SUMMARY MINUTES
Scientific and Statistical Committee

Pacific Fishery Management Council
Sheraton Tacoma Hotel
Main Hall B
1320 Broadway Plaza
Tacoma, WA 98402
(253) 572-3200
March 8 - 10, 2004

Call to Order

The meeting was called to order at 8 a.m. Dr. Donald McIsaac briefed the Scientific and Statistical Committee (SSC) on priority agenda items. He commended Mr. Tom Jagielo for his tenure as chair of the SSC and highlighted the importance of SSC advice to the Pacific Fishery Management Council (Council).

Dr. Kevin Hill was elected chair and Mr. Robert Conrad was elected vice-chair. They will serve as officers for the April 2004 through March 2006 term.

Subcommittee assignments for 2004 are detailed in the table at the end of this document.

Members in Attendance

Mr. Tom Barnes, California Department on Fish and Game, La Jolla, CA
Mr. Steve Berkeley, University of California, Santa Cruz, CA
Mr. Alan Byrne, Idaho Department of Fish and Game, Nampa, ID
Mr. Robert Conrad, Northwest Indian Fisheries Commission, Olympia, WA
Dr. Michael Dalton, California State University, Monterey Bay, CA
Dr. Martin Dorn, National Marine Fisheries Service, Seattle, WA
Dr. Kevin Hill, California Department of Fish and Game, La Jolla, CA
Dr. Han-Lin Lai, National Marine Fisheries Service, Seattle, WA
Mr. Tom Jagielo, Washington Department of Fish and Wildlife, Olympia, WA
Dr. Peter Lawson, National Marine Fisheries Service, Newport, OR
Dr. Stephen Ralston, National Marine Fisheries Service, Santa Cruz, CA
Dr. Hans Radtke, Yachats, OR
Ms. Cynthia Thomson, National Marine Fisheries Service, Santa Cruz, CA
Dr. André Punt, University of Washington, Seattle, WA

Members Absent

Dr. Ramon Conser, National Marine Fisheries Service, La Jolla, CA
Dr. Shijie Zhou, Oregon Department of Fish and Wildlife, Portland, OR

Scientific and Statistical Committee Comments to the Council

The following is a compilation of SSC reports to the Council. Reports developed by the SSC, but not delivered to the Council are *italicized*. At the March 2004 SSC meeting, the SSC reviewed several items that were not on the Council agenda, but were critical to Council decision making during 2004. These reports were delivered to the Groundfish Management Team and Northwest Fisheries Science Center, and are included here at the end of this document.

C. Salmon Management

2. Review of 2003 Fisheries and Summary of 2004 Stock Abundance Estimates

Mr. Dell Simmons, Chair of the Salmon Technical Team (STT), reviewed the 2003 ocean salmon fisheries and preliminary salmon stock abundance estimates for 2004 for the SSC. All natural coho salmon stocks that are not "exceptions" met their conservation objectives in 2003. There were three stocks of chinook salmon that failed to meet their conservation objectives or guidelines in 2003:

1. The 2003 ocean harvest rate of 20.6% for age-4 chinook from the Klamath River Fall stock exceeded the target rate of 16%.
2. Impacts to the Snake River fall chinook stock were underestimated in 2003 because of changes in the Canadian commercial troll fishery.
3. The conservation objective for the spring/summer natural stock in the Quillayute River was not met.

Management actions to prevent a re-occurrence of these problems in 2004 may be needed.

Ocean abundance forecasts for coho salmon in 2004 are sufficiently high that all conservation objectives are expected to be met this year. However, the expected ocean abundance of Snake River Fall chinook, in conjunction with expected impacts by the Canadian commercial troll fishery, make this a stock of concern for 2004 management.

The SSC has a few recommendations to improve the usefulness of the STT reports. Tables I-1 and I-2 in Preseason Report I (*Stock Abundance Analysis for 2004 Ocean Salmon Fisheries*) present several years of preseason predictors for coho and chinook stocks under Council management. The SSC requests the STT add postseason estimates to these tables, where available, to facilitate a reader's ability to compare abundance predictions with previous years' actual abundances. To facilitate review of the overall performance of the various preseason predictors a graphical representation of the data in Tables II-8 and III-1 would be helpful.

The SSC also requests the preseason abundance estimates include a statistical measure of variability such as confidence intervals or coefficients of variation when possible. Without variance estimates it is difficult to assess the likelihood of meeting management objectives and the risks to sensitive stocks for the proposed fishing seasons.

E. Groundfish Management

2. Lingcod and Cabezon Stock Assessments for 2005-2006

Lingcod

The SSC reviewed results from the lingcod stock assessment at its November 2003 meeting (Exhibit D.6, Attachment 3, November 2003) and noted that values of the recruitment variability parameter (σ_r) in both the lingcod north (LCN) and lingcod south (LCS) models were too low (0.2 and 0.3, respectively) and should be increased. This parameter controls the level of year-to-year variation in recruitment. The SSC also recommended that the coastwide rebuilding analysis should be considered the sum of the outputs from the LCN and LCS models.

In reaction to the SSC's requests, the Stock Assessment Team (STAT) prepared a report (Addendum: February 1, 2004 – Response to November 2003 SSC Review, Exhibit E.2.a, Attachment 2, March 2004) that was reviewed by the SSC Groundfish Subcommittee during a public teleconference held February 25, 2004. In responding to the SSC's request the STAT Team re-evaluated the performance of the LCN and LCS lingcod models by increasing the σ_r parameter in increments of 0.1. The STAT Team found that model fit improved as the parameter increased, but that model convergence deteriorated when it exceeded 0.5. Overall, larger values of σ_r tended to better account for the observed data. Specifically, when $\sigma_r = 0.5$; (1) results indicate a much stronger 1999 year-class in both models, which is consistent with catch-at-age data obtained from both the NMFS shelf trawl survey and from commercial fisheries and (2) estimates of unfished spawning biomass (B_0) and spawning biomass in 2002 increase. As a consequence, a more favorable estimate of stock depletion ratio in 2002 results (31% for LCN and 19% for LCS). Moreover, for models with $\sigma_r = 0.5$ the estimated selectivity patterns for the various surveys and fisheries were more consistent with the comments of the STAR Panel, SSC, and Groundfish Management Team (GMT).

The SSC was concerned the model experienced convergence problems when σ_r was greater than 0.5. This problem may have been due to a combination of factors, i.e., (1) a very strong, partially-recruited cohort at the end of the modeled period, and (2) the inability of the assessment model to penalize the recruitment residual of a specific year. The latter problem is a limitation of the Coleraine modeling environment, which was used in the assessment. Given the time available, however, the SSC could not determine the exact reason for the convergence problem and concluded that some aspects of the behavior of the lingcod model are not fully understood. This issue should be explored during the next lingcod stock assessment update.

