

October 22, 1996

CRUISE RESULTS

**CHARTERED VESSEL CRUISE NO. 96-1
F/V DOMINATOR, F/V GOLDEN DAWN, AND F/V VESTERAALEN
1996 GULF OF ALASKA TRIENNIAL GROUND FISH ASSESSMENT SURVEY
MAY 18 - JULY 31, 1996**

The fifth comprehensive triennial bottom trawl survey of Gulf of Alaska (GOA) groundfish resources was conducted from May 18 through July 31, 1996, by the Resource Assessment and Conservation Engineering (RACE) Division of the Alaska Fisheries Science Center (AFSC), in Seattle, Washington. This report summarizes the general sampling operations and preliminary results of the survey.

ITINERARY

Survey sampling was conducted aboard the chartered commercial trawlers *Vesteraalen*, *Dominator*, and *Golden Dawn*. The 75-day survey period was divided into four legs of 18-19 days each. Sampling operations began near the Islands of Four Mountains (long. 170°W) and extended eastward throughout the Gulf of Alaska on the continental shelf and upper continental slope to Dixon Entrance (long. 132°30'W). Sampling occurred at pre-selected stations, or nearby alternate stations, in depths of 20 m to 479 m (Figures 1 and 2). During leg 3, scientists aboard the *Golden Dawn* conducted research to study groundfish escapement under the footrope of the standard RACE survey trawl using video cameras and a secondary trawl attached under the main trawl, behind the fishing line. The results of that research will be reported elsewhere.

OBJECTIVES

The primary focus of these ongoing triennial groundfish surveys is to build a standardized time series of data designed to assess, describe, and monitor the distribution, abundance, and

biological condition of various Gulf of Alaska groundfish stocks. Previous triennial surveys in the Gulf of Alaska occurred in 1984, 1987, 1990, and 1993. Specific objectives of the 1996 triennial survey were to:

1. Define the distribution and relative abundance of the principal groundfish and invertebrate species that inhabit the Gulf of Alaska;
2. Obtain data from which to estimate the absolute abundance of selected groundfish species;
3. Collect data to define various species-specific biological parameters *i.e.*, age, sex, size, growth rates, length-weight relationships, feeding habits, and taxonomy;
4. Collect integrated net configuration and position data for all trawl hauls to obtain precise area-swept estimates;
5. Record surface-to-bottom water column temperatures; and,
6. Perform special collections as requested by cooperating research groups.

VESSELS AND GEAR

All three charter vessels are house-forward stern trawlers with stern ramps, forward and aft net storage reels (mounted aft over the stern ramp and forward of the working deck), telescoping deck cranes, propeller nozzles, and paired, controlled-tension hydraulic trawl winches with 1,280 m to 1,460 m of 2.54 cm diameter steel cable. The *Vesteraalen* is 38 m in overall length (LOA) and is powered by a single, 1,700 continuous horsepower (HP) main engine. The *Dominator* is also 38 m LOA with a 1,300 HP main engine. The *Golden Dawn* is 45 m LOA and is propelled by a 2,000 HP main engine. Electronic equipment on all vessels included Global Positioning Systems (GPS) and LORAN C receivers with video position plotters, at least two radars, single sideband and VHF transmitter-receivers, color video fish-finders, paper recorder depth sounders, and auto-pilots.

Captains Tim Cosgrove and Craig Jenssen operated the *Vesteraalen* and the *Dominator*, respectively, for the entire cruise period. Captains Steven Berets and Gary Hansen operated the *Golden Dawn* for the first and second halves of the cruise, respectively.

Standard RACE Division Poly-Nor' eastern high opening bottom trawls, rigged with roller gear, were towed by all three vessels. Gear specifications included: a 27.2 m headrope with

twenty-one 30 cm diameter floats, and a 24.3 m, 1.3 cm diameter longlink alloy chain "fishing line" attached to a 24.9 m, 0.95 cm diameter 6 x 19 galvanized steel wire footrope. The roller gear was 24.2 m long and constructed of 1.9 cm diameter 6 x 19 galvanized steel wire rope and 36 cm rubber bobbins separated by a solid string of 10 cm rubber disks. In addition, 5.9 m wire rope extensions with 10 cm and 20 cm rubber disks were used to

span each lower flying wing section. The fishing dimensions of the trawls were measured using acoustic net mensuration equipment.

The trawls were constructed of 12.7 cm stretched-mesh polyethylene web with a 3.2 cm stretched-mesh nylon liner in the codend. Net rigging consisted of triple 54.9 m, 1.6 cm diameter galvanized wire rope dandyines. Chain extensions to the dandyines were 46 cm and 23 cm at the headrope and side panel attachments, respectively. Steel V-doors with dimensions of 1.83 x 2.74 m, and weighing approximately 800 kg each were used to open the net.

