SUMMARY MINUTES
Scientific and Statistical Committee

Pacific Fishery Management Council
Doubletree Hotel
California Ballroom Salon 4
2001 Point West Way
Sacramento, CA 95815
916-929-8855
March 5-6, 2010

Call to Order and Scientific and Statistical Committee (SSC) Administrative Matters

The meeting was called to order at 8 a.m. on Friday, March 5, 2010. Dr. Don McIsaac briefed the SSC on priority agenda items.

Members in Attendance

Mr. Tom Barnes, California Department of Fish and Game, La Jolla, CA
Dr. Louis Botsford, University of California, Davis, CA
Mr. Robert Conrad, Northwest Indian Fisheries Commission, Olympia, WA
Dr. Ramon Conser, National Marine Fisheries Service, La Jolla, CA
Dr. Martin Dorn, National Marine Fisheries Service, Seattle, WA
Dr. Carlos Garza, National Marine Fisheries Service, Santa Cruz, CA
Dr. Vladlena Gertseva, National Marine Fisheries Service, Newport, OR
Dr. Owen Hamel, National Marine Fisheries Service, Seattle, WA
Dr. Selina Heppell, Oregon State University, Corvallis, OR
Mr. Tom Jagielo, Oregon Department of Fish and Wildlife
Dr. Peter Lawson, National Marine Fisheries Service, Newport, OR
Dr. Todd Lee, National Marine Fisheries Service, Seattle, WA
Dr. Charles Petrosky, Idaho Department of Fish and Game, Boise, Idaho
Dr. André Punt, University of Washington, Seattle, WA
Dr. Stephen Ralston, SSC Chair, National Marine Fisheries Service, Santa Cruz, CA
Ms. Cindy Thomson, National Marine Fisheries Service, Santa Cruz, CA
Dr. Theresa Tsou, Washington Department of Fish and Wildlife, Olympia, WA
Dr. Vidar Wespestad, Research Analysts International, Seattle, WA

Members Absent

None.

Scientific and Statistical Committee Comments to the Council

SSC Recusals for the March 5-6, 2010 Meeting.		
SSC Member	**Issue**	**Reason**
Mr. Tom Jagielo	Exempted Fishing Permit for Sardine Research	SSC independence, Mr. Jagielo was a Co-Principal Investigator on the research team
Dr. Owen Hamel	Pacific Whiting Assessment Review	SSC independence, Dr. Hamel was on a Stock Assessment Team (STAT).
Dr. Peter Lawson	Oregon Coho Salmon Forecasts	SSC independence, Dr. Lawson was on the Stock Assessment Team (STAT).
Dr. Martin Dorn	National Standard 2 Guidelines	SSC independence, Dr. Dorn served on the workgroup tasked with developing revised guidelines
Dr. Ray Conser	National Standard 2 Guidelines	SSC independence, Dr. Conser served on the workgroup tasked with developing revised guidelines
Dr. Vidar Wespestad	Pacific Whiting Assessment Review	SSC independence, Dr. Wespestad was the STAR Panel Chair.
Dr Todd Lee	Trawl Rationalization, Economic Data Collection	SSC independence, Dr. Lee worked on the development of the data collection program

The following is a compilation of March 2010 SSC reports to the Pacific Fishery Management Council (Council). (Related SSC discussion not included in written comment to the Council is provided in *italicized text*).

Council Administrative Matters

D.2. Proposed Revisions to National Standard 2 Guidelines – Scientific Information

The National Marine Fisheries Service is seeking comment on proposed changes to the guidelines on National Standard 2 – Scientific Information of the Magnuson-Stevens Fishery Conservation and Management Act (MSA). The Scientific and Statistical Committee (SSC) has emphasized the importance of good science, peer review and evaluation of uncertainty in assessment and management, and generally supports the proposed guidelines and the definitions they provide. Updates to our Terms of Reference (TOR) already reflect the proposed guidelines; for example, we identify and eliminate potential conflicts of interest in the review process. However, we have some concern that ambiguous language in the provision could unintentionally constrain rigorous procedures for review and evaluation of scientific information. Specifically, the recommended restrictions on SSC re-evaluation of peer-review reports seem counter to our current framework for assessment review:

"the SSC should not repeat the peer review process by conducting a subsequent detailed

technical review" (pg. 65726, third column)

Our existing process is hierarchical; our TOR specifies SSC leadership and participation in Stock Assessment Review (STAR) Panels, and when necessary, STAR Panel work is re-evaluated in a "mop-up" panel meeting with external peer review. The SSC wants to maintain flexibility to deal with situations which may require additional analysis, for example, following review of the STAR reports by the full SSC. This procedure is complementary, not duplicative, of the STAR Panel process, and assures broad identification of the "best available science." We recommend deletion or clarification of the referenced language in the proposed rule that may restrict additional SSC evaluation.

The SSC also agrees with the proposed guidelines to compile all assessment, Essential Fish Habitat, and Environmental Impact Statement documents in a single Stock Assessment and Fisheries Evaluation (SAFE) report for each fishery management unit. We support the recommendations in the proposed rule to include ecological and economic data in SAFE reports, and emphasize the importance of these report components. We note that economic data, and some ecological data, are often sparse in some of our current SAFE documents.

Groundfish Management

E.2. Stock Assessment Planning for 2013-2014

Proposed list of stocks for review

The Scientific and Statistical Committee (SSC) reviewed the list of stock assessments proposed by NMFS for the 2013-14 management cycle. While generally supportive of the proposed list, the SSC has a number of comments as follows.

A status report is being recommended for cowcod, as there is no new information that would affect the stock assessment or the rebuilding analysis. A status report would compare estimates of discard with projections from the model as a way to evaluate rebuilding progress, and is considered different than an update (which incorporates new data without changing the model). A status report would require no new model runs, unlike an update, and is appropriate given the uniquely data-poor situation for cowcod.

The SSC agrees that an assessment of spiny dogfish is a priority. The productivity-susceptibility analysis (PSA) suggests that spiny dogfish is a highly vulnerable species, which reinforces the need for an assessment. However it should be confirmed that critical data sets from all involved agencies will be available to conduct the assessment.

The SSC encourages an assessment of rex sole, which has not been assessed previously. The SSC recommends that the scope of the rex sole assessment be expanded to include the remaining members of the other flatfish complex (e.g., Pacific sanddabs). The rex sole assessment would likely use a full age-structured model, while the other flatfish would likely need to be assessed using simpler trend analyses. There are advantages of bundling a full assessment with related species: 1) data extracts and analysis of survey data can be done with little additional effort, 2) issues related to species identification of landings in the complex can be addressed comprehensively, rather than on a species-by-species basis, and 3) if done properly, information on the relatively data-rich species can help inform the assessments of the data-poor species.

The SSC discussed the potential for adding an assessment of kelp greenling to the list. The 2005 assessment of kelp greenling in Oregon was accepted by the Stock Assessment Review (STAR) Panel, but was considered highly uncertain. The assessment of kelp greenling in California was not accepted for management purposes. New data sets available for kelp greenling may increase the likelihood of useful assessment results, but further investigation into available information is needed before making a decision.

Due to the major data and modeling issues identified in recent STAR Panel review, a full assessment is recommended for whiting in the next assessment cycle. Some problems encountered during the whiting STAR Panel review could potentially be avoided if a separate Terms of Reference (TOR) were developed with Canada specifically for the whiting review.

Terms of reference for stock assessments and rebuilding analyses

Revised drafts of the TOR for the STAR process and rebuilding analyses were developed by the SSC groundfish subcommittee for Council consideration. Revisions to the rebuilding TOR were all editorial. Additions to the STAR process terms of reference in the appended document include:

1) a section on the history of the STAR process,
2) a section on conflict of interest for STAR Panel members reflecting guidance in the proposed National Standard Two guidelines,
3) additional advice on bracketing runs for decision tables,
4) recommendations for better (and earlier) communication between the STAT and data stewards,
5) a paragraph clarifying potential points of agreement/disagreement between STAR Panels and the STAT, and ensuring the STAR Panel report is viewed by the STAT,
6) requirements for reporting overfishing levels (OFLs) and acceptable biological catch (ABC).