The STAT Team also re-estimated lingcod stock rebuilding, based on the new model runs using $\sigma_r = 0.5$, and computed coastwide rebuilding statistics as the sum of the outputs from the two models. For all rebuilding analyses, fishery selectivity was modeled with a dome-shaped function, which was the preferred scenario recommended by GMT, SSC, and STAR Panel. Projections from the LCN rebuilding analysis suggest that, if considered in isolation, the northern segment of the population may have rebuilt, with spawning biomass in 2004 estimated to be 28% above the rebuilding target (40% of B_0). However, rebuilding projections from the LCS model indicate the southern stock has yet to rebuild, with current biomass estimated to be 70% of the target. However, because lingcod stock rebuilding is currently defined by the sum of outputs from the LCN and LCS models, the STAT Team evaluated rebuilding status by summing projections from the two models. Results are presented in the table below:

	LCN			LCS			Coastwide		
Year	Biomass	Target	Ratio	Biomass	Target	Ratio	Biomass	Target	Ratio
2002	6,376	8,321	0.766	3,885	8,108	0.479	10,261	16,428	0.625
2003	8,477	8,321	1.019	4,482	8,108	0.553	12,959	16,428	0.789
2004	10,661	8,321	1.281	5,656	8,108	0.698	16,317	16,428	0.993

These findings show that on a coastwide basis lingcod has not rebuilt because the total spawning biomass is still less than the target, albeit by less than 1%.

While it is currently the Council's policy to manage lingcod as a coastwide stock, there may be compelling biological reasons to distinguish the northern and southern areas. For example, due to more rapid growth of lingcod in the north, spawning-per-recruit is greater than in the south. Such a biological difference would imply different optimal harvest rates in the two areas. As a matter of practical importance, coastwide stock assessments are based upon larger, more comprehensive data sets, but results may suffer from blending of important spatial differences. The SSC discussed the merits of spatially explicit management of lingcod and concluded that such an approach may be desirable based solely on biological grounds. More generally, this issue is likely to be important in other groundfish stock assessments (e.g., bocaccio in central California versus southern California). When sufficient data are available to support region-specific analyses and spatial differences in productivity are evident, overall management could be improved by region-specific regulations.

The marked improvement in lingcod stock status is due to the estimation of a very strong 1999 year-class, a finding that is supported by a number of data elements in the assessment. It is important to realize, however, that this year-class is a transient phenomenon and that as the cohort ages, the projected acceptable biological catch will decline. To highlight this point, the SSC recommends that, in its final report, the STAT Team prepare a histogram of the 2004 population age-frequency distribution to accompany a graph that shows the projected spawning biomass trajectory of lingcod. Moreover, a set of management measures designed to impose effective harvest constraints will be an important issue for the Council to consider because the 2003 recreational harvest in the southern area seriously exceeded its target, and by year-end the coastwide catch was slightly more than twice the OY.

Cabezon

The SSC reviewed results from the cabezon stock assessment at its November 2003 meeting (Exhibit D.6, Attachment 1, November 2003) and expressed concern that the time series of California Department of Fish and Game (CDFG) Commercial Passenger Fishing Vessel (CPFV) logbook data used to model the stock was truncated to begin in 1960, although published information was available extending back to at least 1947[1/]. Moreover, cabezon harvests and catch rates were apparently highest during the excluded period from 1947-1959. Based on that concern, the SSC recommended to the cabezon STAT Team "that the CPFV logbook data be re-assembled, evaluated, and, if appropriate, included in the assessment model."

In reaction to the SSC's requests, the STAT Team prepared a response (SSC Requests from the

November PFMC meeting, Exhibit E.2.a, Attachment 3, March 2004) that was reviewed by the SSC Groundfish Subcommittee during a public teleconference held February 25, 2004. Results presented in the STAT response (Table 3. SSC) indicate that inclusion of the earlier data in the model did not have a major impact on the conclusions of the assessment, especially with regard to depletion. For example, information in the original assessment (Exhibit D.6, Attachment 1, November 2003) indicated that cabezon spawning output in 2003 was 34.7% of that expected to occur in the absence of fishing, whereas when the earlier CPFV data (labeled "new catch & 1947 " in Table 3. SSC) were included, spawning output was estimated to be 33.4%. However, the model's estimate of 40-10 adjusted optimum yield (OY) changed more substantially, increasing from 60.5 mt to 74.5 mt (a 23% increase).

The STAT Team further argued in their response that "ignoring the data prior to 1960 is the most scientifically defensible approach" and recommended against inclusion of the earlier information. This view was founded on the belief that there was "no actual sampling" to verify the accuracy of self-reported CPFV logbook data from the earlier period. However, that conclusion is incorrect. Published results from a California Department of Fish and Game study[2/] that censussed the actual catch of CPFV vessels from 1947-1951 from San Francisco to San Diego showed that self-reporting by the fleet was very accurate (i.e., the total catch of 11,224 anglers was accurate to within 4%). With respect to cabezon specifically, actual catches were about 10% higher than were the self-reported CPFV logbook catches.

Other published information indicates the entire recreational catch of cabezon during the 1950s was quite high. For example, the CPFV harvest likely accounted for less than 15% of all sport catches[3/]. One investigator[4/] went so far as to say "in view of the sixfold increase in sport landings of the cabezon since the end of the war, the drain on the population may conceivably reach proportions capable of diminishing the stock in the foreseeable future." This opinion is supported by a cursory examination of the data presented in Young[1/], which shows that cabezon may well have been depleted by 1967. Morever, the STAT Team assumed that the average size of cabezon taken in the CPFV fishery was 0.8 kg-2.0 kg, depending on the year and area in question. However, Miller and Gotshall[3/] present information that shows the mean size of cabezon captured in the CPFV fishery in 1960 was 2.4 kg, which is consistent with results presented in O'Connell[4/]. Thus, underestimation of mean size is another potentially significant source of bias in establishing the historical catch of cabezon.

The reliability of the published information relating to cabezon that was collected by CDFG during the period 1947-1959 was discussed by the SSC, and it was concluded those data should be included in the assessment model. Therefore, the SSC recommends the model labeled "New Catch + CPUE index: New catch & 1947-" be adopted by the Council for management of the cabezon stock in 2005-2006. The STAT Team acknowledged that recommendation and indicated a willingness to prepare comprehensive harvest projections using that model, which would include the Council's 40:10 groundfish harvest policy and the California Nearshore Fishery Management Plan 60:20 control rule. In addition, because the SSC has lingering concerns about the status of the cabezon resource, the SSC recommends that during next year's stock assessment update all historical CDFG recreational catch and effort statistics should be more fully evaluated through modeling of the stock.

