

**A Summary Report from
The West Coast Groundfish Data Workshop
held July 26-30, 2004
in Seattle, Washington**

**Northwest Fisheries Science Center
February 16, 2005**

Introduction

The following report summarizes the discussion and outcomes from the West Coast Groundfish Data Workshop, held July 26-30, 2004 at the NOAA Western Regional Center in Seattle, Washington. This workshop was the second of three “Off-Year” Science Improvement Workshops convened during 2004 for the purpose of preparing for the West Coast groundfish stock assessments to be conducted in 2005. The objectives of this workshop were to identify and discuss data and data sources to be used in conducting the 2005 assessments, to discuss and review methods for converting raw data into model inputs, and to explore the potential use of additional data sources in future stock assessments. Workshop participants included data experts from Washington, Oregon, California and NOAA Fisheries, West Coast groundfish stock assessment authors, members of the Scientific and Statistical Committee of the Pacific Fishery Management Council, and the public. Stacey Miller, Elizabeth Clarke, and James Hastie from the Fishery Resource Analysis and Monitoring Division (FRAMD) of the Northwest Fisheries Science Center (NWFSC) organized the workshop.

The first session of the workshop provided an opportunity for data stewards to present overviews of the principal data sources used in West Coast groundfish stock assessments. During the second session, data analysts and stock assessment authors presented methods that have been or could be used to analyze and pre-process input data from each of the principal data sources. The presentations were followed by technical discussions among workshop participants. Presentations and discussions on the use of secondary data sources and exploratory data sources that may be available during the next assessment cycle took place during the third session of the workshop. The recommendations, discussion points, and action items contained in this report were outlined during the wrap up session moderated by Elizabeth Clarke (NWFSC).

Workshop participants attempted to agree on default assumptions regarding how the various types of data are to be analyzed. Assessment authors are expected to produce and consider the default approaches in the assessments. Authors are free to add additional analyses, but must justify their approach and should notify other authors using the same data types of what they plan to do.

Session I. Introduction of Principal Data Sources

Data stewards presented overviews of available data, sampling methodology, data collection and storage, and the process for requesting data for each of the data sources. Presentations were followed by a brief question and answer period. Points of contact for each of the data sources are included in Appendix III.

Beth Horness (NWFSC) presented an overview of the Northwest Fisheries Science Center bottom-trawl groundfish survey, including the history and general features of the survey, sampling design, data collection, an overview of the database and available data, and future plans for the survey and database. Beth Horness is the point of contact for the NWFSC survey data (1998-present) and the 2004 NWFSC triennial shelf survey data. Mark Wilkins from the Alaska Fishery Science Center (AFSC) is the point of contact for the 1977-2001 AFSC triennial shelf survey data

William Daspit of the Pacific States Marine Fisheries Commission (PSMFC) gave a presentation on the Pacific Fisheries Information Network (PacFIN), which is the central repository for commercial catch, effort, and biological data along the West Coast. He provided an overview of the goals and purpose of the program, the general framework of the PacFIN database, along with a more detailed explanation of the sources contributing data to PacFIN and the data submission and review processes. William Daspit, Brad Stenberg, and Jason Sawicki are the points of contact at PSMFC for PacFIN data. The PacFIN coordinators for each of the states are listed on the PacFIN website www.psmfc.org/pacfin/contacts.html.

Jonathan Cusick and Kristen Moynihan provided an overview of the West Coast Groundfish Observer Program (WCGOP). Jonathan presented a summary of the program by highlighting the program goal of providing managers with accurate estimates of discards, the sampling methodology, vessel selection process, and collection of data. Kristen Moynihan followed with a presentation on the general framework of the database, data flow, and types of data stored in the database. A copy of the NWFSC 2004 WCGOP Data Report and Summary Analysis was provided on the workshop background materials CD. Jonathan Cusick is the point of contact for WCGOP data and data summary reports.

Wade Van Buskirk (PSMFC) presented information on the Recreational Fisheries Information Network (RecFIN), which has been designed to integrate state and federal marine recreational fishery sampling efforts into a single, central database. In addition to discussing the RecFIN database framework and the process for retrieving data from the RecFIN website, he also provided an overview of the Marine Recreational Fisheries Statistics Survey (MRFSS). The MRFSS data are used as base data in the RecFIN database. Background materials pertaining to RecFIN were provided on CD Rom and included The MRFSS User's Manual, a memorandum to the RecFIN Technical committee, and a letter summarizing RecFIN. Wade Van Buskirk is the point of contact for RecFIN related questions.

Overviews on recreational fishery sampling efforts conducted by Washington, Oregon, and California were also presented during this session. Farron Wallace presented information on Washington's Ocean Sampling Program (OSP). Three background documents describing the OSP basic program functions, historical accounting of changes in data collection fields, and algorithms to generate catch estimates were provided as part of the data workshop background materials. David Sampson from Oregon State University (OSU) provided an overview of Oregon's Ocean Recreational Boat Survey (ORBS) including the general history of the program, features and examples of the ORBS data for groundfish, and issues with using groundfish CPUE data from ORBS. Additional details on the ORBS program can be found on the data workshop background materials CD in a document titled "Oregon's Ocean Recreational Boat Survey" by David Sampson.

Tom Barnes from the California Department of Fish and Game (CDFG) presented a summary of California's Commercial Passenger Fishing Vessel (CPFV) Data including a an overview of the CPFV program history, logbook data, the Northern/Central California's CPFV onboard data collection program conducted during 1987–1998, and the Southern California's CPFV onboard data collection program conducted by CDFG during 1975-1978, 1986-1989, and 1999. Additional details on the CPFV logbook data can be found in the background document titled "Historical logbook databases from California's Commercial Passenger Fishing Vessel (Partyboat) Fishery, 1936-1997" by Hill et al. (1999). Deb Wilson-Vandenberg provided a summary of California recreational [fishing] regulatory history from 2000-03 for the background materials CD. The points of contact for CPFV data are as follows: Jana Robertson from CDFG for trip-specific CPFV logbook data from 1980-present; Kevin Hill (SWFSC) for historical logbook data; Deb Wilson-Vandenberg (CDFG) for the Northern/Central CA onboard data collection program data; and Steve Ralston (SWFSC) for the Southern CA onboard data collection program data.

Session II. Discussion of Principal Data Sources

NOAA Fisheries' Bottom Trawl Surveys.

Owen Hamel (NWFSC) presented methods for calculating traditional area-swept biomass estimates and building age and length compositions using bottom trawl survey data. The methodology is described in a document titled "The calculation of summary statistics for the Pacific West Coast upper continental slope trawl survey of groundfish resource off Washington, Oregon, and California" included on the background materials CD. Tom Helser (NWFSC) presented an analysis of a multi-vessel fishery resource survey using a generalized linear mixed model.

