



NOAA Technical Memorandum NMFS-AFSC-49

Data Report: 1990 Gulf of Alaska Bottom Trawl Survey

by
J. W. Stark and D. M. Clausen

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Alaska Fisheries Science Center

January 1995

NOAA Technical Memorandum NMFS

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This document should be cited as follows:

Stark, J. W., and D. M. Clausen. 1995. Data Report: 1990 Gulf of Alaska bottom trawl survey. U.S. Dep. Commer., NOAA Technical Memorandum NMFS-AFSC-49, 221 p.

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Data Report: 1990 Gulf of Alaska Bottom Trawl Survey

by
J. W. Stark¹ and D. M. Clausen²

¹Resource Assessment and Conservation Engineering Division
Alaska Fisheries Science Center
7600 Sand Point Way N.E., BIN C-15700
Seattle, WA 98115-0070

²Auke Bay Laboratory
Alaska Fisheries Science Center
11305 Glacier Highway
Juneau AK 99801-8626

U.S. DEPARTMENT OF COMMERCE

Ronald H. Brown, Secretary

National Oceanic and Atmospheric Administration

D. James Baker, Under Secretary and Administrator

National Marine Fisheries Service

Rolland A. Schmitt, Assistant Administrator for Fisheries

January 1995

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ABSTRACT

The third triennial groundfish assessment survey of the Gulf of Alaska was conducted during the summer of 1990 by the Alaska Fisheries Science Center's Resource Assessment and Conservation Engineering (RACE) Division and the Auke Bay Laboratory (ABL). Two chartered trawlers, the Pat San Marie and Green Hope and the National Oceanic and Atmospheric Administration research vessel Miller Freeman successfully sampled 708 survey stations in the Gulf of Alaska from the Islands of Four Mountains (170°W long.) to Dixon Entrance (133°25'W long.) in depths less than 500 m using standard RACE Division Nor'eastern high-opening bottom trawl nets with rubber bobbin roller gear. This document combines the results of the RACE and ABL surveys.

The survey design divided the overall Gulf of Alaska survey area into 49 strata based on bathymetric and geographic features to produce a standard survey area totaling approximately 87,000 square nautical miles (nmi²) (296,700 km²) ranging in bottom depth from 1 to 500 m. Trawl samples were allocated among strata in proportion to fish densities observed during the 1984 U.S.-Japan triennial survey. Stations were selected randomly from a 5 by 5 nmi grid of numbered points, superimposed over each stratum. The bottom area swept during each trawl haul was determined from an acoustic trawl mensuration system and Loran navigational equipment.

The species composition was determined for each catch and the principal species were sampled for sex, length, individual

weight and age distributions.

Seawater temperatures were collected during trawling operations. Ancillary collections included specimens for diet studies, juvenile walleye pollock (Theragra chalcogramma) distribution and predator studies, skate taxonomic delineation, fishery observer training and marine mammal prey studies and sightings.

Results include a ranking of catch abundance for the 20 most abundant species, abundance estimates of the principal fish species, distribution, and size composition by geographic location and depth and length versus weight regression parameters. Age composition data are included for walleye pollock and Pacific ocean perch (Sebastes alutus). Seawater surface and bottom temperature data are presented by area. Appendices contain the survey trawl specifications and diagram, strata definitions and charts, list of species encountered and length-weight relationships of the principal species.

Arrowtooth flounder (Atheresthes stomias), walleye pollock, Pacific halibut (Hippoglossus stenolepis) and Pacific cod (Gadus macrocephalus) were the dominant species throughout the survey area. The rockfish, sablefish (Anoplopoma fimbria), soles and other species were locally abundant in some areas. Red squid (Berryteuthis magister) was the most abundant invertebrate throughout the survey area.

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PREFACE

This data report is one of three types of standard reports presenting data from the 1990 Gulf of Alaska groundfish survey conducted by the National Marine Fisheries Service (NMFS). These reports are:

1) A Cruise Report¹, outlining the survey objectives, documents itinerary, personnel, vessels employed and summarizes major accomplishments.

2) A Report to Industry¹, containing a fishing log consisting of raw haul and catch data for each haul made during the survey, catch summaries for the major species catch per unit effort by haul and gear specifications and diagram.

3) A Data Report (this document), containing detailed descriptions of the survey planning and operation, species distribution and abundance charts, length frequency plots, tables of estimated biomass, catch per unit of effort, average weight and length estimates, length frequency plots, length-weight regression parameters, sea temperature charts, list of species, survey strata specifications and charts, trawl descriptions and diagrams.

¹Central and western Gulf of Alaska survey area reports are available from Director, Resource Assessment and Conservation Engineering Division, Alaska Fisheries Science Center, National Marine Fisheries Service, 7600 Sand Point Way N.E., Building 4, BIN C15700, Seattle, WA 98115-0070. Eastern Gulf of Alaska survey area reports are available from Director, Auke Bay Laboratory, Alaska Fisheries Science Center, National Marine Fisheries Service, 11305 Glacier Highway, Juneau, AK 99801-8626

INTRODUCTION

The third in a series of triennial groundfish surveys was conducted in the Gulf of Alaska (GOA) during the summer of 1990 by the National Marine Fisheries Service's (NMFS) Alaska Fisheries Science Center (AFSC). Survey design and operations were the responsibilities of scientists from the AFSC's Seattle based Resource Assessment and Conservation Engineering (RACE) Division for the western and central GOA (Islands of Four Mountains to Cape St. Elias). The eastern GOA (Cape St. Elias to Dixon Entrance) was the responsibility of the AFSC's Auke Bay Laboratory (ABL) located in Juneau, Alaska. This report presents the combined survey results for the principal fish species in each of the five GOA International North Pacific Fisheries Commission (INPFC) statistical areas: Shumagin, Chirikof, Kodiak, Yakutat, and Southeastern. The purpose of this report is to provide fishery resource managers with results of the two 1990 GOA groundfish surveys, to supplement the status of stocks resource assessment and allocation process. This report presents the 1990 survey results only and makes no comparisons with previous GOA surveys.

The survey objectives were to:

- 1) Delineate the distributions of major groundfish and commercially important invertebrate species inhabiting the Gulf of Alaska between the inner continental shelf and upper continental slope in water depths to 500 m.
- 2) Collect data to estimate the abundance of the major groundfish species.

3) Collect data to define biological parameters for size, sex and age composition, growth, length-weight relationships and reproductive condition.

4) Collect accurate trawl performance data for all survey nets and vessels.

5) Conduct cooperative sampling with other research organizations.

METHODS

Vessels and Gear

Cape St. Elias divided the GOA survey area into a western portion sampled by two chartered trawlers and an eastern portion sampled by a NOAA research vessel. The chartered vessels were house-forward style U.S. commercial stern trawlers, the 30.8 m Pat San Marie and 30.5 m Green Hope powered by 850 and 565 horsepower (hp) main engines, respectively. Both chartered vessels employed dual hydraulic trawl winches mounted forward on the working deck and single net reels over the stern ramp. The trawl cable length was 1,100 m on the Pat San Marie and 1,463 m on the Green Hope with respective diameters of 2.2 cm and 1.91 cm. Navigation and fishing electronics included Loran C receivers and plotter, fish imaging and depth sonars with paper and color video recorders and net sonde units.

The NOAA research vessel was the 65.5 m stern trawler Miller Freeman powered by a 2,250 hp main engine and auxiliary 400 hp bow thruster. Constant-tension hydraulic trawl winches contained 1,830 m of 2.54 cm diameter wire cable. Fishing electronics included SATNAV and Loran C receivers and plotter, fish imaging paper and color video depth sonars and net sonde units.

All vessels used the standard RACE Division four-seam high-opening polyethylene Nor'eastern trawl equipped with rubber bobbin roller gear (Appendix A). The Nor'eastern trawl has a 27.2 m headrope and 36.7 m footrope consisting of a 24.9 m center

section and adjacent 5.9 m "flying wing" extensions. Triple 54.9 m dandylines attached the Nor'eastern trawl to two 1.8 by 2.7 m steel V-doors weighing 0.8 metric tons (t) each.

The Nor'eastern trawl's vertical and horizontal opening was monitored on each vessel by an acoustic link net mensuration system employing headrope and wing transducers. The net's path width as measured between the wing tips generally increased with increasing trawl cable length and averaged 15.7 m for the Pat San Marie, 14.9 m for the Green Hope and 15.0 m for the Miller Freeman. The trawling speed averaged approximately 3 nautical miles per hour (nmi/h) for all vessels.

Survey Area

The Gulf of Alaska forms the northeastern border of the Pacific Ocean and is comprised of complex bathymetric features ranging from jagged mountainous pinnacles to flat muddy areas. The features provide a wide variety of habitats resulting in a complex ecosystem (Fig. 1). Prevailing rough bottom conditions in many areas require the standard use of rubber bobbin roller gear for all bottom trawling operations. The 1990 GOA survey included the entire continental shelf and upper portion of the continental slope to the 500 m depth contour, excluding all the Southeastern INPFC area's generally untrawlable shallow (1-100 m) inner shelf.

The total survey area was approximately 296,700 km² (87,000 nmi², Table 1). The shelf, comprising over 90% of the

total GOA survey area, extends approximately 220 km (120 nmi) off Cook Inlet and narrows to 40 km (22 nmi) off Dixon Entrance and 20 km (11 nmi) off the Islands of Four Mountains. Approximately 80% of the shelf is shallower than 200 m. The remaining shelf area is bisected by numerous gullies, 100-500 m in depth, extending from the upper slope to the inner shore. The outer shelf is bordered by the continental slope, a region approximately 10 nmi in width, which descends steeply into the abyssal Alcutian Trench in the western and central GOA and the Alaska Plain in the eastern GOA. The survey assessed only that portion of the slope shallower than 500 m, an area of approximately 15,000 km² (8,000 nmi²).