1/ Young, Parke H. 1969. *California partyboat fishery, 1947-1967*. Calif. Dept. Fish and Game, Fish Bulletin 145, 91 p.

2/ Baxter, J. L., and P. H. Young. 1953. *An evaluation of the marine sportfishing record system in California*. Calif. Fish and Game 39(3):343-353.
3/ Miller, D. J., and D. Gotshall. 1965. *Ocean sportfish catch and effort from Oregon to Point Arguello, California, July 1, 1957 – June 30, 1961*. Calif. Dept. Fish and Game, Fish Bulletin 130, 135 p.
4/ O'Connell, Charles P. 1953. *The life history of the cabezon,* <u>Scorpaenichthys marmoratus</u> (Ayres). Calif. Dept. Fish and Game, Fish Bulletin 93, 76 p.

3. <u>Stock Assessment Planning for 2007-2008 Fishery Management</u>

Dr. Elizabeth Clarke presented the proposed groundfish stock assessment schedule for 2005 (Exhibit E.3.b, Attachment 1, Table 1) to SSC, which included 24 species, and identified the lead agency for each assessment.

After discussing the proposal with Dr. Clarke, the SSC recommends deleting three species: arrowtooth, bank, and chilipepper and adding starry flounder and splitnose to the 2005 stock assessment list. If the SSC recommendation was adopted, 23 species would be assessed in 2005. Sixteen species would require a full assessment and seven species would be updated assessments. This will require four STAR Panels for the full assessments and two panels for the update assessments (Table 1).

Although this is an extensive list, Dr. Clarke indicated that authors for most species have been identified. In order to complete all assessments, careful planning is required to utilize available personnel in an efficient manner.

The SSC Groundfish Subcommittee plans to update the Terms of Reference for the 2005 stock assessment review process. This update will be presented to the Council at the November 2004 meeting.

Table 1. SSC proposed stock assessments in 2005.

Species	Full or Update assessment
Blackgill	full
California scorpionfish	full
Canary	full
Cowcod	full
Darkblotched	full
Dover sole	full
English sole	full
Longspine thornyhead	full
Pacific hake	full
Petrale sole	full

Species	Full or Update assessment
Sablefish	full
Shortbelly	full
Shortspine thornyhead	full
Splitnose	full
Starry flounder	full
Vermillion	full
Bocaccio	update
Cabezon	update
Lingcod	update
POP	update
Widow	update
Yelloweye	update
Yellowtail	update

5. Pacific Whiting Management

Dr. Martin Dorn, SSC representative on the whiting STAR Panel, gave an overview of the STAR Panel report. Dr. Thomas Helser, lead assessment scientist on the STAT Team, was also present for SSC deliberations and responded to questions concerning the assessment. Mr. Jeff Fargo gave a Canada Department of Fisheries and Oceans perspective on the assessment. Mr. Fargo noted that recruitment to the stock since 1999 is apparently very low, and that stock size is projected to decline 55% in the next three years. Regarding the appropriateness of models with survey catchabilities (*q*) of 1.0 and 0.6, Mr. Fargo noted that many parameters are affected by a change in the value that is assumed for survey catchability, and the behavior of the whiting model is complex. Mr. Fargo underscored the importance of taking a risk-averse approach to managing whiting.

The SSC accepts the STAR Panel conclusion that acoustic survey catchability (*q*) is the major source of uncertainty in the whiting assessment. Catchability is a critical assessment parameter that determines the scaling of survey estimates to population biomass. Although all previous whiting assessments have been based on the assumption that q=1.0, the current assessment brought forward two models (q=1.0 and q=0.6) to provide plausible lower and upper bounds on uncertainty.

The unconstrained model estimate of q was approximately 0.3, which was considered implausible by the STAR Panel. Consideration of the likely lower and upper bounds on selected components of acoustic survey *q* suggested that catchability could be bounded by range q=0.55-1.3. While development of a prior for acoustic survey *q* is a substantial improvement in the whiting assessment, the SSC is concerned these ranges were put together rapidly during the review meeting. A more thorough and systematic approach to developing a prior for acoustic survey *q* using Monte Carlo simulations would increase confidence in the approach. A more structured approach would also allow focused research on the major components of catchability (such as acoustic target strength) to be included in the assessment. The SSC also has reservations about the process used to select models with *q*=1.0 and *q*=0.6. While *q*=0.6 is slightly above the lower bound of *q*=0.55, similar considerations should have resulted in a *q*=1.25 for the upper bound, not *q*=1.0. In addition, the SSC is concerned that emphasis on upper and lower bounds does not take into account the greater likelihood that the true value is in the center of the range.

Estimates of stock depletion in 2003 ranged from 47% to 51% of unfished spawning stock biomass. Therefore, regardless of which model is correct, Pacific whiting is estimated to be above the rebuilding target of $B_{40\%}$. The Council may want to consider a request that National Marine Fisheries Service (NMFS) re-evaluate Pacific whiting's status as an overfished stock in light of the current assessment.

The SSC recommends the decision table (Table 13 in the stock assessment, Exhibit E.5.a) be used to evaluate the consequences of alternative optimum yield (OY) options for 2004. In this table, three-year projections of stock biomass and depletion are given when management actions are based on the *q*=0.6 or *q*=1 model, and the true state of nature is either consistent with that decision or not. Of particular interest are the lower left and upper right diagonal entries in the table, where management actions are based on assuming the incorrect model. When the OY is based on the *q*=0.6 model, and the true state of nature is the *q*=1.0 model, it is possible to reduce the stock to 18% of unfished biomass by 2006.

Although significant declines in stock size are projected for 2004-2006 for all scenarios in Table 13, actual declines will be reduced if the entire OY is not harvested, as is likely due to bycatch constraints. This possibility is considered in Table 13 by including scenarios with a constant U.S. catch of 250,000 tons in 2004-2006, while the Canadian catch was assumed to be the Canadian share of the $F_{40\%}$ OY. Since runs based on assuming the incorrect state of nature were not included in the table, the SSC requested that Dr. Helser do these two runs and report back to the SSC. If management actions are incorrectly based on a *q*=0.6 model (i.e., the true state of nature is *q*=1.0), there is a greater than 50% chance the stock will decline below the overfished threshold in 2006. In contrast, if management actions are based on *q*=1.0 model, the stock has a greater than even chance of being above the overfished threshold in 2006 regardless of the true state of nature.