Recommendations and Action Items:

General

- 1) The 2004 survey data should be included in upcoming assessments. It is anticipated that the NWFSC 2004 triennial shelf survey data will be available by

January 15, 2005 and the NWFSC 2004 slope survey data by February 15, 2005. (Please note that the dates for availability of 2004 survey data have been extended in order to ensure accuracy and reliability of data).

- 2) Biological samples from the survey (i.e. aging structures) should be transmitted to the appropriate aging lab as soon as possible upon the completion of the surveys.
- 3) Exploratory work on whether trawlable and untrawlable areas should be differentiated when expanding density estimates from trawl data will be conducted by the NWFSC and reported to the modeling workshop in October 2004.
- 4) Additional discussion should occur at the modeling workshop in October 2004 on collapsing bin structure for ages and/or lengths instead of utilizing age-length keys.
- 5) Criteria to decide whether an assessment is an “update” or a “full assessment” when new data are used in the assessment should be included in the new Terms of Reference for Stock Assessments.

Shelf Surveys

- 1) Mark Wilkins from the Alaska Fishery Science Center (AFSC) is the point of contact for the AFSC triennial survey (1977-2001). Beth Horness at the Northwest Fisheries Science Center is the point of contact for the 2004 triennial shelf survey data.
- 2) The traditional area-swept biomass estimator will be the default for the triennial shelf survey conducted by the AFSC (1977-2001) and the NWFSC (2004) for the 2005 West Coast groundfish stock assessments. The NWFSC will coordinate with the AFSC to ensure the same methods will be used across all years to calculate biomass estimates and incorporate biological samples, ages, and lengths.
- 3) Due to coverage inconsistency for the triennial survey, 1977 data should not be used unless analysts can make a specific case on a species by species basis.
- 4) In keeping with the general need for simplicity, vessel effect in the triennial survey is noted as a potential topic for future analysis, but will not be addressed during this assessment cycle.
- 5) Mr. Mark Wilkins (AFSC) will re-code the performance field of the hauls identified as "waterhauls" by Zimmermann et al. 2001. The “waterhauls” in the triennial survey will be excluded in all analyses by default.

Slope Surveys

- 1) Workshop participants recommend treating the two slope surveys conducted by the AFSC using the R/V Miller Freeman and the NWFSC using chartered West Coast commercial fishing vessels, separately and applying separate generalized linear models (GLM's) to each survey.
- 2) Assessments should not include age- and length-composition data from the slope survey for years for which the survey was non-synoptic and biomass estimates are consequently based on a “super-year” approach, unless the survey covered a substantial portion of the stock's range.
- 3) Tom Helser (NWFSC) will produce GLM estimates for dover sole, thornyheads, and sablefish (DTS) and slope rockfish species and will also explore and report on

error models, specifically the error distribution assumed when analyzing the data for positive tows for each of the slope species.

Commercial Data Sources

The session on commercial data sources consisted of presentations on retrieving commercial landings and biological data from the Pacific Fishery Information Network (PacFIN) given by Ian Stewart (NWFSC) and the California Commercial database (CalCOM) given by Alec MacCall (SWFSC). Ian Stewart provided a current inventory of PacFIN biological sample data for West Coast groundfish species being assessed in 2005. Alec MacCall provided CalCOM documentation as part of the workshop background materials. Randy Fishery (PSMFC) moderated the session.

Recommendations and Action Items:

General

- 1) All assessments should use data through 2004, to the extent that the data are available.

PacFIN Landings

- 1) Analysts should include only landings from U.S. offshore waters. Foreign catch (i.e. catch occurring outside of U.S. waters) and landings from Puget Sound should not be included.
- 2) Commercial landings summaries, or programming to easily extract them from PacFIN, will be available from Ian Stewart (NWFSC), and will maintain detail regarding the gear group and INPFC area of the catch.

PacFIN Biological Data System (BDS)

- 1) Assessment documents should list both the number of fish and the number of samples from which the biological data are drawn.
- 2) Routines for extracting biological data from PacFIN should include the size of the landing from which each sample is drawn, if that information is available.
- 3) Emphasis will be on submission and extraction of length data, rather than age data from the landings data for 2004. However, an effort will be made to age and submit to BDS a representative set of ages from the 2004 commercial fishery for assessments that include age-composition data, and have STAR panels scheduled for the summer rather than spring of 2005.
- 4) States should submit biological data such as length and age data to PacFIN promptly. Specifically, states need to submit age data to PacFIN after age reading is completed and data are delivered back to the states. A high priority should also be placed on submitting complete 2004 length data to PacFIN as early as possible in 2005. As of the end of July, only one state had submitted biological data for 2003.
- 5) PacFIN will develop a web-based summary of BDS data elements. (This summary was completed subsequent to the data workshop).

- 6) Assessment authors should provide feedback to Ian Stewart on biological data that were previously used in stock assessments that do not appear in current BDS summary tables.
- 7) Assessment authors need to compile and submit BDS errors and fixes to PacFIN data coordinators or other designee via email. Please Cc PacFIN so that they can track the completion.

CALCOM

- 1) PacFIN is working with the California Department of Fish and Game (CDFG) to accommodate data feeds of the “extreme” species composition expansions within the next few months. With the traditional species composition proportions currently provided to PacFIN, poundage landed in market categories is only distributed to individual species when composition sampling has occurred in the same gear/time/area stratum as a landing. The “extreme” expansions distribute all poundage landed in market categories to specific species.

Observer Data

Presentations and discussion during the observer data session focused on methodologies to estimate species discard tonnage for use in calculating total removals. Jim Hastie presented challenges to estimating discard, an overview of data sets and methods used to calculate historical discards, as well as a “simple” model to estimate current discard using data collected by the West Coast Groundfish Observer Program (WCGOP). Han-Lin Lai (NWFSC) presented advanced model techniques to estimate current discards using WCGOP data. Jim Hastie (NWFSC) moderated the session.