The Kodiak INPFC area with 97,530 km² (Table 1) has over 35% more total bottom area than any other GOA area. The Chirikof INPFC area totals 63,460 km², only 1% smaller than the Shumagin INPFC area (64,160 km²), while the Yakutat INPFC area has approximately 53,810 km² in bottom area. The Southeastern INPFC area's bottom area (21,560 km², including the unsurveyed 1-100 m areas) is only 20% of the size of the Kodiak INPFC area.

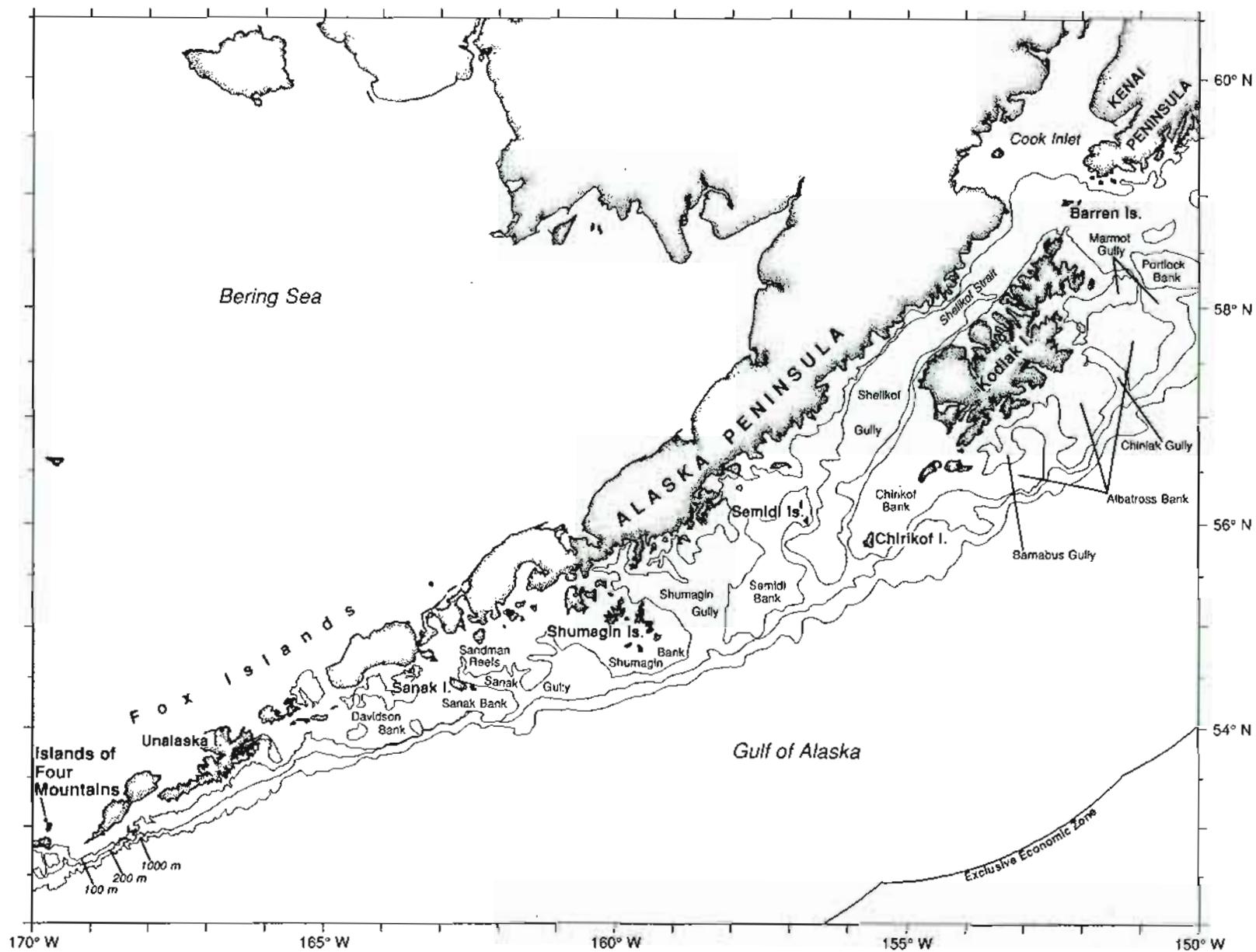


Figure 1.--Bathymetric and geographic features of the Gulf of Alaska groundfish survey area.

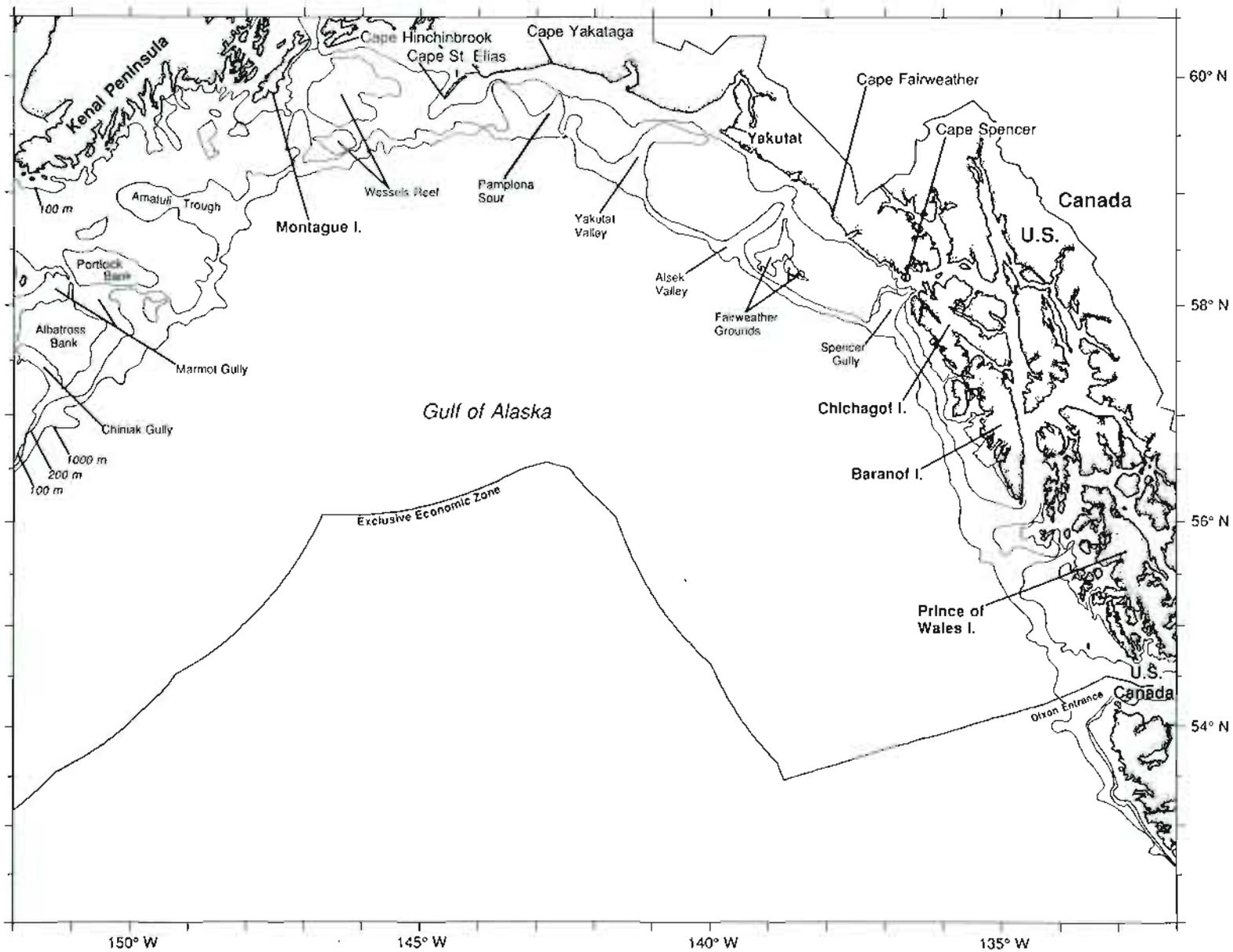


Figure 1.--(continued) Bathymetric and geographic features of the Gulf of Alaska groundfish survey area.

Sampling Design

The 1990 triennial survey design, first used for the 1984 triennial survey (Brown 1985) and again for the 1987 survey (Stark 1988), was based on stratified random sampling. The design objective was to minimize the variances of biomass and population estimates. For the 1990 survey, the Gulf of Alaska was divided into 49 strata categorized by water depth, type of geographical area (e.g. banks, gullies, and slopes) and INPFC statistical area boundaries (Appendix B). Station locations were allocated for each stratum from a grid of points laid over the survey area. Each point in the grid was 5 nmi from adjacent stations along lines of latitude and longitude.

The original 320,648 km² survey area was reduced by 20,130 km² (7%) from the 1984 and 1987 surveys' coverage to include only depths shallower than 500 m. The reduced sampling area was due to a loss of available vessel time related primarily to the suspension of Japanese participation in the survey.

Western and Central Gulf of Alaska

Sample allocation was determined following the method of Neyman for stratified random surveys, (Cochran, 1977). Each stratum was assigned a sampling density, based on the geographical and bathymetric distribution of variances of abundance estimates for selected species from the 1984 triennial survey. Sampling allocation for a stratum with anticipated high fish densities designated one out of every four points on the grid (grid points). Strata expected to have moderate fish

densities were assigned one out of six grid points. Strata expected to harbor low fish densities were allocated one out of nine grid points. After the number of stations were determined for each stratum, a corresponding number of grid points were chosen systematically from an initial randomly selected grid point. Stations were allocated equally between each of the two survey vessels within each stratum to allow a comparison of relative fishing efficiencies between vessels.