Finally, the SSC notes that presentation of uncertainty by means of two contrasting models does not facilitate the council decision-making process. Current Terms of Reference for STAR Panels do not request the Panel to endorse a single model. Terms of Reference will be revised to give greater emphasis and guidance for selecting a preferred model. However, an important task of the STAR Panel is appraisal of assessment uncertainty, a responsibility that may preclude the Panel from unduly limiting model alternatives.

H. Marine Protected Areas

1. <u>SSC Review of Marine Reserves Issues</u>

The SSC discussed the draft report on marine reserve proposals being prepared by the SSC's

Marine Reserves Subcommittee. This meeting was the first opportunity for the entire SSC to review the report, and the SSC does not have a final report for the Council to consider at this time. The draft report is comprehensive, and the SSC commends the Marine Reserves Subcommittee for its work thus far. The SSC received helpful comments from the public during its discussion. The SSC discussion and public comments motivated a set of revisions to the current draft, and the SSC anticipates that a final version of the report will be ready for the Council in June 2004.

The SSC would like to clarify that an intended audience for the report includes agencies and entities that request Council consideration of proposals to establish marine reserves in federal waters on the West Coast. Revisions to the draft report will make this intention explicit. The SSC emphasizes that material in the report should be interpreted as guidelines for future proposals. The report is intended ultimately to be used as a reference, and provide aid for navigating federal policies (e.g., National Environmental Policy Act) that must be followed by the Council to implement fishing regulations.

The SSC is aware that the terminology used to define spatial closures varies from one entity to another (e.g., California's Marine Life Protection Act, National Research Council). The SSC report distinguishes between closures for a specific period of time until some condition is met (e.g., rockfish conservation areas), and indefinite closures. In particular, the report currently refers to marine reserves as permanent closures to some or all forms of fishing. The SSC intends for language in the report to be consistent with terminology in other Council documents.

The report emphasizes the importance of defining objectives, setting performance standards, and establishing criteria to measure progress towards meeting objectives. In general, science can be useful for establishing criteria and methods for measurement. On the other hand, identifying objectives and setting standards for marine reserves will require policy decisions.

The report describes five types of objectives for marine reserves, (1) provide insurance against errors in fishery science or management, (2) provide fishery benefits, (3) provide ecosystem benefits, (4) provide nonfishing social benefits, and (5) provide opportunity to advance scientific knowledge.

Revisions to the draft report will further elaborate on the objectives related to providing social benefits (Section III.D.) and advancing scientific knowledge (Section III.E.). Specifically, Section III.D. will be expanded to include a discussion of trade-offs among consumptive, non-consumptive and non-use values of the ocean and the potential use of non-market valuation techniques (e.g., travel cost, hedonic pricing, contingent valuation) in revealing such trade-offs. Section III.E. will be expanded to focus on study plans for scientific research proposals. In addition, the discussion of EIS examples in Section IV of the current draft is extensive, and much of this material will be moved to an appendix.

2. <u>Update on Other Marine Protected Area Activities</u>

No statement prepared.

SSC Reports Not Provided to the Council at the March 2004 Meeting

Groundfish Observer Data and Bycatch Model

Dr. Jim Hastie summarized updates to the bycatch model for analyses that will be conducted in 2004. The major update to the bycatch model was the addition of the second full year of observer data from the Northwest Fisheries Science Center's West Coast Groundfish Observer Program (WCGOP) in 2003. New bycatch ratios were estimated for both the limited-entry trawl fishery and limited-entry fixed-gear sablefish fishery.

The Scientific and Statistical Committee (SSC) has the following comments on the proposed updates to the fixed-gear bycatch model:

1. *Bycatch ratios should be implemented separately for the two fixed gears (pots and longlines).*
2. *The ratio of active pot permits to active longline permits should be examined for trends in recent years.*

Dr. Hastie proposed three changes to the bycatch model for the limited-entry trawl fishery:

- *Bycatch ratios will be calculated with reference to total catch of the target species instead of landed catch.*
- *Bycatch ratios for depth strata deeper than 150 fathoms will be calculated using a dividing line of 40°10' N Latitude to delineate northern and southern bycatch ratios for all species and depths (with the exception of darkblotched rockfish occurring in depths greater than 150 fathoms).*
- *Seasonal stratification will be defined as two, 6-month (winter/summer) seasons for all depth strata less than 100 fathoms and three, 4-month (winter/transition/summer) seasons for depth strata greater than 150 fathoms.*

The SSC endorses these proposed changes to the bycatch model.

The SSC recommends that bycatch ratios for the limited-entry trawl fishery model be calculated as a weighted average of the two annual rates (mean of the ratios from 2002 and 2003) instead of weighting the annual components of the ratio and then combining them as currently proposed. In addition, the mortality rate for sablefish discards should be re-examined as there is some recent unpublished research information that may be informative.

Although the SSC agrees with the concept of weighting recent observer data more heavily than older observer data, it recommends that a more standardized method of establishing the weights assigned to each year be explored. For example, geometric averaging should be examined as this would be less subjective and would allow the weighting factors for future years, as more observer data become available, to be defined prior to data collection.

Groundfish Exempted Fishing Permit Fisheries Oregon Department of Fish and Wildlife

Mr. Steve Parker of Oregon Department of Fish and Wildlife (ODFW) presented the results of the groundfish "Exempted Fishing Permit Fisheries" to evaluate the abilities of a selective trawl to separate flatfish from rockfish using differences in their behavior as the trawl net approaches. Generally, the results are that this net system is more efficient at catching flatfish and more *efficient in excluding rockfish.*

Providing this exempted fishing permit (EFP) represents the same geographic area (from zero to 100 fathoms and north of 40°10' N latitude to the Canadian border) as the proposed managed fisheries, the EFP bycatch data presents representative fishing and bycatch rates that are likely to occur.

The Scientific and Statistical Committee recommends the Groundfish Management Team use bycatch rates from this EFP for the 2005-2006 management cycle (see ODFW Information Reports Number 2004-01, Using an Exempted Fishing Permit for a Large-scale Test of a Selective Flatfish Trawl in the Continental Shelf Flatfish Fishery).