The SSC endorsed these proposed changes. Several further revisions are needed to deal with issues that arose in the previous management cycle. First, while STAR Panels should evaluate the appropriateness of the F_{MSY} proxies used for calculating OFL and ABC, supporting analyses are needed for recommendations on changes in target harvest rates. The TOR will be updated on guidance on how this will be done. Secondly, a more comprehensive discussion is needed to advise the STAR Panels on the merits of removing data from the assessment model. While removal of inappropriate data sets should remain an option for STAR Panels, the decision to do this should not be made lightly, and should be fully evaluated. These revisions will be incorporated into the draft document for adoption at the June Council meeting.

Groundfish Management, continued

E.6. Amendment 20 –Trawl Rationalization – Economic Data Collection

The Scientific and Statistical Committee (SSC) was briefed by Dr. Todd Lee, Northwest Fisheries Science Center (NWFSC) on a report by the National Marine Fisheries (NMFS) NWFSC Economics Group on "Mandatory Economic Data Collection Program Design for Groundfish Trawl Rationalization" (NMFS Report 5). The report provides initial discussion

regarding design of a program to address the PFMC's mandatory economic data collection requirement for trawl rationalization and the Magnuson-Stevens Act monitoring requirement for Limited Access Privilege Programs.

Currently, the NWFSC conducts voluntary economic surveys of limited entry and open-access harvesting vessels, and the NMFS Regional Offices conduct voluntary processor surveys for their processed products reports. The NWFSC economic surveys provide data from groundfish trawlers on (1) ownership, homeport, and physical vessel characteristics, (2) annual revenue by source – including landings outside the west coast (including Alaska), west coast at-sea deliveries, sale/lease of vessel permits, and fishery disaster relief payments, (3) annual fixed and variable costs (not specific to fishery), and (4) crew compensation and fuel use associated with participation in the west coast groundfish trawl fishery.

While the current NWFSC economic surveys (and the Regional Offices' processor surveys) have many useful applications, the voluntary nature of those surveys - e.g., inadequate samples for some vessel and processor strata and some communities – make them poorly suited for considering the effects of rationalization.

The SSC endorses the mandatory economic data collection requirement and makes the following recommendations:

- Vessel and processor data should be collected for several years prior to rationalization as well as post-rationalization, to provide a basis for comparison.
- Collection of revenue, cost, and employment data from vessels and processors should be mandatory for all fisheries in which they participate – not just the groundfish trawl fishery. Mandatory collection is needed to ensure that data for all fisheries are available to place the effects of rationalization in the context of each business entity's overall economic activity and to evaluate potential spillover effects of rationalization on other fisheries.

The SSC concurs with the NWFSC report that design of the economic data collection will require collaboration with the Council, its advisory bodies, and industry participants, and that respondent burden should be minimized to the extent possible. Consultation with the NMFS Regional Offices will likely be needed to evaluate available processor data and how it can be supplemented for purposes of monitoring rationalization effects.

Groundfish Management, continued

E.3. Pacific Whiting Assessment and Harvest Specification for 2010

The Scientific and Statistical Committee (SSC) was briefed by Dr. Steve Martell (University of British Columbia) on the model (TINSS) selected by Pacific Whiting STAR Panel as the base model, and Dr. Ian Stewart (NWFSC) on the Stock Synthesis model which updated the 2009 stock assessment. The TINSS model was thus formulated using the recommendations by the Stock Assessment Review (STAR) Panel and the Stock Synthesis (SS) model was based on that presented to the STAR Panel and not the version which was considered acceptable by the STAR Panel. Dr. Vidar Wespestad presented the report of the STAR Panel.

During its deliberations, the 2010 whiting STAR Panel identified major issues with both assessments: (a) whether the age and length data from the acoustic survey are representative, (b) whether the commercial length and conditional catch-at-age data are inconsistent with the

assumptions of the models, and (c) whether the 1986 acoustic survey estimate is biased because the pre- and post survey calibrations are substantially different. These issues had also been expressed by past STAR Panels and have also been reflected in past research recommendations. The 2010 whiting STAR Panel also expressed concerns with the 2009 acoustic biomass estimate because of the presence of large numbers of Humboldt squid, which has a similar acoustic signal as whiting.

The response of the STAR Panel to these concerns was to identify a simpler model which did not use data it considered questionable. This led to two new model formulations. The Panel considered both of these as equally acceptable, but adopted the TINSS model as its base model because it had MCMC results immediately available to quantify uncertainty. Catch levels were calculated for both the $F_{40\%}$ and F_{MSY} harvest strategies.

The SSC discussed three key questions arising from the deliberations of the STAR Panel: (a) whether all of the data considered to be questionable should have been omitted from the models, (b) whether the assessment should be based on TINSS or Stock Synthesis, and (c) whether the management advice should be based on the $F_{40\%}$ or F_{MSY} harvest strategies. In relation to this last question, the SSC agreed that management advice should be based on the $F_{40\%}$ harvest strategy (with a 40-10 adjustment as needed) as applied to Markov–Chain Monte Carlo (MCMC) output as was the case last year, in particular because the SSC criteria for using the F_{MSY} estimate had not been met for whiting. The recommended ABC would be the median of the posterior distribution for the catch under the 40-10 control rule, subject to the constraint that the projected spawning stock biomass in 2011 is larger than the overfished threshold of $0.25B_0$.

The SSC discussed the other two questions in considerable detail, and two alternative views emerged.

- Management advice should be based on the STAR Panel recommended TINSS model because there are no demonstrable errors of judgment or failure to follow the terms of reference.
- Management advice should be based on the initial version of the Stock Synthesis model which was presented to the STAR Panel (i.e., which includes all of the data which the STAR Panel recommended be omitted). Reasons for adopting this model include that (a) the removal of large amounts of data used in many previous assessments should have only been done following more thorough review, (b) the model outputs, in particular the recommendations for catch levels, are sensitive to the assumptions regarding prior distributions, and (c) aspects of the TINSS model (such as its assumptions that the stock was unfished in 1966, that selectivity was constant over time, and that the US and Canada catch-at-age data can be pooled by weighting the catch-at-age data by nation by catch weights) have not been fully evaluated.

The SSC, STAT and STAR Panel found themselves in a very difficult situation this year. This is due to several long-standing issues which need to be addressed as soon as possible.

- The timing of the assessment process for whiting is problematic. Specifically, the assessment authors only received the final version of the data three days before the deadline for submitting documents to the Panel. This does not provide enough time for the two groups of assessment authors to collaborate to the extent desirable, limits exploration of the data for the most recent year, and reduces the time available for error checking. The time between the end of the STAR Panel and the briefing book deadline

for the March Council meeting is very short which meant that the assessment authors did not see the draft of the STAR Panel report in sufficient time to respond whether they agreed with its final conclusions or not.
- Many of the concerns which led the STAR Panel to reject data had been identified as research recommendations by previous STAR Panels and the SSC, but had not been addressed.

The SSC agreed the ideal way forward given the issues raised during the STAR Panel and during the SSC discussion would be to hold a mop-up panel as soon as technically feasible. The SSC realizes that there may be logistical reasons why that may be very difficult, but considers a mop-up panel the only way to rectify the problems and allow the SSC to provide a unified scientific recommendation regarding the best available science for Pacific whiting. The SSC strongly encourages the Council to consider the possibility of a mop-up panel for Pacific whiting this year.

Absent a mop-up panel, management decisions will have to be based on model formulations about which the SSC has major concerns, irrespective of which model is adopted. Although it discussed the issue extensively, the SSC was unable to reach consensus regarding which model formulation reflected the best available science for Pacific whiting this year and is consequently forced to put both models forward as best available science without assigning weights to either. The resulting OY values from the two models are 186,000t (Stock Synthesis) and 550,000t (TINSS). These values are less than the corresponding values reported in the assessment documents (224,975t and 617,700t respectively) because those values would lead to predictions of stock depletion to below $0.25B_0$ in 2011. If the SS model is the correct, and a catch exceeding 186,000t is taken, the stock is predicted to drop below the overfished threshold. In contrast, if the TINSS model is correct, taking a catch of 186,000t will lead to forgone yield.