Recommendations and Action Items:

- 1) The “simple” bycatch model is endorsed for estimating discard using WCGOP observer data since it has been reviewed by the Scientific and Statistical Committee (SSC) of the Pacific Fishery Management Council (PFMC), is used for in-season management by the PFMC, and employs fairly simple methods.
- 2) The proposed “simple method” for estimating discard should be used until a formal review of the methods for estimating recent and historic discard can be conducted.
- 3) While employing the “simple method” to estimate discard, year-specific WCGOP data will be used to estimate discard in 2002 and 2003. There will be no pooling across calendar years for 2002-03 periods. The WCGOP data will be pooled from all years to estimate discard in 2000 and 2001. Authors assessing species with strong 1999-year classes will need to evaluate whether discard ratios based on data from 2002 and early-2003 are apt to overstate discard occurring during 2000-01.
- 4) Scientists from the NWFSC will evaluate stratification alternatives and develop annual estimates of discard by INPFC area for 2000-03 for species being assessed in 2005.
- 5) Scientists from the NWFSC will assemble and distribute to authors a compilation of historical discard assumptions used in the most recent assessments. This

compilation will be provided during the modeling workshop being held at the end of October, 2004 in Seattle, Washington.

- 6) The NWFSC will explore the potential for making historical observer data, Pikitch et al. (1988) and Oregon Department of Fish and Wildlife's Enhanced Data Collection Program (EDCP) data available to assessment authors for exploratory analysis.
- 7) Scientists from the NWFSC will explore the availability of length frequency data and average weights from observer data.
- 8) Discussion on how best to handle discard in stock assessment models will be continued at the Modeling Workshop at the end of October

Historical and Foreign Commercial Catch Data

Analyses to estimate historical and foreign components of commercial data were discussed in a session held on the afternoon of Wednesday, July 28. Steve Ralston (SWFSC) presented a summary of references that could be used to reconstruct pre-1981 data needed because PacFIN houses commercial data only for years from 1981 forward. He also described an approach used to estimate historical catches for the black rockfish assessment conducted by Ralston and Dick (2003). Ian Stewart (NWFSC) presented an overview of the Historical Annotated Landings database (HAL), which currently resides with PacFIN. Jean Rogers (NWFSC) reviewed her research of allocating the total catch by foreign countries from 1965 through 1976 off Washington, Oregon, and California among individual *Sebastes* and *Sebastolobus* species.

Recommendations and Action Items:

Reconstructing Pre-1980 Data

- 1) Authors should document the original data (including the sources), the reconstructed data, and the methods applied to determine the reconstructed data, in assessments that reconstruct historical catch data.
- 2) Authors should conduct sensitivity analyses to investigate the effects of including historic catch data in stock assessments.

Foreign Catch Species Composition

- 1) The default assumption for species composition of historical foreign catches of *Sebastes* and *Sebastolobus* spp. (1965-1987 off Washington, Oregon, and California) is to use the results of Rogers (2003).

HAL Database

- 1) Use the HAL database with caution. There has been little quality control and mistakes, such as typing errors and duplicates, were found during a preliminary check.

Data repository for Historical and Foreign Catch Data

- 1) The NWFSC will investigate developing an electronic repository to store historical commercial catch data reports such as the US-Canada Technical-Scientific Committee (TSC) Reports and/or the PFMCI data series, grey literature, and any additional documents as needed.

Recreational Data

Tom Jagielo (WDFW, SSC) presented the outcomes from the Recreational CPUE Statistics Workshop held in Santa Cruz, California June 28-29, 2004 during the Recreational data session. The 2-day workshop was held to 1) provide recommendations to data stewards to identify the needs of data analysts and stock assessment scientists who seek to incorporate recreational data into groundfish stock assessments and derive indices of relative abundance from recreational CPUE statistics, 2) review analytical methods including calculation of effective fishing effort, General Linear Model (GLM) analysis, discard analysis, and bag limit analysis, 3) review existing datasets to identify potential problems and data gaps with respect to calculation of CPUE statistics for use in stock assessments, and 4) provide recommendations, as may be appropriate, to develop revisions to the SSC Terms of reference for stock assessments with respect to incorporating recreational data into groundfish stock assessments. A final report on the workshop findings and recommendations will be available from the SSC of the PFMC.

Recruitment Survey Data

Steve Ralston (SWFSC) presented a brief description of the California pelagic juvenile rockfish midwater trawl survey. Guy Fleischer followed with a presentation describing the Pacific Whiting Conservation Cooperative-National Marine Fisheries Service (PWCC-NMFS) hake/rockfish pre-recruit survey. Elizabeth Clarke (NWFSC) moderated the session.

Recommendations and Discussion Points:

- 1) Information for the southern juvenile rockfish survey will be available from the SWFSC Santa Cruz laboratory. Northern juvenile survey data will be available from the NWFSC. Please note that both surveys have expanded spatial coverage in recent years although integrated coast wide juvenile survey data are not yet ready for use. There is hope that data from these surveys can be combined by 2006.
- 2) Workshop participants noted that southern survey findings are generally consistent with age compositions from stock assessments.

CalCOFI Ichthyoplankton and Zooplankton Surveys

Christian Reiss (SWFSC) presented an overview of the California Cooperative Oceanic Fisheries Investigations (CalCOFI) ichthyoplankton surveys. Ric Brodner (NWFSC) presented the CalCOFI North ichthyoplankton and zooplankton survey data.

Recommendations and Discussion Points:

- 1) Extensive data are scheduled to be available online from CalCOFI in one year. Richard Charter (SWFSC) is the point of contact until the data are available online.
- 2) Data do not yet include Monterey Bay Aquarium Research Institute (MBARI) surveys. Workshop participants recommend the MBARI survey data be included by 2006.
- 3) Most rockfish from the ichthyoplankton surveys are not yet identified to species. Genetic work to identify rockfish species will improve in the future.

- 4) Ichthyoplankton information from the NWFSC will be integrated into the CalCOFI database but most rockfish are not identified.
- 5) Authors should give considerable thought about the relevant time periods, geographic area, and/or gear types used as part of the generation of input files for the assessment of any species in which CalCOFI data may be used.

Session III. Secondary and Exploratory Data

The following presentations were given during the first half of the secondary and exploratory data session: Use of the Pacific whiting observer bycatch index and California power plant impingement data by Alec MacCall (SWFSC); California trawl logbook CPUE by Steve Ralston (SWFSC) based on Ralston, S. 1999. Environmental data sources and potential uses by Michael Schirripa (NWFSC); and the use of genetics in stock assessments by Ewann Berntson (NWFSC) and Paul Moran (NWFSC). Steve Ralston also presented a study conducted by Mary Yoklavich (SWFSC) and Milton Love (UCSB) on evaluating ecological recovery in Southern California's cowcod conservation area. Andre Punt (UW, SSC) moderated the session.