A Review of Analytical Portions of the Environmental Impact Statement for Designating Groundfish Essential Fish Habitat

Introduction

NOAA Fisheries is developing an Environmental Impact Statement (EIS) in response to a court order and settlement agreement to conduct a new NEPA analysis for Amendment 11 to the Pacific Fishery Management Council's (PFMC) groundfish Fishery Management Plan (FMP). Work on the EIS officially started in March 2002, when a team of NMFS and NOS scientists convened to devise a strategy and to identify data sources and responsible parties. The team identified the comparative risk assessment model described by the NRC[1] as the conceptual starting point for the Pacific coast groundfish Essential Fish Habitat (EFH) EIS. The PFMC reviewed the decision-making framework in April 2002 and subsequently formed the PFMC's Groundfish Habitat Technical Review Committee (TRC) to guide the assessment process.

The full Scientific and Statistical Committee (SSC) received an initial briefing by the EFH analytical team in June 2003. The schedule for designation of EFH by the PFMC is mandated by court order and requires that a range of alternatives be available for consideration at the June 2004 Council meeting. Scientific input has largely been provided to the analytical team by the Technical Review Committee (TRC) convened by the council. However, given the rigid schedule that is required for adoption of EFH alternatives by the PFMC and the role of the SSC in advising the Council about scientific and technical issues, a review of analytical tool that has be developed to evaluate EFH options was requested of the groundfish subcommittee of the SSC. That review was conducted February 23-24, 2004 at the Alaska Fisheries Science Center in Seattle, Washington. A substantial set of briefing materials were provided (Appendix 1) to the six members of the SSC that were present for the review (Ralston, Berkeley, Dalton, Dorn, Jagielo, and Lai).

It is clear that considerable advancement has occurred since the SSC was initially briefed by the EIS analytical team. The most substantial progress has been made on developing methods for characterizing and designating EFH. However, at the time of the review the fishing impacts model was not yet complete (see below).

The goal of the analytical team has been to bring a completed EFH assessment to the council at

[1]NRC (2002). Effects of Trawling and Dredging on Seafloor Habitat. National Research Council, Ocean Studies Board, National Academy Press, Washington, D. C., 136 p.

the April meeting, where preliminary alternatives for designating EFH will be presented. Council staff anticipated that the review by the groundfish subcommittee would constitute a "final check" before the completed assessment is brought before the Council. Although significant progress has been made, aspects of the analysis are incomplete (i.e., the fishing impacts model), precluding SSC endorsement of the full EIS assessment. Nonetheless, the subcommittee was able to fully review the analytical tool for designating EFH, for which methods have been most fully developed.

Review of Model for EFH designation

GIS layers for bathymetry and substrate

Geographic Information System (GIS) techniques are used extensively in the EFH analysis. Information in GIS is stored as "layers" that can be linked together by their geographic coordinates. Two basic layers are used to characterize benthic marine habitats: a bathymetric layer (latitude-depth) and a substrate layer (geology of the sea floor). These layers have been assembled from many sources by the EFH analytical team and are the most comprehensive datasets of bathymetry and substrate ever compiled for the West Coast. The area covered extends from the shoreline (including estuaries) to 3000 m. This area does not comprise the entire West Coast EEZ, but does encompass the nearly all of the known habitat for groundfish FMP species. Areas of potential interest further offshore include several seamounts that rise above 3000 m depth that may provide habitat for minor groundfish species such as Pacific rattail and finescale codling. Omission of seamounts is unlikely to be of consequence for the EFH analysis, although they may good candidates for HAPC designation. The technical team indicated they will close this information gap in time for the seamount data to be useful in the EIS process.

Ideally, the quality of the data in a GIS layer should be assessed when the layer is created. A data quality layer is potentially useful in subsequent analysis to incorporate uncertainty, particularly when using Bayesian Belief Networks (BBN). For Oregon and Washington, a data quality layer on a scale of 1-40 was produced for each data source, i.e., bottom grabs, side scan sonar, seismic, etc. Unfortunately, a similar layer has not been generated for California. For the bathymetry layer, a qualitative scale was proposed, whereby a single value would be assigned to the waters off each state. Uneven treatment of uncertainty by layer and by region makes it difficult to carry forward uncertainty in the analysis.

In BBN models, uncertainty is modeled with discrete misclassification matrix, which could be obtained by evaluating an imprecise data set using a more precise data set, or from expert opinion. Unless uncertainty has been evaluated when the original layers were prepared, it is difficult to treat uncertainty appropriately. One option is to simply omit the misclassification matrix to acknowledge the difficulty of treating uncertainty appropriately. Another alternative would be perform a sensitivity analysis with different levels of classification error. Parcels identified for EFH analysis are irregular in shape, and defined according to depth intervals. While the range of depths within a parcel is likely to differ somewhat from the depth intervals used to define the parcel, the entire parcel is unlikely to be belong to a deeper or shallower depth interval. Therefore, we recommend that depth uncertainty not be included in the EFH designation model.

Biogenic habitat

Biogenic habitat (e.g., kelp, sea grass, and structure-forming invertebrates) is both of potential importance to fish populations and potentially sensitive to fishing impacts. With respect to structure-forming invertebrates, however, the draft analysis only provides a map showing the locations of survey stations were these species have previously occurred. Because of the potential importance of these biogenic habitats, the subcommittee recommends additional effort to identify areas with biogenic structure, including especially the structure-forming invertebrates. The review panel is cognizant of the limitations of the NMFS surveys for this purpose, and does not intend to be prescriptive in recommending what additional analyses could be done. Several suggestions are:

1. There currently exists a GIS layer with distribution polygons that characterizes kelp cover. This layer is needed to identify essential habitat for species with specific affinity for kelp habitat. However, the spatial extent of kelp cover expands and contracts in response to environmental variability (e.g., El Niño). When habitat is dynamic in nature, defining EFH by fixed geographic coordinates is problematic. Since the compiled information on kelp cover is the maximum extent of kelp cover, the kelp GIS layer should be understood as an inclusive definition of this habitat. Sea grass habitat presents similar difficulties.

2. Some structure-forming invertebrates are found primarily on soft bottom, and would be sampled effectively in the NMFS trawl surveys. Example include sea whips and perhaps sponges. For these soft bottom invertebrates, maps of relative CPUE by station should be produced.

3. The draft analysis argues that NMFS survey data are not adequate to produce a comprehensive map of hard-bottom coral off the West Coast. It is impossible to assess the adequacy of the survey data without first taking steps to map relative abundance. This exercise could also help to emphasize the need for further research into coral distribution, and ought to be included in the final analysis. Some areas of the West Coast EEZ have been surveyed using ROVs (i.e., Hecata Bank, parts of southern California). Assessing the distribution of coral in these areas is feasible. If at all possible, information on coral distribution in these areas should be included in the EFH analysis.

