SUMMARY MINUTES

Scientific and Statistical Committee

Pacific Fishery Management Council
Hyatt Regency Orange County
11999 Harbor Boulevard.
Garden Grove, CA 92840
Room Terrace A-C
714-750-1234

November 2-3, 2022

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, 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. Dan Holland, SSC Chair, National Marine Fisheries Service Northwest Fisheries Science Center, Seattle, WA
Dr. Galen Johnson, Northwest Indian Fisheries Commission, Olympia, WA
Dr. Kristin Marshall, National Marine Fisheries Service Northwest Fisheries Science Center, Seattle, WA
Dr. Tommy Moore, Northwest Indian Fisheries Commission, Olympia, WA
Dr. André Punt, University of Washington, Seattle, WA
Dr. Matthew Reimer, University of California Davis, Davis, California
Dr. William Satterthwaite, National Marine Fisheries Service Southwest Fisheries Science Center, Santa Cruz, CA
Dr. Jason Schaffler, Muckleshoot 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

None.

SSC Recusals for the November 2022 Meeting		
SSC Member	**Issue**	**Reason**
Dr. Galen Johnson	D.2 Final Methodology Review	Dr. Johnson contributed to many review items and supervised other contributors.
Dr. William Satterthwaite	D.2 Final Methodology Review	Dr. Satterthwaite contributed to the Southern Resident Killer Whale threshold analysis and review items other than FRAM documentation.
Dr. Ole Shelton	D.2 Final Methodology Review	Dr. Shelton contributed to the Southern Resident Killer Whale threshold analysis and developed the Shelton model.

A. Call to Order

Dr. Dan Holland called the meeting to order at 0800. Mr. Merrick Burden briefed the Scientific and Statistical Committee (SSC) on their tasks at this meeting. Dr. Tommy Moore volunteered to serve on the Groundfish, Salmon, and Ecosystem Subcommittees.

C. Administrative Matters

9. Membership Appointments and Council Operating Procedures (SSC Closed Session)

D. Salmon Management

2. Final Methodology Review

The Scientific and Statistical Committee (SSC) received a report summarizing reviews of salmon topics conducted by the SSC's Salmon Subcommittee (SSCSS) via webinar October 12-13, 2022 (appended below). The SSC received summaries concerning five topics:

1. **Sacramento Index Forecast Calculations**
2. **Sacramento River Fall Chinook Conservation Objective**
3. **FRAM Technical Detail Documentation**
4. **Review Fishery Regulation Assessment Model – Round 7.1.1**
5. **Review Updates to Chinook Salmon Ocean Distribution Models**

Sacramento Index Forecast Calculations

The SSCSS received a presentation from Dr. Will Satterthwaite (SWFSC) on "Use of Mean Versus Median in Converting Sacramento Index Forecast from Logarithmic to Arithmetic Scale" and reviewed a document by the same name. The Sacramento Index (SI) is an index of the ocean abundance of adult (age-3 and older) Sacramento River Fall Chinook (SRFC) salmon. Each year a preseason forecast of the SI is generated using a log-scale regression of the previous year's return of jacks (age-2) and is used to set harvest limits for the fishing season. Current management uses the predicted mean from the forecasted lognormal distribution. Using the median value of the forecast lognormal distribution will always produce a smaller forecast than the mean forecast; however, the use of the median forecast should provide equal likelihood of over- and under-forecasting. The SSC recommends that the pre-season SI forecast use the median value when converting from logarithmic to arithmetic scale to improve forecast accuracy beginning in 2023. Use of the median forecast should not preclude the investigation of alternative analyses and measures of forecast accuracy.

Sacramento River Fall Chinook Conservation Objective

The SSC reviewed the basis for the current SRFC conservation objective by examining the literature cited within the Salmon FMP. The SSC identified several places where the language and numbers in the Salmon FMP could not be recreated from the cited source material, such as the mean escapements reported for the 1953-1960 period. The SSC supports the specific language appended to the end of this report to make the FMP consistent with the source material.

The SSC recommends a comprehensive review (as specified in section 3.2.2 of the FMP) of the current SRFC conservation objective, based on three main concerns:

1. The conservation objective applies to both natural and hatchery spawners and reflects hatchery goals at the time of implementation. Assumptions about the lack of distinction between natural and hatchery fish in the Sacramento River may need revisiting based on recent tagging and genetic studies. The conservation objectives for many other stocks, including the Klamath River Fall Chinook, were established for natural spawners.
2. The current proxy for MSY is derived from the SRFC runs observed during a few years. The use of select years of historical data to define a MSY proxy is not compelling without additional scientific justification.
3. There have been changes to habitat, climate, and other factors since the 1950s (when some of the data used to calculate the MSY proxy were gathered) and 1984 (when the current conservation objective was adopted). The lower bound of the conservation objective (122,000 adults) was an interim goal until fish passage problems with the Red Bluff Diversion Dam were rectified; the gates of the dam have been fully open since 2011. The SRFC conservation objective should be assessed with newer data that captures current conditions.

There are several reference points and conservation objectives for other stocks that could be similarly reviewed, some of which are similarly dated (see FMP, Table 3-1). The SSC reiterates its recommendation from October of 2021 that a process be established to periodically review and, if needed, update reference points and conservation objectives for all salmon stocks in the FMP.

FRAM Technical Detail Documentation

The SSC appreciates the work done by the analysts to update and expand the online Fishery Regulation Assessment Model (FRAM) documentation. The online FRAM user's manual and overview are well organized and do not require further review. The SSC recommends that documentation of existing methodologies be completed as soon as possible and updated regularly. Future reviews of changes to FRAM algorithms or portions of FRAM that have not been previously reviewed (e.g., Backward FRAM) will require completed documentation of all the underlying concepts and algorithms.

Review Fishery Regulation Assessment Model – Round 7.1.1 and

Review Updates to Chinook Salmon Ocean Distribution Models

The SSC reviewed two short summary documents informing Southern Resident Killer Whale (SRKW) management measures (Section 6.6.8 of the FMP): Chinook salmon abundance (FRAM version 6.2 versus 7.1.1) and ocean distribution (Shelton et al. 2019, 2021). The SSC appreciated the updates on both topics. The description of data changes to FRAM are reasonable and since Round 7.1.1 is used for pre-season planning purposes, using the same FRAM base period for the SRKW threshold calculations would provide consistency with its use in other areas of Chinook management. Shelton et al. (2021) used 20 more years of data and provided estimated ocean distributions for more stocks than Shelton et al. (2019). The SSCSS did not review how the two model components were combined to produce area-specific abundances.

The FMP states (Section 6.6.8) that the determination of the Chinook abundance threshold is based on the best scientific information available (BSIA). However, it is the SSC's understanding that the adoption of the Chinook abundance threshold was a Council policy decision. The SSC has never fully reviewed the information contributing to the SRKW thresholds nor identified the inputs as BSIA for use in determining the Chinook salmon abundance threshold. The SSC did review the risk analysis from the Ad Hoc SRKW Workgroup, which used FRAM estimates of abundance combined with Shelton et. al (2019) distributions as components, in November 2019. At that time, the SSC found "the data sets used and the analyses performed to be reasonable and appropriate for the questions at hand", where the questions at hand were examining relationships between indices of abundance and SRKW life history and body condition parameters. The SSC did not review the area-specific abundances for the purposes of management (https://www.pcouncil.org/documents/2019/11/agenda-item-e-4-a-supplemental-ssc-report-1.pdf/). Thus, the SSC requests clarification from the Council about what scientific information requires a BSIA determination.

