MINUTES
Scientific and Statistical Committee

Pacific Fishery Management Council
Hilton Vancouver Hotel
Hemlock Room
301 West Sixth Street
Vancouver, Washington 98660
Telephone: 360-993-4500

March 6-7, 2019

Members in Attendance

Dr. Aaron Berger, National Marine Fisheries Service Northwest Fisheries Science Center, Newport, OR
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. Owen Hamel, National Marine Fisheries Service Northwest Fisheries Science Center, Seattle, WA
Dr. Michael Harte, Oregon State University, Corvallis, OR
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. Rishi Sharma, National Marine Fisheries Service Northwest Fisheries Science Center, Seattle, 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 March 2019 Meeting		
SSC Member	**Issue**	**Reason**
Dr. Owen Hamel	G.3 New Methodology Informing Sigma Values - Final Adoption	Dr. Hamel contributed to the sigma analysis.
Dr. André Punt	G.3 New Methodology Informing Sigma Values - Final Adoption	Dr. Punt contributed to the sigma analysis.
Dr. André Punt	K.1 Central Subpopulation of Northern Anchovy	Dr. Punt did the F_{MSY} analysis.

A. Call to Order-SSC Administrative Matters

John Field called the meeting to order at 0800. Chuck Tracy briefed the SSC on their agenda. The effects of the government shut-down have affected the Council agendas for this year, with some items deferred to later. Subsequent litigation and court rulings have also affected Council business. Chuck explained there are some changes to the Council web site including the provision of meeting transcripts and the e-portal for public comments. There was an extended discussion on the court order for the Central Subpopulation of Northern Anchovy. The development of the salmon rebuilding plans has also been delayed due to the shut-down. Chuck encouraged some dialogue between the SSC and the Salmon Technical Team on the schedule for review of rebuilding plans and to begin scoping the selection of salmon methodology review topics, which will be discussed at the April meeting.

E. Ecosystem Management

1. California Current Ecosystem and Integrated Ecosystem Assessment 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 2019 California Current Integrated Ecosystem Assessment (CCIEA) California Current Ecosystem Status Report (Agenda Item E.1.a, IEA Team Report 1, March 2019). The report is a concise source of information on trends in climate and oceanographic, biological, social, and economic indicators. It continues to be an important contribution to the Council process that provides an ecosystem perspective on West Coast fish stocks, fisheries, and coastal communities.

The SSC appreciates the CCIEA team's continued responsiveness to suggestions by the Council and SSC on previous reports and continuing efforts to augment and improve the Status Report with additional information useful to the Council. The 2019 Status Report includes several new indicators and analyses that were reviewed by the SSC Ecosystem Subcommittee (SSCES) in September 2018 including: a new statistical approach to analyze forage time series and improve comparability between regions (section 4.2); an analysis of shifts in availability of petrale sole and sablefish to four major ports (section 6.3); and the seasonal forecasts of ocean conditions off Washington and Oregon (Section 7.2). Other new additions include: an indicator of the occurrence of harmful algal blooms (section 3.2) and a time series of krill length off of Trinidad Head in northern California (section 4.1). There are also a number of new additions in the Supplementary Materials (Agenda Item E.1.a, IEA Team Report 2, March 2019). The CCIEA team was not able

to address some additional requests due to the partial government shutdown; however, the SSC commends the team's efforts to provide the report in a timely manner allowing time for review despite the shutdown.

For the first time there are numerical forecasts of salmon returns included in the Status Report (Figures H.3.1 and H.3.2 in the Supplementary Materials). These forecasts are not comparable to the forecasts used by the Salmon Technical Team (STT) for salmon management. The SSC will work with the CCIEA team to review these forecasts and determine how best to communicate this information in future CCIEA reports.

The SSCES has regularly met with members of the CCIEA prior to the September Council meeting to review selected indicators proposed for inclusion in the annual ecosystem Status Report. A report on the September 2018 SSCES review of new CCIEA topics is attached to this statement as supplementary information. The four topics reviewed were all included in the 2019 Status Report. An additional indicator of the distribution and availability of Albacore in the California Current had been scheduled for joint review by the SSCES and the SSC Highly Migratory Species (HMS) subcommittee in a webinar in January, but the review was not completed and will need to be rescheduled due to the partial government shutdown.

In March 2018 the EWG recommended the SSCES consider holding future reviews of new CCIEA topics on a biennial basis in even years because of the large workload reviewing groundfish assessment in odd years. However, the SSCES is no longer constrained by a conflict with a SSC Groundfish Subcommittee meeting which has been moved to August. The IEA continues to evolve rapidly and new indicators and analyses may benefit from timely feedback. The SSC therefore recommends that it continue to evaluate requests for reviews from the CCIEA team annually in March and schedule reviews at SSCES meetings the following September if needed.

The CCIEA team has proposed one potential topic for review in September 2019 - Spatial indicators of bottom contact by trawl gear and fixed gear. The SSC agrees this would a useful topic to review in September. The SSCES needs to reschedule the review of the Albacore distribution and availability forecasts, and this could be included in the September meeting rather than rescheduling it as a webinar. As noted above, the SSCES also proposes reviewing the salmon forecasts and the stoplight indicators that were presented in the Supplementary Materials. Since the review of the albacore topic was to be done jointly with the SSC Highly Migratory Species subcommittee, and the review of salmon forecasts would benefit from joint review with the SSC Salmon Subcommittee, it may be necessary to hold at least part of the September SSCES subcommittee meeting jointly with these other subcommittees.