Modeling fish distribution

The NMFS guidelines for EFH describe a hierarchy of information that can be used to designate EFH. At level 4 (the highest) information is available on production rates by habitat. For the West Coast (as elsewhere), the information available for EFH designation is at level 2 (habitat-related density) and at level 1 (distribution data). Trawl CPUE is not explicitly habitat-related because substrate is not determined at sampling stations. Interpretation is also problematic because not all substrates are sampled equally well using trawls. The analytical team has devised an approach based on fitting generalized additive models (GAM) to presence/absence information (level 1) from trawls by latitude and depth (i.e., level 1). This approach ignores information on relative density from trawl surveys. While there are good reasons for adopting this approach, the change from a level 2 to level 1 analysis needs to be more carefully justified in the EFH analysis.

The information from literature review entered into the Habitat Use Database (HUD) is used to establish the species-substrate association. Habitat maps produced by EFH analysts show the "habitat suitability probability," which is calculated as the product of probability of occurrence by latitude and depth (from the GAM model) and strength of the species-substrate association. This quantity can be regarded as an estimate of how likely it is that the species will be encountered in a habitat, so perhaps the nomenclature should reflect this. Habitat suitability is a relatively vague concept that implies more about the importance of a particular habitat than is perhaps warranted.

The approach to modeling of EFH has evolved considerably from the initial NOS models used for assessment of central California marine sanctuaries. Rather than polynomial regression using the logarithm of mean survey CPUE, the EFH model is a GAM model for the probability of occurrence. The final modeling approach is based on appropriate error assumptions and careful attention to goodness of fit. Nevertheless, there is some concern that the modeling approach does not make fullest use of the survey information on relative densities. GAMs and GLMs that can accommodate zero catches have been commonly used to obtain indices of abundance using West Coast trawl survey data for stock assessment. Furthermore, the limitations of presence/absence information to infer essential habit should not be ignored. For example, a species may have a broad depth or geographic distribution, but may only reach high densities in a limited area. Surveys provide limited information concerning the function of the habitat for a species. For example, winter spawning grounds for lingcod would not be necessarily be identified as essential habitat using summer survey data.

Existing surveys also have a strong bias towards habitats that can be trawled, and are of limited utility for identifying essential habitat for juvenile stages. For example, biogenic habitat may provide refugia from predation for juvenile fish, yet these habitats could not be identified as essential if the sampling gear does not capture juveniles. Although direct visual surveys are perhaps the best method for identifying species-habitat associations, these surveys are currently limited in scope. Size composition data are available for many groundfish from the NMFS trawl surveys. In many cases, juveniles can be reliably distinguished from adults on the basis of size. Many species occupy different habitats at different life history stages. Information about these ontogenetic shifts present in the trawl data is not being utilized in the present analysis. Therefore, while presence-absence analyses should be relatively robust, EHF designations resulting from such analysis are initial approximations that will need to be refined as additional information becomes available.

Habitat profiles have been generated for adults using GAM models and NMFS survey data for a limited number of species. Habitat profiles have not yet been obtained for egg, larval, and juvenile stages. These profiles will be generated using the HUD database, which will also be used for the adult stages of species which are not well sampled during trawl surveys. Although this work has not yet been completed, the subcommittee was able to review the proposed methods.

HUD database

The life history appendix to the previous EFH amendment to groundfish FMP has been made into relational database of habitat use (HUD). For each species, association with substrate type is characterized on a relative scale (unknown, weak, medium, strong). Depth preferences are *characterized with four depths: minimum observed depth, minimum preferred depth, maximum preferred depth, and maximum observed depth. Geographic (latitude) preferences are recorded similarly. The preferred minimum and maximum depths (and latitudinal ranges) are roughly based on the 5th and 95th percentiles from surveys when these data are available.*

The analytical team proposed an interpolation/smoothing procedure for inferring habitat suitability profiles using information on preferred depths and latitudes in the HUD. While trying to extract as much information as possible from limited data is laudable, there is some danger of over-interpreting data to obtain visually satisfying results. Linear interpolation is preferable to arbitrarily smoothed curves when obtained simply from preferred maximum and minimum preferred depths. Values used to control the shape of suitability profiles could be estimated objectively by comparison with survey-based profiles for species where both can be obtained.

Model for EFH designation

The Bayesian Belief Network model used for designating EFH appears to be a reasonable approach. The EFH model is a very straightforward application that does not depend heavily on BBN methodology (Fig. 1 shows the flow of information in the EFH habitat designation model.) The novelty of the approach should not be considered a significant issue.

The end result of the EFH analysis are maps by life history stage for each groundfish species that show on a qualitative scale the importance of different habitats to that species. EFH is determined by selecting habitats with scores higher than some predetermined value. A low value would produce a broad or inclusive definition of EFH, while a high value would reduce the area defined as EFH. The decision whether to adopt an inclusive or narrow definition of EFH should be considered from a policy standpoint. Adopting an inclusive definition may be appropriate given the incomplete and indirect nature of the information used to identify EFH. However, developing workable alternatives to reduce fishing impacts may be difficult if EFH is defined broadly. Adopting a relatively narrow EHF definition may make it easier to develop effective precautionary alternatives.

The GAM models estimate the probability of occurrence, while suitability profiles based on HUD database are scaled to have a maximum value of one. The probability of occurrence can have a maximum value considerably less than one, particularly for rare species where the probability of occurrence is low everywhere. EHF for individual species should be placed on common scale before they are combined in an EFH definition for all groundfish species. It may also helpful to produce intermediary maps showing EFH maps for various subsets of groundfish, i.e., overfished species, species guilds, or species complexes used for management. One promising alternative for EFH designation would identify the best 10% (or 20%, etc) of habitat over entire assessed region for each groundfish species, and then combine these areas for an overall definition of EFH.

Public comment concerning EFH

1. The final rule for NMFS guidelines discusses the need for different EFH definitions for overfished species.

2. There is concern about using a level 1 analysis (presence/absence) rather than a level 2 *analysis (relative density).*

3. Is HAPC contained within EFH? Answer: Criteria for defining HAPC are different than EFH. HAPC is not necessarily included in EFH.

4. There was public testimony concerning the importance of identifying areas with living structure (specifically, corals and sponges).

SSC Review of the Impacts Model for the EFH EIS Process

Fishing Effort

Spatial data requirements of the EFH project stretch, and in many cases exceed, what are available for most West Coast fisheries. The most comprehensive spatial data for fishing effort on the West Coast are available from trawl logbooks, and work on the EFH project so far has relied exclusively on these data to measure the spatial distribution and intensity of impacts from fishing. The development of spatial data for fixed-gear sectors is an important objective for the EFH project's fisheries impacts model.