The SSC recommends that the analyses that motivate and produce the Chinook salmon abundance threshold be compiled into a single document for transparency. Currently the analyses contributing to the SRKW threshold are spread across STT and SRKW Ad Hoc Working Group documents produced over a number of years.

The SSC suggests clarifying section 6.6.8 of the FMP. For example, after updating the abundance and distribution parameters, the seven lowest years of Chinook salmon abundance in the north of Falcon area may not be the specific years listed in the FMP. Should the calculated abundance be derived from years listed or the seven lowest abundances?

Additional Remarks

The SSC identified language in additional places within the FMP that does not conform to current management practices. For example, salmon fisheries in California are not managed with the goal of maximizing natural production (contrary to p. 51 of the FMP), and some ESA-listed evolutionarily significant units (ESUs) have gone more than five years without stock-specific management for at least one stock in each ESU (contrary to p. 39). The SSC is willing to work with the Salmon Technical Team (STT) to identify areas within the FMP that do not accurately characterize current management practices and recommend updates.

APPENDIX:

Proposed Edits to SRFC Conservation Objective (deletions in ~~strikethrough~~, additions in underline):

> 122,000-180,000 natural and hatchery adult spawners (122,000 is the MSY proxy adopted 1984). ~~This~~ The upper end of this objective is intended to provide adequate escapement of natural and hatchery production based on the sum of previous hatchery goals and reports of average fall Chinook escapements for various parts of the Sacramento Basin (which are inconsistent with current estimates for those years) during various reference periods (PFMC 1984). The lower end of the objective and S_{MSY} are based on a reduction from the average Upper Sacramento escapement, meant to be used until "problems caused by the Red Bluff Diversion Dam are rectified"(p. 3-19, PFMC 1984). ~~for Sacramento and San Joaquin fall and late-fall stocks based on habitat conditions and average run-sizes as follows: Sacramento River 1953-1960; San Joaquin River 1972-1977 (ASETF 1979; PFMC 1984; SRFCRT 1994).~~ The objective is less than ~~the~~ an estimated basin capacity of 240~~5~~,000 fall-run spawners (Hallock 1977), but greater than the 118,000 spawners for maximum ~~production~~ yield estimated for natural areas in the Upper Sacramento alone, based on data from 1954-1963 ~~on a basin by basin basis before Oroville and Nimbus Dams~~ (Reisenbichler 1986).

SSC Notes:

Other forecast methodologies for salmon and groundfish stocks in the PFMC (e.g., Willapa Bay coho, Sacramento River Winter Chinook) currently use approaches that reflect the median forecast.

SRFC genetics: Williamson and May (2005, https://doi.org/10.1577/M04-136.1) documented extensive hybridization and homogenization among Central Valley fall Chinook at the seven microsatellite loci they examined, which they attributed to extensive hatchery straying and introgression with fish spawning in natural areas. However, Meek et al. (2020, https://dx.doi.org/10.1139/cjfas-2019-0171) performed a broader genomic study and found greater population structure than previously documented, including evidence for differentiation

and adaptation. Recent tagging studies have also provided increased understanding of the contributions of hatchery- versus natural-area spawners in different parts of the Sacramento basin (https://www.calfish.org/ProgramsData/ConservationandManagement/CentralValleyMonitoring/CentralValleyCFMProgram.aspx).

The FRAM website (https://framverse.github.io/fram_doc/) now provides equation formatting and descriptions of the terms, expanded descriptions of non-retention calculations for Chinook salmon to reflect length restrictions, expanded descriptions of mark selective bias calculations for Coho salmon, and describes updates to the Chinook FRAM base period.

From the perspective of the SSC, there are at least four potential, general scientific questions relevant to the SRKW management measures:

1. *Does FRAM provide scientifically supported estimates of stock-specific Chinook salmon abundance?*
2. *Does the Shelton et al. (2019 or 2021) model provide scientifically supported estimates of stock-specific Chinook salmon ocean distribution?*
3. *How can outputs from (1) and (2) be combined to provide spatial estimates of stock-specific and aggregate Chinook salmon abundance?*
4. *How do the outputs from (3) connect to aid SRKW recovery?*

The STT verbally reported the methodology used in the risk assessment to be similar to the methods used to calculate area-specific Chinook salmon abundances, but the Council has not asked the SSC to review the threshold methodology.

There are some technical questions about the appropriateness of using FRAM for SRKW thresholds. For example, why is October Chinook salmon abundance used?

SCIENTIFIC AND STATISTICAL COMMITTEE'S

SALMON SUBCOMMITTEE REPORT ON

SALMON METHODOLOGY REVIEW

Pacific Fishery Management Council

Via Webinar

October 12 – 13, 2022

The Scientific and Statistical Committee's Salmon Subcommittee (SSCSS) held an online meeting on October 12 and 13, 2022 with the Model Evaluation Workgroup (MEW) and the Salmon Technical Team (STT) in attendance. The salmon methodology agenda items that were discussed and reviewed at this meeting were: (1) Review Fishery Regulation Assessment Model Round 7.1.1; (2) Review Updates to Chinook Salmon Ocean Distribution Models; (3) FRAM Technical Detail Documentation; (4) Sacramento Index Forecast Calculations and; (5) Sacramento River Fall Chinook Conservation Objective.

1. Review Fishery Regulation Assessment Model – Round 7.1.1

Mr. Jon Carey (NOAA) presented the Fishery Regulation Assessment Model (FRAM) changes that occurred when base period Round 6.2 (Round 6.2) was updated to base period Round 7.1.1 (Round 7.1.1). These changes fall into four categories:

1) Updated coded wire tag recovery information, auxiliary recoveries, and fishery mapping.

2) Escapement expansions to account for inter-dam loss of Columbia River stocks that originate upstream of Bonneville Dam.

3) Updated stock-specific terminal run size inputs.

4) Updated estimates of catches in Canadian sport fisheries.

FRAM algorithms were not modified between Round 6.2 and Round 7.1.1. Twenty-five years (1992-2016) were evaluated to assess the differences in the estimates of stock abundance using the two base periods. Using Round 7.1.1 resulted in little change of the estimated mean starting cohort age-3+ Chinook salmon abundance of most FRAM stocks (see Table 1). The total Chinook salmon October 1 pre-fishing abundance assumed to be in the North of Falcon region increased in all but two years (1997 and 2010, see Table 2) using Round 7.1.1 however, the increase was less than 81,000 fish in all years except 2015 (increase of 120,875). The percent change in the total Chinook salmon abundance ranged from -1% to 6% when using Round 7.1.1.