SSC Notes:

The density of piscivorous seabirds in Figure 4.7.1 may not be a meaningful indicator of the health or productivity of these populations. It would be useful to supplement this with other measures of productivity such as breeding success. There are good data available.

Krill length (Figure 4.1.2) by itself as an indicator of ecosystem productivity could be misinterpreted without also considering density. Both condition and abundance should be presented.

For whale entanglements it would be useful if possible to describe entanglements by stock. Some humpback stocks are going up and some are stocks of concern (Central American stock)

It would be useful to show charts of trends in bottom trawl seafloor contact over longer time periods, e.g., indicate changes relative to levels further back in time - at least back to 1999.

The trends in availability of groundfish to ports may not reflect the availability to the fishery if these trends are driven by changes that are mainly within the RCA. It is not clear whether this might be a problem with petrale sole and sablefish, but it is possible that the fishery may not have seen the increased availability the trends suggest.

The salmon forecasts used by the STT are to the mouth of the Columbia River rather than to Bonneville Dam. The forecasts in the Status Report would exclude all the lower river stocks and they reflect the run size at Bonneville Dam. There is concern that these forecasts may be confusing since they have different meaning than the ones used in the Council process. The differences should be clarified. Reporting the variable used for forecasts (e.g., the value of the principle component from the stoplight analysis used) would also be useful.

It appears that the hypoxia forecast is done in January going 9 months out. A winter forecast might be important for Dungeness crab which has experience crab die-offs this winter off Oregon.

Section 4.4 indicates no new assessments in 2018; however, there was an assessment of Pacific hake.

For Figure 4.2.1-3 these are hard to read in grey scale if you don't have a color printout. Could something be done to make these readable in grey scale?

Figures showing biomass for HMS actually reflect the broader Eastern Pacific rather than just the California Current, which should be clarified in text or caption.

2. Climate and Communities Initiative Update

The Scientific and Statistical Committee (SSC) received a briefing from Dr. Kit Dahl on the Climate and Communities Initiative. The Climate and Communities Initiative deals with climate change scenario planning to inform Council management how to be responsive to the effects of climate change and variability on the California Current Fisheries and Fishing Communities. The Ecosystem Workgroup report has focused on 2 components: i) the planning tools that one may use, and what kind of scenarios to present, and ii) how the Council would pursue these scenario planning exercises. The focus of the work done so far has dealt with the 1st part primarily.

The SSC encourages the work so far and recommends that the Council formulate a process to evaluate outcomes/consequences of these scenarios. Since scenario planning is still in development, using a quantitative approach in conjunction with the collaborative processes used in the North Pacific Fishery Management Council could be a possible model to follow. The key to these planning processes is to combine scenarios and strategies to evaluate outcomes. There should be some engagement between the communities, science centers, and other research institutions within the Council process.

SSC Notes:

1. *North Pacific scenarios (Alaska Climate Integrated Models, ACLIM) are quantitative and combine the qualitative scenarios. Workshop approaches are not recommended as opposed to a more quantitative approach that is being taken by other councils. The Ocean Modelling Forum (OMF) could facilitate model comparisons across alternative scenarios.*
2. *Example of climate scenarios used in conjunction with the ongoing hake Management Strategy Evaluation (MSE), or the Sacramento Winter Run Chinook MSE that was conducted in 2017, could provide some context on how these scenarios could be examined.*
3. *Topics presented by the EWG centered primarily on a specific species with an evaluation of their resiliency and redistribution as effects of climate change. Are we looking at entire system responses or species-specific responses?*
4. *Regional mosaics allow us to examine multi-fishery effects. Workshop scenarios could help scoping out the magnitude of some of these issues.*
5. *Examining projections on temporal scales is important (decadal or inter-annual projections) for some of the scenario planning exercises. Providing guidance on the temporal projections for scenario planning is a worthwhile exercise.*

G. Groundfish Management

Determining a New Rockfish Steepness Prior

SSC Notes:

Dr. Chantel Wetzel (NWFSC) presented an update of the meta-analysis used to derive a prior distribution for steepness (recruitment productivity) of west coast rockfish stocks. This is an update to previous analyses by Dr. Martin Dorn, Dr. Jim Thorson, and Dr. Wetzel and follows Dr. Wetzel's presentation to the Groundfish Subcommittee in November 2018. The SSC identified several concerns with the statistical behavior of sequential updates to the analysis and with some of the assumptions underlying the meta-analytical approach. As a result of these concerns, the SSC does not endorse the updated analysis as best available science. Therefore in the near term (i.e., for the 2019 assessment cycle) the SSC recommends using the same prior distribution and default values as were endorsed for use in the 2017 assessment cycle (steepness = 0.72 (0.16); mean(se)). The SSC also identified potential improvements that should be investigated further to inform the 2021 assessment cycle.