The SSC was informed that the NWFSC acoustics group is engaged in an acoustic data reconstruction project. The SSC strongly encourages this work and asks that they and DFO scientists undertake experimental work to answer key questions such as hake target strength and evaluation of the representativeness of survey biological sampling.

The SSC noted that the high abundance of Humboldt squid in 2009 may well have impacted the size of the whiting resource due to predation. The size of this effect cannot be quantified at present, but may be substantial. The Chilean whiting stock has been greatly reduced because of squid predation. The SSC recommends that an acoustic survey take place in 2010 to explore this issue as well as how to estimate whiting abundance given the presence of squid.

Finally, the SSC emphasizes the assessment of whiting is uncertain at present. The results of the two models are highly uncertain as formulated, there is uncertainty regarding which model is better, there is uncertainty regarding which data sources are best included in assessments of whiting, and there is uncertainty due to the presence of a new but voracious predator species. Some of this uncertainty could be resolved through a mop-up panel but some is inherent to Pacific whiting, although the long-term solution necessarily involves collection of appropriate additional data.

The document describing the TINSS model has not been updated to reflect the final set of runs. This should be done before the document is included in the SAFE.

Pacific Whiting ABCs and OYs from the TINSS and SS Models

TINSS – catch forecasts under F40% harvest rate using median of MCMC posterior

	ABC	OY (w/ 40:10)	prevent B < B25%
2010	641,100	617,700	550,000
2011	377,500	281,900	-
2012	300,500	193,100	-

SS – approximate catch forecasts under F40% harvest rate using median of MCMC posterior

	ABC	OY (w/ 40:10)	prevent B < B25%
2010	270,000	240,000	186,000

Groundfish Management, continued

E.4. Amendment 23 –Annual Catch Limits

Dr. Steve Ralston briefed the Scientific and Statistical Committee (SSC) on the proceedings of the SSC Groundfish and Coastal Pelagic Species (CPS) subcommittee meeting (held with the Groundfish and Coastal Pelagic Species Management Teams in January, 2009) that met for the purpose of discussing implementation of several new requirements of the Magnuson-Stevens Reauthorization Act. (See subcommittee report, attached).

The initial discussion focused on consideration of the various methodological changes that have been made since the SSC last reviewed the analysis described in the document "An approach to quantifying scientific uncertainty in west coast stock assessments "(Agenda Item E.4.b, Supplemental SSC Report 1). It was agreed that: (1) the variance statistic from the meta-analysis (sigma=0.36 from the analysis of 17 data rich stocks) is best characterized as a "total variance" statistic and (2) in cases where within-model variance is greater, that value should be used in lieu of the meta-analysis statistic. For example, the within-model variance for sardine (0.39) is higher than the sigma value of 0.36 derived from the meta-analysis. The report was ultimately approved and the methodology was endorsed by the SSC.

The SSC recognized that this analysis is only a first step, in part because it just considers uncertainty in biomass. Going forward, it will be important to consider other sources of uncertainty, such as F_{msy}. Because of that it was also recognized that the present analysis underestimates total variance. While biomass is most likely the dominant source of uncertainty, it is anticipated that other factors will need to be considered.

The SSC recommends that a table should be provided to the council to show how the information shown in Figure 7 could be used to establish a scientific uncertainty buffer for category 1 (data rich) species. The suggested process is: (1) the SSC determines a value of sigma (e.g. using the methodology described in Agenda Item E.4.b, Supplemental SSC Report 1) and (2) the GMT uses the recommended formulation to translate sigma to a range of p* values (the probability of overfishing). Each p* is then mapped to its corresponding buffer fraction. The Council then

determines the preferred level of risk aversion by selecting an appropriate p* value.

The SSC discussed two options for application the 40:10 control rule with respect to application of buffers for scientific uncertainty. The SSC agreed that choosing between these options is a policy decision for the council to make based on its preferred level of risk aversion.

The SSC also heard a presentation by Dr. E.J. Dick describing methods for determining scientific uncertainty buffers for data poor situations (i.e., category 2 and 3 species). The SSC agreed that the method of depletion-based stock reduction analysis is a useful tool for developing overfishing level (OFL) recommendations for data-poor species in cases where the requisite catch history data are available. It was noted that this method is an improvement over current practice, and is likely to yield numbers more reliable than those in place now. The SSC recommends that this approach should be used on a stock specific basis to establish OFLs for the current specification process. In cases where stocks are in multiple complexes (e.g. north/south), the analysis should parse catches by region, where possible. It was also noted that, in principle, the method allows values of p* to be selected and buffers established to account for scientific uncertainty for these species, as well. Alternatively, it was suggested that buffers could simply be set in the range of a 25-50 percent reduction in OFL.

The SSC also discussed the need to assign categories to the species in the specification tables, but did not have sufficient time to accomplish this task at the present meeting.

SSC Groundfish & CPS Subcommittee Meeting Report
(Hotel Deca, Seattle, WA – January 26-28, 2010)

The Groundfish and Coastal Pelagic Species (CPS) subcommittees of the Scientific and Statistical Committee (SSC) met with the Groundfish Management Team (GMT) and the CPS Management Team (CPSMT) at the Hotel Deca in Seattle from January 26-28, 2010. The purpose of the meeting was to discuss implementation of several new requirements of the 2006 Magnuson-Stevens Reauthorization Act (MSRA). Members of the SSC in attendance included: Steve Ralston (chair), Bob Conrad, Ray Conser, Martin Dorn, Vladlena Gertseva, Owen Hamel, Tom Jagielo, Meisha Key (Barnes alternate), André Punt, Theresa Tsou, and Vidar Wespestad.

The agenda for the meeting is attached as Appendix A and included a number of specific issues that were discussed, including characterization of scientific uncertainty, harvest control rules, productivity-susceptibility analysis, definition of stock complexes, and the development of data-poor methods. The meeting began with Council staff (John DeVore and Mike Burner) outlining the process and timelines for implementation of Amendments 23 and 13 to the groundfish and CPS Fishery Management Plans, respectively. There is particular urgency for completion of Amendment 23 as groundfish management measures need to be developed between now and June so that regulations can be in place by January 1, 2011, as required by law. This summary report of the meeting is organized according to the sequence of agenda items, with individual headings for each topic.

Review of Existing Harvest Control Rules for CPS

The group discussed to what extent existing CPS harvest control rules already reflect adjustments for scientific uncertainty. The discussion initially focused on the FRACTION term of the Pacific sardine harvest control rule (HCR). The FRACTION term of the HCR has previously been referred to as F_{MSY}. This is a misnomer in the case of sardine because in certain instances the value used for FRACTION can be either lower or higher than the F_{MSY} value. For example, the original analysis that was used to motivate the temperature based HCR (Jacobson and MacCall 1995) $_{specified}$ F_{MSY} values of 0.04 for a cool water regime, 0.16 for a moderate temperature regime, and 0.26 for a warm regime. However, when the Council adopted the CPS FMP (1999), it constrained the FRACTION used for management such that $0.05 \leq$ FRACTION ≤ 0.15. The upper limit of the FMP-constrained range (FRACTION =0.15) was less than the best estimate of F_{MSY} during warm temperature regimes – in essence providing a buffer for OFL. During cool regimes, however, the lower limit of FMP-constrained range was greater than the best estimate of F_{MSY} – in essence allowing OFL to be exceeded. The conceptual work of Jacobson and MacCall was updated for use in the CPS FMP (Figure Sardine-1).

