

## NATIONAL MARINE FISHERIES SERVICE REPORT

National Marine Fisheries Service (NMFS) Northwest Region will briefly report on recent regulatory developments relevant to groundfish fisheries and issues of interest to the Pacific Fishery Management Council (Council).

NMFS Northwest Fisheries Science Center (NWFSC) will also briefly report on groundfish-related science and research activities.

### **Council Task:**

### **Discussion.**

### Reference Materials:

1. Agenda Item E.1.b, NWFSC Report 1: A Summary Report from the NWFSC Bottom Trawl Survey Workshop held October 31–November 2, 2006 in Seattle, Washington.
2. Agenda Item E.1.b, NWFSC Report 2: A Summary Report from the WC Groundfish Data/Modeling Workshop held August 8-10, 2006 in Seattle, Washington.
3. Agenda Item E.1.b, Supplemental NWFSC Report 3: Pre-recruit Survey Workshop: A Summary Report prepared by S. Ralston and J. Hastie.

### Agenda Order:

- a. Regulatory Activities
- b. Science Center Activities
- c. Reports and Comments of Advisory Bodies
- d. Public Comment
- e. Council Discussion

Frank Lockhart  
Elizabeth Clarke

**A Summary Report from  
The NWFSC Bottom Trawl Survey Workshop  
held October 31 – November 2, 2006  
in Seattle, Washington**

**NWFSC, FRAM Division  
March 15, 2007**

**Introduction**

The following report summarizes the outcomes from The NWFSC Bottom Trawl Survey Workshop, held October 31 – November 2, 2006 at the NOAA Western Regional Center in Seattle, Washington. This workshop was the third “Off-Year” Stock Assessment Improvement Workshops convened during 2006 for the purpose of preparing for the 2007 West Coast groundfish stock assessments. The goal of the bottom trawl survey workshop was to provide stock assessment authors with guidance regarding the incorporation of data from the NWFSC West Coast groundfish bottom trawl survey into stock assessments, particularly those that will be conducted in 2007. The NWFSC bottom trawl survey was initiated in 1998, covering depths from 100-700 fathoms. The survey was expanded in 2003 to include depths ranging from 30-100 fathoms. While data from the 100-700 fathom range have been included in prior assessments, data from the expanded coverage of shallower depths have not.

Primary workshop objectives included 1) review survey protocols and data collected by the NMFS west coast groundfish bottom trawl surveys: AFSC & NWFSC triennial shelf surveys (1977-2004), NWFSC slope survey (1998-2002), and NWFSC “expanded” shelf-slope survey (2003-2006); 2) Evaluate methods for including AFSC and NWFSC survey time series in stock assessments; 3) Evaluate whether recent data from the NWFSC shelf-slope survey can be used to extend “triennial” shelf survey time series included in previous assessment models, particularly in 2007 update assessments (i.e. English sole) or whether the new NWFSC data should be treated as a new time series; And 4) compare design-based (swept-area) and model-based (Generalized Linear Mixed Models) approaches for developing biomass and variance estimates.

Stacey Miller and Jim Hastie from the Fishery Resource Analysis and Monitoring Division (FRAMD) of the Northwest Fisheries Science Center (NWFSC), organized the workshop. Workshop participants included stock assessment scientists, trawl survey personnel, fishing industry representatives as well as members of the public. A comprehensive list of participants is included at the end of this summary report. Travel restrictions for federal travelers somewhat reduced participation.

**Objective 1. Review survey protocols and data collected by the NMFS West Coast groundfish bottom trawl surveys.**

Participants generally agreed that substantial differences exist between the triennial shelf and NWFSC shelf-slope “expanded” survey protocols and gear (Table 1.). Some of these differences such as towing speed and duration, size and type of the nets and footropes, and selection of tow locations, may contribute to changes in catchability and selectivity. It is difficult to disentangle the effects of the various changes in protocol and gear on catchability and selectivity. However, it appears the effects differ among species.

**Objective 2. Evaluate methods for including AFSC and NWFSC survey time series in “full” stock assessments.**

Workshop participants generally agreed that the triennial and NWFSC Shelf-slope “expanded” surveys are different time series and should be included separately in assessments, based on the analyses presented for canary rockfish, English sole, darkblotched rockfish and arrowtooth flounder. This conclusion was based on the fundamental differences in survey protocols and performance. Stock assessment authors may explore alternative use or combinations of the surveys. Alternative options for including the NWFSC “expanded” survey are outlined below.

In general, two options were discussed for using the NWFSC “expanded” survey data in assessments for species which primarily occur on the slope (e.g. darkblotched rockfish). The first option is to continue using the NMFS conducted slope survey time series (>100 fm) as in previous assessments, and add data from the recently sampled shelf depths (<100 fm) of the NWFSC “expanded” survey as a new and separate time series. Although this approach may represent a viable interim method for including the new data, as it preserves a longer continuous slope time series, participants generally thought this method is not a long term solution. As the length of the “expanded” survey time series increases, information and statistical power may be lost by separating data from the “expanded” survey into two concurrent time series. Also, since the NWFSC survey was not extended to the Mexican border until 2003, a slope time series from 1998 to 2006 would reflect very different geographic coverage. In order to maintain geographic consistency over this time period, data from the Conception INPFC area would need to be excluded from the derivation of a survey index.

The second suggested option for species occurring primarily on the slope, involves including two separate time periods for the NWFSC survey, based on the change in depth coverage (i.e. NWFSC slope (1998-2002) and NWFSC “expanded” slope/shelf (2003-06). Participants noted that if authors are going to include the “expanded slope survey” as new time series, they will need to make sure that the selectivities make sense relative to the first NMFS slope survey.

Three options were explored to include the NMFS triennial shelf survey and the NWFSC “expanded” shelf-slope survey into assessments for species primarily occurring in shelf depths. The first option, agreed by participants as the “default method”, includes using both surveys as separate time series with different catchabilities and selectivities. Participants also discussed options for combining the surveys into one time series. If

authors choose to combine the surveys they should explore setting “Q” and selectivity the same as well as estimating different “Q”s and equal selectivities.

Case studies were presented for three “full” assessments that will be conducted during the 2007 stock assessment cycle. Dr. Ian Stewart presented the canary rockfish case study, Dr. Isaac Kaplan presented preliminary work on arrowtooth flounder, and Dr. Owen Hamel presented the darkblotched rockfish case study.

### Canary rockfish

Workshop participants recommended retaining the NMFS triennial shelf and NWFSC “expanded” shelf-slope surveys as separate indices due to a number of factors. Foremost among these are the substantial differences in the numeric and spatial properties of catch between the two surveys. In addition, differences in survey design and protocol, estimated Q, and length frequencies cannot be captured in the assessment model if the two surveys are combined into one index.