Stations were prioritized within each stratum to provide three potential levels of systemically controlled sampling density. Station prioritization was necessary to accommodate the possible loss of survey days due to bad weather, mechanical breakdowns, etc. In 1990, each of the 754 selected stations was assigned a priority based on the possibilities of completing either 450, 600 or 750 total successful stations. Priority One stations were allocated from the minimum potential sampling level of 450 total stations and comprised 60% of the stations in each stratum. Each stratum's remaining stations were divided equally between priority Two and priority Three sampling densities, corresponding respectively to 600 or 750 total successful stations. The priority One stations were always attempted. Priority Two and Three stations were selected according to the prevailing rate of successful station sampling, amount of available survey time and number of completed stations. If a selected station was deemed untrawlable, a search for a suitable alternate location would commence within 5 nmi of the original

station. If no trawlable location could be found after 20-30 minutes, the nearest station was selected from a list of alternates completed during previous triennial groundfish surveys. All stations were plotted onto large work charts for use aboard the survey vessels.

Eastern Gulf of Alaska

In the eastern Gulf of Alaska, a total of 201 stations were planned for the survey. This number was based on the approximately 40 fishing days available for this area in 1990 and on an expected completion rate of five stations per day. The number of stations in each sampling stratum was based on a modified version of the allocation scheme used during the 1987 eastern GOA triennial survey (Sigler 1987). In 1987, an optimum allocation method for stratified sampling (Snedecor and Cochran 1967) was used to determine the number of stations in each stratum. This method computed optimum sampling densities for each stratum so as to minimize the expected variance of catch per unit of effort (CPUE) for sablefish (Anoplopoma fimbria). Sablefish was chosen as a critical species for the survey in the eastern GOA because it was the most valuable commercial groundfish in this area. In the computations, expected variances for sablefish were estimated from results of the 1984 eastern GOA triennial survey.

The 1990 modifications included: 1) reducing by 50% the station density in Yakutat INPFC area strata at depths from 101 to 200 m and

2) doubling the station density in all strata greater than 200 m. These changes were made so that more stations were located in deeper depths, where most of the commercially important species in the eastern GOA (especially rockfish and sablefish) are found.

The shallowest strata (1-100 m) were treated differently in the 1990 design. In the Southeastern INPFC area, no stations were allocated to this stratum because virtually the entire stratum was found to be untrawlable during the 1987 survey. In the Yakutat INPFC area from 1 to 100 m stratum (Yakutat Shallows), only a minimal number of stations (n=6) were planned because the commercially important species of groundfish in the eastern GOA all reside in depths greater than 100 m.

Stations in shelf and gully strata were randomly selected using the same 5 by 5 nmi grid technique as previously described for the 1990 western and central GOA survey. A slightly different approach was necessary to select stations in slope strata. The grid method was not used because these strata are relatively small in size and are extremely narrow and elongate in shape. Instead, for each slope stratum, transect lines were drawn such that the area between transect lines was 25 nmi². Thus, the slope strata were composed of a number of irregularly shaped segments analogous to the grid squares on the shelf and gullies. The slope stations were then selected randomly from these segments. For each of the 201 randomly located stations, an alternative, non-random station in the same stratum was also

determined. These alternative stations were used as "backup" stations in case the original planned station proved to be untrawlable. The alternative stations were selected from successful trawl hauls made during 10 previous AFSC survey cruises in the eastern GOA from 1978 to 1987.

Overall Gulf of Alaska

The on-bottom trawling duration for each sample was scheduled for 30 minutes but was occasionally only 10 minutes, when trawlable bottom was less than approximately 1.5 nmi or when exceptionally large catches were expected. The on-bottom trawling time (duration) and vertical and horizontal openings were monitored with Scanmar net sonde units. To minimize potential fishing power differences between the survey vessels, standardized trawling and gear handling methods were practiced emphasizing the use of scope ratio tables (trawl warp relative to bottom depth) and maintaining a 3 nmi/hour trawling speed.

A successful trawl sample was one where horizontal and vertical net openings remained within the normal range, the roller gear consistently remained on bottom and only minimal trawl damage occurred through bottom contact. Unsatisfactory performance occurred when the sample result may have been affected by trawl damage, there was evidence of an unstable trawl configuration or if the net fished on the bottom less than 10 minutes duration.

Collection and Processing of Samples

Catches were emptied directly onto a sorting table (capacity approximately 1,100 kg), sorted to species and weighed. Larger catches were weighed with a dynamometer or estimated using a volumetric method and split into portions. A representative subsample was taken from larger catches that approximated the sampling table capacity and weighed. The subsample was obtained by positioning the codend opening so that one side of the codend emptied onto a sampling net positioned within the catch bin. Obtaining a representative sample from both the top and bottom of the codend reduced sampling bias caused by species and size stratification within the codend.

The entire catch was sampled for Pacific halibut (Hippoglossus stenolepis), crab and major groundfish species that occurred in limited numbers. All other fish and large invertebrate species were completely sorted, counted and weighed, whenever possible.

Length measurements were taken for major fish species randomly by sex when numbers exceeded 10 individuals. The measurements were taken from the tip of the snout to the terminus of the middle caudal fin rays for all fish species. The exception was grenadiers, which were unsexed and measured from snout to anus.

Data collection primarily concentrated on 17 species of high commercial value or abundance in the survey area and included:

Arrowtooth flounder	<u>Atheresthes stomias</u>
Pacific halibut	<u>Hippoglossus stenolepis</u>
Flathead sole	<u>Hippoglossoides elassodon</u>
Rock sole	<u>Pleuronectes bilineatus</u>
Rex sole	<u>Errex zachirus</u>
Dover sole	<u>Microstomus pacificus</u>
Yellowfin sole	<u>Pleuronectes aspera</u>
Walleye pollock	<u>Theragra chalcogramma</u>
Pacific cod	<u>Gadus macrocephalus</u>
Sablefish	<u>Anoplopoma fimbria</u>
Pacific ocean perch	<u>Sebastes alutus</u>
Northern rockfish	<u>Sebastes polyspinis</u>
Rougheye rockfish	<u>Sebastes aleutianus</u>
Dusky rockfish	<u>Sebastes ciliatus</u>
Sharpchin rockfish	<u>Sebastes zacentrus</u>
Shortraker rockfish	<u>Sebastes borealis</u>
Shortspine thornyhead	<u>Sebastolobus alascanus</u>

Age data were collected from these 17 species with principal emphasis on walleye pollock, Pacific ocean perch, Pacific cod, northern rockfish, rex sole, rock sole, arrowtooth flounder,

flathead sole, rougheye rockfish and Dover sole. To obtain an age composition representative of the population, samples were stratified by sex and length (i.e., centimeter size group) over a broad geographical area. Weight observations were taken as part of the age structure collection process and recorded to the nearest gram.

Ancillary data were collected for several species by RACE and ABL personnel or by personnel of participating research groups. Pacific halibut sex composition and age structures, blood samples for DNA composition studies and whole juvenile specimens for parasite studies were collected by International Pacific Halibut Commission researchers. Whole stomachs from walleye pollock, arrowtooth flounder, Pacific halibut, sablefish and six rockfish species were collected and preserved by participants from the AFSC's Trophic Interactions Program. Additional stomach content data were recorded from over 4,000 specimens of selected species to provide information on the distribution and predators of juvenile pollock for the RACE Division's Fisheries Oceanography Coordinated Investigations Program. Skates (Family Rajidae) were collected and preserved under an AFSC contract with Bucknell University in Lewisburg Pennsylvania to elucidate species taxonomy. Selected specimens were collected for the AFSC's Fishery Observer Program for species identification training. Shortspine thornyhead whole samples were taken for age structure evaluation studies by the AFSC's Age and Growth Task. Squid specimens were collected for

the AFSC's National Marine Mammal Laboratory study relating squid beak size to body length. Additionally, marine mammal sighting data were recorded.

Data Analysis

The basic unit of sampling effort for each haul station was the bottom area swept by the trawl and was determined for each station using data collected by the trawl mensuration and ship's navigation systems. When the trawl mensuration system was unavailable or inoperative, the area swept was estimated from mensuration information collected from other stations.

Biomass estimates were calculated using the area-swept method (Alverson and Pereyra 1969). A detailed description of the analytical procedures is presented in Wakabayashi et al. (1985). For each species, a catch per unit effort (CPUE) was calculated for each station by dividing catch weight by the area swept by the trawl. Mean catch rates for each species were calculated in weight (kg) and numbers per square kilometer (km^2) for each stratum sampled. Mean catch rates of combined strata were calculated as the component strata catch means weighted by strata area.

Biomass estimates were calculated by multiplying strata mean CPUEs by strata areas and summing the results to obtain estimates by INPFC statistical areas and depth intervals. The 95% confidence interval was determined for each species biomass estimate.

Population length compositions were determined by expanding the length-frequency data to the total catch for each length and sex category at each station. The stratum population within a sex-length category was calculated by multiplying the stratum population by the proportion of fish in that category from the summed station data. Population size composition estimates were summed over strata to create estimates by area.

Age structures were interpreted by the AFSC's Age and Growth Task using otolith surface ageing and the break-and-burn method for pollock and the break-and-burn method for Pacific ocean perch. Age-length data were summarized to form an array of frequencies at each age and length. The resulting age-length key was integrated with the length composition data to apportion the population among age groups by assigning the estimated number of individuals within the population at each sex-length group to corresponding age groups. Age composition was computed for each stratum and summed by area and depth category.