Waldo Wakefield (NWFSC) facilitated the second half of the session on exploratory data, which, consisted of presentations on submersible and in situ observational survey data and habitat mapping efforts. The first presentation, an analysis relating high-resolution submersible and ROV observational data to regional trawl survey data was given by Waldo Wakefield. Tom Jagielo (WDFW) followed with a presentation on the density of demersal groundfish in untrawlable habitat on the continental shelf of Washington. Waldo Wakefield also gave a talk on submersible studies on yelloweye rockfish being conducted in Southeastern Alaska by Victoria O'Connell of Alaska Department of Fish and Game (ADFG) and an overview of current habitat mapping efforts. Chris Romsos (OSU) provided details of the Benthic Habitat Database for Oregon and Washington. Background materials included two manuscripts by Lauth et al. currently in press. Waldo Wakefield also distributed a bibliography of papers, reports and data sets containing direct count information for the U.S. West Coast and for West Coast species in British Columbia and Alaska which is included in Appendix IV.

Farron Wallace (WDFW) provided a brief presentation on the availability of length data in the Coastal Washington Arrowtooth EFP Fishery and rockfish bycatch data in the International Pacific Halibut Commission (IPHC) survey data. Tom Barnes (CDFG) followed with a presentation on California Spearfishing Tournament data and archived California data sets which are available online at http://gis.ca.gov/catalog/BrowseCatalog.epl?id=188&show_datasets=1.

Recommendations and Action Items:

- 1) Authors need to review the additional data sources discussed during the secondary and exploratory data sessions and their utility when developing a final list of data sources for each assessment.
- 2) Exploring the development of environmentally explicit stock assessments is encouraged.

- 3) Priorities for new genetics studies and stock identification work need to be identified as soon as possible and at the very least, as an outcome of the upcoming stock assessments.
- 4) Concern was expressed regarding the disparity among STAR panels of including or excluding data. The question of whether there should be more consistency in the inclusion or exclusion of data is addressed to the SSC and specifically, the Stock Assessment Terms of Reference.
- 5) Discussion on whether it is possible to include a minimum estimate of abundance or biomass derived from in situ observations in stock assessment models was deferred to the modeling workshop.

References

Hill, K., and N. Schneider. 1999. Historical logbook databases from California's commercial passenger fishing vessel (partyboat) fishery, 1936-1997. SIO Reference Series No. 99-19.

Lauth, R., J. Ianelli, and W. Wakefield (in press). Estimating the size selectivity and catching efficiency of a survey bottom trawl for thornyheads, *Sebastes* spp., using a towed video camera sled. Fisheries Research.

Lauth, R., W. Wakefield, and K. Smith. (in press). Estimating the density of thornyheads, *Sebastes* spp., using a towed video camera sled. Fisheries Research.

Pikitch, E.K., D.L. Erickson, and J.R. Wallace. 1988. An evaluation of the effectiveness of trip limits as a management tool. NWAFC Processed Report 88-27.

Ralston, S. 1999. Trends in standardized catch rate of some rockfishes (*Sebastes* spp.) from the California trawl logbook database, NMFS - SWFSC Admin. Rep. SC-99-01.

Ralston, S and E. Dick. 2003. The Status of Black Rockfish (*Sebastes melanops*) Off Oregon and Northern California in 2003. In Pacific Fishery Management Council. 2003. *Volume I Appendix: Status of the Pacific Coast Groundfish Fishery Through 2003: Stock Assessment and Fishery Evaluation*. Pacific Fishery Management Council, 7700 NE Ambassador Place, Suite 200, Portland, Oregon 97220-1384.

Rogers, J. B. 2003. Species allocation of *Sebastes* and *Sebastes* sp. caught by foreign countries from 1965 through 1976 off Washington, Oregon, and California, USA. NOAA Tech Memo NMFS-NWFSC-57.

Zimmerman, M. M.E. Wilkins, K.L. Weinberg, R.R. Lauth, and F.R. Shaw. Retrospective analysis of suspiciously small catches in the National Marine Fisheries Service West Coast Triennial Bottom Trawl Survey. AFSC Processed Report 2001-03. National Marine Fisheries Service.

APPENDIX I. WEST COAST GROUND FISH WORKSHOP AGENDA

West Coast Groundfish Data Workshop July 26-July 30, 2004 Seattle, Washington

Monday, July 26, 2004

12:30 p.m. Welcome, Elizabeth Clarke, NWFSC

Session I. Introduction of Principal Data Sources

Moderator: Stacey Miller, NWFSC

- 12:45 p.m. NWFSC Trawl Survey Data – Beth Horness, NWFSC
- 1:45 p.m. Commercial Data: Catch/Effort/Biological Samples–William Daspit, PSMFC
- 2:45 p.m. *Break*
- 3:00 p.m. West Coast Groundfish Observer Data –Jonathan Cusick and Kristen Moynihan, NWFSC
- 4:00 p.m. Marine Recreational Fisheries Statistics Survey (MRFSS) – Wade Van Buskirk, PSMFC
- 4:25 p.m. California’s Commercial Passenger Fishing Vessel Data (CPFV) – Tom Barnes, CDFG
- 4:45 p.m. Oregon’s Ocean Recreation Boat Survey (ORBS) – David Sampson, OSU
- 5:05 p.m. Washington’s Ocean Sampling Program (OSP) – Farron Wallace, WDFW

Tuesday, July 27, 2004

Session II. Detailed Discussions of Principal Data Sources

NMFS Trawl Survey Data

Moderator: Guy Fleischer, NWFSC

- 8:30 a.m. Generating Biomass Indices - Owen Hamel, NWFSC
- 9:00 a.m. A GLMM Analysis of a Multi-Vessel Fishery Resource Survey - Tom Helser, NWFSC
- 9:30 a.m. Building Age and Length Comps – Owen Hamel, NWFSC
- 10:00 a.m. Discussion
- 10:30 a.m. *Break*
- 10:45 a.m. Discussion of trawl survey data continued
- 12:30 p.m. *Lunch*

Commercial Data Sources

Moderator: Randy Fisher, PSMFC

- 1:30 p.m. PacFIN Landings and Biological Samples – Ian Stewart & Jim Hastie, NWFSC
- 2:15 p.m. CalCOM – Alec MacCall, SWFSC
- 3:00 p.m. Discussion
- 3:15 p.m. *Break*
- 3:30 p.m. Discussion of commercial data continued

Wednesday, July 28, 2004

Session II. Detailed Discussions of Principal Data Sources Continued

Observer Data

Moderator: Jim Hastie, NWFSC

- 8:30 a.m. Evolution of Discard Estimation on the West Coast: Where do we go from here? - Jim Hastie, NWFSC
- 9:00 a.m. Methods for Calculating Total Discards – Han-Lin Lai, NWFSC
- 10:00 a.m. Discussion
- 10:30 a.m. *Break*
- 10:45 a.m. Discussion of observer data continued
- 12:30 p.m. *Lunch*