The Ad-hoc Southern Resident Killer Whale (SRKW) Workgroup identified a group of seven years (1994-1996, 1998-2000, and 2007) that had the lowest modeled pre-fishing October 1 total Chinook abundance in the North of Falcon region using FRAM Round 6.2 (out of candidate years 1993-2016, although the Salmon Fishery Management Plan (FMP) incorrectly states the range as 1992-2016, in which case 1992 would have qualified as one of the seven lowest). These seven years were reflected in the Salmon FMP but it is unclear whether the years would change when

inputs to the threshold calculations are updated, or if they are fixed regardless of whether they remain the lowest years with current and future updates. The update from Round 6.2 to Round 7.1.1 results in a change of the seven lowest pre-fishing abundance years and their modeled abundances in the North of Falcon region. However, there were no measures of uncertainty in the modeled total abundance estimates to evaluate whether the abundance differences between Round 6.2 and Round 7.1.1 were statistically significant.

The description of data changes to FRAM are reasonable and the SSCSS agrees that an improvement in model performance would be expected from these data changes. Further, since Round 7.1.1 is used for pre-season planning purposes, using the same FRAM base period for the SRKW threshold calculations is practical.

2. Review Updates to Chinook Salmon Ocean Distribution Models

The SSCSS reviewed a summary of the differences between two peer reviewed papers by Shelton et al. (2019 and 2021) that describe the abundance and distribution of Fall Chinook Salmon stocks using CWT recoveries. Both papers use a Bayesian state-space model to describe the abundance and distribution of Fall Chinook Salmon stocks since 1978 (release years 1978-1990 in Shelton et al. 2019; release years 1978-2010 in Shelton et al. 2021). The 2021 paper included CWT recovery data from five fishing fleets including two hake fisheries whereas the 2019 model excluded the hake fleets. The 2019 paper included 12 Fall Chinook Salmon stocks and the 2021 paper included 16 Fall Chinook Salmon stocks. A notable change in the stock structure between the two papers was splitting the Upper Columbia stock (UPCOL) into Snake River (SNAK) and upriver bright (URB) components in the 2021 paper. In addition to the data changes, there are two major differences in the statistical models used in the two papers. First, Shelton et al. (2021) derived and used a new likelihood function for connecting the observed data with the parameters of the biological model. This new likelihood improved both the biological interpretability of model parameters and the computational speed of model fitting. Second, Shelton et al. (2021) allowed the ocean distribution of salmon stocks to vary year-to-year as a function of localized sea surface temperature (SST). The 2021 model provides an estimate of the long-term average ocean distribution corresponding to the long-term average SST pattern for each season (1981-2015) as well as estimated distributions for each year. The 2019 model provided a single estimate of ocean distribution for each stock in each season.

The SSC did not receive any material to assess how the stocks and distribution parameters in Shelton's 2019 paper were used in section 6.6.8 of the Salmon FMP and hence can't comment on whether the distribution parameters in Shelton's 2021 model are an improvement from what is currently used.

3. FRAM Technical Detail Documentation

Ms. Angelika Hagen-Breaux (MEW) provided an overview of updates and additions to the FRAM documentation since the 2021 Salmon Methodology review. The FRAM online material documents parts of FRAM, including structural and design changes since 2007, and provides a more detailed description of its procedures and algorithms than previous iterations of the FRAM documentation. The FRAM website now provides equation formatting and descriptions of the

terms, expanded descriptions of non-retention calculations for Chinook salmon to reflect length restrictions, expanded descriptions of mark selective bias calculations for Coho salmon, and describes updates to the Chinook FRAM base period.

The SSCSS strongly recommends that documentation of existing methodologies be completed as soon as possible. As a living document, the documentation on the FRAM website can be updated regularly and new topics added. The SSCSS finds the online FRAM user's manual and overview portion of the documentation to be well organized and user friendly and do not require further review. However, future review of changes to FRAM algorithms or portions of FRAM that have not been previously reviewed (e.g., Backward FRAM) will require completed documentation of all the underlying concepts and algorithms.

4. Sacramento Index Forecast Calculations

The SSCSS received a presentation from Dr. Will Satterthwaite of the SWFSC on "Use of Mean Versus Median in Converting Sacramento Index Forecast from Logarithmic to Arithmetic Scale" and reviewed a document by the same name. The Sacramento Index (SI) is an index of the ocean abundance of adult (age-3 and older) Sacramento River Fall Chinook Salmon. Each year a preseason forecast of SI is generated using the previous year's return of jacks (age-2) and is used to set harvest limits for the fishing season. Since 2014, the SI forecast is generated from the results of a log-log regression with an autocorrelated error term, using inputs starting from adult return year 1983. The log-scale mean SI for year t $\log(SI_t)$ is the sum of an intercept term (β_0), a slope term (β_1) times the estimated logged jack escapement the previous year (J_{t-1}), and the estimated autocorrelation of past deviations from the fitted line (ρ) times the deviation of the previous year's postseason SI estimate from the fitted line prediction (ϵ_{t-1}):

$$\log(SI_t) = \beta_0 + \beta_1 \log(J_{t-1}) + \rho \varepsilon_{t-1}$$

Using this equation generates an SI forecast on the logarithmic scale that is distributed according to the normal distribution (assuming all statistical assumptions are met). However, management is based on the number of fish on the arithmetic scale. Transforming the SI forecast from the logarithmic to arithmetic scale results in a lognormal distribution for the SI forecast. The mean, median, and mode of a lognormal distribution are not equal on the arithmetic scale. Since 2014, the SI forecast has used the mean value when converting from the logarithmic to arithmetic scale.

The median value of a lognormal distribution will always be smaller than the mean. This means that using the median for the SI forecast value will result in smaller pre-season abundance estimates than the current method. Also, use of the median would be expected to be equally likely to produce an over-forecast or an under-forecast. By contrast, use of the mean value would be more likely to produce an over-forecast which seems to be occurring in recent years.

A retrospective analysis was done that compared use of the mean (i.e., the current method) to using the median when deriving a point estimate on the arithmetic scale. The results of all performance metrics considered for the years 1995 – 2021 (see Table 2) found that using the median produces forecasts closer to the postseason estimates than forecasts using the mean. The difference in the average forecast error is small relative to the typical level of forecast error overall. During the

2014-2021 period, using the median forecast would be expected to result in fewer years in overfished status (2 versus 3) and higher average escapement. The median forecast also results in lower average harvest (by about 4,500 fish). However, the analysis did not take into account the impact of higher escapement on future production, which would be expected to increase the average escapement further and reduce the impact on average harvest.

The SSCSS recommends that the pre-season SI forecast use the median value when converting from logarithmic to arithmetic scale to improve forecast accuracy beginning in 2023.

5. Sacramento River Fall Chinook Conservation Objective

Dr. Will Satterthwaite (SWFSC, SSC) gave a presentation of his work documenting the basis for the current Sacramento River Fall Chinook conservation objective in the current Salmon FMP and an overview of two recent analyses relevant to this topic. In addition to his presentation, the SSCSS discussed the literature review that Dr. Satterthwaite conducted on the topic, relevant excerpts from the FMP, and excerpts from the Final Framework Amendment for Managing the Ocean Salmon Fisheries off the Coasts of Washington, Oregon, and California Commencing in 1985 that established the current conservation objective. The SSCSS appreciates the amount of work and careful documentation that Dr. Satterthwaite put into this literature review. The SSCSS notes that there are reference points and conservation objectives for other stocks that could be similarly reviewed, some of which are similarly dated (see FMP, Table 3-1).