Length-weight data collected from individual fish were used to estimate length-weight relationships based on a non-linear least squares regression algorithm. The length-weight relationship was expressed as $W=AL^B$ where W =weight (grams), L =length (mm), A =coefficient, and B =exponent.

RESULTS

From 4 June to 9 September 1990, 780 total standard survey trawl stations were attempted of which 708 were successful (Fig. 2). The survey of the central and western Gulf of Alaska (170°W long to 144°30'W long) was conducted between 1 June and 9 September 1990 aboard the chartered commercial trawlers Pat San Marie and Green Hope. The Eastern Gulf of Alaska (144°30'W long to 133°25'W long) survey was conducted between 14 July to 4 September aboard the NOAA research trawler Miller Freeman. The total station sampling density averaged over two stations for every 1,000 km² (Table 1). Sampling density was slightly higher in the eastern Gulf of Alaska than in the west. The lowest sampling density occurred on the shelf in water depths shallower than 200 m, primarily due to the high proportion of untrawlable bottom.

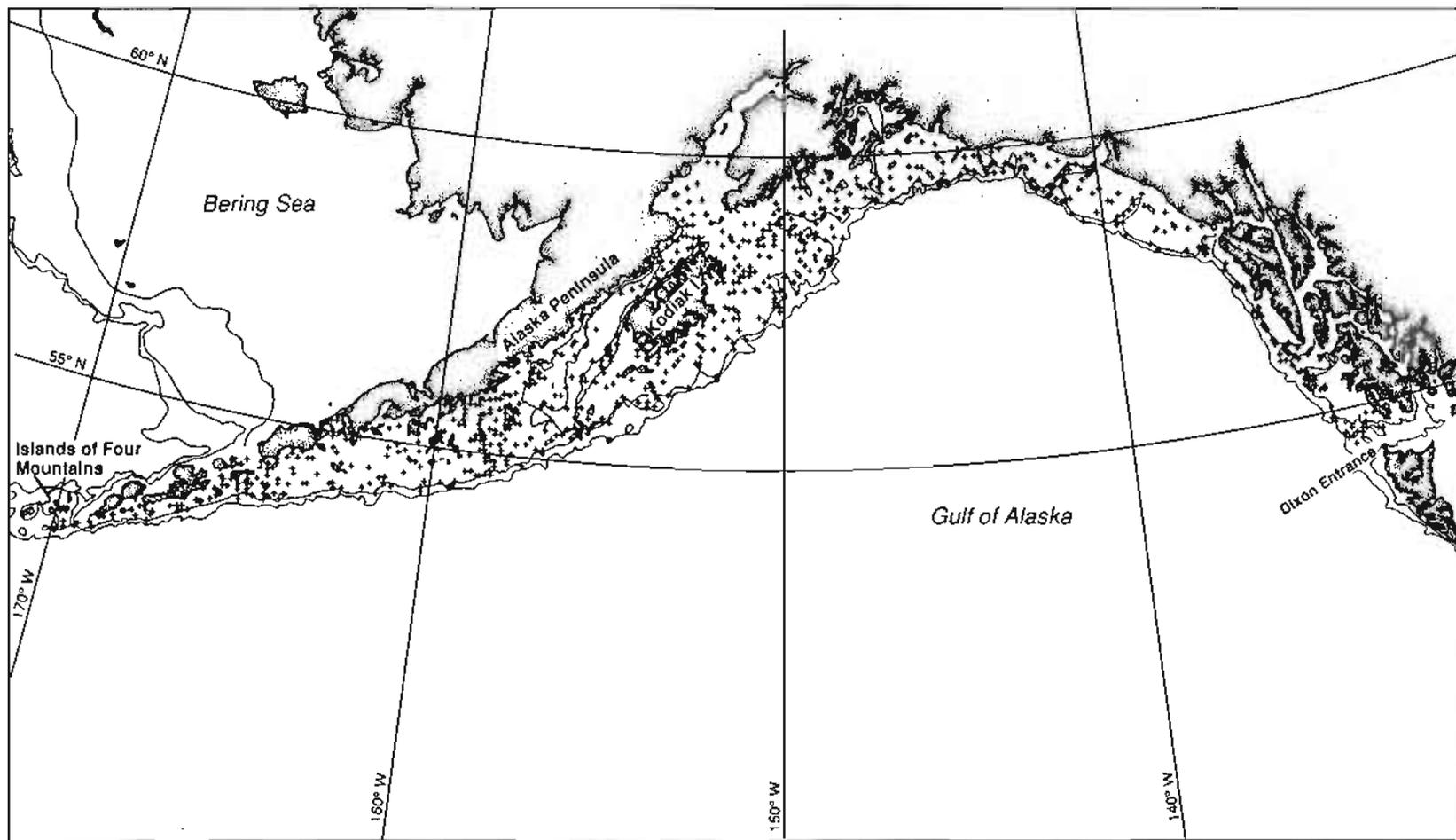


Figure 2.--Successful stations sampled during the NMFS 1990 triennial Gulf of Alaska groundfish survey.

Table 1. --Survey area, depth, area, station allocations at three potential levels of sampling, sampling performance and sampling density from the 1990 NMFS triennial groundfish trawl survey of the Gulf of Alaska by INPFC area and depth.

Survey area	Depth (m)	Area (km ²)	Station allocation (450)	Station allocation (600)	Station allocation (750)	Stations attempted	Stations successful	Sampling density (station/1,000 km ²)
Shumagin	1-100	44,362	91	122	152	89	75	1.7
	101-200	14,536	25	32	41	48	46	3.2
	201-300	2,737	5	7	9	9	9	3.3
	301-500	2,528	4	5	7	7	7	2.8
	1-500	64,163	125	166	209	153	137	2.1
Chirikof	1-100	26,575	42	55	70	38	28	1.1
	101-200	23,749	84	112	140	115	106	4.5
	201-300	11,501	11	14	18	17	16	1.4
	301-500	1,633	2	3	4	5	4	2.5
	1-500	63,458	139	184	232	175	154	2.4

Table 1. --(continued) Survey area, depth, area, station allocations at three potential levels of sampling, sampling performance and sampling density from the 1990 NMFS triennial groundfish trawl survey of the Gulf of Alaska by INPFC area and depth.

Survey area	Depth (m)	Area (km ²)	Station allocation (450)	Station allocation (600)	Station allocation (750)	Stations attempted	Stations successful	Sampling density (station/1,000 km ²)
Kodiak	1-100	39,842	47	63	79	56	51	1.3
	101-200	43,182	106	142	179	139	129	3.0
	201-300	11,545	11	16	20	33	29	2.6
	301-500	2,960	5	6	8	7	6	2.0
	1-500	97,529	169	227	286	235	215	2.2
Yakutat ^a	1-100	8,475		10	13	12	10	1.2
	101-200	7,800		11	14	20	20	1.4
	201-300	350		0	0	3	2	5.7
	301-500	542		0	0	4	4	7.4
	1-500	17,167		21	27	39	36	2.1

^aThe Yakutat INPFC area west of Cape St. Elias (144°30'W long.)

Table 1. --(continued) Survey area, depth, area, station allocations, sampling performance and sampling density from the 1990 NMFS triennial groundfish trawl survey of the Gulf of Alaska by INPFC area and depth.

Survey area	Depth (m)	Area (km ²)	Station allocation	Stations attempted	Stations successful	Sampling density (station/1,000 km ²)
Yakutat ^b	1-100	8,362	6	9	7	0.8
	101-200	21,333	37	37	36	1.7
	201-300	4,524	32	35	34	7.6
	301-500	2,422	22	23	21	8.8
	1-500	36,641	97	104	98	2.7
Southeastern	1-100 ^c	3,766	0	0	0	0.0
	101-200	9,871	36	28	23	2.3
	201-300	5,035	40	28	27	5.4
	301-500	2,884	28	21	18	6.2
	1-500	21,557	104	77	68	3.2

^b The Yakutat INPFC area east of Cape St. Elias (144°30'W long.)

^c Not surveyed during 1990.

Table 1. --(continued) Survey area, depth, area, station allocations at three potential levels of sampling, sampling performance and station density from the 1990 NMFS triennial groundfish trawl survey of the Gulf of Alaska over all areas by depth.

Survey area	Depth (m)	Area (km ²)	Station ^d allocation (450)	Station allocation (600)	Station allocation (750)	Stations attempted	Stations successful	Sampling density (station/1,000 km ²)
Total	1-100 ^e	127,616	186	256	320	203	171	1.4
	101-200	120,472	288	370	447	384	360	3.0
	201-300	35,692	99	109	119	126	117	3.3
	301-500	12,969	61	64	69	67	60	4.6
	1-500	296,749	634	799	955	780	708	2.4

^d 1990 threshold totals include Auke Bay Laboratory planned stations.

^e Does not include the Southeastern INPFC area, which was unsurveyed during 1990.

Water Temperature Distribution

Surface to bottom water temperature profiles were successfully taken at 298 standard trawl survey stations located east of the Shumagin Islands (Figs. 3 and 4). Three types of instruments were used to collect the water temperature profiles in combination or singly and included: expendable bathythermograph probes (XBTs), a conductivity and temperature device and a trawl-mounted Micro-BT. Temperature profile data were not collected west of the Shumagin Islands due to equipment failure.

Surface temperature data however were collected throughout the survey area using calibrated bucket thermometers. The total surface temperature data collected by both profile and bucket thermometers was from 531 stations.

Temperature sampling began in the Shumagin area on 4 June, approximately 40 days before the southeastern Gulf of Alaska sampling commenced, complicating area comparisons. Sampling progressed toward the central Gulf of Alaska from the Shumagin and Southeastern areas.