Historical and Foreign Commercial Catch Data

Moderator: Rick Methot, NOAA Fisheries

- 1:30 p.m. Reconstructing Pre-1980 Data- Steve Ralston, SWFSC
- 1:50 p.m. HAL Database – Ian Stewart and Jim Hastie, NWFSC
- 2:10 p.m. Foreign Catch Comps – Jean Rogers, NWFSC
- 2:30 p.m. Discussion
- 3:15 p.m. *Break*

Recreational Data

Moderator: Tom Jagielo, WDFW

- 3:30 p.m. Draft Report from Recreational CPUE Statistics Workshop – Tom Jagielo, WDFW
- 4:00 p.m. Discussion

Thursday, July 29, 2004

Session II. Detailed Discussions of Principal Data Sources (Continued)

Recruitment Survey Data

Moderator: Elizabeth Clarke, NWFSC

- 8:30 a.m. California Juvenile Rockfish Survey- Steve Ralston, SWFSC
- 9:15 a.m. PWCC-NMFS Hake/Rockfish Pre-recruit Survey – Guy Fleischer, NWFSC
- 10:00 a.m. Discussion
- 10:30 a.m. *Break*

CalCOFI Ichthyoplankton Data

- 10:45 a.m. Overview of CalCOFI Ichthyoplankton Data – Christian Reiss, SWFSC
- 11:15 a.m. CalCOFI North: Ichthyoplankton and Zooplankton Data – Ric Brodeur, NWFSC
- 11:45 a.m. Discussion
- 12:30 p.m. *Lunch*

Session III. Secondary and Exploratory Data

Moderator: **Andre Punt, UW**

- 1:30 p.m. Pacific Whiting Observer Bycatch Index – Alec MacCall, SWFSC
- 1:45 p.m. California Powerplant Impingement Data – Alec MacCall, SWFSC
- 2:00 p.m. California Trawl Logbook CPUE – Steve Ralston, SWFSC
- 2:30 p.m. Environmental Data – Michael Schirripa, NWFSC
- 3:15 p.m. *Break*
- 3:30 p.m. Genetics and Stock Structure – Paul Moran and Ewann Berntson, NWFSC

Friday, July 30, 2004

Session III. Secondary and Exploratory Data Continued

Moderator: Stacey Miller and Waldo Wakefield, NWFSC

- 8:30 a.m. Submersible In Situ Observational Data – Waldo Wakefield NWFSC, Tom Jagielo WDFW, and Steve Ralston SWFSC.
- 9:15 a.m. Discussion
- 9:45 a.m. Habitat Surveys – Waldo Wakefield, NWFSC and Chris Romsos, OSU
- 10:30 a.m. *Break*
- 10:45 a.m. IPHC Survey Data – Farron Wallace, WDFW
- 11:00 a.m. California Spearfishing Tournament – Tom Barnes, CDFG
- 11:15 a.m. Other Data Sources Not Previously Discussed
- 12:30 p.m. *Lunch*

Session IV. Wrap Up, Discussion, and Recommendations

Moderator: Elizabeth Clarke

- 1:30 p.m. Review list of data sources to be used by all authors
- Discuss timeline for compiling a list of preferred methodologies for analyzing primary data sources
- Discuss opportunities and problems of using any of the data sources identified during the workshop

APPENDIX II. WORKSHOP PARTICIPANTS

Tom Barnes, CDF&G
Matt Barnhart, NWFSC
Jim Benante, PSMFC
Ewann Bertson, NWFSC
Ric Brodeur, NWFSC
Ed Casillas, NWFSC
Elizabeth Clarke, NWFSC
Dave Colpo, PSMFC
Jason Cope, UW, NWFSC
Steve Copps, NWR
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Jonathan Cusik, NWFSC
William Daspit, PSFMC
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Martin Dorn, SSC, AFSC
Eric Eisenhardt, WDFW
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Randy Fisher, PSFMC
Guy Fleischer, NWFSC
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Melissa Haltuch, UW, NWFSC
Owen Hamel, NWFSC
Jim Hastie, NWFSC
Tom Helser, NWFSC
Jon Hess, NWFSC
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Tom Jagielo, WDF&W
Steve Joner, Makah Tribe
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Han-Lin Lai, NWFSC
Todd Lee, NWFSC
Carl Lian, NWFSC
Alec MacCall, SWFSC
Janell Majewski, NWFSC
Rick Methot, NWFSC
Stacey Miller, NWFSC
Paul Moran, NWFSC
Kristen Moynihan, NWFSC
Pat Patterson, NWFSC
Kevin Piner, SWFSC
Andre Punt, UW and SSC
Steve Ralston, SWFSC and SSC
Christian Reiss, SWFSC
Jean Rogers, NWFSC
Chris Romsos, OSU
David Sampson, OSU and SSC
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Brad Stenberg, PSMFC
Ian Stewart, NWFSC
Ian Taylor, UW
Theresa Tsou, WDFW
Wade Van Buskirk, PSMFC
Waldo Wakefield, NWFSC
Farron Wallace, WDFW
John Wallace, NWFSC
Vidar Weststad, PWCC
Mark Wilkins, AFSC
Curt Whitmire, NWFSC

APPENDIX III. POINTS OF CONTACT FOR DATA SOURCES

Data Source	Contacts	Email Address
NWFSC Survey Data (1998-Present)	Beth Horness	Beth.Horness@noaa.gov
Triennial Shelf Survey Data (2004)	Beth Horness	Beth.Horness@noaa.gov
Triennial Shelf Survey Data (1977-2004)	Mark Wilkins	Mark.Wilkins@noaa.gov
PacFIN data	William Daspit	William_Daspit@psmfc.org
PacFIN data	Brad Stenberg	Brad.Stenberg@psmfc.org
PacFIN data	Jason Sawicki	Jason_Sawicki@psmfc.org
West Coast Groundfish Observer Program data	Jonathan Cusick	Jonathan.Cusick@noaa.gov
RecFIN data	Wade Van Buskirk	Wade@psmfc.org
CDFG CPFV trip-specific logbook (1980-Present)	Jana Robertson	CDFG, 4665 Lampson Avenue, Suite C Los Alamitos, CA 90720 Fax: 562-342-7137
CDFG CPFV historical logbook data	Kevin Hill	Kevin.Hill@noaa.gov
Northern/Central CA Onboard Data Collection Program	Deb Wilson-Vandenberg	dwilsonv@dfg.ca.gov
Southern CA Onboard Data Collection Program	Steve Ralston	Steve.Ralston@noaa.gov

APPENDIX IV. BIBLIOGRAPHY FOR DIRECT COUNT INFORMATION FOR THE U.S. WEST COAST.

