and it may be fruitful to investigate whether this error seems attributable to error in the smolt abundance hindcast or the marine survival hindcast.

WDFW response to SSCSS smolt forecast request

Dr. Marisa Litz was able to provide the SSCSS with the results of the multiple regression models for forecasting natural origin smolt abundances in the Chehalis basin that included outliers on February 27, 2020. She provided results from two models: (1) the maximum summer flow and minimum overwinter flow (the WDFW preferred model) and (2) the average incubation flow and minimum winter flow model. She used these results to forecast the Willapa Bay natural run-size using the previously discussed methods.

With the outliers removed, using the maximum summer flow with incubation flow did not change the final run size forecast of 17,850 (due to the binning of smolt densities). Including the four "outlier" years in the models changed the forecasted adult run size from 17,850 (WDFW preferred model) to 15,300.

Quantifying Uncertainty

Several of the intermediate calculations informing the run size forecast are accompanied by estimates of uncertainty. The SSCSS supports attempts to quantify uncertainty and appreciates progress toward quantifying and reporting uncertainty in the models used for salmon management. However, no attempt was made to propagate uncertainty through the final run size forecast product, and some of the uncertainty calculations were not completely documented.

SSCSS Recommendation

The SSCSS appreciates the work that has been done to document the Willapa Bay natural coho run size forecast at a level that allows for review. The current run size forecast method likely outperforms naïve approaches based on recent or mean returns. The SSCSS could not identify a better currently-available basis for S_{ABC} determination than the proposed run size forecast methodology, although several points of potential improvement to the theoretical basis of the

forecast were noted, including less ad hoc methods of scaling smolt densities between watersheds, alternative treatments of putative "outliers," and model averaging rather than repeating the model selection process each year. There was not sufficient time to fully evaluate or implement these alternatives.

A number of factors suggest that the current year's forecast may have additional uncertainty relative to the years in the hindcast exercise, including the unprecedented low value of maximum summer flow, lower marine survival forecasted by a competing model with higher support according to some model evaluation metrics, and potential bias introduced by excluding the four lowest smolt estimates on record from the input data.

Hatchery-origin forecast

Natural-area spawners also include some hatchery-origin fish that stray to natural areas, and this has been accounted for in the past in setting the ABC. The hatchery-origin run size forecast uses the same marine survival as the natural-origin forecast, and hatchery smolt production is enumerated at the hatchery as described in the document. The document provided limited information on how hatchery strays in natural areas are quantified, and no information on how stray rates (i.e., the proportion of hatchery-origin fish returning that stray into natural area, as opposed to the proportion of natural-area spawners that are of hatchery origin) are calculated. Hatchery-origin strays to natural areas need to be accounted for in setting the Willapa Bay natural coho S_{ABC}. How strays are enumerated will need to be addressed by the STT and SSC at the March 2020 Council meeting.

SSC Notes:

(see also SSCSS notes, these are additions based on the SSC meeting discussion)

If we review salmon forecasts routinely, a more detailed terms of reference would be useful. The TOR should identify what documentation is necessary, if not sufficient.

Better to plot observed versus predicted as x-y plot rather than timeseries.

Had time allowed, the hindcasting exercise should have repeated the model selection process each year and been limited to the data available at the time of each forecast (i.e., one year ahead cross validation).

SSCSS Notes:

Rather than an arbitrary staircase function, a scalar between Chehalis and Willapa Bay smolt numbers could be fit based on historical Willapa Bay natural adult return estimates along with either historical estimates or hindcasts for Chehalis smolt numbers and Bingham Creek wild and/or Willapa Bay hatchery marine survival estimates. Once scalars were estimated in this way, an additional hindcasting exercise could compare the performance of models based on Bingham Creek wild versus Willapa Bay hatchery survivals.

It is not clear why smolts per area is used rather than smolts per length of stream.

Historical smolt abundances are estimated by multiplying the number of tagged smolts by the inverse of the fraction of returning adults that are tagged.

The exact criteria for identifying outliers in the smolt forecast model are not clear in the document but were described further during the webinar. Although p. 11 refers to potential outliers in the marine survival data, no data were excluded from that model this year.

The text should clarify whether the MPE and MRE values are based on observation-forecast (seems to be the case based on response to queries) or forecast-observation (which is how these quantities are defined in the Haeseker et al. 2008 document cited to define these terms).

Whether the low correlation between Bingham Creek natural and Willapa Bay hatchery marine survival estimates is due to geographic differences, hatchery effects, and/or observation error is unclear.