There was a discussion about various technical aspects of the meta-analysis. Of particular note was the implausible result that showed a very high estimated posterior predictive mean steepness for rockfish (> 0.9). This estimated value is notably larger than estimates from previous meta-analyses (estimated steepness of 0.72 in 2017; 0.58 in 2007) and appears to conflict with the fundamental biology of long-lived, live-bearing rockfish species. The changes in estimated steepness are concerning to the SSC as they are not consistent with the expected statistical behavior of estimators with increasing amounts of information. The last few years of data have resulted in a dramatic increase in estimated steepness for multiple species of rockfish on the West Coast, radically changing their estimated productivity over the past decade. Of particular note is the inferred high precision of estimated steepness at the bound of 1 for several species, which are

disproportionately influential in determining the results of the meta-analysis. An increased estimated steepness has dramatic consequences for perceived stock productivity and status determinations, understanding the origins of the changing steepness estimates are of paramount importance.

The SSC had discussions about the shape and precision of the likelihood profiles that feed into the meta-analysis. In particular, the large number of profiles that identified the upper bound (1) as the most likely value were concerning. Several of these likelihood profiles imply high precision of the steepness. The SSC discussed possible causes for this behavior - e.g., do these attributes suggest substantial mis-specification in the broader stock-assessment model(s)? - and the downstream consequences of using such results.

Examination of the estimated likelihood profiles for individual rockfish species from successive assessments also revealed that the estimated steepness for individual species could vary dramatically among assessments. For example, estimate for yelloweye rockfish shifted from an MLE of about 0.4 to an estimate of 1.0 between the assessments in 2009 and 2017. Such dramatic changes occurred in a several species. This suggests a relatively small number of years of additional recruitment information radically altered the estimated steepness. Given the similarity of model structure among assessments, and the longevity of most rockfish, such behavior is statistically unsavory.

A further concern was that there is non-independence among rockfish stocks in recruitment. Rockfish appear to share good and bad years of recruitment and as such the assumption of independence of rockfish included in the analysis is likely inappropriate. The effect of such non-independence for inference about steepness is unclear.

Given the SSC's concerns about the meta-analysis, Dr. Owen Hamel provided a number of options for choosing a steepness prior for use in groundfish assessments. Options considered include reverting to the value used during the previous assessment cycle (steepness = 0.72), using a value consistent with established proxies the PFMC uses for F_{MSY} and B_{MSY}/B_0 (steepness = 0.6), or the new meta-analysis (steepness = 0.93). No options below the prior distribution mean of 0.6 were considered.

This cycle the assessors will not be doing type C analyses.

Proposals that were discussed without being fully fleshed out:

- *Scale likelihood profiles such that the optima identified by later analyses are generally within ~2LL units of the optima identified by early analyses; i.e., if the location of the negLL minimum moves around a lot as data accumulate for a single stock, the likelihood profile should be shallow enough that all of the later values for the optima would have appeared plausible based on the earlier likelihood profiles.*
- *Using the Mangel et al. (2010) method for determining steepness based on life-history characteristics.*
- *Include results from multiple assessments for a single species in a single model structure?*
- *Consider a mixture distribution parameterization to allow for greater flexibility such as bimodality.*

3. New Methodology Informing Sigma Values - Final Adoption

The Scientific and Statistical Committee (SSC) reviewed analyses relating to the scientific uncertainty in estimating the overfishing limit (OFL), denoted sigma (σ). Sigma, in combination with the Council's policy choice for the overfishing probability (P*), determines the size of the buffer between the OFL and the acceptable biological catch (ABC) for groundfish and coastal pelagic species (CPS). The Council's current sigma value for category 1 stocks (0.36) is based on the analysis by Ralston et al. (2011) that estimated among-assessment variation in historical spawning biomass for a set of groundfish and CPS stock assessments completed through 2009. That analysis was based on spawning biomass and not OFL and did not directly account for increases in scientific uncertainty that accrue as assessment results are projected into the future.

The SSC received a presentation from Ms. Kristin Privitera-Johnson (University of Washington) summarizing results from several different approaches for estimating sigma for the first year after an assessment is conducted (the baseline sigma; Agenda Item G.3, Attachments 1 and 2). Another presentation from Dr. Chantel Wetzel (Northwest Fisheries Science Center) summarized results from an analysis of increased scientific uncertainty (hence sigma) with assessment age (Agenda Item G.3, Supplemental REVISED Attachment 3). Initial versions of both analyses were reviewed by the Groundfish and CPS Subcommittees in November 2018 (see Agenda Item G.3.a, SSC Groundfish and Coastal Pelagic Species Subcommittees' Report 1).

Baseline Value for Sigma

Agenda Item G.3, Attachments 1 and 2 compared various approaches for setting a baseline sigma, including the "historical biomass approach" used in Ralston et al. (2011). The analyses considered approaches that set sigma based on between-assessment variation in projections of spawning biomass or OFL, with alternative methods of accounting for recruitment variability.

The projection approach presented to the SSC's Groundfish and CPS Subcommittees in November conducted 25-year projections for each assessment starting in 1998, 2003, and 2008, and set fishing mortality to the F_{MSY} proxy for those years, with deterministic or stochastic recruitment. The Subcommittees requested an additional approach ('Method B', which is more consistent with uncertainty in recruitment in the final years of an assessment) that used 1-year projections derived across 15 years for each of the two or three assessments used for each species. The SSC considers sigma derived from the 1-year projections, using Method B, to be the best approach to set sigma representing scientific uncertainty for 1-year projections of category-1 assessments. This value is 0.439.