This bibliography contains a list of papers, reports and data sets containing direct count information for the U.S. West Coast and for West Coast species in British Columbia and Alaska. It was assembled by Waldo Wakefield, NOAA Fisheries, Northwest Fisheries Science Center FRAM Division, November 2004.

Papers and Reports:

Adams, P.B., J.L. Butler, C.H. Baxter, T.E. Laidig, K.A. Dahlin, and W.W. Wakefield (1995) Population estimates of Pacific Coast groundfishes from video transects and swept-area trawls. *Fish. Bull.* 93(3):446-455.

Allee, R.J., M. Dethier, D. Brown, L. Deegan, R.G. Ford, T.F. Hourigan, J. Maragos, C. Schoch, K. Sealey, R. Twilley, M.P. Weinstein, and M. Yoklavich. (2000). Marine and estuarine ecosystem and habitat classification. NOAA Technical Memorandum NMFS-F/SPO-43. 43 p.

Amend, M., M.M. Yoklavich, Y. Rzhanov, C.B. Grimes, and W.W. Wakefield. In Review. Mosaics of benthic habitats using laser line scan technology: it's in the details. *In* B. Todd and H.G. Greene, editors. *Marine benthic habitat mapping*. Geological Association of Canada, St. Johns, Newfoundland, Canada.

Anderson, T. J., M. M. Yoklavich, and S. L. Eittrheim. (In press). Linking fine-scale groundfish distributions with large-scale seafloor maps: issues and challenges of combining biological and geological data. *In* P. W. Barnes and J. P. Thomas (eds). *Benthic habitats and the effects of fishing*. American Fisheries Society, Symposium 41, Bethesda, Maryland.

Brock, R. J., J.A. Bohnsack, M.J. Fogarty, S.A. Murawski, M.M. Yoklavich, and M.S. Love. (2003). Marine fisheries of the USA: moving from single-species management to a more holistic ecosystem-based approach. pp 521-531, *IN*: Beumer, J.P., A. Grant, and D.C. Smith (eds), *Aquatic Protected Areas: What Works Best and How Do We Know?*, University of Queensland Printery, St. Lucia, Queensland, Australia. 689pp.

Butler, J. L., W. W. Wakefield, P. B. Adams, B. H. Robison, and C. H. Baxter. 1991. Application of line transect methods to surveying demersal communities with ROVs and manned submersibles. *Proceedings of the IEEE Oceans '91 Conference*.

Cailliet, G.M., A.H. Andrews, W.W. Wakefield, G. Moreno, and K.L. Rhodes. 1999. A comparison of the fish fauna from beam trawl samples, camera sled photographs and submersible observations in benthic deep-sea habitats off central California. *Oceanologica Acta*, 22:579-592.

- Drazen, J.C., S.K. Goffredi, B. Schlining, and D.S. Stakes. 2003. Aggregations of egg-brooding deep-sea fish and cephalopods on the Gorda Escarpment: a reproductive hot spot. *Biological Bulletin* 205:1-7.
- Else, P., Halderson, L., Krieger, K., 2002. Shortspine thornyhead (*Sebastolobus alascanus*) abundance and habitat associations in the Gulf of Alaska. *Fishery Bulletin* 100: 193-199.
- Grantham, B.A.; Chan, F.; Nielsen K.J., Fox, D.S.; Barth, J.A.; Huyer, A.; Lubchenco, J; Menge, B. 2004. Upwelling-driven nearshore hypoxia signals ecosystem and oceanographic changes in the northeast Pacific. *Nature* 429: 749-754.
- Greene, H.G. M.M. Yoklavich, R.M. Starr. V.M. O'Connell, W.W. Wakefield, D.E. Sullivan, J.E. McCrea, and G.M. Cailliet. 1999. A classification scheme for deep seafloor habitats. *Oceanologica Acta* 22(6):663-678.
- Greene, H.G., M.M. Yoklavich, V.M. O'Connell, R.M. Starr, W.W. Wakefield, C.K. Brylinski, J.J. Bizzarro, and G.M. Cailliet. 2000. Mapping and classification of deep seafloor habitats. International Council for the Exploration of the Sea (ICES) CM2000/T:08
- Greene, H.G., V.M. O'Connell, W.W. Wakefield, Brylinsky. The offshore Edgecumbe Lava Field, Southeast Alaska: Geologic and habitat characterization of a commercial fishing ground. *In* B. Todd and H.G. Greene, editors. *Marine benthic habitat mapping*. Geological Association of Canada, St. Johns, Newfoundland, Canada.
- Gunderson, D.R., 1993. *Surveys of fisheries resources*. John Wiley and Sons, Inc., New York, NY.
- Hixon, M. A., B. N. Tissot, and W. G. Percy. 1991. Fish Assemblages of rocky bBanks of the Pacific Northwest (Heceta, Coquille, and Daisy Banks). Final Report, OCS Study 91-0052, U. S. Minerals Management Service, Camarillo, California.
- Hixon, M. A. and B. N. Tissot 1992. Fish assemblages of rocky banks of the Pacific Northwest. Final Report Supplement, OCS Study 91-0025, U. S. Minerals Management Service, Camarillo, California.
- Jagiello, T. A. Hoffmann, J. Tagart, M. Zimmerman. 2003. Demersal groundfish densities in trawlable and untrawlable habitats off Washington: Implications for the estimation of habitat bias in trawl surveys. *Fishery Bulletin* 101:545-565.
- Krieger, K.J. 1993. Distribution and abundance of rockfish determined from a submersible and bottom trawling. *Fishery Bulletin* 91: 87-96.
- Krieger, K.J. and D.H. Ito. Distribution and abundance of rockfish determined from a submersible and by bottom trawling. *Fishery Bulletin* 97:87-96.

Laidig, T.E., J.R. Chess, E.S.Hobson, and D.F. Howard. In preparation. Long term trends in annual abundance of juvenile rockfish (*Sebastes* spp.) off northern California and possible mechanisms for the variation.

Lauerman, L.M.L, R.S. Kaufmann, K.L. Smith, Jr. 1996. Distribution and abundance of epibenthic megafauna at a long time-series station in the abyssal Northeast Pacific. *Deep-Sea Research (Part I)* 43(7): 1075-1103.

Lauth, R.R., W.W. Wakefield, K. Smith. 2004. Estimating the density of thornyheads, *Sebastolobus* spp., using a towed video camera sled. *Fisheries Research*. *Fisheries Research* 70:39-48.