The SSCSS further noted that, while it is not an entirely fair comparison (due to different sets of years included, different measures of postseason abundance estimates, and the difference between leave-one-out hindcasting versus forecasting based on the data available at the time), performance of the hindcasted model over the full range of years available compared favorably to the typical performance of coho forecasts reported in Preseason Report 1.

The additional outputs requested by the SSCSS may help characterize the uncertainty associated with the 2020 forecast.

Clarification is needed in the documentation on exactly how outliers are identified and how competing models are chosen when performance metrics disagree.

p. 5, Table 2: There is some ambiguity in the table: What happens if modeled Chehalis smolts/mi^2 is less than 200, and what happens if it is right on the border between categories, i.e., does 400 become 300 or 400? During the webinar, it was stated that this would be addressed in the revision.

Error in equation at top of p. 6, the fraction should be inverted or the multiplication changed to division. An email from the analysts indicated this would be fixed in the revision.

p. 6, It is not fully described how the CVs on smolt numbers are estimated, or how uncertainty related to expanding tag recoveries for sampling was accounted for. It is assumed that the sampling rate was exactly 30 percent each year, but it is not clear how variable sampling rates were in practice.

The "Number of Tagged smolts" column in Table 4 reflects the number of tagged smolts adjusted to account for tag retention and tagging mortality, the values in the table are rounded to the nearest integer but calculations were done to full precision.

p. 7, text above the figure refers to average overwinter rearing flow being included in the model, but Figure 2, the equation at the bottom of the page, and Table 5 refer to minimum overwinter flow

p. 7, equation is missing notation for taking the log of smolt abundance, the coefficients, the intercept, and the error term (or could be changed to not use an equal sign and instead use Y ~ X notation similar to that used on p. 13 and 14). An email from the analysts indicated this would be fixed in the revision.

p. 10 Root mean square error not raw mean square error. During the webinar this was described as root mean square error.

p. 16 text in starting the first paragraph refers to model performance being calculated for the 2010-2018 ocean entry years/2011-2019 return years but Table 10 refers to years (type not specified) 2011-2018. It was clarified that ocean entry years 2010-2018 were used.

Appendix B (run reconstruction methodology) was not discussed.

4. Review of 2019 Fisheries and Summary of 2020 Stock Forecasts

Dr. Michael O'Farrell (Southwest Fisheries Science Center) and members of the Salmon Technical Team (STT) presented an overview to the Scientific and Statistical Committee (SSC) of the Review of 2019 Ocean Salmon Fisheries and the 2020 Preseason Report I and responded to questions. The SSC did not receive the 2020 Preseason Report I until February 28 and did not have adequate time for a thorough review.

The Council adopted five salmon rebuilding plans in 2019. Two Chinook stocks (Sacramento River fall Chinook and Klamath River fall Chinook) and two natural coho stocks (Queets and Juan de Fuca) remain overfished, defined as when the most recent three-year geometric mean of escapement is below the Minimum Stock Size Threshold (MSST). The Snohomish natural coho stock is now in the "not overfished/rebuilding" category, defined as when the most recent three-year geometric mean of escapement is greater than the MSST but is less than S_{MSY}. No stocks were subject to overfishing in 2019.

The SSC endorses the forecasts for Willapa Bay natural coho (including the hatchery stray contribution), Sacramento River fall Chinook and Klamath River fall Chinook stocks as the best available science for use in 2020 salmon management to set acceptable biological catches and overfishing limits (Table V-5). In the future, the SSC encourages that the uncertainty of the forecasts be reported for these and other stocks.

In the Preseason I Report there are qualitative statements on the presence or absence of bias in some forecasts. The basis for these statements is not clear and the SSC recommends that a quantitative assessment of forecast bias be included in future reports. The SSC shares the concern of the STT that without an updated base period calibration for the Chinook Fishery Regulation Assessment Model, the fisheries impacts to Upper Columbia River summer Chinook stock will be over-estimated and the fisheries impacts on other stocks under-represented in both Council fisheries and other fisheries along the coast.

SSC Notes:

What metrics could be used to determine if forecasts are biased and what steps could be taken if a forecast is determined to be biased?

The recent years' exploitation rates (ER) for Upper Columbia River summer Chinook were potentially overestimated in FRAM (after the new base period was adopted) relative to an historic perspective and from coded wire tag expansions. The SSC notes that problems such as this in FRAM may be wider than this specific issue, because changes in exploitation rates to one stock will cause changes to exploitation rates in other stocks. Hence any proposed adjustment to reduce ER for the upper Columbia River summer stock may have unintended consequences on other stocks. The STT has not discussed how to deal with this issue.