Surface temperatures were warmest (14-16°C) between Dixon Entrance and Resurrection Bay (133°30'W long.-149°30'W long.) but decreased to 11-14°C westward from Resurrection Bay to the Barren Islands area and southwest through Shelikof Straits. Generally colder surface waters (8-11°C) extended up the gullies adjacent to Kodiak Island and the Shumagin Islands and nearby banks. West of the Shumagin Islands, surface temperatures decreased to 5-8°C

Surface to bottom sea temperature profiles indicated pronounced mixing of the water column within the general vicinity of lower Cook Inlet, denoted by similar surface (11-14°C) and bottom water (9-12°C) temperatures. The coldest bottom temperatures (3-5°C) occurred in the 101-200 m deep Shumagin Gully northeast of the Shumagin Islands, the 201-300 m Shelikof Strait gully and the 301-500 m gullies off Cape Spencer, Yakutat Bay, and Cape Yakataga.

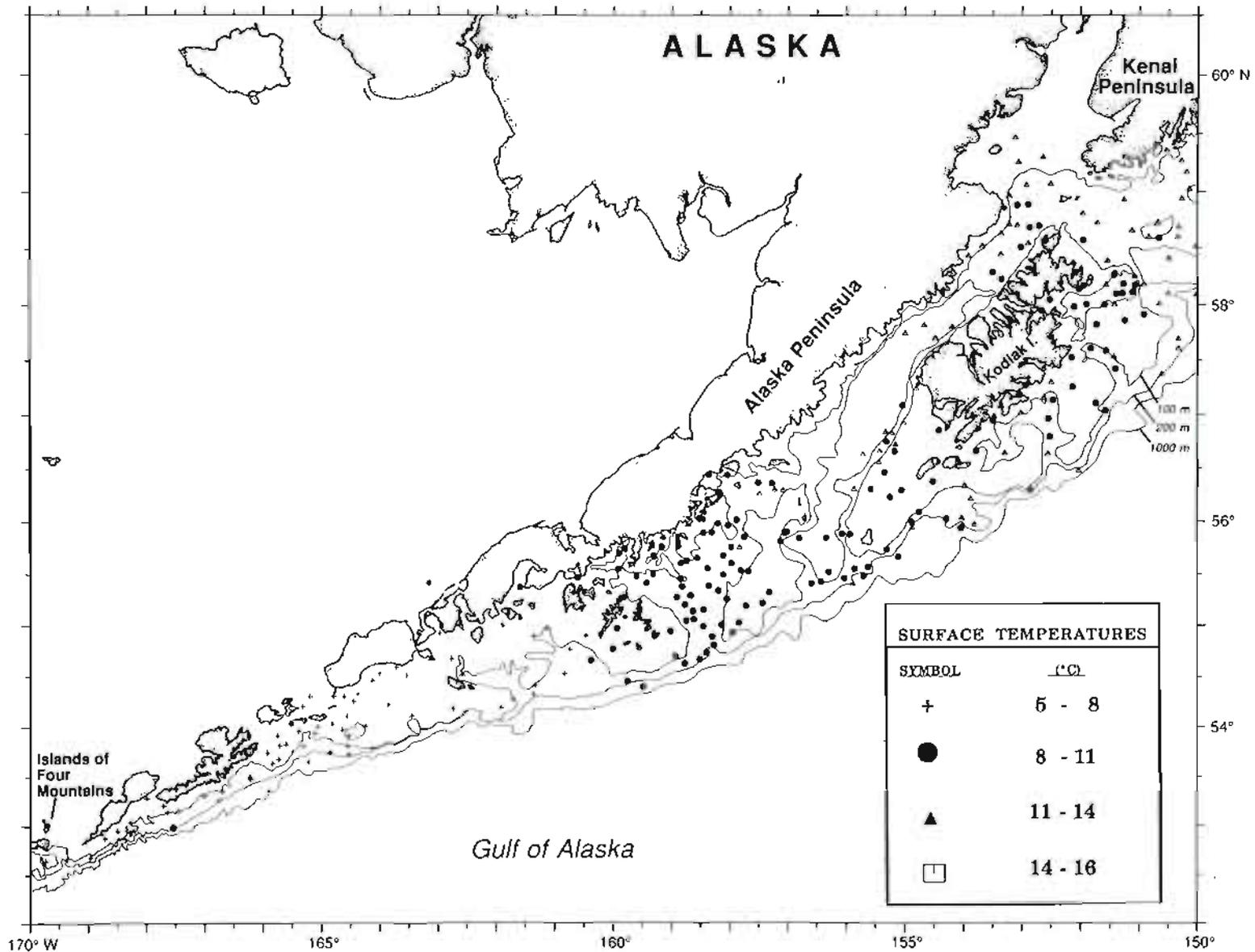


Figure 3.--Distribution of sea surface temperatures (°C) observed during the NMFS 1990 Gulf of Alaska groundfish survey.

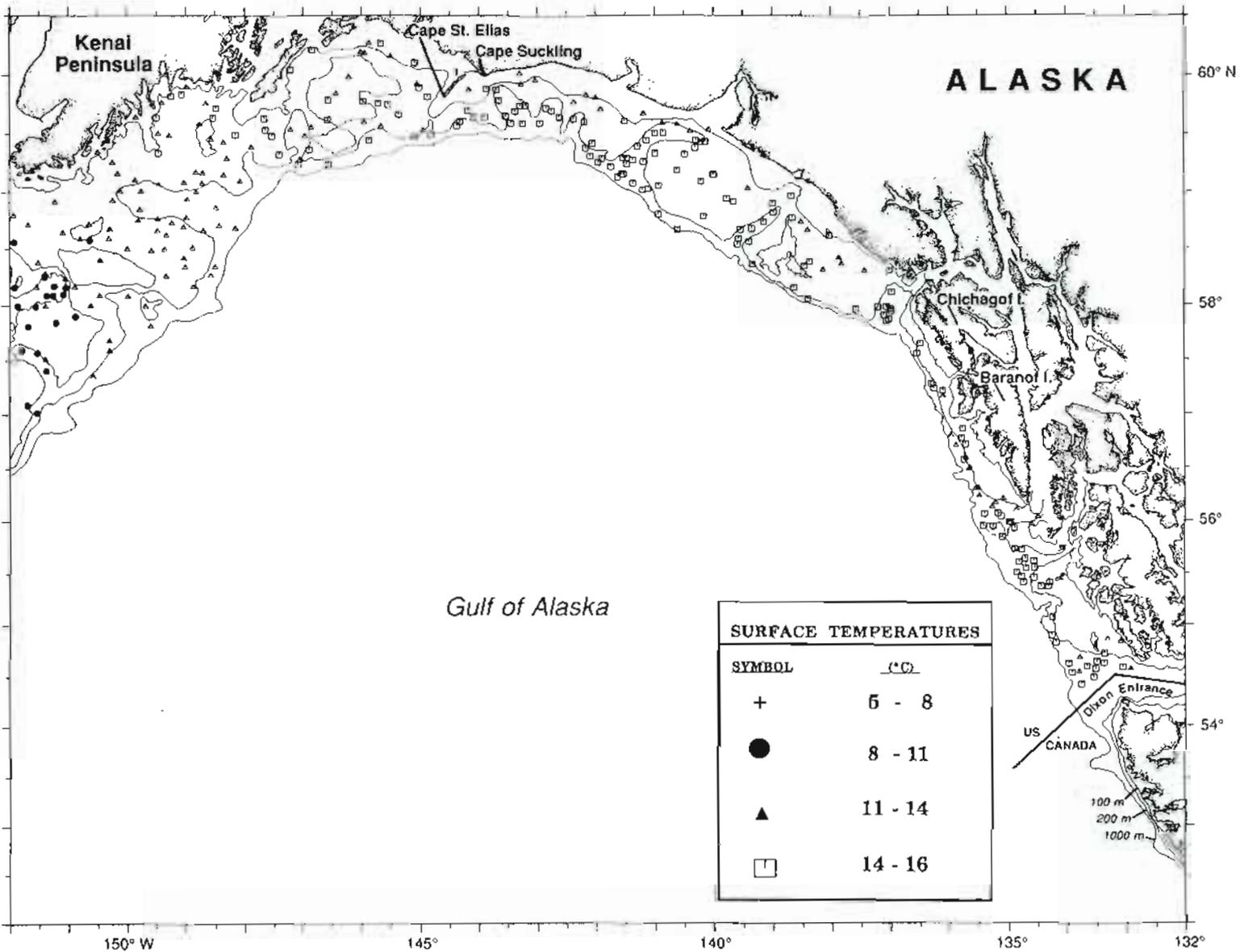


Figure 3.--(continued) Distribution of sea surface temperatures (°C) observed during the NMFS 1990 Gulf of Alaska groundfish survey.