For the trawl fisheries, impacts are measured in the EFH project by total tow hours in a year at each location, or fishing block, where trawling occurred. This definition of fishing effort is appropriate for the EFH project.

No coast-wide source of spatial data for fixed-gear fisheries exists. Recently, the Ecotrust organization developed a model to estimate the coast-wide spatial distribution of fishing effort for fixed-gear and other groundfish fisheries using information from fish tickets, but the accuracy of these distributions was not tested. Wisely, the EFH project team investigated the potential reliability of using Ecotrust's effort distributions to represent spatial distributions of fishing effort in trawl, long-line, and groundfish pot fisheries. To check Ecotrust's effort distribution for one area, focus group meetings with knowledgeable fishermen were conducted to develop baseline effort maps for an area off the Oregon coast.

The focus group meetings for the EFH project were conducted under sound socioeconomic research protocols (Final Report, Pilot Project to Profile West Coast Fishing Effort). The SSC endorses the use of social science research methods to collect primary data based on fishermen's knowledge and expertise. The SSC encourages further use of these methods to continue collecting primary data on baseline fishing effort off the West Coast. These data would be used to develop baseline effort maps for other areas, and provide the best available science to the EFH-EIS process.

The focus groups produced a set of maps showing the spatial extent and intensity of fishing effort for trawl, long-line, and groundfish pot fisheries in an area between the ports of Newport and Astoria. Based on survey responses, fishermen in the focus groups were confident in the spatial extent of fishing effort depicted on the maps, but uncertain about the groups' estimates of the spatial intensity of fishing effort.

Maps from the EFH project's focus group were compared to Ecotrust's distributions of fishing effort for fixed-gear fisheries between Newport and Astoria over two recent time periods, 1997 and 2000. To show results, the EFH project team provided several maps that compare the baseline effort maps from the focus groups with Ecotrust's effort distributions. Results of the comparison are discouraging. For example, the areas reported by the focus groups for the fixed-gear fisheries were generally much larger and further from port than Ecotrust's distributions.

For the long-line fishery, Ecotrust's distributions cover 8-12% of the area reported by the focus groups. On the other hand, around 50% of each Ecotrust's distribution is outside that area. Results of the comparison for the groundfish pot fishery are worse. In this case, Ecotrust's *distributions cover only 0-3% of the area reported by the focus groups, and 80-100% of each Ecotrust distribution is outside that area. In one case, the center of Ecotrust's distribution is more than 100 km from the area identified by the focus groups.*

These comparisons reinforce the SSC's concerns, which have been described previously, regarding the spatial algorithm used by Ecotrust. Based on the above comparisons, the SSC is doubtful that the effort distributions derived from the Ecotrust methodology broadly represent baseline patterns of fishing effort in non-trawl fisheries. Consequently, the SSC cautions against relying on those effort distributions, to avoid biasing the estimated spatial distribution of impacts from non-trawl fisheries.

Effects of Fishing Gear on Habitat: Sensitivity and Recovery Rates

The EFH project team conducted an extensive literature review, and developed a database of gear effects for different habitat types. As with any multi-dimensional classification system, the number of cells requiring data grows quickly as more gear or habitat types are added to the database. Information to fill these cells is constrained by the literature review. To allow a reasonable number of cells, a scoring system was developed to rank gear effects with three levels each for sensitivity and recovery times (Tab. 2, p. 12, Appendix 10).

Data from the literature were standardized and a given a score in the range 0-3. For habitat sensitivity, zero represents minimal effects or no impact, and a score of three represents a major or catastrophic effects. Recovery times range from zero to periods lasting from three to seventeen or more years. For this reason, interpretation of the scores as real numbers is problematic. Nonetheless, scores are added together to calculate average scores for sensitivity and recovery rates.

The literature review provided a robust ranking of gear types by damage per unit effort, in increasing order: hook and line, pots and traps, nets, trawl, and dredges. The literature review also provided a robust ranking of habitat sensitivities to gear effects, in increasing order: soft bottom, hard bottom, and biogenic (broadly defined as having vertical biological structure).

The SSC notes the biogenic habitat category needs attention. Ideally, a refinement of this category could include corals, sea pens, or other invertebrates, but spatial data exist only to partly support this formulation. While the incomplete distributions may not be appropriate for use in the Bayesian network model, maps showing the spatial distribution of known biogenic features (e.g. corals in trawl surveys), and the distribution of fishing effort, would be useful for reference in future documents. In addition, the SSC notes that refinement of other categories, such as soft sediments, may also be advised.

Scores assigned to different gear and habitat types from the literature review involved subjective judgment. To address this issue, scores were assigned independently by a group of researchers that rated studies in the literature review. The mean of the individual scores, plus or minus a standard deviation, is used to represent low, medium, and high values for each gear and habitat type.

Overall, the SSC finds this method of constructing habitat sensitivity and recovery indices to be acceptable, but is concerned about whether data from the literature review are sufficiently *representative of West Coast fisheries. Only 2 of the 89 studies included in the literature review took place in West Coast fisheries. Another potential source of bias is that 90% of the studies are about trawl or dredge gear.*

Of particular concern to the SSC is the use of gear effect estimates from studies on New England trawlers to infer habitat effects from West Coast trawl vessels, which are usually smaller with different gear characteristics. Effects of trawling on hard-bottom shelf habitats are likely to be important in West Coast fisheries, and estimates of sensitivity and recovery for the hard bottom-shelf-trawl category in the EFH database are from only two studies (Tab. A10.2, Appendix 10 attachment). One study is about beam trawls, and the other was done in New England (Auster et al., 1996).

The SSC recommends investigating the relationship between gear effects and vessel size or fishing power, and if necessary controlling for this factor in the gear effects tables. A related issue that deserves further investigation is an assessment of each gear type's ability to access different habitat types.

Clarification is needed about relationships between the overall level of fishing effort and gear effects. For example in most cases, gear effects are measured for a single trawl, but replicates are sometimes used. Questions were also raised about whether replicate trawls occurred at exactly the same location. An important uncertainty in the data is that overall effort is controlled in the studies, and results may not apply, or may apply only in a limited way, to situations where effort is not controlled.