Sacramento River fall chinook (SRFC) forecast in Pre-I is for both hatchery origin and natural returns (SI—Sacramento Index) and was the highest forecast since 2015. In the CCIEA report (Table 4.3.1) a forecast for natural origin SRFC based on environmental indicators is presented and categorized as "very low". Hatchery fish are not subject to the river environmental conditions that natural fish were hence these two outlooks (good hatchery return and poor natural return) are possible.

SST uses forecasts from co-managers and many have not been reviewed by the SSC. Is there a desire to proceed with a methodology review of these forecasts??

The Chehalis River used as a surrogate for the Willapa Bay coho forecast and the Queets is used as a surrogate for the Chehalis coho forecast. Why isn't the Chehalis data used for the Chehalis coho forecast?

H. Groundfish Management

2. Initial Stock Assessment Plan and Terms of Reference

Information pertinent to deciding 2021 stock assessment priorities

The Scientific and Statistical Committee (SSC) received a presentation from Dr. Jim Hastie (Northwest Fisheries Science Center) on the synthesis of available information for deciding which groundfish stocks are to be assessed during the 2021 stock assessment cycle. The categories and factors on which the synthesis is based are mostly unchanged from 2018. However, the assessment frequency scores now account for the increased sigma between overfishing limits (OFLs) and acceptable biological catches (ABCs) based on the degree to which recent catches compare to 2022 OFLs. Eight of the ten highest-ranked stocks for assessment in 2021 based on the prioritization tool match those identified during 2018, and all ten were in the top 16 identified in 2018.

The SSC provided Dr. Hastie with suggestions for modifications to the tool that could be implemented for the 2023 assessment cycle. The May 2020 workshop on data-moderate assessments may provide information that could allow use of length-based data-moderate assessments.

Revisions to the Terms of Reference (TOR) for stock assessments, rebuilding analyses and methodology reviews

The SSC reviewed a marked-up version of the draft TOR for the Groundfish and Coastal Pelagic Species Stock Assessment Review Process for 2021-2022 (see the appended draft). The changes reflect the outcomes from the 2019 Groundfish Stock Assessment Process Review Workshop (Agenda Item H.2, Attachment 3, March 2020) and input from stock assessment authors. The SSC recommends that the suggested changes be made available as part of the public review document for the June 2020 meeting. Areas where there are major proposed changes to the TOR include the timing of meetings and the provision of documents, and approaches for constructing decision tables. The SSC Groundfish and Coastal Pelagic Species Subcommittees plan to hold a joint webinar during April 2020 to further revise the TOR and will continue to refine the Acceptable Practices Guidelines For Groundfish Stock Assessments.

The SSC recommends that any changes to the sigma values and how they change with time be adopted by the April Council meeting of the year of the assessment cycle, with analyses presented at earlier meetings.

The SSC did not have any suggestions for revisions to the TOR for rebuilding analysis and methodology reviews.

SSC Notes:

Suggestions for modifications to the stock assessment prioritization tool:

Consideration should be given to accounting for effort when defining recreational importance of species. In principle, recreational importance could be quantified using the results of choice studies but the benefits of doing so are unlikely to justify the cost.

Consider accounting for spatial variation in ACL attainment and stock status.

The Constituent Demand tab covers many diverse aspects. Each is important but a better documentation of how the information is used to assign scores would make the assignment of scores more transparent.

The ratio of quota lease to ex-vessel price could be used to identify choke species.

The SURF index of Plagányi and Essington could be used as an alternative way to identify species of ecosystem importance.

Compute the "new information" score for flatfish and roundfish scaling out the "updated rockfish steepness prior" factor.

Wait until the outcomes of the May data-moderate panel are available before eliminating species from the detailed summary.

The 2014-16 OFL contributions in the Ecosystem tab will be updated for the June meeting, but will not likely impact final scores to any noteworthy extent.

TOR-related issues:

The suggestion to conduct Panel reviews at least three weeks apart is impractical.

Providing the draft assessment document to the Panel two weeks prior to the review meeting and requesting the reviewers provide the STAT with an initial list of issues will assist the STAT prepare for the review.

The agenda for the May 2020 data-moderate workshop should include discussion how data-poor assessments are updated and reviewed, as well as criteria for when data-poor assessments need to be updated.

Add the tables with buffers values as a function of sigma and P to the TOR by the June meeting.*

G. Ecosystem Management (continued)

2. Fishery Ecosystem Plan (FEP) Five-Year Review – Final Action

The Scientific and Statistical Committee (SSC) received a briefing from Dr. Kit Dahl on the Fishery Ecosystem Plan (FEP) five-year review, detailing proposed revisions to Chapters 1 and 2 and the proposed process for future changes to the FEP (Agenda Item G.2, Attachment 1, September 2019). The SSC does not have any specific changes to suggest to the revisions to Chapters 1 and 2 of the FEP.