The new analyses were restricted to benchmark assessments conducted using recent versions of the stock synthesis software (from 2009 to present) and technical constraints prevented the use of seasonal models (e.g., for Pacific sardine). To account for the limitations associated with having only a subset of groundfish species in the analysis, the SSC recommends that the value chosen for sigma from the full set of species (including CPS) be scaled by the ratio of the sigma from the updated historical biomass approach (0.389) and from the subset of species used for this analysis (0.342).

The SSC recommends a baseline sigma value of 0.50 (= 0.439*(0.389/0.342)) for category 1 groundfish and CPS stocks. As in the 2011 recommendation, the SSC recommends baseline sigma values of twice the category 1 value for category 2 stocks (1.0) and four times that value for category 3 stocks (2.0) (Table 1).

Increase in Sigma Due to Stock Assessment Age

Agenda Item G.3, Supplemental REVISED Attachment 3 was based on deterministic projections of spawning biomass starting from a low state of nature relative to base-model projections of spawning biomass. The low state of nature was constructed so that starting spawning biomass is consistent with the previous value for sigma (0.36) with a probability of 25%. Projections for both the base model and the low state of nature were based on an assumption of full attainment of the ABCs derived from the base model, which causes the two projections to diverge with the rate of divergence reflecting the population dynamic characteristics of the stock.

Due to concerns that the projections would be highly sensitive to the assumption of full ABC attainment, the Subcommittees in November requested additional analyses with Dover sole and chilipepper rockfish be excluded, as attainment rates for these stocks have been consistently low. Removing these two stocks made very little difference in the increase in sigma over time. The SSC recommends using the analysis with all species included, and applying the relative rate of increase in sigma (7.5% of the baseline value with each additional year) to the baseline category 1 and 2 sigmas of 0.5 and 1.0, i.e.:

Sigma (years since assessment) = (baseline sigma) * (1.0 + (years since assessment – 1)*0.075).

For example, for assessments conducted in 2019 the baseline sigma will apply in 2020. However, for the first year of application (2021) the sigma will be 7.5% larger and the resulting buffer will increase accordingly (e.g., to 6.5% rather than 6.1%) (Table 1).

As the OFLs from category 3 analyses are constant, there is no reason for the category 3 sigma to increase with time. Depending on the Council's selected value for P*, the reductions in catch to account for increasing scientific uncertainty with projection year should conform to the values shown in the first attached table.

The projection year resets to 1 when a full or update assessment is conducted. The projection year will not reset following a catch-only update.

The SSC will review the baseline values of sigma and the rate of increase in sigma with assessment age prior to the next assessment cycle.

Literature Cited

Ralston, S.; A.E. Punt; O.S. Hamel; J.D. DeVore; and R.J. Conser. 2011. A meta-analytic approach to quantifying scientific uncertainty in stock assessments. Fish. Bull. 109: 217–231.

Table 1. SSC-recommended reductions to OFL for scientific uncertainty for category 1, 2, and 3 groundfish and CPS stocks based on sigma and P* values by projection year and P*. The sigmas in the first header row are the baseline sigmas.

	Category 1 (σ=0.5)		Category 2 (σ=1)		Category 3 (σ=2)	
Year P*	**0.45**	**0.40**	**0.45**	**0.40**	**0.45**	**0.40**
1 (baseline)	6.1%	11.9%	11.8%	22.4%	22.2%	39.8%
2 [a/]	6.5%	12.7%	12.6%	23.8%	22.2%	39.8%
3	7.0%	13.6%	13.5%	25.3%	22.2%	39.8%
4	7.4%	14.4%	14.3%	26.7%	22.2%	39.8%
5	7.8%	15.2%	15.1%	28.1%	22.2%	39.8%
6	8.3%	16.0%	15.9%	29.4%	22.2%	39.8%
7	8.7%	16.8%	16.7%	30.7%	22.2%	39.8%
8	9.1%	17.6%	17.4%	32.0%	22.2%	39.8%
9	9.6%	18.3%	18.2%	33.3%	22.2%	39.8%
10	10.0%	19.1%	19.0%	34.6%	22.2%	39.8%

[a/] Projection Year 2 is the first year of the management cycle following groundfish stock assessments.

Table 2. A comparison of the old and new sigma values for category 1, 2, and 3 groundfish and CPS stocks.

	Category 1 σ		Category 2 σ [a/]		Category 3 σ	
Year	**Old**	**New**	**Old**	**New**	**Old**	**New**
1	0.36	0.50	0.72	1.0	1.44	2.00
2	0.36	0.5375	0.72	1.075	1.44	2.00
3	0.36	0.575	0.72	1.15	1.44	2.00
4	0.36	0.6125	0.72	1.225	1.44	2.00
5	0.36	0.65	0.72	1.30	1.44	2.00
6	0.36	0.6875	0.72	1.375	1.44	2.00
7	0.36	0.725	0.72	1.45	1.44	2.00
8	0.36	0.7625	0.72	1.525	1.44	2.00
9	0.36	0.80	0.72	1.60	1.44	2.00
10	0.36	0.8375	0.72	1.675	1.44	2.00

[a/] Note that some older category 1 assessments have been reassigned to category 2 in the past to account for the increased uncertainty. This will no longer be necessary.