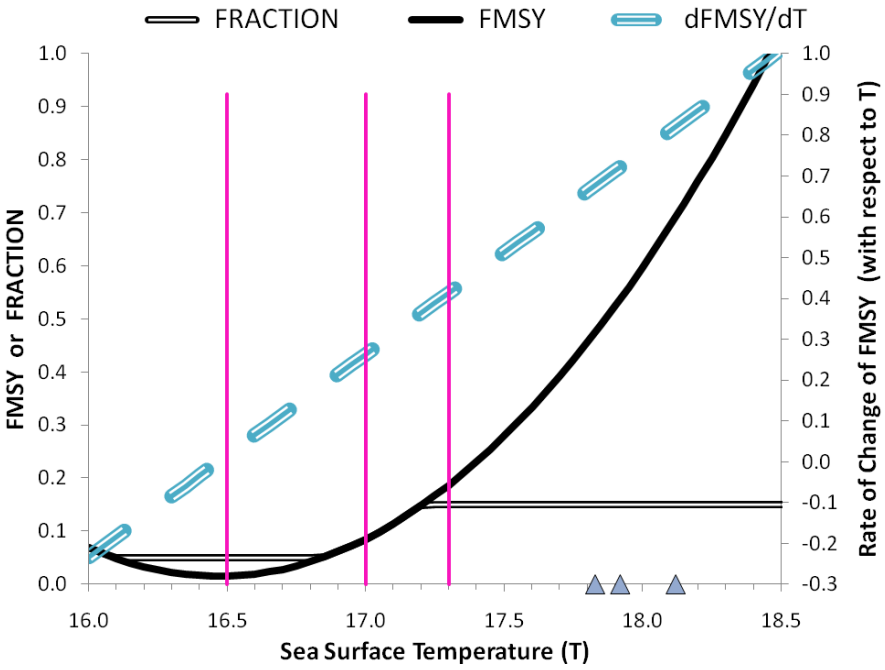


Figure Sardine-1. Pacific sardine F_{MSY} as a function of sea surface temperature (T) as used in the CPS FMP (1999). Note that while the function is conceptual based on Jacobson and MacCall (1995), it was updated for the FMP and differs somewhat from that given in Jacobson and MacCall (1995). *FRACTION* is the PFMC-imposed constraint on F that requires $0.05 \leq F \leq 0.15$. dF_{MSY}/dT is the derivative of F_{MSY} with respect to T. Vertical lines are the 25th, 50th, and 75th percentiles of SST from Jacobson and MacCall (1995). Triangles on the T axis show the SST for the last three years (from left to right: 2008, 2009, and 2007, respectively).

To evaluate the degree of buffer provided by the current HCR over the full span of temperature regimes, the SSC recommends conducting an analysis where OFL is computed using regime-specific best estimates of F_{MSY}. A comparison of those results with prospective ACLs, as they might be computed using the current HCR, would be useful in gauging the extent to which the

HCR is more or less conservative than an OFL.

However, the SSC's primary responsibility is in evaluating the OFL and ABC rather than the ACL. The temperature-dependent F_{MSY} for sardine (Figure Sardine-1) is unique among F_{MSY} definitions for Council-managed species. Sardine assessment uncertainty (a combination of within and among assessment variance) is the largest of all the Council-managed species that have been examined to date – implying the need for a significant buffer between OFL and ABC. After the SSC's work on "Quantifying Scientific Uncertainty in PFMC Stock Assessments" has been completed, it will be important to compare OFL, ABC (buffered for scientific uncertainty), and ABC (subject to the PFMC *FRACTION* constraint) over a range of P* values (say 0.2 – 0.5) for cool, intermediate, and warm temperature regimes. The likely outcome is that, should the Council continue to implement its *FRACTION* constraint on F, that process may provide adequate OFL buffers for some range of warmer SSTs. However, in cooler temperature regimes, additional buffering will likely be needed.

Finally, some consideration should be given to limiting the range of SST over which the F_{MSY} function can be considered reliable. Recent SSTs are well above the bulk of the data used for deriving the F_{MSY} function (Figure Sardine-1). While this may not be a major issue for a linear function, the nonlinear sardine F_{MSY} function at current SSTs exhibits appreciable differences in F_{MSY} for rather small changes in SST. While it may not be practical to revise and/or replace this F_{MSY} function on the Council's schedule for NS1-related FMP amendment, it may be possible to suggest some reasonable sideboards to limit its use, e.g., to restrict its use to SSTs that fall below the 75th percentile of SST from the Jacobson and MacCall (1995) work.

Update on Characterization of Variation in Stock Size Based on Variation Within and Among Stock Assessments

Dr. Steve Ralston presented a brief overview of "Quantifying Scientific uncertainty in PFMC Stock Assessments".

Two main assertions were made in pursuing quantification of scientific uncertainty in stock assessments: (1) data-poor assessments cannot be more certain than data-rich assessments and (2) variation among stock assessments captures a wide variety of sources of uncertainty. Some of those sources of uncertainty include: the modeling software, the types of data incorporated into the model, model specification issues, parameter priors, STAT team composition, and STAR panel composition.

The general method undertaken in the analysis was to compare previous full assessments (or the most recent update thereof), and consider the logarithms of the ratios of the biomass estimates for each pair of assessments and their reciprocals using the last 20 years from an assessment. This provides a distribution of stock size differences in log-space and, if this variation is averaged over species, provides a general view of total biomass variation that emerges among

repeat assessments of stocks, while embracing a wide range of factors that affect variability in results. While the original standard deviation (σ) reported from this method was 0.48, a revision that incorporated a correction factor[1] for using paired points ($\sqrt{2}$), revised that value down to 0.34.

The analysis also considered the CV "within" assessments as an additional source of uncertainty that could be combined with the uncertainty calculated "among" assessments in some way. It was agreed that, due to some parameters being pre-specified in some assessments, which would reduce "within" variance estimates, the median value of the distribution for the CV "within" (0.15) should be used in lieu of the reported CV, if the reported value was less than the median.

Dr. André Punt presented work that considered the above method for estimating "among" assessment variance, along with three other methods. All four approaches gave generally similar results, even though there were differences in methodology. The attending SSC members agreed that the standard method of calculating "among" assessment variance should be one that starts with the most recent stock assessment, goes back a fixed number of years (20), and compares all of the assessment biomass estimates in a year to the mean estimate of biomass for that year (based on averaging over the available data). It was recommended that the rest of the analysis be carried out in a manner analogous to that described above.

The notion that, in the adopted approach, "among" assessment variance is contaminated by "within" assessment variance was raised and was discussed at some length. It was argued that variation estimated by comparing past stock assessments in the manner described was better characterized as a "total" variance statistic. Several potential methods to estimate the extent of potential double counting were proposed and, based on that discussion, a recommendation was made that an analysis using assessment retrospectives should be pursued to further evaluate the issue. Dr. Owen Hamel, Dr. Punt, and Dr. Ralston agreed to follow-up on this topic.

A discussion of productivity/susceptibility analysis (PSA) metrics then transpired and it was concluded that such metrics would likely not add useful insights to the quantification of scientific uncertainty for data-rich stocks that have been evaluated with a full assessment.

Lastly, there was discussion about the merits of estimating the probability of exceeding the true OFL by 50% (1.5×) or 100% (2×). Example analysis of these probabilities is shown in the tables below. Given that most standard errors this year are likely to be less than 0.4, limiting a P* to a maximum of 0.4 would avoid either of the below limits in most cases.

[1] Mohr, M.S. Groundfish ABC accounting for scientific uncertainty – derivation of biomass scalar. Unpublished document dated 17 November 2009, 4 p.

To limit to 10% the chance of exceeding the true OFL by 50%

σ (log space)	P*	Buffer Factor
0.10	0.50	1.00
0.20	0.50	1.00
0.30	0.50	1.00
0.40	0.39	0.90
0.50	0.32	0.79
0.60	0.27	0.70

To limit to 5% the chance of exceeding the true OFL by 100%

σ (log space)	P*	Buffer Factor
0.10	0.50	1.00
0.20	0.50	1.00
0.30	0.50	1.00
0.40	0.50	1.00
0.50	0.40	0.88
0.60	0.31	0.75

Reference Points and Control Rules for Monitored CPS

The monitored CPS species include jack mackerel, northern anchovy (central and northern sub-populations), market squid, and krill. Krill are a non-targeted (and currently prohibited) species that could reasonably be classified as an ecosystem component (EC) species. The lifecycle of market squid is shorter than one year and so status determination criteria are required but not an ACL. The fishery is managed by maintaining egg escapement > 30% calculated on a per-recruit basis.

