

CRUISE RESULTS

NOAA Ship Miller Freeman, Cruise 97-11

1997 West Coast Upper Continental Slope Groundfish Bottom Trawl Survey

October 20-November 25, 1997

The Resource Assessment and Conservation Engineering (RACE) Division of the Alaska Fisheries Science Center (AFSC) completed a five-week bottom trawl survey of the upper continental slope groundfish resources off Washington, Oregon, and California on November 25, 1997. The survey covered the upper continental slope habitat 183-1,280 m deep in the International North Pacific Fisheries Commission (INPFC) U.S. Vancouver, Columbia, Eureka, Monterey, and northern Conception statistical areas (U.S./Canada border-3450'N lat.). Sampling for the survey began near Point Arguello (3450'N lat.) and progressed northward to the U.S./Canada border (Fig. 1). This report summarizes the preliminary results of the survey.

ITINERARY

The 1997 slope survey was conducted during two legs aboard the NOAA Ship Miller Freeman between October 20 and November 25. Scientific personnel were exchanged during a mid-cruise break in Eureka, California, on 8-9 November.

OBJECTIVES

Results from annual groundfish slope surveys are used by fishery managers to assess stock conditions and establish annual harvest guidelines for sablefish (*Anoplopoma fimbria*), Dover sole (*Microstomus pacificus*), and two species of thornyhead rockfish (*Sebastolobus alascanus* and *S. altivelis*). West Coast upper continental slope (WCUCS) surveys have been conducted on an annual basis since 1988. All but one of these surveys was aboard the NOAA Ship Miller Freeman and each of them covered anywhere from 20% to 50% of the WCUCS during any given year. The survey area was expanded this year to cover a much broader section of the West Coast compared to prior years. In order to complete the expanded survey area in the given amount of time, we had to reduce the sampling density by one-third. For the third consecutive year, the 1997 WCUCS groundfish bottom trawl survey used trawl gear and towing protocols instituted in 1995. Slight modifications to trawl gear and towing protocol were made in 1995 to better standardized sampling techniques and to help stabilize gear performance.

The specific objectives for this cruise were:

1. to describe and monitor the abundance, biological characteristics, and the geographic and bathymetric distribution of major groundfish resources inhabiting the upper continental slope of the INPFC U.S. Vancouver, Columbia, Eureka, Monterey, and northern Conception statistical areas;
2. to obtain age samples and biological data including sex, length-weight relationships, and maturity for shortspine and longspine thornyhead,

sablefish, Dover sole, Pacific grenadier (*Coryphaenoides acrolepis*), and arrowtooth flounder (*Atheresthes stomias*) for stock assessment purposes; and

3. to describe the slope fish community and how it varies with bathymetry.

VESSEL AND GEAR

The NOAA Ship Miller Freeman is a 65.5 m stern trawler equipped with a modern trawl sampling system and navigation and fishing electronics. A polyethylene high-opening Nor'eastern bottom trawl, built to RACE Division standards and equipped with mud-sweep roller gear, was used to collect all samples.

Dimensions of this net are: 27.2 m headrope and 37.4 m footrope including the "flying wings." The body is constructed of 127 mm stretched-mesh polyethylene netting, 89 mm stretched-mesh web in the codend, and a 32 mm stretched-mesh codend liner. The roller gear is constructed of 203 mm solid rubber disks strung on 16 mm high tensile chain. Connecting the footrope and roller gear at each attachment point is a toggle, two shackles, and a single link of 10 mm alloy chain. Three 55 m dandyines made of 16 mm galvanized steel cable lead from each wing to a 1.8 x 2.7 m steel V-door weighing 1,000 kg. Each door has a 4-point bridle on its backside made with 13 mm long link chain having 33 links forward, top and bottom, and 22 links aft, top and bottom. Instruments attached to the trawl gear to monitor gear performance included the SCANMAR(1) equipment for measuring net dimensions, a Furuno wireless netsonde for real-time monitoring of the headrope height, and a bottom contact sensor on the footrope. A Wesmar sonar was used to verify good trawl performance during the initial part of the cruise and for proper net configuration during wire marking. A Richard Brancker XL-200 submersible data logger was attached to the trawl and used in conjunction with a Trimble Global Positioning System (GPS) unit to record data on the time, depth, water temperature and geodetic position during each trawl. These data were integrated with fishing dimensions of the net, producing a comprehensive set of data describing gear performance in space and time.

SURVEY DESIGN AND METHODS

The sampling design used for this survey was a cross between a systematic and random design. Sampling was conducted between 183 and 1,280 m in six strata of 183 m depth intervals (183-366, 367-549, 550-732, 733-914, 915-1,097, 1,098-1,280 m). The design included 200 stations along 31 east-west tracklines spaced 50 km apart between lat. 4805'N near Nitinat Canyon and lat. 3450'N near Point Arguello. Stations were surveyed with the ship's fathometer and GPS plotter before setting the net. Sampling at each station consisted of a controlled bottom trawl haul with net metering instrumentation attached to the trawl to monitor gear performance. After the trawl settled to the bottom, it was towed for 30 minutes using scope ratios ranging from 1.5 to 2.5. Towing speed was approximately 3.7 km/hour (2.3 knots) at all stations and trawling operations continued around the clock (24 hours per day). The trawl's fishing dimensions were monitored with the Furuno netsonde at all depths, and with SCANMAR at stations shallower than 900 m. Station data, including time, geodetic position, trawl dimensions, distance fished, temperature profile, and catch and length information, were stored for later analysis using shipboard computer systems.