Table 3. A comparison of the old and new scientific uncertainty reductions for P* = 0.45.

P*=0.45	Category 1		Category 2		Category 3	
Year	Old	New	Old	New	Old	New
1	4.4%	6.1%	8.7%	11.8%	16.6%	22.2%
2	4.4%	6.5%	8.7%	12.6%	16.6%	22.2%
3	4.4%	7.0%	8.7%	13.5%	16.6%	22.2%
4	4.4%	7.4%	8.7%	14.3%	16.6%	22.2%
5	4.4%	7.8%	8.7%	15.1%	16.6%	22.2%
6	4.4%	8.3%	8.7%	15.9%	16.6%	22.2%
7	4.4%	8.7%	8.7%	16.7%	16.6%	22.2%
8	4.4%	9.1%	8.7%	17.4%	16.6%	22.2%
9	4.4%	9.6%	8.7%	18.2%	16.6%	22.2%
10	4.4%	10.0%	8.7%	19.0%	16.6%	22.2%

Table 4. A comparison of the old and new scientific uncertainty reductions for P* = 0.4.

P*=0.4	Category 1		Category 2		Category 3	
Year	Old	New	Old	New	Old	New
1	8.7%	11.9%	16.7%	22.4%	30.6%	39.8%
2	8.7%	12.7%	16.7%	23.8%	30.6%	39.8%
3	8.7%	13.6%	16.7%	25.3%	30.6%	39.8%
4	8.7%	14.4%	16.7%	26.7%	30.6%	39.8%
5	8.7%	15.2%	16.7%	28.1%	30.6%	39.8%
6	8.7%	16.0%	16.7%	29.4%	30.6%	39.8%
7	8.7%	16.8%	16.7%	30.7%	30.6%	39.8%
8	8.7%	17.6%	16.7%	32.0%	30.6%	39.8%
9	8.7%	18.3%	16.7%	33.3%	30.6%	39.8%
10	8.7%	19.1%	16.7%	34.6%	30.6%	39.8%

SSC Notes:

- *At the time that the current sigma values were adopted, the SSC noted that additional sources of uncertainty had been identified, and indicated that the overall estimate of uncertainty could increase with additional analyses (Agenda Item B.2.b, Supplemental SSC Report, June 2010).*
- *The SSC should include a statement in June or September regarding the spex process on uncertainty in very long term projections where uncertainty for category 1 and 2 exceed the data poor uncertainty.*
- *The Subcommittee report states that because recruitment variation with CPS is large the analysis primarily applies to groundfish; the approach is not ideal for CPS. However, it is better to include the adjustment for increasing uncertainty than not make any adjustment.*

D. Salmon Management

2. Review of Rebuilding Plans

Dr. Michael O'Farrell (Southwest Fisheries Science Center) and members of the Salmon Technical Team (STT) briefed the Scientific and Statistical Committee (SSC) about the five draft salmon rebuilding plans. All five plans had the rebuilding and economic analysis removed, hence the SSC did not review the plans at this time. Dr. O'Farrell reported that the STT is working on the plans using the SSC recommendations from the November 2018 meeting. They intend to submit a final draft of the Chinook plans in April; however, the coho plans may not be ready until June.

SSC Notes:

Coho plans had the no fishing alternative removed and incorporated new co-manager recommendations.

In the Strait of Juan de Fuca plan Appendix D presents an analysis to support a change in management breakpoints. There are standard methods (i.e., Ricker, Beverton-Holt) to fit a stock-recruit relationship that should be explored.

Changes in hatchery practices and trucking of Sacramento River fall Chinook (SRFC) may affect the utility of using SRFC as the indicator stock for the Central Valley fall chinook stock complex, which includes hatchery and natural fall chinook from the Sacramento and San Joaquin rivers as well as the late fall chinook return.

3. Review of 2018 Fisheries and Summary of 2019 Stock Forecasts

Dr. Michael O'Farrell (Southwest Fisheries Science Center) and members of the Salmon Technical Team (STT) briefed the Scientific and Statistical Committee (SSC) about the five draft salmon rebuilding plans, presented an overview of the Review of 2018 Ocean Salmon Fisheries and the 2019 Preseason Report I to the SSC, and responded to questions.

Two Chinook stocks (Sacramento River fall Chinook and Klamath River fall Chinook) and three natural coho stocks (Queets, Juan de Fuca, and Snohomish) remain overfished, defined as when the most recent three year geometric mean of escapement is below the Minimum Stock Size Threshold. No stocks were subject to overfishing in 2018 and no stocks met the criteria for approaching an overfished condition.

The SSC endorses the 2019 acceptable biological catches and overfishing limits (2019 line in Table V-5) in Preseason Report I as the best available science for use in 2019 salmon management.

SSC Notes:

Sacramento late Fall Chinook had the lowest escapement on record, but high jack counts indicate a likely increase next year.

Chapter 1: Coho 2016 and 2017 overpredicted escapement for Stock Recruitment on page 41, consider revisiting projection methods.

Stillaguamish coho just barely above MSST, landslide effect not fishing issue.

In the future, the SSC may consider more detail regarding the stocks for which the forecasts and ABC/OFL are being endorsed in the statement since Willapa Bay coho methods have not been reviewed but are in Table 5.