The SSCSS recommends a comprehensive technical review (as specified in section 3.2.2 of the Salmon FMP) of the current SRFC conservation objective, based on three main concerns:

1. The conservation objective applies to both natural and hatchery spawners and reflects hatchery goals (since changed) at the time of implementation. Assumptions about the lack of distinction between natural and hatchery fish in the Sacramento River may need revisiting based in part on recent genetic studies. The conservation objectives for many other stocks, including the Klamath River Fall Chinook, were established for natural spawners.
2. The current proxy for MSY is derived from the SFRC runs observed during a few years. Without a compelling scientific justification, the SSCSS does not find the use of select years of historical data to define a MSY proxy to be compelling.
3. There have been changes to habitat, climate, and other factors since the 1950s (when some of the data used to calculate the MSY proxy was gathered) and 1984 (when the current conservation objective was approved). The SRFC conservation objective should be assessed with newer data that captures these changes.

In addition to these scientific concerns, the mean escapements reported for the 1953-1960 period could not be reproduced based on available data sources, and the lower bound of the conservation objective (which also serves as the S_{MSY} reference point needed for status determinations) is described as an "interim" goal meant to be used until passage problems at Red Bluff Diversion Dam are rectified. The gates of Red Bluff Diversion Dam have been fully open since 2011.

The literature review uncovered a number of factual errors in the FMP language, and the SSCSS strongly recommends resolving those errors. The literature review contains recommended edits on page 13, lines 443-462, which the SSCSS supports.

The SSCSS reiterates its recommendation from October of 2021 that a process be established for the periodic review and, if needed, updating reference points and conservation objectives for all salmon stocks in the FMP.

SSC Notes:

Review Fishery Regulation Assessment Model – Round 7.1.1

FRAM is likely to be updated in the future which would result in a need to update the SRKW threshold to maintain a consistent currency.

Data changes in many instances are likely to have cascading impacts that may not be predictable.

The SSC has not reviewed many of the algorithms in the base period calibration program.

The inter-dam loss (IDL) adjustment may warrant SSC review as it is not a straight-forward "data issue".

Table 2 with percent changed column added

Run Year	Round 6.2	Round 7.1.1	Difference	Round 7.1.1 percent change from Round 6.2
1992	1,037,717	1,045,154	7,437	0.71%
1993	1,079,609	1,113,993	34,384	3.09%
1994	813,496	864,802	51306	5.93%
1995	1,023,196	1,061,620	38,424	3.62%
1996	1,035,298	1,072,843	37,545	3.50%
1997	1,144,311	1,133,318	-10,993	-0.97%
1998	861,060	879,596	18536	2.11%
1999	1,046,803	1,069,361	22,558	2.11%
2000	1,036,777	1,097,210	60,433	5.51%
2001	1,921,284	1,981,902	60,618	3.06%
2002	2,135,524	2,179,640	44,116	2.02%
2003	1,961,412	2,041,672	80,260	3.93%
2004	1,969,918	2,037,024	67,106	3.29%
2005	1,479,101	1,497,312	18,211	1.22%
2006	1,279,111	1,300,767	21,656	1.66%
2007	946,534	964,276	33,742	3.50%
2008	1,253,810	1,327,574	73,764	5.56%
2009	1,062,844	1,096,557	33,713	3.07%
2010	1,941,252	1,916,653	-24,599	-1.28%
2011	1,523,081	1,552,971	29,890	1.92%

2012	1,553,165	1,590,635	37,470	2.36%
2013	2,440,406	2,482,455	42,049	1.69%
2014	1,976,400	2,046,114	69,714	3.41%
2015	2,292,869	2,413,744	120,875	5.01%
2016	1,437,249	1,481,619	44,370	2.99%

Sacramento Index forecast calculations, use of mean or median

The SSCSS notes that the notation used for the SI in Preseason Report I, and repeated in this report, does not clearly distinguish between forecasts and postseason estimates. To distinguish between data and estimates, we would suggest replacing the equation:

$log(SI_t)=\beta_0+\beta_1 log(J_{t-1}) + \rho\varepsilon_{t-1}$

with:

$$\widehat{log(SI_t)} = \beta_0 + \beta_1 log(J_{t-1}) + \rho\varepsilon_{t-1}$$

where $\widehat{log(SI_t)}$ *indicates the predicted mean of the forecast on the log-scale*

Sacramento River fall Chinook Conservation Objective

KRFC MSY was updated in 2005, a similar process could be considered for SRFC.

There is an assumption that "ocean management for Sacramento River chinook [sic] within the escapement range adopted will provide adequate escapement of San Joaquin stocks". Is this a valid assumption, or should San Joaquin be more explicitly addressed? San Joaquin fall Chinook are part of the Central Valley Fall Chinook stock complex for which SRFC is the indicator stock.

G. Highly Migratory Species Management

4. Biennial Harvest Specifications and Management Measures – Preliminary

The Scientific and Statistical Committee (SSC) discussed the suitability of proxies proposed as status determination criteria for Eastern Pacific skipjack tuna and North Pacific bluefin tuna as presented in the 2021 HMS SAFE Report, the September 2022 NMFS Supplemental Report on Biennial Harvest Specifications and Management Measures, and an additional document (appended to this report) describing the rationale for the selection of proxies prepared for the SSC by Dr. Steve Teo (Southwest Fisheries Science Center), who was available for the discussion.

The SSC supports the choice of the maximum sustainable yield (MSY) proxy of 30 percent of unfished spawning biomass recommended for skipjack tuna. This value was developed from the bigeye and yellowfin assessments, from which relative B_{MSY} could be calculated directly, and the rationale provided is appropriate. However, skipjack is an important prey species for other tunas in the Eastern Pacific and it might also be reasonable to consider a more precautionary reference point to account for their trophic role.

For bluefin tuna, the SSC agrees that the new rebuilding target should be at least 20 percent of unfished spawning biomass and supports using this value for management in this biennial cycle. Although this proxy value is consistent with the B_{MSY} value extracted from the assessment model output, the SSC has reservations about adopting this B_{MSY} proxy for future cycles without further investigation. Compared to the shorter-lived and faster-growing skipjack tuna, bluefin life history suggests it is likely to be less productive, and thus B_{MSY} relative to unfished spawning biomass for bluefin is likely higher than the ratio adopted for skipjack and most other tunas. The B_{MSY} from the bluefin assessment is based on the optimistic assumption that recruitment is independent of spawning biomass. Future analyses should explore the sensitivity of the target to the assumed steepness value in the assessment along the lines of previous work completed for bigeye and yellowfin tunas in the Eastern Tropical Pacific. The management strategy evaluation being undertaken by the Pacific Bluefin Working Group will include evaluation of alternative reference points, which will also help inform the choice of an updated rebuilding target in future management cycles.