Jack mackerel and Northern anchovy are targeted species that require an OFL. In the current FMP, OFL is the product of biomass, F_{MSY}, and a distribution fraction (portion vulnerable in the US) for these species. ABC is then established at 25% of OFL. The values used for biomass and F_{MSY} are quite dated and should be re-evaluated. The applicability of the 75% buffer should also be reviewed.

The specific values for jack mackerel are: OFL = 195,000mt × 0.65 = 124,800mt; ABC = OFL × 0.25 = 31,000mt. The group discussed the idea of setting an annual catch target (ACT) at 4,000mt (the highest recent catch). For northern anchovy (northern subpopulation), the biomass from a recent acoustic survey is 159,800mt, but F_{MSY} is unknown. For the central subpopulation, OFL = 123,000mt × 0.82. The group discussed the idea of setting an ACT at 19,000mt (highest recent catch).

Productivity and Susceptibility Analysis for Groundfish

Dr. Jason Cope reported on the progress made by the PFMC GMT and the NMFS Vulnerability Evaluation Work Group (VEWG) for determining the vulnerability of a stock. The vulnerability of a stock to becoming overfished is defined in the National Standard 1 (NS1) guidelines as a function of its productivity and susceptibility to the fishery. The guidelines note that the "vulnerability" of fish stocks should be considered when: (1) differentiating between stocks "in the fishery" and ecosystem component stocks, (2) assembling and managing stock complexes, and (3) creating management control rules.

The productivity and susceptibility of a stock was determined by providing a score ranging from 1 to 3 for a set of attributes related to each component. Currently there are 10 attributes for productivity that reflect stock life history and 12 attributes that reflect susceptibility to the impacts of fishing and management. The table below lists all attributes evaluated in the productivity-susceptibility analysis (PSA):

productivity attributes	**susceptibility attributes**
population intrinsic growth rate (*r*)	management strategy
maximum age	areal overlap
maximum size	geographic concentration
von Bertalanffy growth rate (*k*)	vertical overlap
natural mortality	fishing rate relative to M
measured fecundity	biomass of spawners (SSB) or other proxies
breeding strategy	seasonal migrations
recruitment pattern	schooling/aggregation and other behaviors
age at maturity	gear selectivity
mean trophic level	survival after capture and release
	desirability/value of the fishery
	Fishery impact to habitat

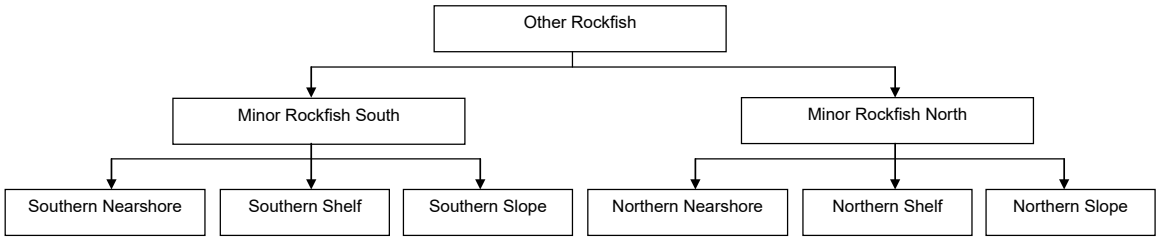
PSA scores have been calculated for all groundfish stocks and were graphically displayed on an x-y scatter plot. Stocks with a low productivity score and a high susceptibility score were considered to be more vulnerable, while stocks with a high productivity score and low susceptibility score were considered to be less vulnerable. Vulnerability is calculated as the Euclidean distance from the origin {3,1}. Each attribute score is also evaluated for the quality of the data used to determine the score. Data quality scores range from 1 to 5, where low numbers indicate better quality.

A four step approach was presented to define the relationship between fisheries and appropriate stock complexes: (1) calculate PSA scores for each species in the FMP, (2) identify the overlap in distributions of each species based on latitude and depth range, (3) assign each species to the various fisheries, and (4) overlay the groupings onto the PSA plot. The GMT is finalizing PSA vulnerability scores for west coast groundfish and completed a cluster analysis based on latitude and depth to identify spatial overlaps. Preliminary results indicate that there is a need to adjust the assignment of FMP stocks to complexes.

Description of Existing Methods for Determining ABCs for Stock Complexes

John Devore provided an overview of current groundfish stock complexes and existing harvest specifications (ABCs and OYs) for these complexes. There are currently six rockfish complexes and two non-rockfish complexes.

The "Other" rockfish complexes are classified as shown below:



These rockfish assemblages contain a large number of species. Some species with coastwide distributions may be managed in a complex in one region and stock-specifically in the other region. An example is bocaccio, which is managed in the "Minor Rockfish North – Northern Shelf" complex north of lat. 40°10'N and as a specific data-rich stock to the south of that management line. For some stocks considerable information is available; for many others we know very little.

For species with some fishery-independent survey information available, Rogers *et. al.* (1996) calculated species-specific harvest specifications (ABCs) using an approach where F_{MSY} was set equal to the natural mortality rate (M) applied to swept-area biomass. In 2000, these ABCs were reduced to account for scientific uncertainty by applying a 25% buffer (i.e., $OY = 0.75 \times ABC$). For species with little information other than landings statistics, average historical catch was used to set ABCs, and OYs were calculated as either 25% or 50% of ABC (depending on the species).

Over time, several species were removed from the other rockfish complexes (for example, darkblotched and widow rockfish) and are currently managed as separate stocks. The harvest specifications for complexes are recalculated every time a species is removed. The "Other flatfish" complex includes species that have not been assessed (e.g., rex sole). Two species having somewhat more information have their ABCs set based on both average historical catch and survey abundance data (area-swept approach). Existing OYs for these two species were calculated as 25% of ABCs. The other species in the complex have their ABCs calculated based on average historical catch only, with OY set as 50% of ABC. Starry flounder was initially in the other flatfish complex, but was recently assessed (with species-specific ABCs and OYs calculated), and removed from the complex. The specifications for the complex were recalculated reliably, since the catches of starry flounder were monitored and well-documented.

The "Other Fish" complex is the most problematic. Harvest specifications were established to not to constrain the fishery, and species compositions were not monitored. Existing ABCs are based on average historical catch, and OY is calculated as 50% of ABC. Only one species in the Other Fish complex (longnose skate) has been assessed. There is no reliable way to estimate the historical contribution of longnose skate to the aggregate total for the complex because species compositions have not been monitored. There is, therefore, no way to remove it from the complex. Most species in the Other Fish complex are caught in small numbers, with some exceptions (e.g., spiny dogfish). Due to its life history characteristics this species is a cause for concern. There is consideration to remove all the elasmobranchs from the "other fish" complex and to place them in their own assemblage. This would provide an opportunity for better

monitoring and protection of those species, which is desirable given their life history characteristics.

It was noted that a major problem is that current harvest specifications for stock complexes have been used for decades without updating or reconsideration of ABCs. In addition, it is not clear exactly what methods and data were applied to calculate the original ABCs and OYs for each component stock in each complex. The GMT is now engaged in the process of trying to reconstruct the statistics that provide the basis for our existing harvest specifications.

In the short-term, documentation of methods used to derive the existing ABCs and OYs for each component stock in each complex will be attempted by John DeVore, which should be available for review at the April Council meeting. In the long term, the goal is to determine whether stock complexes should be re-defined (based on the approaches such as PSA) and to explore new, more sensible approaches to set harvest specifications for complexes (see below).