No forecasts other than the SRFC and KRFC have been reviewed by the SSC.

K. Coastal Pelagic Species Management

1. Comments on Court Ordered Rulemaking on Harvest Specifications for the Central Subpopulation of Northern Anchovy (*NOTE: This item was cancelled on the Council's agenda since no proposed rule was published. The SSC still reviewed material associated with K.1.a and their notes are captured below. These notes will inform a report to the Council in April*)
    a. Review Approach for Computing F_{MSY}, B_{MSY}, and MSY for the Central Subpopulation of Northern Anchovy

SSC Notes:

The SSC discussed two draft documents prepared by Dr. André Punt (University of Washington) informing management options for the central subpopulation of northern anchovy (CSNA). These documents were prepared in response to an April 2018 Council motion and not in response to the recent court order. The SSC endorsed the basic approach in both documents, while offering suggestions for short-term and long-term revisions and next steps.

AN APPROACH FOR COMPUTING F_{MSY}, B_{MSY} and MSY FOR THE CSNA

This document builds on the MSST report (September 2016 Agenda Item E.1.a, Supplemental NMFS Report), performing a Bayesian analysis to fit alternative formulations of the stock-recruit relationship (Ricker or Beverton-Holt, with or without autocorrelation) to the assessment estimates and assumed life history parameters reported in the Jacobson et al. (1995) assessment. Model fitting was performed using the Sample Importance Resample algorithm and model formulations were compared using Bayes Factor. The SSC recommends retaining all model formulations for consideration rather than restricting consideration to the formulation with the highest Bayes Factor.

The analysis generates a posterior distribution for values of F_{MSY}, the annual exploitation rate corresponding to maximum sustainable yield. Using this output in management further requires selecting a point estimate of F_{MSY} and thus choosing between the mean and median (or other quantile/moment) as the point estimate, and when applying the estimate of F_{MSY} to a biomass estimate further account needs to be taken for selectivity and whether the biomass estimate is based on spawning biomass, 1+ biomass, or some other metric. The SSC recommends use of the posterior median as the point estimate for F_{MSY}, given that accepted practice is to use the posterior

median to determine OFLs from Bayesian assessments and because the logic used in assigning buffers against the OFL starts from a baseline 50% probability of overfishing.

The SSC endorsed the basic approach and had the following requests for short-term additions to the analysis:

- *Add notation specifying units.*
- *Explain how the value used for observation error (σ_I) was derived.*
- *Specify in the text that S_a is selectivity at age.*
- *Double-check the specific panels of Figure 5 referred to in the text.*
- *Use a log-uniform prior for R_0, which is more appropriate than a uniform prior when uncertainty spans orders of magnitude.*
- *As a sensitivity analysis, show the results when negative values of autocorrelation in recruitment are excluded.*
- *Consider showing the results of projections assuming a natural mortality of M=1.1. Refitting the stock-recruit relationship based on alternative assumptions of M is not feasible in the time available.*

In the longer term, the SSC recommends considering alternative formulations of the stock-recruit relationship and attempting to account for seasonal effects and the continuous, income-breeding nature of anchovy reproduction rather than a model based on discrete years and age classes.

WHITEPAPER ON FREQUENCY OF ASSESSMENTS AND UPDATES TO OFLs, ABCs AND ACLs FOR THE CENTRAL SUBPOPULATION OF NORTHERN ANCHOVY

This document provides an illustrative example of the tradeoffs involved in different frequencies of updating OFL specifications based on new biomass estimates, assuming that F_{MSY} is known, illustrating the tradeoff between greater catch stability but larger buffers required to maintain a given risk of overfishing when updates are less frequent. It also describes how an MSE or MSE-lite approach could be used to further assess the value of different frequencies of new assessments (allowing updates to reference points such as F_{MSY} and B_{MSY} in addition to updating biomass) and the required timeline for such analyses (assuming full time staff were available). The SSC endorsed the conceptual illustration, proposed approaches, and approximate timelines, assuming that staff are available. The SSC notes that the time required for an MSE increases with the amount of stakeholder involvement desired.

Suggested short-term additions:

- *Add an illustrative example for a constant catch scenario, setting catch equal to 25% of MSY.*
- *Consider adding an example assuming less frequent updates, e.g. once every ten years. It was noted that if updates were so infrequent, it would likely be accompanied by a shift to using a running average biomass rather than using just the result of the most recent survey. Options like this could be better addressed in an MSE-lite scenario.*

References

Jacobson, L. D., N. C. H. Lo, S. F. Herrick, Jr., and T. Bishop. 1995. Spawning biomass of the northern anchovy in 1995 and status of the coastal pelagic fishery during 1994. NMFS, SWFSC Admin. Rep. LJ-95-11. 52 p.

Statistical Note
Comparisons based on Bayes Factor are sensitive to the range of the priors.

Nomenclature Note
In other contexts, F_{MSY} refers to an instantaneous rate and the annual rate is denoted by E_{MSY}, however F_{MSY} is used for the annual rate here following typical practice for CPS.

C. Council Administrative Matters, Continued

5. Future Council Meeting Agenda and Workload Planning

NOTE: The workload planning table at the end of these minutes was originally appended to the SSC report to the Council in March.