All catches were sorted to the lowest possible taxon, weighed, counted, and processed according to standard RACE protocols. Samples of most fish species caught in every haul were measured for length composition. Stratified otolith (age) samples were collected from the primary target groundfish species by

sex-centimeter intervals in three depth strata (183-548 m, 549-913 m, and 914-1,279 m). Other biological data were collected from the major fish species encountered. Special study collections were stored in appropriate fixatives or frozen.

RESULTS

One-hundred-and-ninety (190) tows were attempted during the survey. Out of 200 possible stations, 182 stations were sampled successfully (Figure 1). Eighteen stations were abandoned because they were too rough or steep. The remainder of the attempted tows were unsuccessful due to hang-ups, rips, bad bottom, excessive mud in tows, crossing into the wrong stratum, or gear problems. SCANMAR net mensuration data were obtained from 147 tows, submersible bathythermograph data from 186 tows, bottom contact sensor data from 188 tows, and GPS course and position data from 190 tows.

A total of 190 fish species were identified in catches throughout the survey. Samples also contained representatives from numerous orders of invertebrates. Table 1 summarizes the biological data collected from fish species. Specimen ages will be determined by the NMFS Alaska Fisheries Science Center, NMFS Northwest Fisheries Science Center, and the Oregon Department of Fish and Wildlife using the collected otoliths.

Table 2 lists the dominant groundfish species and selected crab species caught during the survey. Catch rates are expressed in kg/ha and ranked in order of catch per unit of effort (CPUE) by depth stratum. Pacific hake and spiny dogfish had the highest mean catch rates in strata 1 and 2, and longspine thornyhead, Dover sole, and Pacific grenadier were among the fish species with the highest mean catch rates in the deepest 4 strata. Plots of unweighted size frequency of primary groundfish species are provided in Figures 2 through 7, showing their frequency by depth stratum and by sex for the entire survey area. The lengths reported in these figures are all fork lengths except for Pacific grenadier (Fig. 5) which were measured from the snout to the insertion of the anal fin. Further analyses will be completed to describe distribution and to estimate biomass, population size, and age composition of these groundfish resources. Length-weight and length-maturity relationships will be derived to assist managers in assessing the status of important upper slope groundfish species.

SCIENTIFIC PERSONNEL

Leg I (Oct. 20 - Nov. 8)

Day Watch (noon to midnight)

Robert Lauth (Chief Scientist)	Fishery Biologist AFSC
Dan Kamikawa (Deck Boss)	Fishery Biologist NWFSC
Roger Clark	Fishery Biologist AFSC
Bob Mikus	Fishery Biologist ODFW
Keith Smith	Fishery Biologist AFSC
Troy Buckley	Fishery Biologist AFSC

Night Watch (midnight to noon)

Robin Harrison (Watch Leader)	Fishery Biologist AFSC
Mark Zimmermann (Deck Boss)	Fishery Biologist AFSC
Jay Orr	Fishery Biologist AFSC

Jim Smart	Gear Specialist AFSC
Jerry Hoff	Fishery Biologist AFSC
Kate Shaw	Fishery Biologist NHSUK

Leg II (Nov. 9 - Nov. 25)
Day Watch (noon to midnight)

Robert Lauth (Chief Scientist)	Fishery Biologist AFSC
Dan Kamikawa (Deck Boss)	Fishery Biologist NWFSC
Roger Clark	Fishery Biologist AFSC
Allen Harvison	Gear Specialist AFSC
Allen Shimada	Fishery Biologist AFSC
Heather Munro	Fishery Biologist WCPA

Night Watch (midnight to noon)

Bill Flerx (Watch Leader)	Fishery Biologist AFSC
Michael Martin (Deck Boss)	Fishery Biologist AFSC
Mike MacEwan	Gear Specialist AFSC
Lisa Mooney	Fishery Biologist AFSC
John Seaborn	Fishery Biologist ODFW
Steve Kupillas	Fishery Biologist ODFW

AFSC = Alaska Fisheries Science Center, Seattle, WA
NWFSC = Northwest Fisheries Science Center, Newport, OR
ODFW = Oregon Department of Fish and Wildlife, Newport, OR
ST = Science and Technology, Silver Springs, MD
WCPA = West Coast Seafood Processors Association, Portland, OR
NHSUK = Natural History Museum, University of Kansas, Lawrence, KA

For further information, contact Dr. Gary Stauffer, Director, Resource Assessment and Conservation Engineering Division, Alaska Fisheries Science Center, National Marine Fisheries Service, 7600 Sand Point Way NE., BIN C15700, Building 4, Seattle, WA 98115-0070. Telephone (206) 526-4170.

1. Reference to trade names or commercial firms does not constitute U.S. government endorsement.