SURVEY AREA

The Gulf of Alaska triennial survey area is dominated by the continental shelf (depths to 200 m) that is crossed by numerous gullies or troughs, some as deep as 300 m. The width of the shelf area varies from approximately 18.5 km in the Unalaska Island to Islands of Four Mountains region to 185 km off the Kenai Peninsula (Figures 1 and 2). The continental shelf represents approximately 84% of the 299,500 km² survey area. Irregular bathymetric features along with an extensive and complex shoreline region, provide a rich variety of habitat types for many juvenile and adult groundfish such as walleye pollock (*Theragra chalcogramma*), Pacific cod (*Gadus macrocephalus*), juvenile sablefish (*Anoplopoma fimbria*), flatfish species such as Pacific halibut (*Hippoglossus stenolepis*), rockfish species such as Pacific ocean perch (*Sebastes alutus*), and many invertebrates including several commercial crab species, scallops, and pandalid shrimp.

The continental slope between the depths of 200 m and 500 m represents approximately 16% of the survey area. Often steep and rugged, the upper continental slope provides habitat for several important species such as roughey and shortraker rockfishes (*Sebastes aleutianus* and *S. borealis*), adult sablefish, shortspine thornyheads (*Sebastolobus alascanus*), and grenadiers (Macrouridae).

SURVEY DESIGN AND METHODS

The Gulf of Alaska survey region was divided into 49 strata based on bathymetry, major geographic features, and North Pacific Fishery Management Council (NPFMC) regulatory areas. Strata range from near-shore areas on the continental shelf to 500 m depths on the upper continental slope. A Neyman optimum allocation strategy based on data from the four previous triennial surveys was used to develop a stratified random sampling distribution for the 1996 triennial survey.

Tow tracklines and start and end positions were recorded using GPS output. Standard trawl hauls were 15 minutes in actual on-bottom duration. Trawl time on bottom was determined using real-time net configuration data transmitted to the vessel by acoustic net mensuration equipment which could be verified posteriorly by time, depth, and temperature recordings from a bathythermograph. The acoustic devices continuously measured wing spread and headrope height above the bottom. Efforts were made to maintain constant depth during a tow, but when depths changed trawl warp length was adjusted accordingly. At most stations, tilt sensors attached to the fishing line were used to record how well the net maintained contact with the bottom. However, the tilt sensors frequently did not function well enough to allow that data to be integrated with the other trawl performance data. Further development and testing of the tilt sensors will be performed to perfect these useful devices.

Catches were sorted to species, weighed and enumerated according to standard AFSC and RACE Division protocol. Extensive size composition data were collected with barcode based recording devices and downloaded to computer database files after each tow. A variety of biological data including age structures (mostly otoliths), lengths, and weights of individual specimens were collected and entered in the computer database. Special collections included extensive stomach contents samples, parasite, muscle tissue and ovary samples, coral assemblages, and whole animals.

Surface to bottom seawater temperature profiles were recorded at most sampling sites using a headrope-mounted bathythermograph. After each tow, temperature profile data were downloaded and stored in computer files, then integrated with net mensuration data to help verify actual time on bottom. Additional sea surface temperature observations were taken with bucket thermometers.

RESULTS

Time lost to bad weather and gear repair was generally small, but during the first leg bad weather was common, frequently making working conditions marginal. Sampling proceeded from west to east. There were three tiers of sampling priorities. Virtually all first priority stations were visited. Priority two and three stations were sampled only if time permitted. Some pre-assigned stations were not sampled due to unsuitable bottom conditions. In cases where trawlable bottom could not be found at a given station, a pre-selected alternate location was sampled. Successful tows ranging in depth from 20 m to 479 m were performed at 807 of the 868 sites where tows were attempted. Sea surface temperatures were collected at 643 stations and successful bathythermograph recordings were made at 771 stations.

Summarized total catch data indicate that arrowtooth flounder (*Atheresthes stomias*) and Pacific ocean perch were the two dominant species in trawl catches in all three NPFMC regulatory areas (Table 1). Atka mackerel was ranked third in the Western area, due mostly to a single large catch. Walleye pollock and sharpchin rockfish (*Sebastes zacentrus*) were ranked third in total catch in the Central and Eastern areas, respectively. Gulfwide, walleye pollock and Pacific cod ranked third and fourth, respectively, closely followed by Pacific halibut.

Otolith collections were made for a number of species (Table 2). Generally, they were made for species with the highest commercial value or those of special scientific interest. Length and weight measurements were recorded from individual fish of many species to update length-weight relationships used by AFSC scientists. Length measurements were the most common biological data collected. Over 262,000 fish were measured during the 1996 Gulf of Alaska triennial groundfish survey (Table 2). In addition, over 2,450 stomach samples were collected from four major predator species: Arrowtooth flounder, Pacific cod, Pacific halibut, and walleye pollock.