Appendix:

October 19, 2022

This document is being provided by the NMFS SWFSC in response to an informal request for information about reference point selection for EPO skipjack tuna and Pacific Bluefin tuna. The SWFSC has provided background as requested but notes that the selection of reference points for HMS by RFMOs is not a NMFS decision. Rather, both NMFS scientists and managers participate in RFMO and RFO meetings and reference points are chosen through the RFMO process. As such, much of the information provided below on selection of reference points is also found in RFMO reports.

MSY proxy for EPO Skipjack Tuna (SKJ)

Based on the analysis of the SKJ assessment in the EPO by IATTC scientific staff, it was considered inappropriate to use MSY-based reference points for SKJ (SAC-13-07). Given the fast growth and high natural mortality of SKJ, previous assessments of SKJ in the EPO have found estimation of MSY reference points to be problematic because recruitment is assumed to be independent of stock-size and maximum YPR is obtained by catching fish at ages younger than the age at entry into the fishery. For the 2022 assessment, the IATTC scientific staff found that "optimal yield occurs by capturing the fish as young as possible. There is only a narrow range of ages where the growth is higher than survival (3-5 quarters) and where the biomass of the cohort increases. Within this short age range the cohort's biomass is maximized at 6 quarters. However, since the overall selectivity of all fisheries combined includes ages older than age 6, the yield calculations estimate that increasing mortality always increases yield". Therefore, it was considered inappropriate to use MSY-based reference points for SKJ stock status. Instead, MSY proxies for SKJ were developed from the bigeye and yellowfin assessments.

For a steepness of h = 1, which is the assumption made in the SKJ assessment, SSB_{MSY} for bigeye ranges from 20 – 24% of SSB_0 and the range for yellowfin is 23 - 32% of SSB_0. Other ranges are available in Table 2 of SAC-13-07 (reproduced below). The range for bigeye tuna is most sensitive to the steepness of the Beverton-Holt stock-recruitment relationship and the range for yellowfin is sensitive to a variety of factors. Based on this analysis, the IATTC scientific staff proposed and the IATTC Scientific Advisory Committee (SAC) agreed that a proxy for SSB_{MSY} of $30\%SSB_0$ be used for determining SKJ stock status.

Following that, the NMFS agrees that $30\%SSB_0$ is a reasonable B_{MSY} proxy for SKJ in the EPO and therefore the proxy for F_{MSY} would be the level of fishing mortality corresponding with the biomass target (i.e., $F_{Btarget}$ where Btarget is equal to $30\%SSB_0$). Applying these proxies to domestic status determination criteria results in an MFMT = $F_{Btarget}$ and MSST = 0.5 x $30\%SSB_0$ because M is assumed to be >0.5 y^{-1} for the SKJ assessment.

Modified from Table 2 of SAC-13-07. Ranges of SSB_{MSY}/SSB_0 estimated in the bigeye (SAC-11-06) and yellowfin (SAC-11-07) stock assessments.

Steepness (h)	**Bigeye**	**Yellowfin**
1.0	0.20 – 0.24	0.23 – 0.32
0.9	0.25 – 0.27	0.28 – 0.35
0.8	0.28 – 0.30	0.32 – 0.37
0.7	0.31 – 0.32	0.35 – 0.40

Pacific Bluefin Tuna Management / Rebuilding Target

Pacific Bluefin Tuna (PBF) are co-managed by an RFMO Joint Working Group (JWG) composed of members from the WCPFC's Northern Committee and the IATTC. U.S. managers and scientists are included in the JWG and are included in deliberations and drafting of recommendations. When the PBF stock was first declared overfished, the JWG established an initial target of rebuilding SSB to the historical median by 2024 with at least 60% probability – a goal that was recently met. At a meeting of the JWG in 2017, a second rebuilding target was established to inform management once the first target had been met. The second management objective was to rebuild the SSB to 20%SSB0 within 10 years of reaching the historical median or by 2034, whichever is earlier, with at least 60% probability. That goal is anticipated to be met in the very near future. The WCPFC identified PBF as level 2 stock under the Commission's hierarchical approach for setting biological limit reference points (link here; steepness is not known well, so the Limit Reference Points are specified in terms of %SPR0, %SB0, or %SBcurrent, F=0). The stock is now in the second rebuilding phase under the rebuilding plan with 20%SSBF=0 (link here). Once the stock is rebuilt, the Northern Committee will develop more refined management objectives as well as limit reference point(s)and target reference point(s).

It is important to note that no biological reference points (BRPs) or status determination criteria (SDCs) have been officially adopted for PBF by the RFMOs. The choice of $20\%SSB_0$ as a second rebuilding target was not based on any analyses specific to PBF, but instead is based on the WCPFC's general review of candidate reference points for HMS stocks in the North Pacific Ocean (WCPFC 2010), as well as general consensus reached by the JWG at subsequent meetings to establish rebuilding strategies for PBF. The choice of $20\%SSB_0$ was not made solely by NMFS scientists, but rather by NMFS scientists and managers as part of the JWG in their consensus building process. Moreover, the PBF assessment model estimates of SSB/SSB0 at MSY in the most recent years is roughly 20%, and thus a reasonable proxy for MSY given our current understanding. The ISC's PBFWG is beginning an MSE process to set long-term management

which will include a detailed analysis of target and limit reference points. The PBF MSE process should be completed in the next few years.

WCPFC. 2010. A review of candidate biological reference points for northern stocks of highly migratory species in the North Pacific Ocean. WCPFC-NC12-IP-06. https://meetings.wcpfc.int/node/9831

WCPFC. 2017. Summary of additional PBF projections. WCPFC-NC13-IP-04. https://meetings.wcpfc.int/node/10333

WCPFC. 2021. Harvest strategy for Pacific Bluefin Tuna fisheries. HS-2021-01. https://www.wcpfc.int/doc/hs-2021-01/harvest-strategy-pacific-bluefin-tuna-fisheries

ISC. 2022. Stock assessment of Pacific bluefin tuna in the Pacific Ocean in 2022. ISC/22/Annex/13. https://isc.fra.go.jp/pdf/ISC22/ISC22_ANNEX13_Stock_Assessment_for_Pacific_Bluefin_Tuna.pdf

3. Drift Gillnet Fishery Hard Caps – Final Action

The Scientific and Statistical Committee (SSC) received a presentation from Dr. Stephen Stohs (NMFS SWFSC) on a bootstrap simulation model used to analyze a range of alternatives to establish hard-caps for high priority protected species (HPPS) in the large-mesh drift gillnet fishery. The model predicts the effects of different hard-cap options on the catch of marketable and unmarketable species, HPPS mortalities and injuries, and revenue and profits. The SSC reviewed an earlier version of the bootstrap simulation model in September 2015. The model has been revised to accommodate hard-cap options for individual and fleet closures of varying lengths and separate treatment of unobservable vessels.