The observed survey catch rate of canary rockfish per unit effort has been variable, and typically includes a small number of large tows. The NWFSC survey 2003-2005 has caught canary rockfish in a smaller proportion of the total tows (0.12 compared to the triennial 0.18) but positive catch rates tend to be larger (mean log (CPUE) = 0.78) and more variable (SD of mean log CPUE = 1.68) than those observed in the triennial survey time series (mean log (CPUE) = -0.095, SD 1.28). Further, many more positive tows south of San Francisco Bay have been observed in the NWFSC survey. When analyzed in numbers of juveniles (those that are less than the length at 50% maturity) the difference between surveys throughout this area is even more pronounced. Many more small (< 30cm) canary rockfish are collected in the NWFSC survey, even in 2004 when both surveys were performed nearly simultaneously. Although survey design has varied, the cause of this difference is unknown.

Design-based estimators of biomass are very sensitive to the largest NWFSC catches in 2004 and 2005, with changes in the total on the order of +/-50% when the single largest tow was removed. GLMM-based estimators are much more robust to these tows, due to a more appropriate characterization of the error structure of positive catches and the explicit estimation of the fraction of hauls catching zero canary rockfish. The GLMM approach examined resulted in lower biomass estimates for all years, but less inter-annual variability. A similar pattern was observed for GLMM-based biomass estimates derived from triennial survey data.

Selectivity patterns estimated in preliminary model runs were markedly different (dome-shaped for the Triennial survey and asymptotic for the NWFSC survey), although the change in likelihood was modest (~ 6 units NLL for 7 selectivity parameters with age data not included). Both GLMM and design-based estimators showed similar selectivity and catchability estimates.

### Arrowtooth flounder

Arrowtooth flounder catch rates and distributions appeared similar in both the NMFS triennial survey and the NWFSC “expanded” shelf-slope survey. Therefore, the authors will cautiously explore combining them into one time series, rather than treating the NWFSC “expanded” shelf-slope survey as a separate short time series. Since the development of this essentially new assessment was in the very early stages at the time of the workshop, differences in survey catchability and selectivity and estimated biomass trajectories associated with alternative methods for including data from the two surveys were not presented. However, catch rates and length frequencies in the two surveys were reviewed.

Data for arrowtooth flounder were only available for one year (2004) from both the triennial survey and the NWFSC “expanded” shelf-slope survey. Given the limited data for arrowtooth flounder, it is not clear if there is sufficient statistical power to detect differences between the two surveys for this species. A comparison of catch per unit effort (kg/hectare) of hauls containing arrowtooth flounder revealed no significant difference between the two surveys in 2004. Data from the two time series (2003-2004 NWFSC “expanded” shelf-slope survey and 1980-2004 triennial survey) were also compared, and in both surveys peak abundances are found near a depth of 200m and at the northern limit of the surveys. Average fish weight (kg/fish) increases with depth (Figure 1) in both surveys and the length compositions in the two 2004 surveys are quite similar (Figure 2).

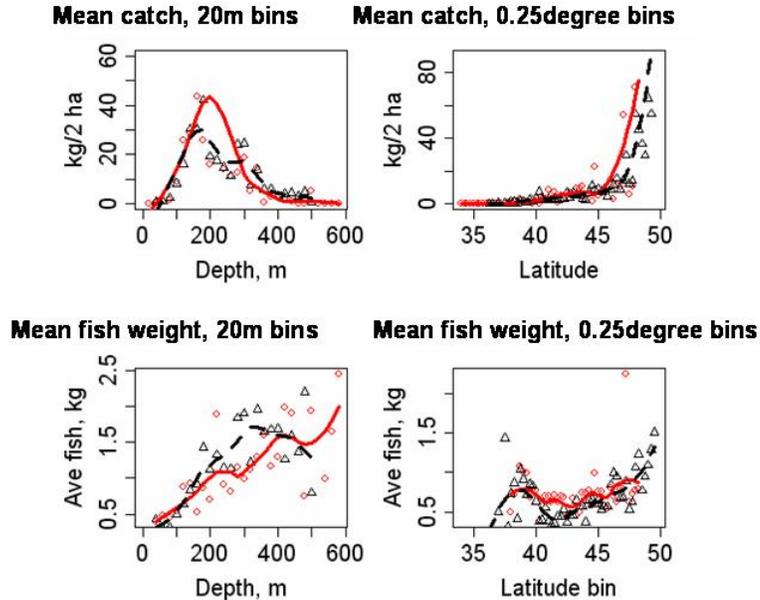


Figure 1. Mean catch and Mean fish weights for arrowtooth flounder for the NWFSC “expanded” shelf-slope survey (2003-2004, solid red line) and triennial survey data (1980-2004, black dashed line).

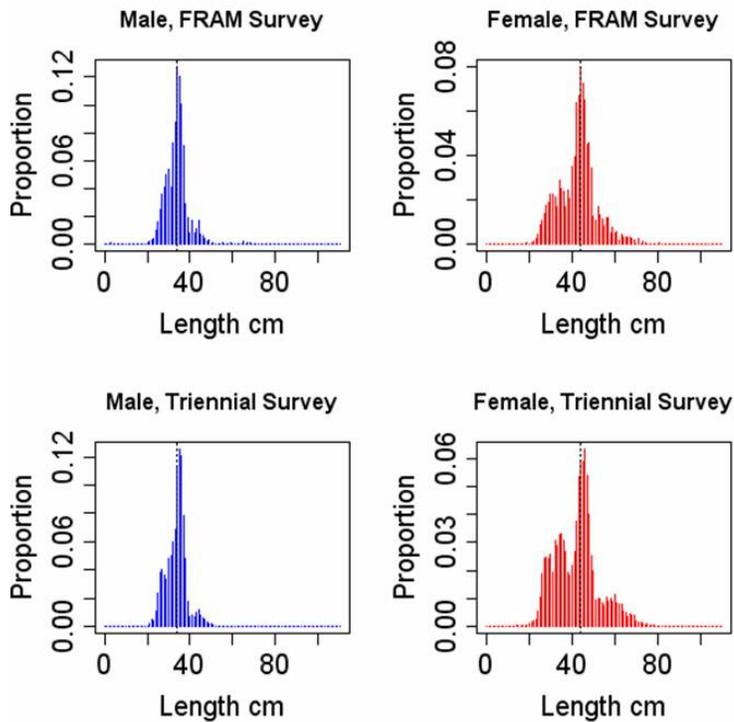


Figure 2. Arrowtooth flounder length compositions collected during 2004 by the FRAM NWFSC “expanded” shelf-slope survey and triennial survey.