The Scientific and Statistical Committee (SSC) discussed future workload planning and the impacts of the partial government shutdown on previously scheduled meetings, and has the following updates and recommendations. The partial government shutdown resulted in the cancellation of several meetings (Groundfish Subcommittee meeting in January in Seattle for best practices and skate catch reconstructions, the remotely operated vehicle (ROV) survey methodology review, Highly Migratory Species webinar on albacore distribution).

The SSC has rescheduled the Groundfish Subcommittee meeting concurrent with the Pre-Assessment workshop for groundfish stock assessments for March 25-26, in Portland, OR with listening stations and remote participation from Newport, OR and Santa Cruz, CA. That meeting will include subcommittee review of the best practices guidelines. That meeting will be followed by a one-day review of skate catch reconstructions on March 27, also in Portland, OR. The SSC recommends that the ROV survey methodology review be rescheduled for late 2019 or early 2020.

As reported in the SSC statement on the California Current IEA Report (Agenda Item E.1.b, Supplemental SSC Report), the SSC recommends that it continue to evaluate requests for reviews from the CCIEA team annually in March and schedule reviews at SSC Ecosystem Subcommittee (SSC-ES) meetings the following September as needed. For this September, the SSC recommends that the SSC-ES and Highly Migratory Species subcommittees review of drivers of albacore distribution and availability to fisheries, and that the SSC-ES review spatial indicators of bottom contact by trawl gear and fixed gear. The SSC-ES also proposes reviewing the salmon forecasts and the stoplight indicators that were presented in the CCIEA Supplementary Materials, pending availability of IEA team members. If the latter is reviewed, the meeting would benefit from joint review with the SSC Salmon Subcommittee.

As the partial government shutdown also precluded the ability of the CPS subcommittee to review Pacific sardine assessment as part of the March meeting, due to the inability of the assessment team to complete the assessment, that review has been scheduled for a webinar for March 28.

With respect to previously planned stock assessment review panels (Pacific mackerel and the four groundfish panels), the SSC recommends that these remain as previously scheduled. However,

the Northwest Fisheries Science Center has indicated that delaying review of the two update stock assessments, widow rockfish and petrale sole, would allow for age readers to catch up on age determination efforts that were delayed due to the government shutdown. Consequently, the SSC recommends delaying review of those updated stock assessments to the previously scheduled August 20 Groundfish subcommittee meeting. To accommodate the time needs for that review, the SSC recommends that this be a 1.5 day meeting in either Portland, OR or Seattle.

The SSC continues to recommend a Groundfish Mop-up review panel be held, if needed, from September 30 to October 4, 2019, in Seattle.

The SSC recommends that a salmon methodology review be held in October of 2019, most likely in Portland, OR, with potential topics to be discussed in April.

SSC Notes:

Make sure we have the appropriate representation of STT and salmon staff officer at the April discussion of salmon methodology topics. We should also revisit the question of when we are reviewing pre-season report 1, what are we actually supposed to be endorsing (we have never formally reviewed forecast methods for Willapa Bay Coho). Ensure that it is clear that we are not endorsing every forecast in preseason 1.

From the SSC statement on E.1, it was noted that the SSC-ES is no longer constrained by a conflict with a SSC Groundfish Subcommittee meeting at the September Council meeting, as the SSC Groundfish Subcommittee meeting has been moved to August. The IEA continues to evolve rapidly and new indicators and analyses may benefit from timely feedback.

SSC Subcommittee Assignments, March 2019

Salmon	Groundfish	Coastal Pelagic Species	Highly Migratory Species	Economics	Ecosystem-Based Management
Alan Byrne	**David Sampson**	**André Punt**	**Aaron Berger**	**Cameron Speir**	**Dan Holland**
John Budrick	Aaron Berger	Aaron Berger	John Field	Michael Harte	John Field
Owen Hamel	John Budrick	John Budrick	Michael Harte	Dan Holland	Michael Harte
Michael Harte	John Field	Alan Byrne	Dan Holland	André Punt	Galen Johnson
Galen Johnson	Owen Hamel	John Field	André Punt	David Sampson	André Punt
Will Satterthwaite	André Punt	Owen Hamel	David Sampson		Will Satterthwaite
Rishi Sharma	Rishi Sharma	Will Satterthwaite	Rishi Sharma		Ole Shelton
Ole Shelton	Tien-Shui Tsou	Tien-Shui Tsou			Cameron Speir
Cameron Speir					Tien-Shui Tsou