The SSC supports using the bootstrap simulation model to estimate the effects of the hard-cap alternatives. While the SSC discussed several ways in which the model could be extended to analyze the performance of hard-cap alternatives under higher HPPS interaction rates, the SSC agrees that the current simulations from the bootstrap model provide an adequate basis for evaluating the range of alternatives. However, the reporting and the discussion of the simulation results should be improved for decision-making purposes in the following ways:

- The estimated effects of the hard-cap options are primarily reported as averages; however, with HPPS interactions being relatively rare, the average is not an appropriate metric since the distribution of impacts can be highly skewed, and the average does not capture the risk (economic- or conservation-wise) associated with the different hard-cap options. The analysts should also report measures of risk that focus on the magnitude of the economic and conservation impacts associated with extremely bad events—for example, the expected effects conditional on being in the 5 percent worst-case outcomes.
- Rather than comparing the distributions of the simulated outcomes under the different hard-cap options, the analysts could report the distributions of the effects for each hard-cap option as differences from the status quo.

- While there is little quantitative difference between some of the Alternative 3 options, there are qualitative differences between the options that should be discussed in the analysis. For example, vessel-level caps are relatively riskier for individual vessels than fleet-wide caps and may not provide additional conservation benefit if vessels do not have much control over the likelihood of HPPS interactions. On the other hand, individual caps would provide additional incentives to the extent that vessels can influence the likelihood of HPPS interactions.

SSC Notes:

Testing whether the mean difference in model outcomes across hard-cap options is statistically different from zero, as discussed in Section IX, is not valid. Since the bootstrap simulations represent the sampling distribution of the model outcomes, there is no uncertainty regarding the mean difference between outcomes across hard-cap options. Statistical significance is therefore meaningless. The analysis should instead focus on whether the differences across options are meaningfully different regarding their economic and conservation significance.

H. Groundfish Management

4. Methodology Review – Final Fishery Impact Model Topics and Final Assessment Methodologies

Dr. John Budrick (CDFW) briefed the Scientific and Statistical Committee (SSC) on Groundfish Subcommittee reports from two Subcommittee meetings conducted during summer 2022 for ageing coordination and for the methodology review of the Oregon Department of Fish and Wildlife (ODFW) video-hydroacoustic survey for semi-pelagic rockfish. Dr. Owen Hamel (NWFSC) spoke to the Groundfish Subcommittee report on the Washington Department of Fish and Wildlife (WDFW) hook-and-line surveys. Dr. Chantel Wetzel (NWFSC) briefed the SSC on the updated analysis for estimating discard mortality when descending devices are used and the Groundfish Management Team's (GMT's) associated responses to the SSC's requests from the September meeting.

Ageing coordination

To inform 2023 groundfish stock assessments, the SSC Groundfish Subcommittee met to coordinate ageing tasks and identify data sources among the state and federal agencies that conduct biological sampling along the U.S. West Coast. The SSC finds the meeting productive and commends the collaborative efforts.

ODFW video-hydroacoustic survey review

ODFW's video-hydroacoustic survey has three components – a hydroacoustic survey, a stereo camera video survey, and a hook-and-line survey. The video survey component provides information on species composition and length frequency distributions. The ODFW hook-and-line survey complements these efforts by collecting biological samples for length-weight relationships and growth curves. Biomass estimates were derived by combining information collected from the

three components. Oceanographic data were also collected during the survey and were used as covariates in the model-based estimation method.

The SSC agrees with the issues identified by the review panel and supports the research and data needs highlighted in the Groundfish Subcommittee Report. The two main concerns raised during the review were the relationship between acoustic target strength and fish density, and the large discrepancy between the design- and the model-based estimates of biomass. The target strength models used in the ODFW report were from studies conducted in other regions and on various rockfish species. More research is needed to estimate species-specific target strengths for rockfish and other species of interest. There is a need for in-situ calibration of acoustic systems in deep, semi-protected waters, such as Puget Sound or Monterey Bay.

Large discrepancies in the biomass estimates between the design- and model-based approaches were observed. The design-based estimates of population size in numbers and biomass were derived using acoustic data on schools and single targets along with video counts and length estimates by species. Model-based biomass estimates were derived for each species by fitting spatiotemporal hurdle models. Model-based estimates were almost double the design-based estimates for black and blue/deacon rockfish, but the CVs were substantially lower. Further exploration is needed to understand these differences before the model-based estimates can be used in assessments.

Despite the unresolved issues and further development needed, the SSC commends the ODFW staff for their hard work and finds the first-year survey a good start. The design-based biomass estimate can be used in the 2023 black rockfish assessment with caution, for example, by providing a prior on stock size or as an absolute biomass estimate in a sensitivity analysis. This survey can be valuable in generating an index of relative abundance in the future regardless of its uncertainty as an absolute abundance estimate.

WDFW hook-and-line survey workshop

WDFW conducts two types of hook-and-line surveys: the rod-and-reel survey for nearshore groundfish species and the setline survey for yelloweye rockfish. The rod-and-reel survey is conducted in spring for semi-pelagic species and in fall for demersal species. The yelloweye setline survey expands the IPHC setline survey by adding eight fixed stations in high yelloweye catch locations. The goal of the setline survey was to construct a Washington-specific yelloweye abundance index. The SSC agrees with the subcommittee's recommendation to reduce the number of drifts per site and eliminate the two sites in Marine Area 1 in the rod-and-reel nearshore survey and to increase the number of sites elsewhere as feasible. The SSC also agrees that the WDFW yelloweye stations to supplement the IPHC setline survey are not informative for yelloweye rockfish abundance given their high CV. An exploration of other ways to obtain information for yelloweye rockfish, such as exploring deeper depths (> 40 fathoms) in the demersal rod-and-reel survey may be warranted.

Generalized discard mortality rates reflecting the use of descending devices for rockfishes

Revisions were made in the updated report in response to SSC feedback in September. The SSC endorses the updated analysis for developing discard mortality rates reflecting the use of

descending devices. The SSC recommends using species-specific estimates when there are adequate sample sizes and using guild-specific estimates when observations are lacking or sparse. The SSC notes that selection of upper quantiles of mortality estimates is a policy decision.

The SSC thanks the methodology review panels and workshop participants for their time and thoughtful input. The SSC thanks the GMT for their work on the discard mortality rate analysis. The SSC also endorses a methodology review of the revised sablefish trip limit model in 2023.

SSC Notes:

- *A centralized repository for age data from all sources, including unaged structures, should be established.*
- *Some simple rules/principles should be considered when composing the mortality table, such as the discard mortality for shallow depth bins should be lower than the mortality for deep depth bins.*

Major revisions from the September report based on SSC feedback in the discard mortality analysis:

- *A less informative hyper-prior for the Bayesian hierarchical models is used in the updated report to allow the data to have a greater influence in the posterior predictive estimates. The updated parameterization has low impacts on estimated discard mortalities for species with reasonable sample sizes (>~10) but has relatively higher impacts for species with lower sample sizes. For example, chilipepper rockfish in the pelagic guild with sample size of seven, had a median of 48% mortality in previous analysis and 58% in the updated analysis. For black rockfish, also in the pelagic guild, with more than 100 samples, the estimated median and 90th percentile mortalities remain the same.*
- *Bocaccio was moved from pelagic guild to demersal guild in updated analysis. The median and 90th percentile of the mortality estimates for bocaccio were 14% and 23% in previous analysis. Moving to the demersal guild had little effect on bocaccio mortality estimates, but there are shifts in the unobserved groups.*
- *The calculation for cumulative mortality, which includes model estimated mortality and additional unaccounted mortality, was simplified in the updated analysis.*
- *The two-sided Kolmogorov-Smirnov test and a power analysis were conducted to determine whether the species-specific posterior predictive distribution was significantly different from the guild and depth bin unobserved species posterior predictive distribution.*

I. Coastal Pelagic Species Management

4. Stock Assessment Terms of Reference – Final Action

The Scientific and Statistical Committee (SSC) discussed the draft Terms of Reference (TOR) for stock assessments of coastal pelagic species (CPS). Jessi Doerpinghaus (Council Staff) was available to provide details. The SSC revisited the revised draft TOR provided in the advance November briefing book and recommends:

1. Revising font size and shading in the bottom left panel of Figure 1 to clearly show $x_3 = 0.9$ rather than $x_3 - 0.9$.