Darkblotched rockfish (full assessment)

Workshop participants generally agreed the 2007 darkblotched rockfish assessment should include the shelf (30-100 fathom) portion of the NWFSC “expanded” shelf-slope survey as a new index (with 4 data points). In the future, the “expanded” shelf-slope survey may be used as a single index, with the 1999-2002 portion of the slope survey used as an independent (though related) index.

Relatively larger darkblotched rockfish (lengths between 32-40 cm and ages of 6+ years old) were encountered more frequently in the 2003-2005 NWFSC “expanded” shelf-slope survey than in the 1977-2004 Triennial survey. This was primarily due to a few tows in the 2003 and 2005 NWFSC “expanded” shelf-slope surveys which captured large numbers of these larger individuals. Despite this finding, the population as a whole is estimated to have included more fish in that length range in the earlier years of the Triennial survey.

The 2004 NWFSC “expanded” shelf-slope survey (which used 3 boats instead of the customary 4) lacked any of those rare but important darkblotched tows seen in 2003 and 2005 and therefore the length composition of the 2004 NWFSC “expanded” shelf-slope and triennial surveys appear fairly similar. However, the 2004 triennial survey encountered a much larger proportion of 1 year old fish than did the 2004 NWFSC

“expanded” shelf-slope survey. Modeled selectivity for the two surveys reflects this difference in selection for both the smallest and largest fish. If selectivity is forced in the model to be the same between the two surveys, the estimated catchability of the NWFSC “expanded” shelf-slope survey is much higher (nearly 3 times) than that of the triennial survey, and the fit of the model to the data is severely degraded.

**Objective 3. Evaluate whether recent data from NWFSC “expanded” shelf-slope survey should be included in update assessments. If they are to be included, should they be treated as a new time series or included as an extension to the time series previously used assessment models?**

English sole is scheduled as an “update” assessment in the 2007 assessment cycle. The NWFSC “expanded” survey data will not be included in the update assessment model. Based on the analyses reviewed during the workshop, there was no compelling reason to combine the surveys into one time series. Additionally, there is enough complexity associated with including the NWFSC “expanded” shelf-slope survey data as an expansion of the triennial survey, that the assessment would no longer be considered an “update” as defined by the SSC’s Terms of Reference for Stock Assessments and STAR Panels. Fishery catch, age / length data will be included in the update and the analyses produced for this workshop will be included as an appendix in the assessment document.

Workshop participants discussed the inclusion of the NWFSC “expanded” shelf-slope data in other assessments scheduled as updates. Although not all the authors for update assessments attended the meeting, and therefore participants did not see the raw data for other species, it was generally concluded the other update assessments (e.g. widow rockfish) should use the same approach as recommended for the English sole update assessment (i.e. don’t use new survey data unless doing a full assessment).

**Objective 4. Compare biomass and variance estimates generated using a design-based swept-area approach and model-based (Generalized Linear Mixed Models) approach.**

Results from analyzes of the NWFC slope survey using generalized linear mixed models (GLMM) for canary rockfish, English sole (northern and southern regions, and arrowtooth flounder were presented by Dr. Tom Helser. In general, the results suggest that GLMM-based estimators are more robust when catches are comprised of many zero hauls, positive catch rate distributions are skewed (infrequent, very large hauls), and when the assumption of the variance-mean relationship is non-normal. Based on the historical performance of GLMMs and these workshop case studies, participants agreed that the GLMM is the preferred method for developing biomass estimates from survey data for most species. If authors would like to use the GLMM, they are strongly encouraged to evaluate and request the appropriate post stratification for the GLMM by early-March, 2007.

In order to comport with the SSC's Terms of Reference for Stock Assessments and STAR panels, the English sole assessment (and other updates if applicable) should use the design-based estimates for triennial shelf surveys as done in prior full assessments.

### **Additional Notes**

Until the expanded NWFSC survey series contains more observations and has been examined rigorously in assessments, authors should explore a range of possibilities through the use of alternate runs and sensitivity analyses. For stocks that are near a critical level, sensitivity tests, including model likelihoods, point estimates and their uncertainties, and posterior distributions are particularly important. The impact of the choice of data preparation method (GLMM or design-based) should also be presented for review.

Limited case-study analysis revealed a significant degradation in model fit when the triennial and shelf/slope surveys (design-based estimates example) were forced into a single series with a common  $q$  and selectivity. This type of analysis should be repeated for other stocks and with the GLMM-based estimates. More analysis should also be conducted to identify the best point estimate for characterizing survey biomass trends among candidates such as the arithmetic mean, the geometric mean, and the mode.

## **Appendix A. Workshop Participants**

Jason Cope, University of Washington (UW)  
Owen Hamel, Northwest Fisheries Science Center (NWFSC) and Scientific and  
Statistical Committee (SSC)  
Jim Hastie, NWFSC  
Tom Jagielo, Washington Department of Fish and Wildlife (WDFW) and SSC  
Isaac Kaplan, NWFSC  
Aimee Keller, NWFSC  
David King, Alaska Fisheries Science Center (AFSC)  
Shirley Lee, NWFSC  
Pete Leipzig Fishermen's Marketing Association (FMA)  
Jim Likes, Fish and Wildlife Service, Retired  
Stacey Miller, NWFSC  
Bob Mohn, Center for Independent Experts  
Brad Pettinger, Oregon Trawl Commission  
Andre Punt, UW and SSC  
Victor Simon, NWFSC  
Ian Stewart, NWFSC  
Theresa Tsou, WDFW  
John Wallace, NWFSC  
Mark Wilkins, AFSC

## Appendix B. NWFSC Bottom Trawl Survey Workshop Agenda

October 31- November 2, 2006

NOAA Western Regional Center  
Building 9, Conference Room  
Seattle, WA 98115

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### Tuesday, Oct. 31, 2006

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- 9:00 a.m. Welcome, Review Terms of Reference (TOR), and Introductions
- 9:30 a.m. TOR #1. Review survey protocols and data collected by the NMFS bottom trawl surveys: AFSC & NWFSC shelf triennial surveys (1977-2004), NWFSC slope survey (1998-2002), and NWFSC shelf-slope survey (2003-2006) and discuss the implications of the differences for use in stock assessments.
- 11:00 a.m. Coffee Break
- 11:15 a.m. TOR #2. Evaluate methods for including AFSC and NWFSC bottom trawl survey time series in stock assessments focusing on "shelf" species:
- Ian Stewart – Canary rockfish
  - Isaac Kaplan and Tom Helser - Arrowtooth flounder
  - Ian Stewart - English sole update
- 12:30 p.m. Lunch
- 1:30 p.m. Continue Case Study Presentations
- 3:30 p.m. Coffee Break
- 4:00 p.m. Discussion

### Wednesday, Nov. 1, 2006

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- 9:00 a.m. TOR #2. Evaluate methods for including AFSC and NWFSC bottom trawl survey time series in stock assessments focusing on "shelf-slope" species:
- Owen Hamel - Darkblotched rockfish
  - Michael Schirripa - Sablefish
  - Owen Hamel - Pacific ocean perch update
- 12:30 p.m. Lunch
- 1:30 p.m. TOR #3. Discuss whether recent data from NWFSC shelf-slope survey should be included in update assessments (i.e. English sole) only if they can be treated as a new time series, or whether the new data can be used to extend time series included in previous assessment models.
- 3:30 p.m. Coffee Break
- 4:00 p.m. TOR # 4. Compare biomass and variance estimates generated using a design-based swept-area approach and model-based (Generalized Linear Mixed Models) approach.
- Tom Helser - "Generalized Linear Mixed Model Analysis of the NMFS West Coast Groundfish Bottom Trawl Surveys".