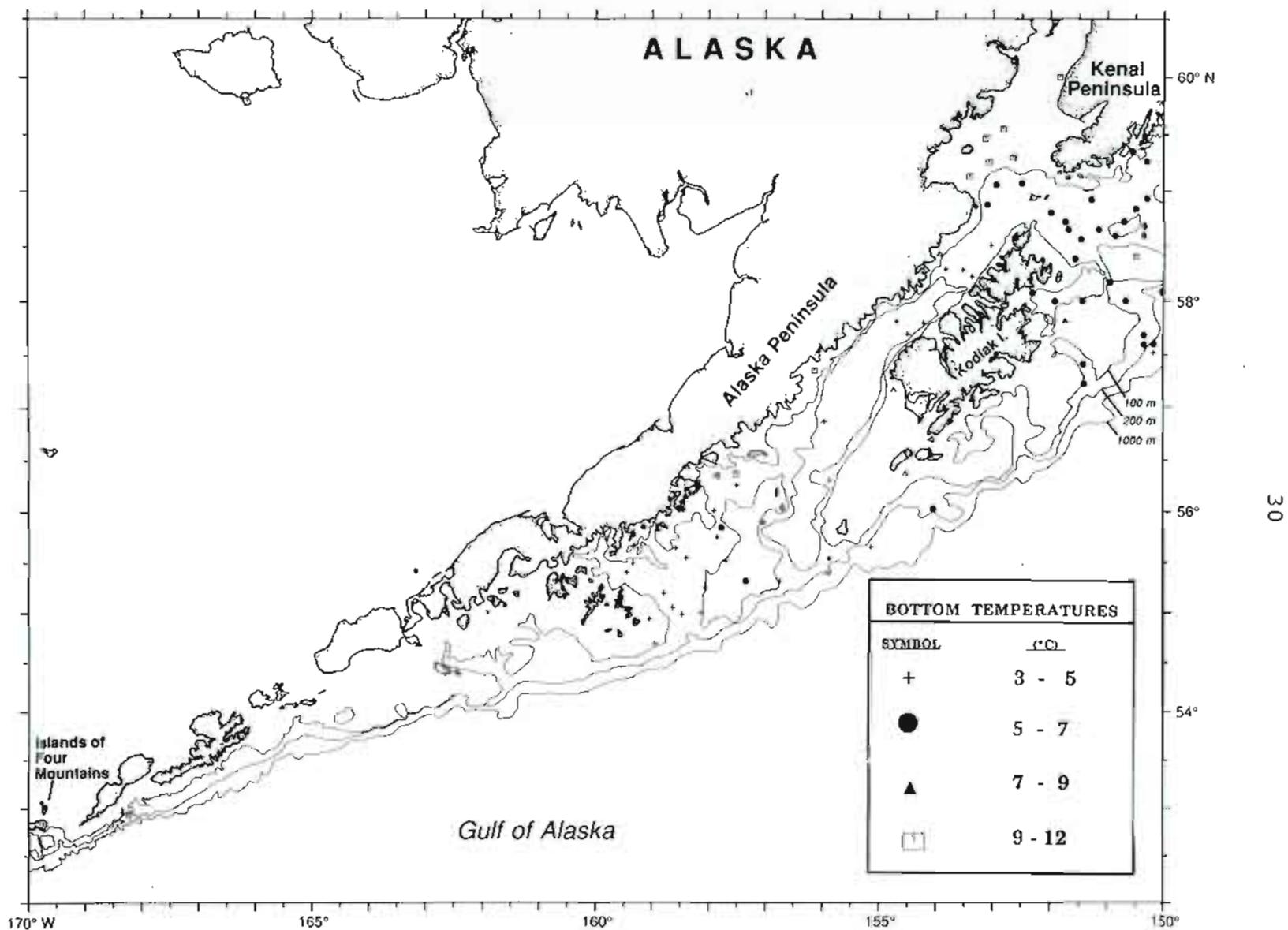


Figure 4.--Distribution of bottom surface temperatures (°C) observed during the NMFS 1990 Gulf of Alaska groundfish survey.

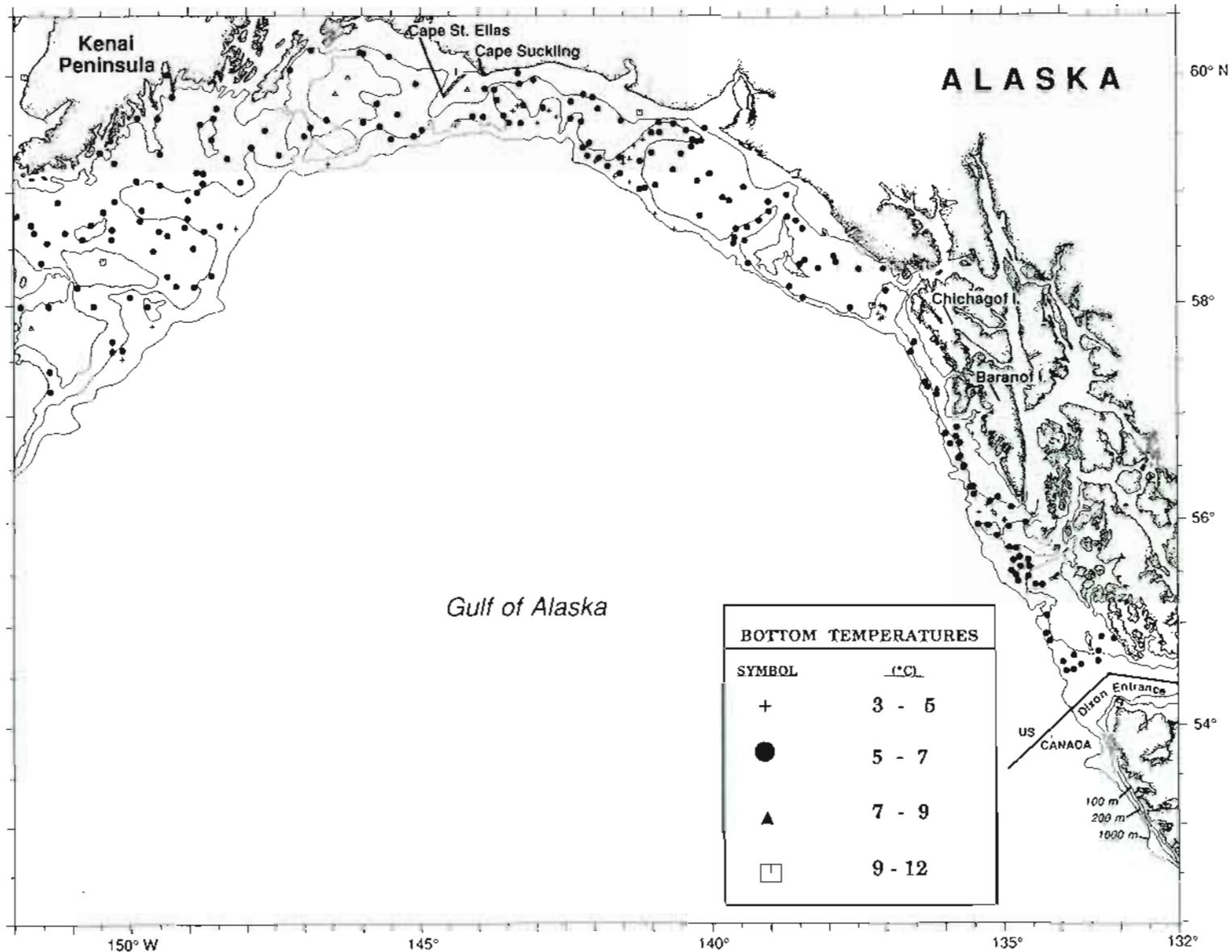


Figure 4.--(continued) Distribution of bottom surface temperatures (°C) observed during the NMFS 1990 Gulf of Alaska groundfish survey.

Overall Abundance and Distribution of Major Fish Groups

The survey was designed to assess the demersal fisheries resource and does not provide adequate information on the distribution and abundance of invertebrates due to the catch inefficiency of roller gear on the trawl. Not sampled were species inhabiting depths above the range of the headrope and species residing in the relatively large untrawlable areas like Sandman Reefs northeast of Sanak Island and the Southeastern INPFC area's inner shelf in depths less than 100 m. The lack of sampling in depths over 500 m resulted in an inadequate assessment of groundfish species whose depth range extends into deeper waters. These deepwater species primarily include adult sablefish, shortspine thornyheads, Dover sole, and grenadiers.

The 708 successful standard survey trawls completed in 1990 captured 124 fish species from 32 families (Appendix C as defined in Robins et al., 1991). The flatfish family Pleuronectidae was represented by 14 species and had the highest catch abundance, led by arrowtooth flounder (Table 2) at over twice the total CPUE (6,480 kg/km²) of any other species. The cod family Gadidae's three species were second in overall catch abundance dominated by walleye pollock (2,890 kg/km²) and Pacific cod (1,400 kg/km²). The rockfish family Scorpaenidae, dominated by Pacific ocean perch (470 kg/km²) and northern rockfish (380 kg/km²) represented the largest number of species, although 11 of the 25 rockfish species were unavailable west of the Kenai Peninsula (152°W long.) area. The highest rockfish catch rates occurred

east of the Kenai Peninsula and consisted primarily of Pacific ocean perch. Sablefish was the only Anoplopomatidae family representative and had an overall catch rate of 712 kg/km² and was most prominent in the central GOA. Skates species catches had a combined average of 160 kg/km² overall and occurred predominately in depths shallower than 200 m. The 20 sculpin species (Cottidae) encountered during the survey were widely distributed on the continental shelf. The smaller sculpin species may have escaped through the net's comparatively large-sized mesh. The most abundant sculpins included the bigmouth sculpin (Hemitripterus bolini), great sculpin (Myoxocephalus polyacanthocephalus) and yellow Irish lord (Hemilepidotus jordani). Highest catch rates of yellow Irish lord (190 kg/km²) and great sculpin (60 kg/km²) occurred in the Shumagin INPFC area's 1-100 m depth interval. Bigmouth sculpin was most abundant (230 kg/km²) in the Chirikof INPFC area's 201-300 m depth interval.

Table 2. - Mean CPUE (kg/km²) for the 20 most abundant fish species by International North Pacific Fisheries Commission Area during the 1990 triennial Gulf of Alaska groundfish trawl survey.