Section 1.2 states that the FEP is an informational document and not prescriptive. However, achieving many of the objectives in Section 1.3 of the FEP would require actions that fall under the authority of other FMPs to implement, or research, education or policy actions that may be beyond the authority or resources of the Council. Revision of later chapters should detail how the FEP can promote achievement of these objectives, including ensuring that the research and data collections needed to support associated management decisions are undertaken. The 2018 Research and Data Needs document already identifies research and data collection gaps that may limit the ability to achieve some FEP objectives. The next research and data needs evaluation and the research and data needs database soon to be under development should specifically consider the objectives of the FEP when identifying and ranking research and data collection priorities.

The material in Chapter 3 is dated and is in need of revision. If the Council chooses to update this or other chapters of the FEP, the SSC recommends additional scientific resources be allocated to support the revision process. The scientific expertise needs will likely be similar to those allocated to the development of the 2013 FEP.

SSC Notes:

Some of the objectives are aspirational so may be beyond the ability of existing science and data collection resources to achieve. For example, the information to map trophic flows is not currently collected.

An example of an objective that requires actions that fall under the authority of other FMPs is "to rebuild individual overfished stocks and minimize overfishing and bycatch." The FEP needs to identify how it will contribute to achieving this objective.

C. Administrative Matters (continued)

5. Future Council Meeting Agenda and Workload Planning

The Scientific and Statistical Committee (SSC) discussed an anticipated methodology review for data-limited methods, currently envisioned as a three-day meeting in either late April or early May 2020, with final dates to be determined prior to the April Council meeting. Dr. André Punt has tentatively agreed to chair this meeting. The meeting will include both a formal methodology review of two length-based data limited stock assessment methods (Length-based Integrated Mixed Effects, or LIME, and simple implementation of Stock Synthesis, SSS) proposed in September of 2019 (Agenda Item H.10, Attachment 2, September 2019), as well as a workshop to review of a variety of data-limited approaches and tools not explicitly under review for use in the 2021 stock assessment cycle. As reported in November, the SSC does not see a need for a

committee of independent experts reviewer, and the SSC continues to recommend that Drs. Tom Carruthers and Adrian Hordyk be invited to participate.

In light of the Oregon Department of Fish and Wildlife (ODFW) decision to postpone the methodology review for the ODFW visual-hydroacoustic nearshore rockfish survey, the SSC has removed this from the near-term planning.

The SSC recommends a webinar be held in April to discuss suggested and additional changes to the Terms of Reference for the Groundfish and Coastal Pelagic Species Stock Assessment Review Process for 2021-2022. The webinar should include Groundfish and Coastal Pelagic Species stock assessment analysts and Council advisory body representatives.

The 7th national meeting of the Scientific Coordination Subcommittee (SCS7) is currently planned to be held August 4-6, 2020 in Sitka, Alaska. The North Pacific Fishery Management Council

will host the meeting, which will focus on ongoing developments to better incorporate ecosystem indicators into the stock assessment process and otherwise consider ecosystem information by management. The SSC anticipates developing a preliminary list of Pacific Fishery Management Council SSC attendees at the April Council meeting.

SSC notes:

Regarding the SCS7, it would be good to clarify whether additional NOAA SSC members (beyond the nominal four participants per Council) are welcome to attend the meeting.

WDFW is revisiting how they assign market category catches to the species level, a topic that could have an influence on future stock assessments; the SSC should consider whether these changes warrant some level of review prior to the 2021 stock assessment cycle. The SSC should also discuss options to evaluate and standardize California size and age composition weighting.

SSC Administrative Matters (continued)

9. Planning the Research and Data Needs Database

André Punt, Cameron Speir, John Budrick, Alan Byrne, Marisol Garcia-Reyes, and Owen Hamel volunteered to help John DeVore design the new Pacific Council Research and Data Needs database. The Pacific Council database is envisioned as a modification to the North Pacific database. The first step is John DeVore will set up a webinar with PSMFC staff to go over the North Pacific database to understand how it is constructed. André Punt explained the first step in redesigning the North Pacific database will be a major step as he anticipates the need for significant changes in the structure of the North Pacific database to suit our needs.