### Thursday, November 2, 2006

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- 9:00 a.m. TOR #4 Discussion Continued
- 10:30 a.m. Summary Wrap-Up
- 12:00 p.m. Workshop Adjourns

**Appendix C. Summary table of Triennial Shelf Survey and NWFSC Shelf-Slope Survey. This table was completed with input from Victor Simon and Aimee Keller (NWFSC) and Mark Wilkins (AFSC).**

	<b>AFSC Triennial Shelf</b>	<b>NWFSC Shelf-Slope</b>
<b>Survey Design</b>		
Year range	1977-2004	2003-06
Depth range	1977: 50-250+ fm / 90-460 m 1980-92: 30-200 fm / 55-366 m 1995-2004: 30-275 fm / 55-500 m	30-700 fm / 55-1280 m
Latitudinal range	1977: 34°00'N – US/Canada border 1980-86: 36°48'N - 49°15'N 1986: 36°48'N - US/Canada border 1989-2001: 34°30'N - 49° 40'N	32° 30' - 48° 10' N
Latitudinal stratification	Various: 1977, 1980-83, 1986, 1989-92, 1995-2004	
Station allocation	Transect – track lines are spaced at ~10 nautical mile intervals	Stratified random block
Station selection	Systematic-random design	Randomly selected without replacement
Search time	~120 minutes	60 minutes sequentially for each of 3 cells per station
Depth zones in survey design	30-100 fm / 55-183m 101-200 fm / 184-366m 201-275 fm / 367-500m	30-100 fm / 55-183m 101-300 fm / 184-549m 301-700 fm / 550-1280m
No. of vessels / year	2	4 (in 2004 only 3 vessels were used)
Total number of vessels	16	7
Vessel class	Quite variable in early years (1977-1995): ranged 76 ft-125 ft More recent years (1989-2004): Alaska Class Commercial Trawlers	West Coast Commercial Trawlers
Vessel size	65' -147'	65' -92'
Vessel horsepower	<500-1,710 horsepower	400 - 600 horsepower
<b>Gear/Tow Protocol</b>		
Trawl type	High-opening Nor'Eastern trawl	4-panel Aberdeen-style
Trawl dimension	See diagram	See diagram
Net material	1977-1986: Nylon 1986-2004: Polyethylene	Polyethylene
Mesh size (net)	5 inch	5 ½"
Mesh size (codend)	3.5 inch	5"
Mesh liner	1.25 inch	2"
Headrope	89' (27.2 m)	85'
Footrope	121' (37.4 m)	104'
Roller gear	120' rubber bobbin roller gear, with 14" bobbins with 4" disk	None – solid footrope

	spacers	
Door size and weight	2.1 × 1.5 m steel V-doors weighing approximately 567 kg each	5' × 7' steel V-doors
	<b>AFSC Triennial Shelf</b>	<b>NWFSC Shelf-slope</b>
Wire specs	Specifications were not set during early surveys; 5/8 and 3/4 inch diameter and 800 m length specifications were set for later surveys	1200 fm of 5/8" steel-core wire rope
Scope	Varies non-linearly with depth. Scope set by skipper in early years and by results of empirical settling experiments since 1992 (95?)	Varies non-linearly with depth
Trawl warps	Tows were made with winch brakes set at wire marks.	
Towing Speed	3.0 ± 0.2 knots (speed over ground)	2.2 ± 0.5 knots (speed over ground)
No. minutes net on bottom	30 minutes	15 minutes
Sensors routinely deployed? (post 1998)	SCANMAR acoustical net mensuration system since 1986. Bathythermograph (since 1992) and bottom contact sensors (since 2001)	Yes
<b>Sampling Protocol</b>		
Sub-sampling protocol	1977- about 1995: Whole-haul sampled catches weighing ~1.2 mt or less Since about 1998: Whole-haul all catches	* See manual
Selection of tows for biological sampling	All	All
Length samples – random or stratified?	Random	Random
Age samples – random or stratified?	Some random, most stratified. Varied by year, species.	Random

**A Summary Report from  
The WC Groundfish Data/Modeling Workshop  
held August 8-10, 2006  
in Seattle, Washington**

**NWFSC, FRAM Division  
March 15, 2007**

**Introduction**

The following report summarizes the outcomes and action items from the West Coast Groundfish Data/Modeling Workshop, held August 8-10, 2006 at the NOAA Western Regional Center in Seattle, Washington. This workshop was the first of the “Off-Year” Stock Assessment Improvement Workshops convened during 2006 for the purpose of preparing for the 2007 West Coast groundfish stock assessments. The workshop was held to review available data sources for West Coast groundfish stock assessments, address a number of topics relating to the treatment of data in assessments and other modeling issues, including a review of the features and functionality of the SS2 modeling platform.

Scientists from the Fishery Resource Analysis and Monitoring Division (FRAMD) of the Northwest Fisheries Science Center (NWFSC) organized the workshop. Workshop participants included stock assessment scientists from NOAA Fisheries and State agencies, data managers, fishing industry representatives as well as members of the public.

This report outlines the action items and general areas of agreement reached during the workshop and are reported as bullets. The full list of presenters is outlined in the agenda, included in this report as Appendix A. PowerPoint presentations can be downloaded at [ftp://ftp.afsc.noaa.gov/S\\_Miller/WC\\_GroundfishDataModelingWorkshop\\_2006/Data\\_Modeling\\_Workshop](ftp://ftp.afsc.noaa.gov/S_Miller/WC_GroundfishDataModelingWorkshop_2006/Data_Modeling_Workshop)

**Summary of Data Sources**

A summary table of available data sources (as updated during workshop) is included in appendix B of this report. This table will be updated with additional data sources as information becomes available. Workshop participants discussed the availability of data as well setting a process for assessment authors to receive data. The general conclusions, areas of agreement and/or action items are outlined below.

- Stock Assessment Coordinator (SAC) will send an announcement to data managers and William Daspit (PacFIN) as a heads up once the list of assessments and STAR panel dates are finalized. This list is also included in this report in appendix C.