Lauth, R.R., J. Ianelli, W.W. Wakefield. 2004. Estimating the size selectivity and catching efficiency of a survey bottom trawl for thornyheads, *Sebastolobus* spp., using a towed video camera sled. *Fisheries Research* 70:27-37.

Love, M. and M. Yoklavich. (In Review). Fishes on Deep Rock Habitats. In: Allen, Horn, and Pondella (eds.) *Ecology of Marine Fishes of California*. UC Press.

Love, M.S., M. Yoklavich and L. Thorsteinson. (2002). *The Rockfishes of the Northeast Pacific*. University of California Press. 405 pages.

Mathews, K.R. and L.J. Richards. Rockfish (Scorpaenidae) assemblages of trawlable and untrawlable habitats off Vancouver Island, British Columbia. *North American Journal of Fisheries Management* 11:312-318.

Murie, D.J., D.C. Parkyn, B.G. Clapp, and G.G. Kruase. 1994. Observations on the distribution and activities of rockfish, *Sebastes* spp., Sannich Inlet, British Columbia, from the Pisces IV submersible. *Fisheries Bulletin* 92:313-323.

Nasby-Lucas, N.M., B.W. Embley, M.A. Hixon, S.G. Merle, B.N. Tissot, and D.W. Wright. 2002. Integration of submersible transect data and high-resolution multibeam sonar imagery for a habitat-based groundfish assessment of Heceta Bank, Oregon. *Fishery Bulletin* 100:739-751.

O'Connell, V.M, and C.W. Carlile. 1993. Habitat-specific density of adult yelloweye rockfish *Sebastes ruberrimus* in the Eastern Gulf of Mexico. *Fishery Bulletin* 91:304-309.

O'Connell, V.M. and W.W. Wakefield. 1994. Applications of Side-Scan Sonar and Laser-Line Systems in Fisheries Research. Alaska Department of Fish and Game, Special Publication no. 9.

Wakefield, W.W., V. M. O'Connell, H.G. Greene, DW. Carlile, and J.E. McRea. 1998. The role of sidescan sonar in seafloor classification with a direct application to

commercial fisheries management. International Council for the Exploration of the Sea (ICES) CM1998/O:36.

O'Connell, V.M., D.W. Carlile, and W.W. Wakefield. 1998. Using line transects and habitat-based assessment techniques to estimate the density of yelloweye rockfish (*Scorpaenidae: Sebastes*) in the eastern Gulf of Alaska. International Council for the Exploration of the Sea (ICES) CM1998/O:56.

O'Connell, V.M., C. Brylinsky, and D. Carlile. 2002. Demersal shelf rockfish stock assessment for 2003. Regional Information Report No. 1J02-44, Alaska Department of Fish and Game, Division of Commercial Fisheries, Juneau, Alaska.

O'Connell, V.M., C. Brylinsky, and D. Carlile. 2003. Demersal shelf rockfish stock assessment and fishery evaluation report 2004. Regional Information Report No. 1J03-39, Alaska Department of Fish and Game, Division of Commercial Fisheries, Juneau, Alaska.

O'Connell, V., C. Brylinsky, and H.G. Greene. In Review. The use of geophysical survey data in fisheries management: a case history from Southeast Alaska. In B. Todd and H.G. Greene, editors. Marine benthic habitat mapping. Geological Association of Canada, St. Johns, Newfoundland, Canada.

Pearcy, W.G., D.L. Stein, M.A. Hixon, E.K. Pikitch, W.H. Barss, and R.M. Starr. 1989. Submersible observations of deep-reef fishes of Heceta Bank, Oregon. Fishery Bulletin 87:955-965.

Richards, L.J. 1986. Depth and habitat distributions of three species of rockfish (*Sebastes*) in British Columbia: observations from the submersible PISCES IV. Environmental Biology of Fishes 17:13-21.

Romsos, C., C. Goldfinger, R. Robison, R. Milstein, and W. Wakefield. In review. Development of a Regional Seafloor Surficial Geologic (Habitat) Map for the Continental Margins of Oregon and Washington, USA. In B. Todd and H.G. Greene, editors. Marine benthic habitat mapping. Geological Association of Canada, St. Johns, Newfoundland, Canada.

Smith, C.R. and S.C. Hamilton. 1983. Epibenthic megafauna of a bathyal basin off southern California: patterns of abundance, biomass, and dispersion. Deep-Sea Research 30:907-928.

Starr, R.M., D.S. Fox, M.A. Hixon, B.N. Tissot, G.E. Johnson, and W.H. Barss. 1996. Comparison of submersible-survey and hydroacoustic-survey estimates of fish density on a rocky bank. Fishery Bulletin 94:113-123.

Stein, D. L., B. N. Tissot, M. A. Hixon, and W. Barss. 1992. Fish-habitat associations on a deep reef at the edge of the Oregon continental shelf. Fishery Bulletin 90:540-551.

Tissot, B.N., M.M. Yoklavich, M.S. Love, K. York, and M. Amend. (In Prep.) Structure-forming invertebrates as components of benthic habitat on deep banks off Southern California.

Wakefield, W.W. 1990. Patterns in the distribution of demersal fishes on the upper-continental slope off central California with studies on the role of ontogenetic vertical migration in particle flux. Ph.D. Thesis, Scripps Institution of Oceanography.

Wakefield, W.W. and K.L. Smith, Jr. 1990. Ontogenetic vertical migration in *Sebastolobus altivelis* as a mechanism for transport of particulate organic matter at continental slope depths. *Limnol. Oceanog.* 35: 1314-1328.

Wakefield, W.W., V. M. O'Connell, H.G. Greene, D.W. Carlile, and J.E. McRea. 1998. The role of sidescan sonar in seafloor classification with a direct application to commercial fisheries management. International Council for the Exploration of the Sea (ICES) CM1998/O:36.

Wakefield, W.W., C.E. Whitmire, J.E.R. Clemons, B.N. Tissot. 2004. Fish habitat studies: Combining high-resolution geological and biological data. In P. W. Barnes and J. P. Thomas, editors. *Benthic habitats and the effects of fishing*. American Fisheries Society, Symposium 41, Bethesda, Maryland.

Yoklavich, M.M., H.G. Greene, G.M. Cailliet, D.E. Sullivan, R.N. Lea, and M.S. Love. 2000. Habitat associations of deep-water rockfishes in a submarine canyon: an example of a natural refuge. *Fishery Bulletin* 98:625-641.

Yoklavich, M.M., C.B. Grimes, and W.W. Wakefield. 2003. Using laser line scan imaging technology to assess deepwater habitats in the Monterey Bay National Marine Sanctuary. *Marine Technology Society Journal* 37:18-25.