2. Deleting the catch report for sardine in Appendix A.

While not requiring any changes to the text in the TOR, the SSC notes two cases where recent practice has not conformed with the TOR. The most recent multi-year projections for CPS have not increased sigma over the projection period. However, the SSC intends to do so in the future. Ideally, a CPS-specific rate of increase should be derived, but in the interim, rates derived for groundfish should be used. In addition, SSC members who were also Stock Assessment Review Panelists have not been recused from SSC reviews of recent assessments and will be recused in the future.

The SSC is supportive of developing a separate TOR for CPS rebuilding analyses. The SSC notes the request in public comment from Oceana to modify the TOR to require calculation of a maximum sustainable yield exploitation rate "E_{MSY}" for Pacific sardine. This type of analysis is not straightforward and would likely require re-evaluation of the relationship between recruitment and an environmental variable as well as simulation to compute E_{MSY} as a function of the environmental variable. Given the changes in the assessment since the last update to the E_{MSY} formula, this would first require a proponent to propose a methodology review of the updated E_{MSY}, complete the analyses required, present results, and respond to potential requests for further analyses.

5. Stock Assessment Prioritization

The Scientific and Statistical Committee (SSC) reviewed the Situation Summary document provided for Agenda Item I.5, Coastal Pelagic Species (CPS) Stock Assessment Prioritization. Jessi Doerpinghaus (Council Staff) raised the question of how to establish harvest specifications for Pacific sardine for the 2023-2024 fishing year in the absence of a new assessment and was present to answer questions.

The SSC supports the schedule in Table 1 of the Situation Summary. If no stock assessment is performed for Pacific sardine in 2023, the SSC will consider any new information provided at the April 2023 meeting, along with the results of the update assessment endorsed in 2022. Rolling over the overfishing limit (OFL) from the 2022 update assessment is one option. Any new information, along with the time since the last full assessment (2020), will be considered in determining the appropriate maximum sustainable yield exploitation rate (E_{MSY}) and OFL, and in setting sigma to reflect the current level of uncertainty.

H. Groundfish Management *(continued)*

5. Stock Definitions

The Scientific and Statistical Committee (SSC) discussed the proposed range of alternatives for Council consideration for Amendment 31 to the Pacific Coast Groundfish Fishery Management Plan, as well as the document prepared for this agenda item (Agenda Item H.5, Attachment 1). As noted in the SSC's June and September 2022 statements on this agenda item, defining stocks through an amendment to the Groundfish FMP involves a combination of scientific and policy considerations, and the SSC limited discussion to scientific considerations.

The SSC discussed the white paper that synthesizes the state of the knowledge for priority stocks and the management implications of the different prioritized stock definitions. The SSC supports the proposed alternatives for all species listed in Attachment 1, with the exception of sunset/vermillion rockfish. The SSC recommends replacing alternative 3 for vermilion/sunset rockfish in favor of a new alternative 4 that draws a line at Point Conception and also allows for state-specific breaks. This better aligns with the sunset/vermillion rockfish population structure and eliminates the need for new assessments. In the future, a generalized version of alternative 3 that allows for latitudinal breaks informed by scientific evidence could be considered.

The SSC recommends examining the evidence for stock structure on a species-specific basis for nearshore stocks. Past SSC recommendations for stock definitions have generally been consistent with the recognition that nearshore rockfish are more likely to have finer-scale population structure compared to shelf or slope groundfish species. Typically, management of nearshore stocks is not based on coastwide overfishing limits, acceptable biological catches, and status determinations because the evidence supports population structure at a finer scale than coastwide. In cases where there is a lack of data on spatial structure, the SSC recommends stock definitions and stock assessments at finer spatial scales, based on scientific evidence for similar species and data availability.

SSC Notes:

The SSC discussed improvements for Table 1. SSC members will work with Council staff and analysts (Todd, Marlene, Gretchen, and John until January) to clarify information in Table 1 for future iterations of this work.

Future stock definitions documents would benefit from an appendix of terminology definitions. For example, the management implications section uses the term substock, but there are multiple interpretations of substock. Publications by Steve Cadrin should be useful for compiling an appendix of stock definition terminology.

Step 1 of Figure 1 could include additional scientific information for defining management units, for example socio-economic considerations such as the historical spatial distribution of catches.

In the case that separate assessments or rebuilding analyses are conducted within a single management region, the results of these separate analyses should be combined for status determination and development of rebuilding plans but management actions may be appropriate at a finer scale.

Assessment units that are at a finer spatial scale that management units will need to match the boundaries of the stock definitions for management.

C. Administrative Matters *(continued)*

10. Future Council Meeting Agenda and Workload Planning

The Scientific and Statistical Committee (SSC) discussed workload planning and has the following updates to its September 2022 statement under this agenda item.

The SSC recommends holding its March meeting in-person March 4-5, 2023. We tentatively recommend holding the April and June SSC meetings as webinars and the September meeting as an in-person meeting.

Several members of the SSC Coastal Pelagic Species Subcommittee (SSC-CPS) will participate in the Pacific Sardine stock structure workshop organized by the Southwest Fisheries Science Center to be held in La Jolla November 15-17, 2022. This will be a hybrid meeting. Dr. André Punt will attend in-person while other SSC-CPS Subcommittee members will attend remotely.

The SSC recommends holding a Groundfish Subcommittee (GFSC) Meeting to Resolve Accepted Practices for Groundfish Stock Assessments on December 12, 2022 as a webinar with participation by the SSC Groundfish Subcommittee and Science Center assessment staff.

The SSC recommends delaying the remaining groundfish-related workshops to the next biennium as 2023 stock assessment-related duties now supersede workshop efforts that can be revisited in Spring of 2024. The workshops on accounting for large spatial closures in assessments and application of remotely-operated vehicle data in stock assessments would benefit from further development, as other efforts have taken precedence. Efforts will be made to document-related methods applied in previous assessments in the accepted practices document at the GFSC meeting on December 12. The topics related to the catch estimation workshop will be addressed in the course of the pre-assessment workshop.

A Council-sponsored methodology review with the goal of improving estimates of the abundance of the Northern Subpopulation of Pacific Sardine is proposed for Winter of 2023 (tentatively February 21-23) with participation from the CPS Subcommittee along with Science Center assessment and survey staff and the CPS Management Team (CPSMT) and CPS Advisory Subpanel (CPSAS). The meeting may be held in person or as a webinar.