- Establish deadlines for receiving data to incorporate into assessments, if possible. Use of data sent to analysts after agreed upon time are up to author's discretion (based on time, etc.) if they can be included in assessments.
- Data managers ask all authors request data early in the process so they have time to plan and respond in a timely manner
- California Sanitation Departments requested one coordinated data request in 2005. Only 2 species (bocaccio and cowcod) may use these data in 2007 assessment cycle. In the future, requests for impingement data should be coordinated.
- If analysts find data in PacFIN are suspicious or incorrect, please send an email to William Daspit. He will work with states to investigate and fix problems.
- PacFIN BDS
  - The BDS is updated at least once per year but may be updated more frequently if States submit new data feeds. Workshop participants agreed it may help to have data uploaded more frequently.
  - William Daspit has scripts for BDS data extraction. Contact him for assistance, if needed.
  - A BDS Summary table is available on line at <http://www.psmfc.org/pacfin/bds.html>. Data managers should check these tables now to identify if there are gaps
  - Participants generally agreed we need to move towards getting sablefish and Pacific whiting biological data into PacFIN BDS Tables. More discussion on how to do this took place at PacFIN data committee meeting in November.
- States have committed to updating RecFIN within a month or two. However, assessment authors should still contact State agencies for recreational data because there are some data that aren't housed in RecFIN.
- RecFIN Workshop meeting held in August 2006.

### **Reconstructions of Domestic Historical Catch**

Jim Hastie presented a summary of the variety of approaches used to reconstruct historical domestic catches in previous assessments. The summary focused on capturing authors' decisions for time periods, areas, or fleets where available landings reports do not identify the species of concern.

- Workshop participants generally agreed a need exists to have a comprehensive reconstruction of catch on a state by state basis.
- The NWFSC will explore having the PSMFC [historical data book] keypunched.

### **Methods for Preprocessing Assessment Data:**

Owen Hamel presented a summary of methods employed to construct age and length compositions during the 2005 assessments. Three approaches were generally used to construct length compositions however, many assessments did not adequately document the methods used. Other issues including choices made regarding stratifications, use of "super years", aggregate market categories, accounting for species mis-identification, and filling in missing data were also discussed.

- Participants generally agreed that better documentation of the methods analysts used to construct age- and length-compositional data is needed. Many 2005 assessments didn't include any details on methods for creating age/length comps.
- Workshop participants agreed a need exists to investigate optimal binning of composition data (i.e. coarse vs. fine). This should be added to the "long-term wish list" or considered a "special project".

### **Historic Groundfish Age Reading**

Recent assessments have identified anomalies in historic size-at-age observations for several important species. These could be due to either changes in growth or changes in otolith reading techniques. It is critical to determine as best as possible which of these two explanations is most likely as each is modeled differently within the assessment. In an effort to address these issues, Michael Schirripa outlined the data flow between West Coast ageing laboratories and PacFIN's Biological Data System (BDS), reviewed current fields in PacFIN's BDS, and suggested adding meta-data regarding who, when, and where age estimates have been produced.

- Workshop participants discussed how the meta-data recorded by some readers are not being carried forward into the State's databases and onto the PacFIN database. This information would be helpful especially since different ageing laboratories read structures from the same species. Michael Schirripa will poll authors to find out which fields are most valuable to include as meta-data. Current suggestions include date aged, readers' initials, laboratory, reading method and method for choosing sub-samples to age.
- Once meta-data fields are identified, a formal request should be sent to William Daspit. William will forward the request to the States and work with them so that this information can be included in PacFIN.
- Creation of an electronic record of historic ages, including what was read, by whom, and the method used, was discussed. This may be a project for the off-year production ageing cycle (2007). If the assessment community thinks this is an important project, the States can be requested to resurrect records and keypunch the data.
- Port samplers should send collected otoliths to ageing labs more frequently than once per year in order to permit improved ageing-lab planning for the timely delivery of data.
- A need exists for a Coast-wide Biological Data Coordinator to act as liaison between port samplers and assessment analysts.

### **GLMM Analysis for Triennial Shelf Survey Data**

Tom Helsler presented a review of General Linear Mixed Model (GLMM) theory, its application to survey data, in particular, the west coast groundfish bottom trawl surveys, and showed results from a preliminary analysis for canary rockfish.

- Workshop participants were generally interested in using the GLMM and agreed to discuss this topic in more detail during the NWFSC Bottom Trawl Survey workshop held in October, 2006.

- Workshop participants suggested that Tom 1) conduct simulations of GLMM vs. swept area biomass estimates, 2) explore the appropriateness of mean vs median point estimates, and 3) explore where to draw depth boundaries.

### **Stock Assessment and STAR Panel TOR**

Martin Dorn presented a review of the Scientific and Statistical Committee's Terms of Reference for Stock Assessments and Stock Assessment Review (STAR) panels, as well as few issues discussed during the Groundfish Stock Assessment Review Workshop in January, 2006.

- Phase Plots should use F not SPR. For models with multiple fleets, Martin Dorn (SSC) suggested calculating a global F using: Total Catch / Summary Biomass. Some workshop participants have concerns about the accuracy of this calculation.
- Guidance is needed from the Council family on whether there is a desire to have briefings of assessment results and if it is preferred to have assessment authors (or SSC STAR panel chair) provide the briefing. Expectations regarding assessment author attendance at Council meetings when the SSC review will occur and when Council action will be taken should be clarified.
- Mechanisms (can be formal or informal) for involving / consulting GAP representatives (and industry) on data use and issues in upcoming assessments should be documented by assessment authors. It is up to the discretion of analysts if they want/need to pursue formal or informal avenues of "consultation". The NWFSC will be holding pre-assessment workshops for NWFSC-sponsored assessments. It may be possible to include other species if analysts are interested in participating in those meetings. Note: there was concern expressed for the need of a mechanism to facilitate this process if it is formalized.
- The Port Liaison Project (PLP) is working to get interested members of industry in touch with stock assessment analysts. Pete Leipzig has more information if people are interested.

### **Effective Sample Size**

Xi He presented the results of a simulation experiment designed to look at the role of weighting in the Widow rockfish stock assessment (a non-SS2, ADMB-programmed model).

Ian Stewart and Stacey Miller presented a summary of issues surrounding the weighting of compositional data, tuning of input sample sizes, and a new method for specifying input sample sizes based on an analysis of effective sample sizes observed in 2005 stock assessments. The presentation included:

- Discussion of likelihood options used in stock assessment was presented along with some caveats particular to the multinomial which is used in SS2.
- A summary of the highly varied methods for calculating and iterating (or not) input sample sizes was presented for 17 stock assessments conducted in 2005, drawing the conclusion that use of a standardized approach would add consistency and objectivity.