Shumagin Area		Chirikof Area		Kodiak Area		Yakutat Area		Southeastern Area		Total areas	
Species	CPUE	Species	CPUE	Species	CPUE	Species	CPUE	Species	CPUE	Species	CPUE
Arrowtooth flounder	3,532	Arrowtooth flounder	13,176	Arrowtooth flounder	6,909	Arrowtooth flounder	2,556	Arrowtooth flounder	2,696	Arrowtooth flounder	6,477
Walleye pollock	2,587	Walleye pollock	3,030	Walleye pollock	4,502	Walleye pollock	863	Pacific ocean perch	2,629	Walleye pollock	2,888
Pacific Cod	2,084	Pacific cod	2,450	Flathead sole	1,162	Pacific ocean perch	662	Sharpchin rockfish	1,762	Pacific cod	1,395
Pacific halibut	1,301	Pacific halibut	1,482	Sablefish	1,333	Flathead sole	479	Redstripe rockfish	1,097	Pacific halibut	1,110
Rock sole	1,277	Flathead sole	861	Pacific halibut	1,258	Pacific halibut	449	Walleye pollock	745	Flathead sole	862
Flathead sole	965	Sablefish	784	Pacific cod	1,027	Dover sole	367	Pacific cod	579	Sablefish	712
Yellowfin sole	798	Rex sole	505	Northern rockfish	707	Sablefish	303	Sablefish	454	Rock sole	542
Northern rockfish	589	Dover sole	408	Rock sole	552	Pacific cod	269	Shortspine thornyhead	424	Pacific ocean perch	465
Atka mackerel	475	Rock sole	350	Dover sole	460	Rex sole	229	Pacific halibut	283	Northern rockfish	381
Pacific ocean perch	380	Pacific ocean perch	252	Rex sole	441	Big skate	210	Dover sole	277	Rex sole	328
Yellow Irish lord	149	Giant grenadier	179	Rougheye rockfish	265	Eulachon	117	Rex sole	194	Dover sole	327
Sablefish	112	Rougheye rockfish	178	Pacific ocean perch	156	Dusky rockfish	108	Lingcod	159	Yellowfin sole	207
Rex sole	102	Pacific herring	142	Spiny dogfish	160	Silvergray rockfish	101	Harlequin rockfish	145	Rougheye rockfish	156
Giant grenadier	76	Eulachon	105	Dusky rockfish	172	Pacific herring	115	Yellowmouth rockfish	107	Sharpchin rockfish	125
Alaska plaice	48	Northern rockfish	92	Butter sole	136	Rougheye rockfish	106	Silvergray rockfish	452	Eulachon	92
Dusky rockfish	46	Salmon shark	83	Eulachon	129	Lingcod	99	Eulachon	85	Dusky rockfish	94
Great sculpin	44	Longnose skate	81	Harlequin rockfish	130	English sole	98	Spotted ratfish	71	Redstripe rockfish	77
Shortspine thornyhead	27	Bigmouth sculpin	71	Skates unidentified	89	Shortraker rockfish	91	Redbanded rockfish	86	Giant grenadier	63
Dover sole	26	Shortspine thornyhead	32	Shortspine thornyhead	39	Shortspine thornyhead	78	Rougheye rockfish	100	Shortspine thornyhead	65
Rougheye rockfish	25	Shortraker rockfish	26	Shortraker rockfish	24	Sharpchin rockfish	47	Shortraker rockfish	89	Shortraker rockfish	36
Number of hauls	137	Number of hauls	154	Number of hauls	215	Number of hauls	134	Number of hauls	68	Number of hauls	708

Principal Fish Species Abundance,
Distribution and Size Composition

Results by individual species are tabulated by INPFC statistical area and depth interval. Charts of species catch density by individual survey station are included. The catch abundance categories by station for individual species are: 1) none, 2) CPUEs less than the mean, 3) CPUEs between the mean and two standard deviations and 4) CPUEs greater than two standard deviations above the mean. The proportion of the total catch of each species represented by the three categories are approximately 60% (category 2), 30% (category 3) and 10% (category 4). The length compositions are plotted by sex category, INPFC statistical area, and depth interval. Individual weight and length measurements were collected for 13 of the dominant fish species. The data were used to estimate the relationship of length and weight using a non-linear regression (Appendix D). Abundance estimates (CPUE and biomass) are presented by individual strata in Appendix E for the most dominant species and include the estimates of variance and confidence intervals. These precision estimates do not incorporate the variation associated with measurements of effort. CPUE is measured in kilograms per kilometer squared (kg/km^2). Estimates are given for each stratum in which catch occurred. Catches are ranked in descending order. The strata are defined in Appendix B.

Arrowtooth flounder--With twice the abundance of any other species at nearly 2 million t, arrowtooth flounder (Table 3, Fig. 5) was dominant in the GOA, in every depth and all areas except the Southeastern INPFC area. The combined Chirikof and Kodiak INPFC areas had 79% of the total arrowtooth flounder biomass and less than 10% of the total biomass occurred east of the Kodiak INPFC area. Over all INPFC areas 84% of the arrowtooth flounder biomass occurred in depths less than 200 m. The highest catch rates of arrowtooth flounder occurred generally on the outer edge of the Chirikof and Albatross Banks, in surrounding gullies, and the Shumagin Gully. Arrowtooth flounder was widely distributed on the broad flats between Kodiak Island and the Kenai Peninsula.

The arrowtooth flounder length composition over all areas and depths (Fig. 6) averaged 42 cm and ranged from approximately 18 to 81 cm. The length distribution was multimodal and dominated by the 38-50 cm group primarily from areas west of the Yakutat INPFC area. A second length mode ranged from approximately 30 to 35 cm and occurred primarily on the shallow (< 100 m) inner shelf of the central and western GOA. The largest fish (50-55 cm) occurred in the deepest depths sampled (301-500 m).

Table 3.--Total number of survey hauls, hauls containing arrowtooth flounder, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	62	2,353	104,375	0.5	35.8
	101 - 200	46	46	8,318	120,911	0.6	39.3
	201 - 300	9	8	440	1,204	0.8	41.8
	301 - 500	7	3	45	114	0.9	---
	All depths	137	119	3,532	226,604	0.6	37.4
Chirikof	1 - 100	28	18	11,694	310,776	1.0	43.2
	101 - 200	106	105	12,414	294,816	0.8	41.5
	201 - 300	16	16	20,001	230,023	2.1	55.6
	301 - 500	4	3	309	505	2.2	---
	All depths	154	142	13,176	836,120	1.0	44.0
Kodiak	1 - 100	51	44	3,035	120,911	0.7	40.1
	101 - 200	129	124	11,104	479,508	0.9	43.2
	201 - 300	29	27	6,269	72,371	1.3	48.6
	301 - 500	6	3	367	1,088	1.9	54.6
	All depths	215	198	6,909	673,878	0.9	43.0
Yakutat	1 - 100	17	15	1,841	31,004	0.6	35.7
	101 - 200	56	56	3,427	99,827	0.7	38.3
	201 - 300	36	35	1,091	5,315	0.9	42.0
	301 - 500	25	23	476	1,411	1.5	47.2
	All depths	134	129	2,556	137,557	0.7	37.8
Southeastern	1 - 100	0	0	0	0	---	---
	101 - 200	23	23	4,416	43,590	0.8	41.3
	201 - 300	27	26	572	2,880	0.7	38.1
	301 - 500	18	17	516	1,488	1.5	55.3
	All depths	68	66	2,696	47,958	0.8	41.3
All areas	1 - 100	171	139	4,444	567,067	0.8	39.9
	101 - 200	360	354	8,622	1,038,651	0.8	41.5
	201 - 300	117	112	8,736	311,794	1.8	52.3
	301 - 500	60	49	355	4,605	1.6	51.8
	All depths	708	654	6,477	1,922,117	0.9	41.9

All areas biomass, 95% confidence interval: 1,434,274 - 2,409,959 metric tons (t)