SCIENTIFIC STAFF AND AFFILIATIONS***VESTERAALEN - LEG I**

DATES: May 18 - June 5
 PORTS: Dutch Harbor-Sand Point, AK

FPC	Bill Flerx	AFSC
	Dan Ito	AFSC
	Larry Haaga	AFSC
	Nancy Roberson	AFSC
	Chris Lundsford	AFSC
	Teresa Turk	IPHC

GOLDEN DAWN - LEG I

DATES: May 18 - June 5
 PORTS: Dutch Harbor-Sand Point, AK

FPC	Michael Martin	AFSC
	Ron Payne	AFSC
	Jay Orr	AFSC
	Mei-Sun Yang	AFSC
	Kent Scott	AFSC
	Ken Krieger	AFSC

DOMINATOR - LEG II

DATES: June 6 - June 23
 PORTS: Sand Point - Kodiak, AK

FPC	Mark Wilkins	AFSC
	Michael Martin	AFSC
	Lyle Britt	AFSC
	Dave Somerton	AFSC
	Tonya Builder	NWFC
	Sheryl Corey	AFSC

VESTERAALEN - LEG III

DATES: June 24 - July 12
 PORTS: Kodiak - Cordova, AK

FPC	Eric Brown	AFSC
	James Stark	AFSC
	David Clausen	AFSC
	Chris Johnston	AFSC
	SungKwon Soh	UW
	Teresa Turk	IPHC

GOLDEN DAWN - LEG III

DATES: June 24 - July 12
 PORTS: Kodiak - Cordova, AK

FPC	Peter Munro	AFSC
	Ken Weinberg	AFSC
	Dan Kamikawa	NWFC
	Bill Rugen	AFSC
	Nancie Parrack	SEFC
	Tammy MacKay	AFSC

DOMINATOR - LEG IV

DATES: July 13 - July 31
 PORTS: Cordova - Ketchikan, AK

FPC	Harold Zenger	AFSC
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	Bill Flerx	AFSC
	Jay Orr	AFSC
	Delsa Anderl	AFSC
	Gaines Tyler	UCON
	Helena Piotrowski	UCON

DOMINATOR - LEG I

DATES: May 18 - June 5
 PORTS: Dutch Harbor-Sand Point, AK

FPC	Eric Brown	AFSC
	Robin Harrison	AFSC
	Jerry Hardman	AFSC
	Ron Erickson	AFSC
	Steve Syrjala	AFSC
	Roger Clark	VOSC

VESTERAALEN - LEG II

DATES: June 6 - June 23
 PORTS: Sand Point-Kodiak, AK

FPC	Robin Harrison	AFSC
	Mark Zimmerman	AFSC
	Dick Haight	AFSC
	Teresa Turk	IPHC
	Michelle Armstrong	VOSC
	Stephen Hochberg	AFSC

GOLDEN DAWN - LEG II

DATES: June 6 - June 23
 PORTS: Sand Point - Kodiak, AK

FPC	Bill Flerx	AFSC
	Harold Zenger	AFSC
	John Karinen	AFSC
	Troy Buckley	AFSC
	Mike MacEwan	AFSC
	Russ Nelson	AFSC

DOMINATOR - LEG III

DATES: June 24 - July 12
 PORTS: Kodiak - Cordova, AK

FPC	Bob Lauth	AFSC
	Mike Sigler	AFSC
	Frank Shaw	AFSC
	Jerry Hardman	AFSC
	Roger Clark	VOSC

VESTERAALEN - LEG IV

DATES: July 13 - July 31
 PORTS: Cordova - Ketchikan, AK

FPC	Michael Martin	AFSC
	Peter Munro	AFSC
	Nancy Maloney	AFSC
	Wendy Emerson	AFSC
	Jane DiCosimo	NPFMC
	Teresa Turk	IPHC

GOLDEN DAWN - LEG IV

DATES: July 13 - July 31
 PORTS: Cordova - Ketchikan, AK

FPC	Robin Harrison	AFSC
	Bob Lauth	AFSC
	James Stark	AFSC
	Mike MacEwan	AFSC
	Roger Clark	VOSC

*Key to acronyms:

AFSC - Alaska Fisheries Science Center
 NWFC - Northwest Fisheries Center
 NPFMC- North Pacific Fisheries Management Council
 SEFC - Southeast Fisheries Center
 IPHC - International Pacific Halibut Commission
 UW - University of Washington, Volunteer
 UCON - University of Connecticut, Volunteer
 VOSC - Volunteer scientist

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