Fishing Impacts Model

The fishing impacts model for the EFH-EIS analysis is work in progress, and the SSC was unable to conduct a full review of the model at this time. The fishing impacts modeling team has a complex, and impressive, set of tasks to complete in order to accomplish its stated objectives. Fortunately, major computational challenges related to model development, and execution, have been solved, and a working version of the model and data were used to produce quantitative results for the effects of gear on fish habitat. The SSC appreciates the EFH project team's openness, particularly regarding suggestions about future model development.

Currently, the fishing impacts model is reduced to a single index value that is intended to represent a broad measure of status for fish habitat based on cumulative impacts. Fishing effort and sensitivity of habitat to gear type determine gross impacts. The fishing impacts model is dynamic, and effects of recovery and previous impacts determine net impacts. A simplifying assumption is that fishing effort is uniformly distributed over the year, which might ignore important seasonal effects. Dynamics of the habitat index value are based on a logistic difference equation, similar to population models. Parameters in the logistic equation are linked to habitat sensitivity and recovery rates from the gear effects tables described above.

The single index variable can be used with different model formulations. In one formulation, the index value represents a mean or average status for fish habitat over an entire area. An alternative formulation is to assume that fish habitat consists of many individual patches that follow a discrete two-state process between healthy and damaged conditions. Under this interpretation, the index value represents the fraction of patches in, for example, the damaged *state. Either formulation has problems, and the SSC recommends developing a multivariate description of impacts, based on explicit and measurable physical effects of gear on habitat, in terms of individual species, or types of organisms.*

Saturating functions for gross impacts, and logistic (S-shaped) recovery profiles are important features to be added to the fishing impacts model. The SSC notes that a stochastic or probabilistic model of fishing impacts may be appropriate. Another alternative worth considering is the development of a spatially explicit model of gear effects that incorporates the notion of a gear footprint, such as the area swept by trawls, and whether a focus group approach similar to that for fishing effort could be pursued to estimate footprints for different gear types.

Impacts from Non-fishing Activities

The EFH team's work on impacts from non-fishing activities is just starting, with some data but no model to review. Modeling the impacts of non-fishing activities is important, but the SSC recognizes these activities are outside the control of fisheries management.

Appendix 1. *Briefing materials presented to members of the SSC Groundfish Subcommittee for their review of the EFH EIS analytical tool.*

1. *Pacific Coast Groundfish EFH –* ***Analytical Framework*** *(Version 4, February 10, 2004). Prepared for Pacific States Marine Fisheries Commission by (a) MRAG Americas, Inc., 110 South Hoover Blvd., Suite 212, Tampa, FL 33609, (b) Terralogic GIS, Inc., P.O. Box 264, Stanwood, WA 98292, (c) NMFS Northwest Fisheries Science Center, FRAM Division, and (d) NMFS Northwest Regional Office, 89 p.*

2. *Appendix 1: Active Tectonics and Seafloor Mapping Laboratory Publication 02-01 – Interim Seafloor Lithology Maps for Oregon and Washington (Version 1.0), by C. Goldfinger, C. Romsos, R. Robison, R. Milstein, and B. Myers, Active Tectonics and Seafloor Mapping Laboratory, College of Oceanography and Atmospheric Sciences, Oregon State Unversity, Burt 206, Corvallis, OR 97331, 11 p.*

3. *Appendix 2: Final Report – Essential Fish Habitat Characterization and Mapping of the California Continental Margin, by G. Greene and J. Bizzarro, Center for Habitat Studies, Moss Landing Marine Laboratories, Moss Landing, CA, 21 p.*

4. *Appendix 3: Organizations contacted for information on non-fishing impacts to EFH, 6 p.*

5. *Appendix 4: List of groundfish species in life histories appendix, 2 p.*

6. *Appendix 5: Gear types in the PACFIN data base, 2 p.*

7. *Appendix 6: Description of habitat suitability index (HSI) modeling conducted by NOS, 4 p.*

8. *Appendix 7: Development of profiles of habitat suitability probability based on latitude and depth for species and life stages in the Groundfish FMP, 34 p.*

9. *Appendix 8: Discrete time damage model for fishing impacts, 3 p.*

10. *Appendix 9: Useful websites on Bayesian Belief Networks, 1 p.*

11. *Appendix 10: Pacific Coast Groundfish EFH – The effects of fishing gears on habitat: west coast perspective (Draft 5), by MRAG Americas for the PSMFC, February 9, 2004, 32 p. + annex.*

12. *Appendix 11: Pacific Coast Groundfish FMP Habitat Use Database User Manual for Version 15B (Draft), 50 p.*

13. *Non-Fishing Impacts on Bottom Habitats – Draft 1 (February 19, 2004), 7 p.*

14. *Letter from Dr. M. Mangel to S. Copps (dated 17 October 2003) concerning the Ecotrust Methodology, 2 p.*

15. *Final Report – Pilot Project to Profile West Coast Fishing Effort Based on the Practical Experience of Fishermen, by T. Athens, A. Bailey, F. Conway, S. Copps, R. Fisher, M. Larkin,*

S. McMullen, and F. Recht, 31 p.

16. *Fishing Effort GIS Data Exploration for West Coast Groundfish EFH EIS Project, Terralogic GIS, December 2003, 20 p. + appendices.*

17. *Excerpt from Northwest Power and Conservation Council's Independent Science Advisory Board Report on Salmonids Supplemental, Section 7. Benefit-Risk Assessment and Decision Making, 19 p.*

Public Comment

Mr. Dan Wolford, Coastside Fishing Club commented on several initiatives his association is working on.

Adjournment

The SSC adjourned at approximately 4 p.m., Wednesday, March 10, 2004.

PFMC
03/21/04

SSC Subcommittee Assignments for 2004

Salmon	Groundfish	CPS	HMS	Economic	Marine Reserves
Alan Byrne	Steve Berkeley	**Tom Barnes**	Tom Barnes	**Michael Dalton**	Tom Barnes
Robert Conrad	Ray Conser	Alan Byrne	Steve Berkeley	Han-Lin Lai	Steve Berkeley
Kevin Hill	Michael Dalton	Michael Dalton	Alan Byrne	Hans Radtke	Ray Conser
Pete Lawson	Martin Dorn	Ray Conser	Robert Conrad	Cynthia Thomson	Michael Dalton
Shijie Zhou	Tom Jagielo	Tom Jagielo	**Ray Conser**		Martin Dorn
Hans Radtke	Han-Lin Lai	André Punt	Kevin Hill		Tom Jagielo
	André Punt	Shijie Zhou	André Punt		Pete Lawson
	Steve Ralston		Hans Radtke		André Punt
					Steve Ralston
					Cynthia Thomson

Bold denotes Subcommittee Chairperson