Depletion-Corrected Average Catch (DCAC) Analysis for Groundfish

Dr. E.J. Dick presented results of recent work with Dr. Alec MacCall on estimating yield for data-poor stocks. His presentation compared yield distributions derived from two data-poor methods, Depletion-Corrected Average Catch (DCAC) and Depletion-Based Stock Reduction Analysis (DB-SRA), with point estimates of yield from 28 data-rich groundfish stock assessments. Both data-poor methods require time series of historical catch and four prior distributions (M, F_{MSY}/M, B_{MSY}/B_0, and relative stock status). DB-SRA also requires an estimate of age at 50% maturity. DCAC distributions are yields that were likely to be sustainable over the time period of historical catch, and these were compared to SPR proxy MSY values from the data-rich assessments. Median DCAC values for most stocks were typically below MSY (as expected), but sometimes exceeded the proxy values. The subcommittee discussed the distribution of DCAC across stocks, relative to MSY proxy values from the assessments, and the potential use of this ratio as an empirical bias-correction factor for applications to unassessed species. DB-SRA extends DCAC by using draws from the prior distributions to fully specify a delay-difference production model. This extension generates distributions of MSY, B_{MSY}, B_0, and OFL that are conditioned on the time series of catch. Dr. Dick presented two sets of results comparing yield distributions: (1) when expected relative abundance (depletion) was assumed known (set equal to that estimated in the stock assessments for the species being compared) and (2) when expected relative abundance was unknown, but was assumed to be at 40% of the unfished biomass level. The second comparison was intended to evaluate the effect of uncertainty in stock status on yield estimates. Distributions of OFL generated using DB-SRA were generally consistent with assessment results, with evidence of a slight negative bias. The subcommittee discussed how integrated (across species) DB-SRA distributions of OFL and MSY, relative to their respective assessment results, could be used to correct for potential bias.

The SSC's groundfish subcommittee inquired about the relative influence of each prior distribution on the results. The subcommittee agreed that a better understanding of which distributions have the greatest effect on model outputs would be beneficial. Factors that may determine the direction of bias relative to SPR proxy reference points should also be investigated. It was suggested that relative yield distributions be plotted against spawner-recruit steepness to evaluate its effect on yield estimates. Rejection rates, i.e., the fraction of implausible (negative) biomass trajectories, differed among species and further explanation of

these differences was also considered important by the subcommittee. Interpretation of P^* for stock complexes was also discussed. In this context, P^* might be considered as the fraction of stocks within a stock complex that would likely experience overfishing.

The groundfish subcommittee endorsed application of DCAC and DB-SRA, if possible, to unassessed stocks in the groundfish FMP. Dr. Dick agreed to compile the time series of historical catch and life history information needed as inputs to the models, and will present his results to the SSC at the March 2010 meeting in Sacramento, CA.

Overfishing Limits (OFLs) for Groundfish Including Revisions due to New Harvest Proxy for Flatfish Species

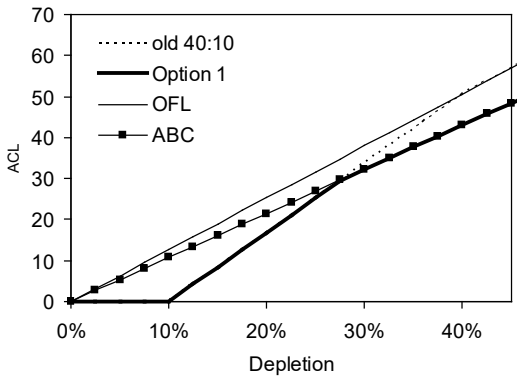
John Devore presented the list of OFLs for groundfish species, these OFLs will be discussed in detail during the March SSC meeting.

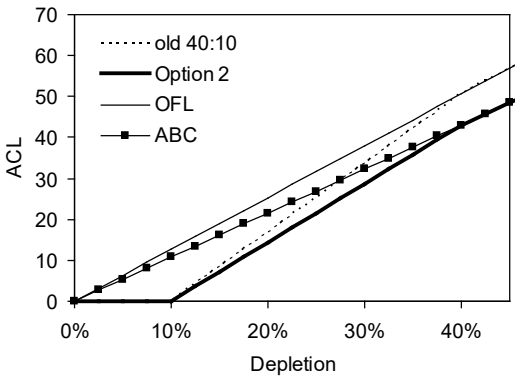
Application of the Groundfish 40-10 Rule

The SSC regards the "40-10" and analogous rules as aids in setting the ACL when stocks fall below their biomass target (B_{MSY} or its proxy). The SSC, moreover, considers the decision on how to apply the "40-10" rule in conjunction with the new ABC definition as a policy decision that should be made by the Council. The two options to consider, along with their underlying supporting philosophies/arguments, are outlined and diagrammed below. In addition, an analogous rule for flatfish is described and arguments for and against implementing such an analogous rule are presented.

Option 1: The 40-10 rule and the ABC rule would be applied separately to the OFL and the lower of the two would be the maximum acceptable ACL. The philosophy behind this approach is that the 40-10 rule and the new ABC rule (applying an offset from the OFL) are precautionary adjustments which are both attempting to achieve the same thing, namely adjusting for uncertainty in stock status and F_{MSY}, and therefore the minimum of the two should be taken.

Option 2: The 40-10 rule would be applied directly to the newly defined ABC and that value would be the maximum acceptable ACL. This would result in two reductions for stocks depleted below the target level of $0.4B_0$, one for scientific uncertainty to provide an ABC, as buffered from the OFL, and a second (the 40-10 adjustment) to provide the ACL based on the 40-10 rule. The philosophy behind this approach is that the ABC rule adjusts for uncertainty in the absolute scale of biomass or the correct F_{MSY}, whereas the 40-10 rule facilitates "rebuilding" towards the biomass target.





The SSC suggests an analogous rule to 40-10 for flatfish be the "25-5" rule, which would essentially ramp down catches linearly from 25% of B_0 to zero catch at 5% of B_0. This rule results in a 20% reduction in fishing mortality at the overfished threshold (12.5% of B_0), which is the same reduction seen in the 40-10 rule at 25% of B_0 (the overfished threshold) for rockfish. The use of such a rule in determining ACLs would achieve the same benefits as the 40-10 rule for rockfish. Given the higher productivity, in general, for flatfish compared to rockfish, the 25-5 rule should be sufficient, even given the lower absolute proportion of virgin biomass. The treatment of the 25-5 rule in conjunction with ABCs should be equivalent to the treatment of the 40-10 rule, i.e. the choice of options 1 and 2 above should apply to flatfish as well.

An example of the ABC and ACL levels under options 1 and 2 over a range of depletion levels and scientific uncertainty buffers is given in the table below.

Example - OFL at target (B40) is 1000 mt						
			Depletion Level			
Buffer Factor		25%	30%	35%	40%	
1	ABC	625	750	875	1000	(Current ABC)
1	ACL Option 1	500	667	833	1000	
1	ACL Option 2	500	667	833	1000	(Current 40-10 rule)
0.95	ABC	594	713	831	950	
0.95	ACL Option 1	500	667	831	950	
0.95	ACL Option 2	475	633	792	950	
0.9	ABC	563	675	788	900	
0.9	ACL Option 1	500	667	788	900	

0.9	ACL Option 2	450	600	750	900	
0.85	ABC	531	638	744	850	
0.85	ACL Option 1	500	638	744	850	
0.85	ACL Option 2	425	567	708	850	
0.8	ABC	500	600	700	800	
0.8	ACL Option 1	500	600	700	800	
0.8	ACL Option 2	400	533	667	800	
0.75	ABC	469	563	656	750	
0.75	ACL Option 1	469	563	656	750	
0.75	ACL Option 2	375	500	625	750	

OFLs, ABCs, and Annual Catch Limits (ACLs) for Groundfish Stock Complexes &

ABC Control Rules for Category 1, 2, and 3 Groundfish Stocks

Species in the Groundfish FMP are placed into one of three categories. Stocks in category 1 are those with quantitative assessments that allow harvest control rules and status determination criteria to be applied. Stocks in category 2 are generally those with some quantitative basis for estimating stock abundance (i.e., a time series of survey biomass estimates), while category 3 stocks are those where only estimates of landed catch are available. These categories are somewhat fuzzy in their definition, which has hampered consistent application of the framework in the past.