- The potential problems with ‘untuned’ weightings where input sample size differed substantially from effective sample size were outlined, with emphasis on those cases where input sample sizes were much larger than effective sample sizes. Across all 2005 assessments, the input sample size for most fleets were either tuned to be very close to effective sample size (33%), or allowed to be somewhat smaller (50%), with only 17% remaining much larger than effective values.
- Because effective sample size might logically be a function of both the number of fish sampled as well as the number of trips sampled, a relationship was developed to relate the effective sample size observed in the stock assessment to these metrics of the raw data. Survey and fishery data were separated.
- Fitted parameter values were reported which allow assessment authors to calculate initial input sample sizes that would: 1) retain sampling heterogeneity among years, 2) recognize the differences in sample sizes between commercial trips and survey hauls, and 3) not require subjective weighting and be expected to need less iteration than other methods.
- Workshop participants generally agreed the approach was promising, and should be explored in the next round of assessments. Use of harmonic mean effective sample size could be considered instead of arithmetic mean. Further review of the use of the multinomial likelihood might also be valuable.
- Authors can contact Ian at: [Ian.Stewart@noaa.gov](mailto:Ian.Stewart@noaa.gov), for a copy of the presentation with parameter values or assistance in applying this method.

### **Tuning**

EJ Dick presented a work-in-progress designed to improve the standardization of pre-recruit catch to a fixed age and to capture the uncertainty in this standardization. He presented a linear hierarchical approach, drawing strength of inference from examination of multiple years years and species. He provided examples that indicated this method might be a desirable alternative to the small sample sizes available for many species in some years.

- Workshop participants generally agreed that this method was promising and should be developed further.

### **Stock Synthesis 2 (SS2)**

Dr. Richard Methot reviewed some of the new features in Stock Synthesis 2 (SS2) and workshop participants provided comments and suggestions for additions. Rick will unveil the added features during a SS2 workshop February 27-28, 2007 in Seattle, Washington. Please contact Rick for more information.

### **R Software for Model Diagnostics and Plotting of SS2 Output**

Ian Stewart presented a tool for quickly summarizing the results of a Stock Synthesis 2 (SS2) model run. Using the free software “R” ([www.r-project.org](http://www.r-project.org)), five SS2 output files are condensed into a short list of statistics and a number of plots with one function call. This enables quick and easy evaluation of all aspects of a model run during exploratory development. Many plots are suitable for document preparation, including those specifically required by the Scientific and Statistical Committee’s stock assessment terms

of reference. “Value added” features include scanning of the .cor file, parameter and model convergence metrics, as well as traps for common errors and issues specific to SS2. Some examples were presented. This function is generalized for most SS2 option configurations and has been tested on a number of files.

- Workshop participants generally agreed that improved integration of tools like this will facilitate consistent reporting of detailed results among authors as well as rapid presentation and electronic reporting during STAR panels.
- Authors can contact Ian at: [Ian.Stewart@noaa.gov](mailto:Ian.Stewart@noaa.gov), for a copy of the software or assistance in using it.

### **Spatial Scales for Assessments**

Rick Methot provided an overview of approaches used to define stock structure and management units for West Coast groundfish including using genetics, demographic patterns and management/assessment units. Steve Ralston presented work on spatial variation in fishing intensity and its effect on yield. Results from his age-structured simulations show that minor to moderate heterogeneity in the spatial distribution of fishing effort has little overall impact on yield. Moderate localized depletions (and surpluses) have only a minor effect on the total yield of the system. However, the ontogenetic stage at which density-dependence is expressed (i.e., pre- or post-settlement) has a marked influence on sustainable yield.

Jason Cope presented preliminary work to identify stock structure using commonly collected data (catch per unit effort; CPUE) and simple clustering techniques. Comparison of the spatially-resolved CPUE to the CPUE assumed under a hypothesis of one coast-wide population revealed important differences in the dynamics of each population. Such differences translate directly into stock assessment and therefore should be recognized. Jason’s preliminary work points to the benefits of using clustering techniques that incorporate the uncertainty about each estimated abundance index and the need for further exploration into methods of incorporating small-scale abundance measures into assessments at larger scales.

### **Priors**

A summary of the priors used in 2005 assessments (compiled by Laura Bozzi (PFMC) and John Field (NMFS)) was presented and discussed. This table is included in Appendix B. Owen Hamel presented preliminary work on prediction intervals for natural mortality (M), using arrowtooth flounder and darkblotched rockfish as examples. Xi He followed by presenting a method to calculate priors for Beverton-Holt stock-recruitment steepness, which included reduced probabilities of low values of steepness due to the evolutionary persistence principle.

- Participants generally agreed that it would be worthwhile to investigate creating priors or profiling ranges for natural mortality rate (M) using prediction intervals derived from data sets relating M to maximum observed lifespan, von Bertalanffy K, gonadosomatic index (GSI), or other life history parameters.

# Appendix A. Workshop Agenda West Coast Groundfish Data / Modeling Workshop

August 8-10, 2006

NOAA Western Regional Center  
Traynor Seminar Room  
Building 4, Room 2076  
Seattle, WA 98115

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## Tuesday, August 8, 2006

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8:15 a.m. - 8:30 a.m. Coffee and greetings

8:30 a.m. - 9:00 a.m. Introductions / Workshop Overview

### Discussion Topic: Review Available Data Sources

9:00 a.m.–10:30 a.m.

- Presentation: Summary of available data including points of contact and dates when data will be available (Stacey Miller)
- Discussion Items:
  - 1) Are there known data gaps in various databases?
  - 2) How should the GMT's scorecard be used?
  - 3) Author access to data sources

10:30 a.m. - 10:45 a.m. Coffee Break

### Discussion Topic: Reconstructing Historical Catches

10:45 a.m. – 12:00 p.m.

- Presentation: Summary of approaches used in the 2005 assessments (Jim Hastie)
- Discussion Items:
  - 1) Are the methods used to reconstruct catch series consistent across similar species? If not, can we suggest improvements or projects to facilitate greater consistency?
  - 2) When should discards be estimated within the model vs. outside the model?

12:00p.m. – 1:00 p.m. Lunch

### Discussion Topic: Methods for Pre-Processing Assessment Data

1:00 p.m. – 4:45 p.m. Age and Length Comps

- Presentation: Summary of methods employed to construct age/length compositions during the 2005 assessments (Owen Hamel)
- Presentation: Overview of historical groundfish age reading (Michael Schirripa)
- Presentation: How to use data from multiple readers when constructing ageing error matrices (Rick Methot)
- Presentation: To GLM or Not to GLM (Tom Helser)
- Discussion Item:
  - 1) Can we develop guidelines for pre-processing age/length data?
  - 2) Preliminary discussion on constructing survey age and length compositions using GLM-based analyses. A follow-up discussion will take place at the bottom trawl survey workshop.