The Western Groundfish Conference will be held April 23-29, 2023 in Juneau, Alaska. Several SSC members are likely to attend.

The Pacific Mackerel STAR Panel will be held in May 2023 in La Jolla with Dr. André Punt as chair and with participation from SSC, CPS Subcommittee Members, the CPSMT, CPSAS, and a Center of Independent Experts (CIE) participant to be determined.

The SSC recommends holding a methodology review of the Sablefish Trip Limit Model in Spring 2023 as a webinar to be chaired by Dr. Cameron Speir with participation by SSC Economics and Groundfish Subcommittee members as well as the GMT and GAP.

The SSC will participate in the three STAR panels for groundfish assessments in June and July of 2023 with participation from the SSC, GMT, and GAP.

- Groundfish STAR Panel 1 for copper rockfish in CA, shortspine thornyheads, and rex sole will be held June 5-9, 2023 in Seattle with Dr. Jason Schaffler as chair.
- Groundfish STAR Panel 2 for black rockfish will be held July 10-14, 2023 in Santa Cruz with Dr. John Budrick as chair.
- Groundfish STAR Panel 3 for petrale sole and canary rockfish will be held July 24-28, 2023 in Seattle with Dr. John Field as chair.

The SSC recommends holding an SSC Groundfish Subcommittee meeting to prepare Spex Recommendations in August 2023 with a location to be determined if an in-person meeting is preferred.

The SSC recommends holding the SSC Ecosystem-based Management Subcommittee Meeting in September of 2023 with the CCIEA team. The EWG and EAS are also invited to this meeting. The date and location are yet to be determined.

The SSC will participate in the Groundfish Mop-up Panel, if needed, September 25-29, 2023 at a place to be determined.

The SSC recommends holding a Salmon Methodology Review in October 2023 with participation from the SSC Salmon Subcommittee, the Salmon Technical Team (STT), and the Model Evaluation Workgroup (MEW) at a time and place to be determined.

The SSC recommends participation of the next Sablefish MSE Workshop in 2024 at a time and place to be determined with participation from the SSC Groundfish Subcommittee, the GMT, and the GAP.

The SSC proposes holding a Workshop to Develop Alternative Harvest Control Rules for Spiny Dogfish in 2024 at a time and place to be determined.

SSC Notes:

Consider a workshop for exploration of ageing spiny dogfish. This may be proposed as a methodology review topic in September 2023.

A methodology review to consider the use of ages from the spectroscopy method in stock assessments could be undertaken as a new methodology review topic in September 2023 to be undertaken in winter 2023-2024. (This is also from the ageing coordination meeting report.)

Western Groundfish Conference is scheduled for April 23-29, 2023.

Proposed Workshops and SSC Subcommittee Meetings for 2022 and Beyond							
Workshop/Meeting		**Potential Dates**	**Sponsor/ Tentative Location**	**SSC Reps.**	**Additional Reviewers**	**AB Reps.**	**Council Staff**
1	Pacific Sardine Stock Structure Workshop	Nov 15-17, 2022	SWFSC/La Jolla	CPS Subcommittee Members	Science Center Assessment/ Survey Staff	CPSMT CPSAS	Doerpinghaus
2	Groundfish Subcommittee Meeting to Resolve Accepted Practices for Groundfish Stock Assessments	Dec 12, 2022	Council/Webinar	Groundfish Subcommittee Members	Science Center Assessment Staff	GMT GAP	Bellman
3	Pacific Mackerel STAR Panel	May 2023	Council/La Jolla	CPS Subcommittee Members (Punt - chair?)	CIE (TBD)	CPSMT CPSAS	Doerpinghaus
4	Methodology Review on Abundance and Catch Estimation of the Northern Subpopulation of Pacific Sardine	Feb 21-23, 2023 (tentative)	Council/TBD	CPS Subcommittee Members (Punt - chair)	Science Center Assessment/ Survey Staff	CPSMT CPSAS	Doerpinghaus
5	Methodology Review of the Sablefish Trip Limit Model	Spring 2023	Council/Webinar	Economics and Groundfish Subcommittee Members (Speir -chair)	NA	GMT GAP	Bellman
6	Groundfish STAR Panel 1 for copper rockfish in CA, shortspine thornyhead, and rex sole	June 5-9, 2023	Council/Seattle	Schaffler - chair	CIE (TBD)	GMT GAP	Bellman
7	Groundfish STAR Panel 2 for black rockfish	July 10-14, 2023	Council/Santa Cruz	Budrick - chair	CIE (TBD)	GMT GAP	Bellman
8	Groundfish STAR Panel 3 for petrale sole and canary rockfish	July 24-28, 2023	Council/Seattle	Field - chair Marshall	CIE (TBD)	GMT GAP	Bellman

Proposed Workshops and SSC Subcommittee Meetings for 2022 and Beyond							
Workshop/Meeting		**Potential Dates**	**Sponsor/ Tentative Location**	**SSC Reps.**	**Additional Reviewers**	**AB Reps.**	**Council Staff**
9	Groundfish Subcommittee Meeting to Prepare Spex Recommendations	August 2023	Council/TBD	Groundfish Subcommittee Members	TBD	GMT GAP	Bellman
10	SSC Ecosystem Subcommittee Meeting	Sept 2023 TBD	Council/TBD	Ecosystem Subcommittee	TBD	EWG EAS	Bellman Dahl
11	Groundfish Mop-up Panel, if needed	Sept 25-29, 2023	Council/TBD	Groundfish Subcommittee Members	TBD	GMT GAP	Bellman
12	Salmon Methodology Review	October 2023 TBD	Council/TBD	Salmon Subcommittee Members	TBD	STT MEW	Ehlke Bellman
13	Sablefish MSE Workshop	2024 TBD	TBD	Groundfish Subcommittee Members	TBD	GMT GAP	Bellman
14	Proposed Workshop to Develop Alternative Harvest Control Rules for Pacific Spiny Dogfish	2024 TBD	Council/Webinar	Groundfish Subcommittee Members	TBD	GMT GAP	Bellman

SSC Subcommittee Assignments

Salmon	Groundfish	Coastal Pelagic Species	Highly Migratory Species	Economics	Ecosystem-Based Management
Alan Byrne	**John Budrick**	**André Punt**	**John Field**	**Cameron Speir**	**Kristin Marshall**
John Budrick	John Field	John Budrick	Dan Holland	Dan Holland	John Field
Owen Hamel	Owen Hamel	Alan Byrne	Kristin Marshall	André Punt	Dan Holland
Galen Johnson	Kristin Marshall	John Field	André Punt	Matthew Reimer	Galen Johnson
Tommy Moore	Tommy Moore	Owen Hamel	Matthew Reimer		Tommy Moore
Will Satterthwaite	André Punt	Will Satterthwaite			André Punt
Jason Schaffler	Jason Schaffler	Tien-Shui Tsou			Matthew Reimer
Ole Shelton	Tien-Shui Tsou				Will Satterthwaite
Cameron Speir					Ole Shelton
Tien-Shui Tsou					Cameron Speir

Bold denotes Subcommittee Chairperson

ADJOURN

PFMC
03/07/23