SSC Subcommittee Assignments, March 2020

Salmon	Groundfish	Coastal Pelagic Species	Highly Migratory Species	Economics	Ecosystem-Based Management
Alan Byrne	**John Budrick**	**André Punt**	**Michael Harte**	**Cameron Speir**	**Kristin Marshall**
John Budrick	John Field	John Budrick	John Field	Michael Harte	John Field
Owen Hamel	Melissa Haltuch	Alan Byrne	Marisol Garcia-Reyes	Dan Holland	Melissa Haltuch
Michael Harte	Owen Hamel	John Field	Dan Holland	André Punt	Michael Harte
Galen Johnson	Kristin Marshall	Marisol Garcia-Reyes	Kristin Marshall		Dan Holland
Will Satterthwaite	André Punt	Owen Hamel	André Punt		Marisol Garcia-Reyes
Jason Schaffler	Jason Schaffler	Will Satterthwaite			Galen Johnson
Ole Shelton	Tien-Shui Tsou	Tien-Shui Tsou			André Punt
Cameron Speir					Will Satterthwaite
Tien-Shui Tsou					Ole Shelton
					Cameron Speir

Bold denotes Subcommittee Chairperson

PFMC
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Council Meeting Dates	Location	Likely SSC Mtg Dates	Major Topics
June 11-18, 2020 Proposed Subcommittees may meet Tues, June 11 Advisory Bodies may begin Wed, June 12 Council Session may begin Thur, June 13	DoubleTree by Hilton San Diego – Mission Valley 7450 Hazard Center Drive San Diego, CA 92108 Phone: 619-297-5466	Two-day SSC Session **Wed, June 12 – Thur, June 13**	Final groundfish Stock Assessment Plan and Terms of Reference GF Methodology Report Sablefish MSE DGN Bycatch Performance Report Standardized Bycatch Reporting Methodology Research and Data Needs Database Planning
September 10-17, 2020 Proposed Subcommittees may meet Thur, Sept 10 Advisory Bodies may begin Fri, Sept 11 Council Session may begin Sat, Sept 12	DoubleTree by Hilton Spokane City Center 322 N. Spokane Falls Court Spokane, WA 99201 Phone: 509-455-9600	One-day SSC Ecosystem Subcommittee Session **Thur, Sep 10** Two-day SSC Session **Fri, Sep 11 – Sat, Sep 12**	Review of CCIEA Focus Topics Pacific Sardine Rebuilding Plan Groundfish Methodology Prelim Topic Selection Salmon Methodology Review – Adopt Priorities HMS Biennial Management Measures and Harvest Specifications FEP 5-year Review Research and Data Needs Database Planning
November 13-20, 2020 Proposed Subcommittees may meet Fri, Nov 13 Advisory Bodies may begin Sat, Nov 14 Council Session may begin Sun, Nov 15	Hyatt Regency Orange County 11999 Harbor Blvd. Garden Grove, CA 92840 Phone: 714-750-1234	Two-day SSC Session **Sat, Nov 14 – Sun, Nov 15**	CPS Methodology Review Topic Selection CPS Prelim. EFP Review GF Methodology Final Topic Selection Salmon Methodology Review Final Report Research and Data Needs Update
March 3-10, 2021 Proposed Subcommittees may meet Wed, Mar 3 Advisory Bodies may begin Thur, Mar4 Council Session may begin Fri, Mar 5	Doubletree by Hilton Hotel Seattle Airport 18740 International Boulevard Seattle, WA 98188 Phone: 206-246-8600	Two-day SSC Session **Thur, Mar 4 – Fri, Mar 5**	Identify Salmon Management Objectives Salmon Review/Pre I CA Current IEA Report

Proposed Workshops and SSC Subcommittee Meetings for 2020							
Workshop/Meeting		**Potential Dates**	**Sponsor/ Tentative Location**	**SSC Reps.**	**Additional Reviewers**	**AB Reps.**	**Council Staff**
1	Webinar for the Terms of Reference for Groundfish and CPS stock assessments	April 21, 2020	Council/ webinar	GF and CPS subcommittee members	Stock Assessment Analysts	GMT, GAP CPSMT, CPSAS	DeVore
2	Data-Limited Methodology Workshop, Combined with Length-Based Data-Moderate Assessment Methodologies Review	May 12-14, 2020	Council/ TBD	GF Subcommittee Members	Carruthers, Hordyk	NA	DeVore
3	7th National Meeting of the Scientific Coordination Subcommittee of the Council Coordination Committee	August 4-6, 2020	NPFMC/ Sitka, AK	4 TBD	NA	NA	DeVore
4	Salmon Methodology Review	October 2020	Council/TBD	Salmon Subcommittee	NA	STT, MEW	Ehlke