Bold denotes Subcommittee Chairperson

Council Meeting Dates	Location	Likely SSC Mtg Dates	Major Topics
April 9-16, 2019 Proposed Subcommittees may meet Apr 9 Advisory Bodies may begin Wed, Apr 10 Council Session may begin Thur, Apr 11	DoubleTree by Hilton Sonoma One Doubletree Drive Rohnert Park, CA 94928 Phone: 707-584-5466	Two-day SSC Session **Wed, Apr 10 – Thu, Apr 11**	Pacific Sardine Assessment and Management Measures CPS EFP Review CPS Methodology Review Topic Selection CSNA Management Update CSNA Litigation Response Groundfish Science Improvement and Methodology Review Report Salmon Methodology Review Topic Selection
June 18-25, 2019 Proposed Subcommittees may meet Tues, June 18 Advisory Bodies may begin Wed, June 19 Council Session may begin Thur, June 20	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 19 – Thu, June 20**	Pacific Mackerel Assessment and Management Measures CPS Stock Prioritization 2021-2022 Groundfish Spex Planning
September 11-18, 2019 Proposed Subcommittees may meet Wed, Sept 11 Advisory Bodies may begin Thur, Sept 12 Council Session may begin Fri, Sept 13	The Riverside Hotel 2900 Chinden Blvd Boise, ID 83714 Phone: 208-343-1871	One-day Ecosystem Subcm Session **Wed, Sep 11** Two-day SSC Session **Thu, Sep 12 – Fri, Sep 13**	Groundfish Assessments Review 2021-2022 Groundfish Spex Groundfish Stock Assessment Methodology Review Topic Selection Off-year Science Improvements Salmon Methodology Topic Priorities
November 13-20, 2019 Proposed Subcommittees may meet Wed, Nov 13 Advisory Bodies may begin Thur, Nov 14 Council Session may begin Fri, Nov 15	Hilton Orange County/Costa Mesa 3050 Bristol Street Costa Mesa, CA 92626 Phone: 714-540-7000	Two-day SSC Session **Thu, Nov 14 – Fri, Nov 15**	CPS Methodology Topic Selection CPS SAFE Groundfish Stock Assessments & Cowcod Rebuilding Analysis (if needed) 2021-2022 Groundfish Spex Groundfish Stock Assessment Methodology Topic Priorities Salmon Methodology Review

Proposed Workshops and SSC Subcommittee Meetings for 2019							
	Workshop/Meeting	**Potential Dates**	**Sponsor/ Tentative Location**	**SSC Reps.**	**Additional Reviewers**	**AB Reps.**	**Council Staff**
1	Pre-Assessment Workshop for 2019 Groundfish Assessments (Except Cabezon), Portland, OR/ webinar	Mar. 25-26	Council/ Portland, OR; / webinar	STAR Chairs & Interested GF Subcommittee members	None	GMT GAP	DeVore
2	Review of Historical Catch Reconstructions of Skate Species and Other Skate Data Issues	Mar. 27	Council/ Portland, OR/ webinar	GF Subcommittee	TBD	Doerpinghaus (GMT) Richter (GAP)	DeVore
3	Pacific Sardine Update Assessment Review	Mar. 28 (9-noon) Webinar	Council/ Vancouver, WA	CPS Subcommittee	None	CPSMT CPSAS	Griffin
4	Pacific Mackerel STAR Panel	Apr. 23 – 25	Council/ La Jolla, CA	Punt (Chair), Hamel, Budrick	CIE	CPSMT CPSAS	Griffin
5	Cabezon STAR Panel	May 6-10	Council/ Newport, OR	Sharma (Chair),	CIE	Mirick (GMT) Richter (GAP)	DeVore
6	Longnose and Big Skates STAR Panel	June 3-7	Council/ Seattle, WA	Sampson (Chair)	CIE ~~Dorn~~	Doerpinghaus (GMT) Richter (GAP)	DeVore
7	Sablefish STAR Panel	July 8-12	Council/ Seattle, WA	Field (Chair)	CIE	Mirick (GMT) Richter (GAP)	DeVore

Proposed Workshops and SSC Subcommittee Meetings for 2019							
Workshop/Meeting		**Potential Dates**	**Sponsor/ Tentative Location**	**SSC Reps.**	**Additional Reviewers**	**AB Reps.**	**Council Staff**
					Ianelli		
8	Gopher/Black-and-Yellow RF and Cowcod STAR Panel	July 22-26	Council/ Santa Cruz, CA	Hamel (Chair), Satterthwaite	CIE	Mandrup (GMT) Richter (GAP)	DeVore
9	Review of STAR Panel Reviews to Develop the Mop-Up Review, if needed; Review of update GF assessments	Aug. 20-21	Council/ Portland, OR or Seattle, WA	GF Subcommittee	NA	GMT GAP	DeVore
10	Ecosystem Indicators Review, Including Review of Analyses of Drivers of Albacore Distribution and Availability to Fisheries in the California Current	Sep. 11	Council/ Boise, ID	HMS, Salmon, & Ecosystem Subcommittees	TBD	None	Dahl DeVore
11	Groundfish Mop-Up Review Panel, if needed	Sep. 30 – Oct. 4	Council/ Seattle, WA	GF Subcommittee members	CIE	GMT GAP	DeVore
12	Salmon Methodology Review	Oct. TBD	Council/ TBD	Salmon Subcommittee members	NA	STT, MEW	Ehlke

Proposed Workshops and SSC Subcommittee Meetings for 2019							
Workshop/Meeting		**Potential Dates**	**Sponsor/ Tentative Location**	**SSC Reps.**	**Additional Reviewers**	**AB Reps.**	**Council Staff**
13	Review of Nearshore ROV Survey Designs and Methodologies	Fall 2019/Winter 2020 TBD	Council/ Santa Cruz, CA	Hamel (Chair?), Shelton, Tsou, Sharma, Berger, Field	CIE	None	DeVore
14	Data-Limited Methodology Workshop	2020 - TBD	Council/ TBD	GF & CPS Subcommittee members	TBD	TBD	DeVore