Yoklavich, M.M., G.M. Cailliet, R.N. Lea, H.G. Greene, R. Starr, J. deMarignac, and J. Field. (2002). Deepwater habitat and fish resources associated with the Big Creek Ecological Reserve. *CalCOFI Reports* 43:120-140.

Yoklavich, M.M. (1997). Applications of side-scan sonar and in situ submersible survey techniques to marine fisheries habitat research. p.140-141. In: Boehlert, G.W. and J.D. Schumacher, eds. *Changing oceans and fisheries: environmental data for fisheries research and management*. NOAA Tech. Memo. NOAA-TM-NMFS-SWFSC-239.146 pp.

ODFW, Marine Resources Program ROV and SCUBA Nearshore Reef/Fish Research (* identifies studies with fish density data)

* Amend, M., D.S. Fox, C. Romsos. 2001. 2001 Nearshore rocky reef assessment ROV Survey. Newport, OR: Oregon Department of Fish and Wildlife. 33 pp.

Fox, D.S., M. Amend, A. Merems, B. Miller, J. Golden. 1998. 1998 Nearshore rocky reef assessment. Newport, OR: Oregon Department of Fish and Wildlife. 54pp.

Fox, D.S. M. Amend, A. Merems. 1999. 1999 Nearshore rocky reef assessment. Newport, OR: Oregon Department of Fish and Wildlife. 40 pp.

* Fox, D.S., M. Amend, A. Merems, M. Appy. 2000. 2000 Nearshore rocky reef assessment. Newport, OR: Oregon Department of Fish and Wildlife. 32 pp.

* Fox, D., A. Merems, M. Amend, H. Weeks, C. Romsos and M. Appy. 2004. Comparative characterization of two nearshore rocky reef areas: a high-use recreational fishing reef vs. an unfished reef. Newport OR: Oregon Department of Fish and Wildlife, Marine Habitat Project, Marine Resources Program. 66 pp.

* Fox, D.S., A. Merems, J. Golden, M. Amend. 1996. 1996 Kelp/reef habitat assessment. Newport, OR: Oregon Department of Fish and Wildlife. 61pp.

Grantham, B.A.; F. Chan, K.J. Nielsen, D.S. Fox, J.A. Barth, A. Huyer, J. Lubchenco, B. Menge. 2004. Upwelling-driven nearshore hypoxia signals ecosystem and oceanographic changes in the northeast Pacific. *Nature* 429: 749-754.

* Merems, A. 2003. 2002 Nearshore rocky reef assessment, ROV Survey. Newport, OR: Oregon Department of Fish and Wildlife. 24 pp.

Merems, A. and C. Romsos. 2004. Nearshore Rocky Reef Habitat Survey Using Multibeam Sonar. Newport, OR: Oregon Department of Fish and Wildlife, Marine Habitat Project, Marine Resources Program. 15 pp.

* Miller, B.M; D.S. Fox, A. Merems, M. Amend. 1997. 1997 Kelp/reef habitat assessment. Newport, OR: Oregon Department of Fish and Wildlife. 40pp.
Other Reports / Databases

ROV surveys off California: California Department of Fish and Game, Fort Bragg and Eureka Offices (Constantine Karpov and Michael Prall)

Karpov, et al. 2001b. Quantitative Inventory of Habitat and Species of Management Concern at Punta Gorda Ecological Reserve. In: Sea Grant Marine Ecological Reserves Research Program, Research Results 1996-2001. MERRPS Project Number PG-1, January, 2001, 204 p.

Datasets:

1998-1999 ROV survey at Punta Gorda Ecological Reserve, California.

2000 ROV survey of invertebrates (Red abalone and red urchin) at the Farallon Islands, California.

2001 ROV survey of nearshore fish at three sites near Fort Bragg, California. (Laguna Point, Soldier Point and Point Cabrillo).

2002 Assessment of temporal differences in nearshore reef fish abundance at Carmel Point and Stillwater Cove (ROV and SCUBA) – Carmel Bay, California.

2003 and 2004 ROV survey of habitat and nearshore fish inside and outside marine protected areas at Channel Islands.

2004 ROV survey of nearshore fish at two sites off Laguna Point – Fort Bragg, California.

Karpov and colleagues currently have two manuscripts in progress. One addresses sampling precision estimation for length and width of ROV strip transects and the other will present estimates of sampling effort needed (length of ROV transect using our methods) to survey key nearshore fish species for density.

Northwest Fisheries Science Center: Additional data sets and information

Unpublished data sets of density, size, habitat associations, species composition of all benthic fishes quantified by direct observations from ROVs and occupied submersibles off Oregon and southern Washington – this data is being developed into an assessment of demersal rockfish abundance on Heceta Bank:

Heceta Bank, Oregon (1988 – 1990, 2000, 2001, 2002 Wakefield, Hixon, Tissot, Yoklavich)

Astoria Canyon, Oregon/Washington (2001 Wakefield, Tissot, Brodeur, Yoklavich)

Southwest Fisheries Science Center, Santa Cruz Laboratory: Additional data sets and information

- Substantial data set on SCUBA surveys off northern and central CA conducted for the past 21 years (and continuing) by Tom Laidig (Habitat Ecology Team, Santa Cruz Lab, SWFSC). These are direct counts of blue, black, yellowtail, canary, and other species of young-of-the-year rockfishes during summer months of settlement in kelp beds.

- Unpublished data sets of density, size, habitat associations, species composition of all benthic fishes quantified by direct observations from an occupied submersible off CA:
 - within the Cowcod Conservation Areas off southern CA (2002; Yoklavich and Love)
 - off Point Sur, central CA coast (1994; Yoklavich)
 - within submarine canyon heads off central CA coast (1992, 1993, 2003, 2004; Yoklavich)
 - on shelf rock outcrops off central coast (1993, 2004; Yoklavich)

Other Groups / Projects with direct count information

SCUBA surveys off California: California Department of Fish and Game

Direct count surveys in Puget Sound area: Washington Department of Fish and Wildlife, Mill Creek Office (Wayne Palsson and Robert Pacunski)

Direct count surveys off the northern coast of Washington: Washington Department of Fish and Wildlife, Mill Creek Office (Tom Jagielo)

PISCO - Partnership for Interdisciplinary Studies of Coastal Oceans:

Oregon State University

Stanford University

University of California, Santa Barbara

University of California, Santa Cruz

Occupied submersible and ROV transect data for Olympic Coast National Marine Sanctuary: OCNMS, Port Angeles office (Ed Bowlby and Mary Sue Brancato)