4:45 p.m. – 5:00 p.m. Public Comment

### **Wednesday, August 9, 2006**

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#### **Discussion Topic: Stock Assessment and STAR Panel Terms of Reference**

8:30 a.m. – 9:00 a.m. Overview of the terms of reference for the 2007 Stock Assessments and STAR Panels including reporting of SS2 generated summary statistics (Martin Dorn)

#### **Discussion Topic: Effective Sample Size**

9:00 a.m. – 10:30 a.m.

- Presentation: Overfitting compositional data relative to surveys (Xi He)
- Presentation: Fish, samples and assumptions: Logical and objective weighting for length and age frequency data (Ian Stewart)
- Discussion Items:
  - 1) Can we develop guidelines for treating effective sample sizes?

10:30 a.m. - 10:45 a.m. Coffee Break

#### **Discussion Topic: Uncertainty in Tuning Indices**

10:45 a.m. – 12:00 pm

- Presentation: An overview of SWFSC's attempt to express uncertainty in the Santa Cruz pre-recruit index using a Bayesian hierarchical linear modeling (EJ Dick)
- Discussion Item:
  - 1) Treatment of uncertainty in tuning indices

12:00 p.m. – 1:00 p.m. Lunch

#### **Discussion Topic: Stock Synthesis 2 (SS2)**

1:00 p.m. – 5:00 p.m. Review of the features and functionality of the SS2 modeling platform, with emphasis on the improvements since 2005 (Rick Methot)

### **Thursday, August 10, 2006**

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#### **Discussion Topic: Stock Synthesis 2 (SS2)**

8:30 a.m. -10:30 a.m. SS2 Discussion Continued

- Presentation: R software for model diagnostics and plotting of SS2 output (Ian Stewart)

10:30 a.m. – 10:45 a.m. Coffee Break

#### **Discussion Topic: Appropriate Spatial Scales for Assessments**

10:45 a.m. – 12:00 p.m.

- Presentation: Come together or break away: Addressing spatial issues in standardizing indices of abundance for near shore species (Jason Cope)
- Presentation: Stock structure and management units for West Coast groundfish (Rick Methot)
- Presentation: Spatial variation in fishing effort (Steve Ralston)
- Discussion Items:
  - 1) Have approaches in defining spatial scales for assessment been consistent? If not, can guidelines be developed for defining spatial scales.

12:00 p.m. – 1:00 p.m. Lunch

#### **Discussion Topic: Priors**

1:00 p.m. – 2:30 p.m.

- Presentation: Summary of priors used in 2005 Assessments
- Presentation: M and GSI: Prediction Intervals (Owen Hamel)
- Presentation: A prior for steepness in stock-recruitment relationships, based on an evolutionary persistence principle (Xi He)
- Discussion Items:
  - 1) Dealing with uncertainty in parameter values (use of priors)

#### **Discussion Topic: Wrap-Up Session**

2:30 p.m. General Wrap-Up / Workshop Agreements

5:00 p.m. Workshop Adjourns

## APPENDIX B. Summary Tables Presented During Workshop

**Table 1. Summary of Data Sources and Points of Contact for West Coast Groundfish Stock Assessments. Table compiled by Stacey Miller (NMFS).**

Data Source	Years	Data Type	Contacts	Contact Email	Notes
NWFSC Survey	1998-2006	Questions on Data / Raw Data	Beth Horness	<a href="mailto:Beth.Horness@noaa.gov">Beth.Horness@noaa.gov</a>	NA
NWFSC Survey	1998-2006	Traditional Area-Swept Biomass Estimates	Beth Horness	<a href="mailto:Beth.Horness@noaa.gov">Beth.Horness@noaa.gov</a>	1998-2005 data are available 2006 data avail. Mid-February
NWFSC Survey	1998-2006	Traditional (Design-based) Length Comps	Beth Horness	<a href="mailto:Beth.Horness@noaa.gov">Beth.Horness@noaa.gov</a>	1998-2005 data are available 2006 data avail. Mid-February
NWFSC Survey	1998-2006	GLMM-Based Biomass Estimates	Tom Helser	<a href="mailto:Thomas.Helser@noaa.gov">Thomas.Helser@noaa.gov</a>	Authors interested in using GLMM need to contact Tom to discuss stratification
Triennial Shelf Survey	2004	Questions on Data / Raw Data	Beth Horness	<a href="mailto:Beth.Horness@noaa.gov">Beth.Horness@noaa.gov</a>	NA
Triennial Shelf Survey	1977-2004	Traditional Area-Swept Biomass Estimates and Length Comps	Mark Wilkins	<a href="mailto:Mark.Wilkins@noaa.gov">Mark.Wilkins@noaa.gov</a>	Mark has already provided estimates and size comps for interested analysts. Beth Horness has copies of the traditional area-swept biomass estimates
AFSC Slope Survey	1990*-2001	GLMM-Based Biomass Estimates	Tom Helser	<a href="mailto:Thomas.Helser@noaa.gov">Thomas.Helser@noaa.gov</a>	
Santa Cruz Pre-Recruit Survey	1983-2006	Pre-recruit Index	Steve Ralston	<a href="mailto:Steve.Ralston@noaa.gov">Steve.Ralston@noaa.gov</a>	
PWCC/NWFSC Pre-Recruit Survey	2001-2006	Pre-recruit Index	Vidar Weststad (PWCC) or Elizabeth Clarke (NMFS)	<a href="mailto:vidarw@verizon.net">vidarw@verizon.net</a> or <a href="mailto:Elizabeth.Clarke@noaa.gov">Elizabeth.Clarke@noaa.gov</a>	

Data Source	Years	Data Type	Contacts	Contact Email	Notes
RecFIN	1980-2006		Wade Van Buskirk	wade@psmfc.org	Comprehens recreational catch
OR Sport Data	1980-2006	See Oregon Data Sources / POC	Don Bodenmiller	Don.Bodenmiller@oregonstate.edu	
WA Ocean Sampling Program			Farron Wallace	wallafrw@dfw.wa.gov	
CDFG CPFV trip-specific logbook	1980-Present		Jana Robertson		
CDFG CPFV Historical Logbook Data			Kevin Hill	Kevin.Hill@noaa.gov	
Northern/Central CA Onboard Data Collection Program			Deb Wilson-Vandenberg	<a href="mailto:dwilsonv@dfg.ca.gov">dwilsonv@dfg.ca.gov</a>	
Southern CA Onboard Data Collection Program			CDF&G		
PacFIN	1981-Present	Commercial landings and biological sample data for WA, OR, CA	William Daspit	<a href="mailto:william_daspit@psmfc.org">william_daspit@psmfc.org</a>	BDS Summary Tables available online - updated when new data are uploaded
GMT Scorecard	2006	2006 Projected Total Mortality for Overfished Stocks	John DeVore	<a href="mailto:John.Devore@noaa.gov">John.Devore@noaa.gov</a>	Finalized at GM's Feb or March meeting
CalCOM	Pre-1981	CA Biological Data	Don Pearson	Don.Pearson@noaa.gov	
West Coast Groundfish Observer Program	2001-2005	Discard rates	Jim Hastie / Cameron Hagstrom	<a href="mailto:Jim.Hastie@noaa.gov">Jim.Hastie@noaa.gov</a> or <a href="mailto:Cameron.Hagstrom@noaa.gov">Cameron.Hagstrom@noaa.gov</a>	March 2007