The Groundfish Management Team (GMT) has applied a policy of setting the OY to 75% of the ABC for category 2 stocks, and setting the OY to 50% of the ABC for category 3 stocks. Bringing management practices for category 2 and 3 stock into compliance with the new National Standard 1 guidelines will require some changes in nomenclature, but the buffers already in place were implemented to account for scientific uncertainty, and presumably reflect Council's risk preferences for data-poor species. The larger buffer for category 3 stocks reflects the greater scientific uncertainty associated with these stocks. Under such an approach, the current ABC would be designated as the new OFL, and old OY would be designated as the new ABC.

The SSC's role in making ABC recommendations for category 2 and 3 stocks would be to review the assignment of stocks to category, and to review the methods used to determine the

OFLs and ABCs. The SSC, as a review body, will not be responsible for producing estimates of OFL and ABC, but will provide recommendations on the methods that are applied, and review the estimates to determine whether they represent the best scientific information.

Many of the ABCs and OYs for category 2 and 3 stocks have been established for a long time, and have been carried over from one assessment cycle to the next without further review. The basis for some of the ABCs and OYs is not readily available, and those based on Rogers *et al.* (1996)[2i] do not make use of the groundfish assessment surveys that have occurred in recent years. Given the compressed schedule for Amendment 23 and the groundfish biennial specifications process, it is unlikely that all OFL and ABC estimates for category 2 and 3 stocks can be updated and reviewed by the SSC for the 2011-12 management cycle. However, as a first step, the SSC requests that that the GMT or Council staff prepare a list of each species in the FMP with the following information:

1. Species category
2. Basis for category assignment
3. OFL
4. Basis for OFL.
5. Species complex (if any).
6. Whether the species is a candidate for the ecosystem component category.

Species complexes are used extensively for Category 2 and 3 stocks. Determining the OFL and ABCs for species complexes is a simple matter of summing the OFLs and ABCs for the species in the complex. An initial review of the current grouping of stocks into complexes showed no serious deficiencies, but suggested that further refinements may be possible. Ongoing work with PSA may provide a more objective approach to grouping species with similar life history, vulnerability to the fishery, and geographic distribution (see discussion above).

Depletion-corrected average catch (DCAC) and depletion-based stock reduction analysis (DB-SRA) offer advantages over the methods that have been used in the past to estimate ABC and OFL for category 2 and 3 stocks. The SSC encourages application of these methods to as many stocks as is feasible, but would need to review the results before recommending changes from the existing methods.

For rebuilding stocks, no additional analysis is required, as the OFL is already calculated for the rebuilding analysis. A rebuilding OY is functionally equivalent to an ACL, which must be less than or equal to the ABC.

[2] Rogers, J.B., Wilkins, M.E., Kamikawa, D., Wallace, F., Builder, T., Zimmerman, M., Kander, M., and Culver, B. 1996. Appendix E: status of the remaining rockfish in the Sebastes complex in 1996 and recommendations for management in 1997. In Appendix Volume II to the Status of the Pacific Coast Groundfish Fishery through 1996 and recommended acceptable biological catches for 1997. Pac. Fish. Manag. Council, Portland, OR 97201.

Appendix A:

PROPOSED AGENDA

Management Teams and Scientific and Statistical Subcommittees for Coastal Pelagic Species and Groundfish

Pacific Fishery Management Council
Hotel Deca
4507 Brooklyn Avenue Northeast
Seattle, Washington 98105
(800) 899-0251

January 26-28, 2010

Management Team and Scientific and Statistical Committee (SSC) Subcommittee meetings for Groundfish (GF) and Coastal Pelagic Species (CPS) are open to the public and public comments will be taken at the discretion of the meeting Chair. Agenda times are approximate and are subject to change.

TUESDAY, JANUARY 26, 2010

8:30 a.m.	Welcome and Introductions
8:35 a.m.	Approval of the Agenda
8:45 a.m.	Rapporteur assignments
9:00 a.m.	Process and timelines for Groundfish FMP Amendment 23 (Devore)
9:30 a.m.	Process and timelines for CPS FMP Amendment 13 (Burner)
10:00 a.m.	Coffee Break
10:15 a.m.	Review of existing harvest control rules for CPS (Hill/Burner)
12:00 noon	Lunch
1:15 p.m.	Update on characterization of variation in stock size based on variation within and among stock assessments (Punt/Ralston)
2:15 p.m.	Expressing uncertainty – Acceptable Biological Catch (ABC) Control Rules for CPS (Hill/Burner)
3:15 p.m.	Coffee Break
3:30 p.m.	Reference points and control rules for monitored CPS (CPSMT/Burner)
5:00 p.m.	Adjourn for the day

WEDNESDAY, JANUARY 27, 2010

8:30 a.m.	Productivity and Susceptibility Analysis for groundfish (Cope)
10:00 a.m.	Coffee Break
10:15 a.m.	Description of existing methods for determining ABCs for stock complexes (Devore)
10:30 a.m.	Depletion-Corrected Average Catch (DCAC) analysis for groundfish (Dick)
12:00 noon	Lunch
1:00 p.m.	Overfishing Limits (OFLs) for groundfish including revisions due to new harvest proxy for flatfish species
3:00 p.m.	Coffee Break
3:15 p.m.	Application of the groundfish 40-10 rule (DeVore)
4:14 p.m.	ABCs and Annual Catch Limits (ACLs) for groundfish stock complexes
5:00 p.m.	Adjourn

THURSDAY, JANUARY 28, 2010

8:30 a.m.	ABC control rules for category 1, 2, and 3 groundfish stocks
10:00 a.m.	Coffee Break
10:15 a.m.	ABC recommendations for all groundfish stocks (continued)
12:00 noon	Lunch
1:00 p.m.	ACL and Annual Catch Target Strategies for groundfish stocks/complexes
2:00 p.m.	Preparation of report for SSC consideration
3:00 p.m.	Coffee Break
3:15 p.m.	Preparation of report for SSC consideration (continued)
5:00 p.m.	Adjourn

Coastal Pelagic Species Management

H.3. 2010 Pacific Sardine Exempted Fishing Permits

The Scientific and Statistical Committee (SSC) was briefed by Mr. Tom Jagielo and Dr. Doyle Hanan on the west coast sardine survey application for an EFP in 2010. Dr. Kevin Hill of the National Marine Fisheries Service was also present to answer questions about how the survey results could be used in the next sardine stock assessment. The permit application expands upon an EFP that was conducted from Monterey Bay to the U.S./Canada international boundary in 2009, and is composed of a summer survey and an autumn pilot study. The coastwide summer survey is slated for July through early September 2010, and is divided into northern (WA-OR) and southern (CA) regions. The pilot study is proposed for the Southern California Bight during the autumn of 2010.

A coordinated synoptic summer survey would range from the Southern California Bight to the U.S./Canada international boundary. Survey design is a two-stage sampling approach that includes: 1) a photographic aerial survey, and 2) an at-sea point set sampling component to

estimate species composition, school density, and biological characteristics of the fish, including the collection of otoliths for age determination. Changes from the 2009 survey design include a latitudinal expansion in survey coverage so that it encompasses the entire coastline, and an increase in the number of transects and point sets to achieve a reduction in the variance of biomass estimates. In addition, the 2010 survey design provides for eight vessels to participate in point set sampling, four from each region, which is double the number compared to 2009.

The autumn pilot study is designed to explore ways to further improve biomass estimates by using acoustic methods, LIDAR (Light Detection and Ranging), and night-time bioluminescence to determine school size, as well as aerial photography. The pilot study will be conducted off southern California during autumn months, which also provides an opportunity to investigate seasonal changes in abundance by comparison with summer results from the same area.

As part of their presentation to the SSC, the applicants included a supplemental handout that discusses the summer survey design revisions in accordance with Stock Assessment and Review Panel recommendations from September 2009. The SSC recommends that these changes be included in a revised EFP proposal.

The SSC further recommends that a revised proposal include explicit protocols for spatial distribution of point sets, to address a concern that the sets tended to be geographically clustered in the 2009 survey, and therefore, might not have captured possible spatial variability in the relationship between school size and biomass. Finally, the proposal should also provide the experimental design and survey protocols for the autumn pilot study.