<b>Data Source</b>	<b>Years</b>	<b>Data Type</b>	<b>Contacts</b>	<b>Contact Email</b>	<b>Notes</b>
West Coast Groundfish Observer Program	2001-2005	Length / Age Comps & Mean Weights	Jim Hastie / Cameron Hagstrom	<a href="mailto:Jim.Hastie@noaa.gov">Jim.Hastie@noaa.gov</a> or <a href="mailto:Cameron.Hagstrom@noaa.gov">Cameron.Hagstrom@noaa.gov</a>	March 2007
West Coast Groundfish Observer Program	2003-Present	Questions on data collection / program	Janell Majewski	<a href="mailto:Janell.Majewski@noaa.gov">Janell.Majewski@noaa.gov</a>	NA
OR Shoreside Hake		Biological samples reside in Newport - Not PacFIN	Primary: Lori Jesse Secondary: Mark Saelens		
At-Sea Hake Observer	1991-Present	Bycatch weights and counts	Vanessa Tuttle	<a href="mailto:Vanessa.Tuttle@noaa.gov">Vanessa.Tuttle@noaa.gov</a>	Data are updated frequently during fishing season (opens mid-May)
At-Sea Hake Observer	2003-Present	Bycatch sexed lengths and ages	Vanessa Tuttle	<a href="mailto:Vanessa.Tuttle@noaa.gov">Vanessa.Tuttle@noaa.gov</a>	Data are updated frequently during fishing season (opens mid-May)
Edison S. Cal.			Kevin Herbison		Impingement data
Submersible surveys		Washington areas (WDFW) California areas (SWFSC)	Tom Jagielo Mary Yoklavich	jagiethj@dfw.wa.gov <a href="mailto:Mary.Yoklavich@noaa.gov">Mary.Yoklavich@noaa.gov</a>	
S California Hook and line survey			John Harms	<a href="mailto:John.Harms@noaa.gov">John.Harms@noaa.gov</a>	
IPHC Hook and line			Claude Dykstra		

**Table 2. Summary of Priors Used in 2005 West Coast Groundfish Stock Assessments. Compiled by Laura Bozzi (PFMC) and John Field (NMFS)**

Species	Steepness of S/R curve (h)		Sigma R*		von-Bertalanffy growth coefficient (K)		Natural Mortality (M)	
	value	method	value	method	females	males	females	males
Blackgill rockfish	0.65	fixed	0.5	fixed	0.068	0.04	0.04	0.04
Bocaccio rockfish	0.21	estimated	1	fixed	0.19	0.21	0.15	0.15
Cabazon	0.7	fixed	1	fixed	0.2	0.2	0.25	0.3
California scorpionfish	0.7	estimated	1	fixed	0.13	0.12	0.25	0.25
Canary rockfish	0.32	estimated	0.4	fixed	0.14	0.175	0.06 (young) 0.09 (old)	0.06
Cowcod	0.5	fixed	0	deterministic	0.06	0.06	0.055	0.055
Darkblotched rockfish	0.95	fixed	0.83	iterated	0.2	0.25	0.07	0.07
Dover sole	0.8	fixed	0.35	fixed	0.1189	0.0732	0.09	0.09
English sole	0.83	estimated	0.36	iterated	0.23-0.40 a/	0.28-0.48 a/	0.26	0.26
Gopher rockfish	0.65	fixed	0.5	fixed	0.186	0.186	0.2	0.2
Lingcod	0.9	fixed	1	fixed	LCN: 0.104 LCS: 0.145	LCN: 0.149 LCS: 0.223	0.18	0.32
Longspine thornyhead	0.75	fixed	0.6	fixed	0.064	0.064	0.06	0.06
Kelp greenling	0.7	fixed	1	fixed	0.3 c/	0.4 /c	0.26	0.26
Pacific whiting	0.75	fixed	1.13	iterated	0.33	0.33	0.23	0.23
Pacific Ocean perch	0.55	estimated	1	fixed	N/A b/	N/A b/	0.051	0.051
Petrable sole	North: 0.88 South 0.72	estimated	North: 0.50 South: 0.46	iterated	0.08	0.08	0.2	0.2
Sablefish	0.34	est. with prior	0.68	iterated	0.246	0.298	est. with prior	est. with prior
Shortspine thornyhead	0.6	fixed	0.5	fixed	0.018	0.018	0.05	0.05
Starry flounder	0.8	fixed	1	fixed	0.251	0.426	0.3	0.45
Widow rockfish	0.28	estimated	0.5	fixed	North: 0.14 South: 0.2	North: 0.18 South: 0.25	0.125	0.125
Yelloweye rockfish	0.44	fixed	0.5	fixed	0.0664	0.0664	0.036	0.036
Yellowtail rockfish	N/A	N/A	N/A	N/A	0.07-0.23	0.08-0.25	0.11-0.28	0.11

**Appendix C. 2007 West Coast Groundfish STAR Panel Schedule**

<b>Stock</b>	<b>Assessment</b>	<b>Lead Author(s)</b>	<b>2007 STAR Panel Dates</b>
Pacific hake/whiting	Full	Tom Helser & Steve Martell	Feb. 5-9
Longnose skate	Full	Vlada Gertseva	May 7-11
Sablefish	Full	Michael Schirripa	May 7-11
Black rockfish (N&S)	Full	David Sampson & Farron Wallace	May 21-25
Blue rockfish (Calif)	Full	Meish Key	May 21-25
Bocaccio	Full	Alec MacCall & Steve Ralston	June 25-29
Chilipepper rockfish	Full	John Field	June 25-29
Darkblotched rockfish	Full	Owen Hamel	July 16-20
Canary rockfish	Full	Ian Stewart	July 30-Aug. 3
Arrowtooth flounder	Full	Isaac Kaplan & Tom Helser	July 30-Aug. 3
Yelloweye rockfish	Update	John Wallace	June 11-13
English sole	Update	Ian Stewart	June 11-13
Pacific ocean perch	Update	Owen Hamel	June 11-13
Cowcod	Update	EJ Dick and Steve Ralston	June 11-13
Widow rockfish	Update	Xi He	June 11-13