There may be a correlation between the estimates of abundance for 2009 and 2010 because they will be based upon the same data, and this needs to be addressed. An extended stock assessment update review is currently scheduled for the next sardine assessment during the autumn of 2010, and provides a venue to address the technical basis for recalculating the variance from 2009 and incorporating the new 2010 survey results into the assessment.

There is a strong scientific basis for this application. The SSC recommends that it be approved for public review following submission of a revised proposal that addresses the issues described above.

Coastal Pelagic Species Management

H.2. Amendment 13 – Annual Catch Limits

Mr. Mike Burner provided an overview of "*Measures for Integrating New Provisions of the Magnuson-Stevens Fishery Conservation And Management Act and National Standard 1 Guidelines Into Coastal Pelagic Species Management"* (Agenda Item H.2.a Attachment 1) and Dr. Kevin Hill presented the section on overfishing limit (OFL), acceptable biological catch (ABC), and annual catch limit (ACL) considerations for Pacific sardine. The Scientific and Statistical Committee (SSC) discussion focused primarily on the sardine harvest control rule (HCR).

At several earlier meetings, the SSC and the Coastal Pelagic Species Management Team (CPSMT) have discussed the extent to which the existing Pacific sardine HCR reflects OFL adjustments that account for scientific uncertainty. The issue is somewhat complex because:

1) sardine assessment uncertainty is the largest of all the Council-managed species that have been examined to date – implying the need for a significant buffer between OFL and ABC;
2) the temperature-dependent F_{MSY} for sardine is unique among F_{MSY} definitions for Council-managed species; and
3) to some extent, the existing sardine HCR provides OFL adjustments – particularly during warm temperature regimes.

Using preliminary results from the SSC's work on "Quantifying Scientific Uncertainty in PFMC Stock Assessments" (Agenda Item E.4.a, Supplemental SSC Report 1), the CPSMT addressed this issue quantitatively for the first time. The analysis, although preliminary in nature, was quite helpful in clarifying the SSC's thinking on this matter.

Prior to the Council's final consideration on the FMP Amendment (June 2010), the SSC suggests that the analysis be revised as follows:

a) update the best estimate of scientific uncertainty for sardine (σ=0.39);
b) in Table 2, re-calculate ABC = BUFFER x OFL (for P* in the range 0.2 – 0.5) and add ACL as the minimum of ABC and the catch resulting from application of the HCR;
c) extend the range of sea surface temperatures (SST) considered to that used in Figure 1; and
d) display results (ABC and ACL) as a function of P*, SST, σ, and biomass (ages 1+).

The SSC would also like to see a critical examination of the SST dependent F_{MSY} function. It is quite likely that there is considerable uncertainty in this relationship (especially for warmer SSTs), and if properly accounted for in the value of σ used for calculating buffers, would increase the OFL buffer appreciably, i.e. decrease the ABC. Over the longer term, the concept and support for the F_{MSY} function should be re-evaluated. The original work was carried out in the late 1990's prior to the resurgence of the sardine stock. Considerably more data are now available and should be examined to ascertain whether or not the original function is still appropriate. The importance of the F_{MSY} function has increased considerably in light of the new NS1 guidelines.

With regard to the monitored species in the CPS FMP, the ABC alternatives (ABC = 0.25 x BIOMASS or ABC = 0.25 x BIOMASS x BUFFER) should be examined in light of the highly dynamic nature of species such as anchovy. Biomass for such species cannot be estimated on a regular basis. As such, if biomass is estimated at a time of high stock size, the resulting ABC may not be appropriate.

Regarding Section 3.5 (State and Federal Management Considerations), some of the status quo advantages should be reconsidered. For example, it is not likely that continuing to include all current species in the FMP will provide a vehicle to account for climate change, etc.

Salmon Management

G.2. 2009 Fisheries & 2010 Stock Abundance Estimates

Dr. Robert Kope of the Salmon Technical Team (STT) provided the Scientific and Statistical Committee (SSC) with an overview of the 2009 salmon fisheries and the forecast of abundance for the 2010 salmon fisheries.

The Sacramento River Fall Run Chinook (SRFC) continues to be a concern. The SSC commends the STT for their development of confidence intervals for the predictions of SRFC. Dr. Michael O'Farrell of the STT presented a range of approaches to expressing the error structure in this regression. This general topic deserves further attention.

The SRFC escapement was roughly 1/3 of the predicted value in 2009. There are reasonable explanations for its under-prediction. The Sacramento Index (SI) is not age-structured, but jacks are predictors for age 3 fish. In most years of the time series there are also age 4 and 5 fish present, and these are built into the regression, with the implicit assumption that they are a constant proportion of the population. Since 2007 there have been very few SI fish, so the expectation is that there are few older-age fish present. This may have contributed to the high prediction in 2009 and suggests that the predictor for 2010 may again be biased high. Nonetheless, the SSC endorses the use of this estimator, but cautions that escapement goals should be precautionary. The performance of this estimator under variable conditions could be improved by the availability of age structured data.

Because of the dependence of salmon management on sibling regressions all along the coast, and the need to characterize the associated uncertainty, the SSC recommends a workshop on sibling predictors.

Salmon Management

G.3. Stocks Not Meeting Conservation Objectives

Dr. Robert Kope reported on identification of Pacific salmon stocks not meeting conservation objectives. Four stocks have failed to meet their Fishery Management Plan (FMP) escapement goals for three or more consecutive years and are subject to a conservation concern. The stocks are; Sacramento River fall Chinook (SRFC), Grays Harbor coho, Queets coho, and Western Strait of Juan de Fuca coho. Two additional stocks, Queets and Quillayute spring/summer Chinook, failed to meet escapement goals for three or more consecutive years but are exceptions to the Council overfishing policy because they are harvested at a less than five percent exploitation rate in Council fisheries.

The SRFC stock failed to meet its escapement goal in 2007, 2008 and 2009, triggering an overfishing concern; SRFC are forecast to be above the escapement goal in 2010. The Scientific and Statistical Committee (SSC) shares the concern expressed by the Salmon Technical Team (STT) about prospects for SRFC recovery given forecast uncertainty and lack of demonstrable increases in adult abundance or escapement to date. The STT concluded that Queets coho were overfished, but abundance is projected to be above the FMP escapement goal in 2010.

The STT concluded that the Western Strait of Juan de Fuca coho were not overfished because adult ocean abundance was insufficient to meet the FMP escapement goal. However, Council action in 2009 combined the Eastern and Western Strait of Juan de Fuca coho stocks; the combined stock will be managed consistent with Pacific Salmon Treaty allowable exploitation rates for Puget Sound coho management units beginning in 2010. Conservation objectives for the combined Eastern and Western Strait of Juan de Fuca coho stock, for the purpose of determining an overfishing concern, are under review and will likely be modified during 2010. The SSC recommends a review of the revised conservation objectives and methodologies when they are completed.

The SSC continues to have concerns about the unavailability of data necessary for a timely assessment of the status for some stocks (e.g., Grays Harbor and Queets natural coho).

Adjournment: The SSC adjourned at approximately 6:00 p.m., Saturday March 6, 2010.

SSC Subcommittee Assignments, March 2010

Salmon	Groundfish	CPS	HMS	Economic	Ecosystem-Based Management
Robert Conrad	**Vidar Wespestad**	**André Punt**	**Ray Conser**	**Cindy Thomson**	**Selina Heppell**
Loo Botsford	Loo Botsford	Tom Barnes	Tom Barnes	Vlada Gertseva	Tom Barnes
Carlos Garza	Ray Conser	Ray Conser	Robert Conrad	Todd Lee	Ray Conser
Owen Hamel	Martin Dorn	Carlos Garza	Selina Heppell	André Punt	Martin Dorn
Pete Lawson	Vlada Gertseva	Owen Hamel	André Punt		Vlada Gertseva
Charlie Petrosky	Owen Hamel	Selina Heppell	Vidar Wespestad		Pete Lawson
	Tom Jagielo	Tom Jagielo			Todd Lee
	André Punt				André Punt
	Theresa Tsou				Cindy Thomson
					Theresa Tsou

Bold denotes Subcommittee Chairperson

PFMC
03/24/10