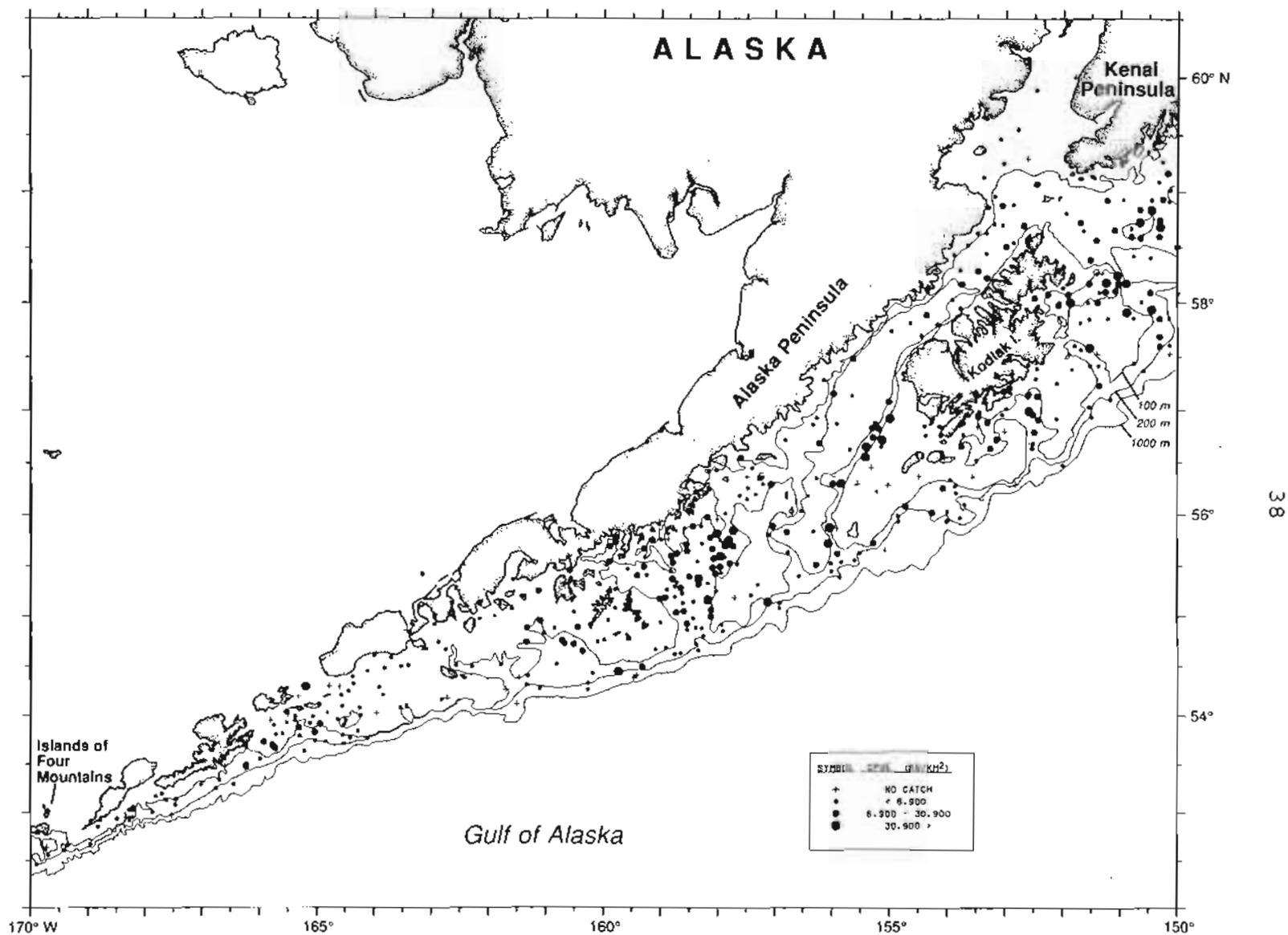


Figure 5.--Arrowtooth flounder catch distribution and relative abundance during the NMFS 1990 Gulf of Alaska groundfish survey. Catch abundance categories are: 1) none, 2) less than the mean (6,900 kg/km²), 3) between the mean and two standard deviations and 4) greater than two standard deviations above the mean.

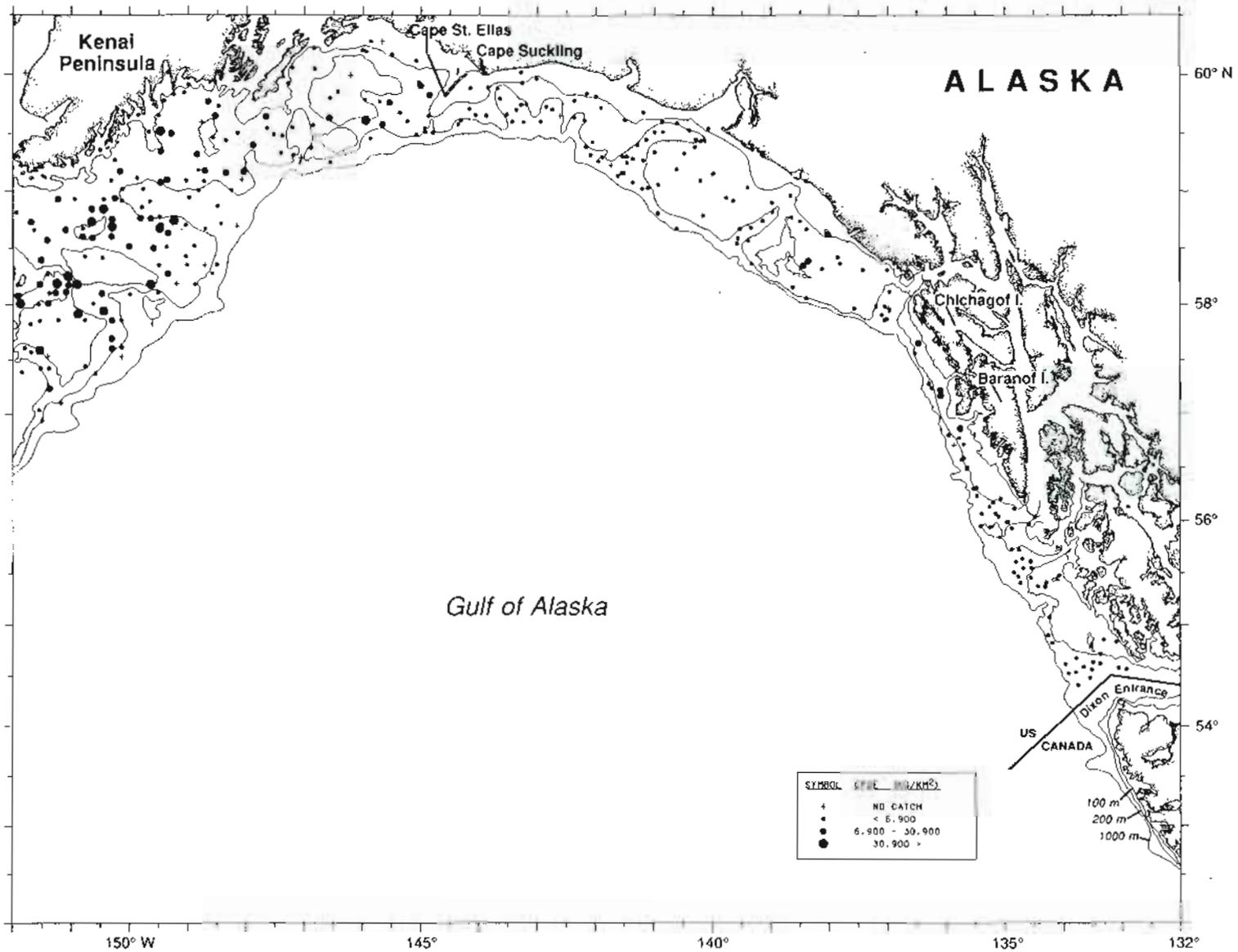


Figure 5.--continued.

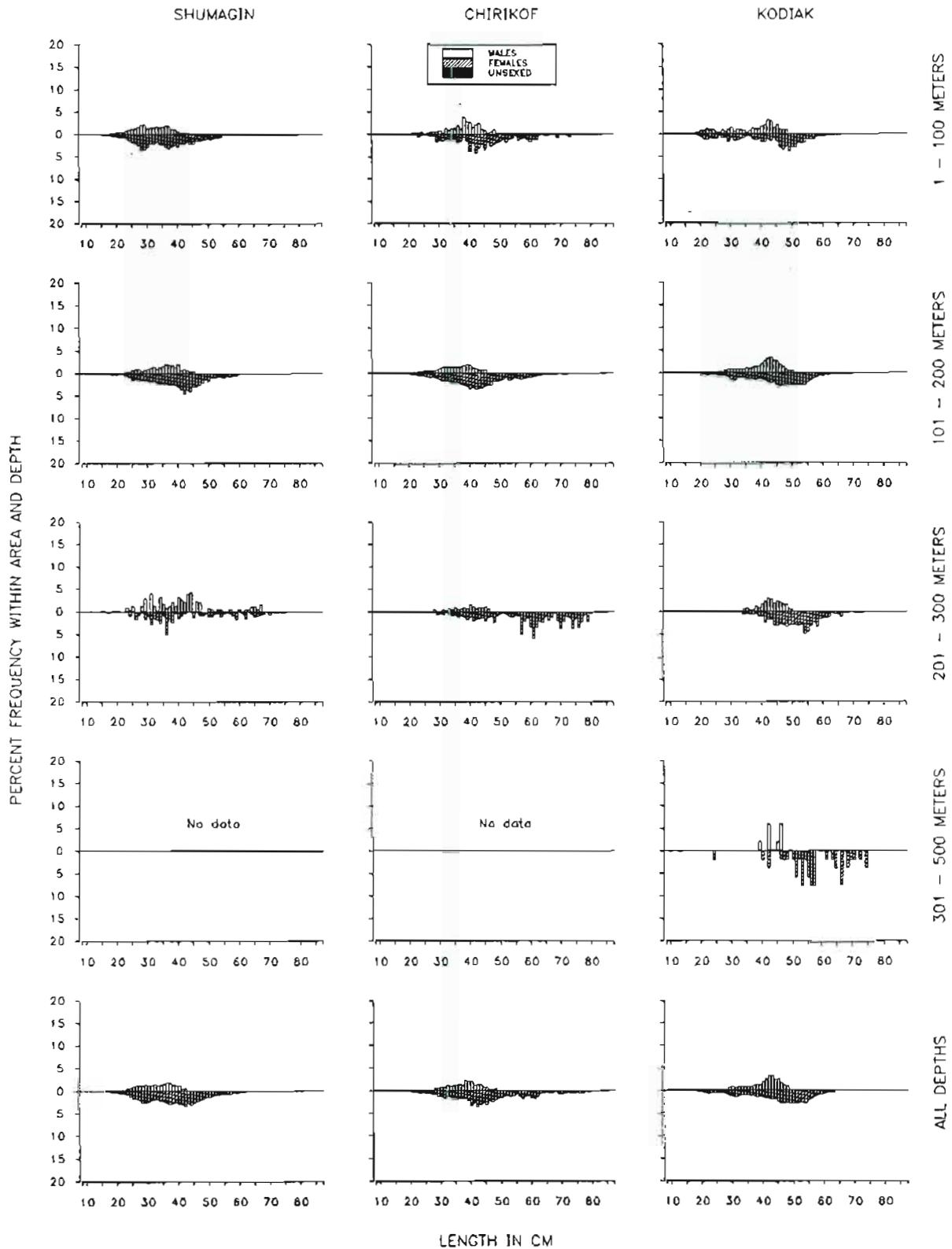


Figure 6.--Arrowtooth flounder length composition during the NMFS 1990 Gulf of Alaska groundfish survey by International North Pacific Fisheries Commission statistical area and depth.

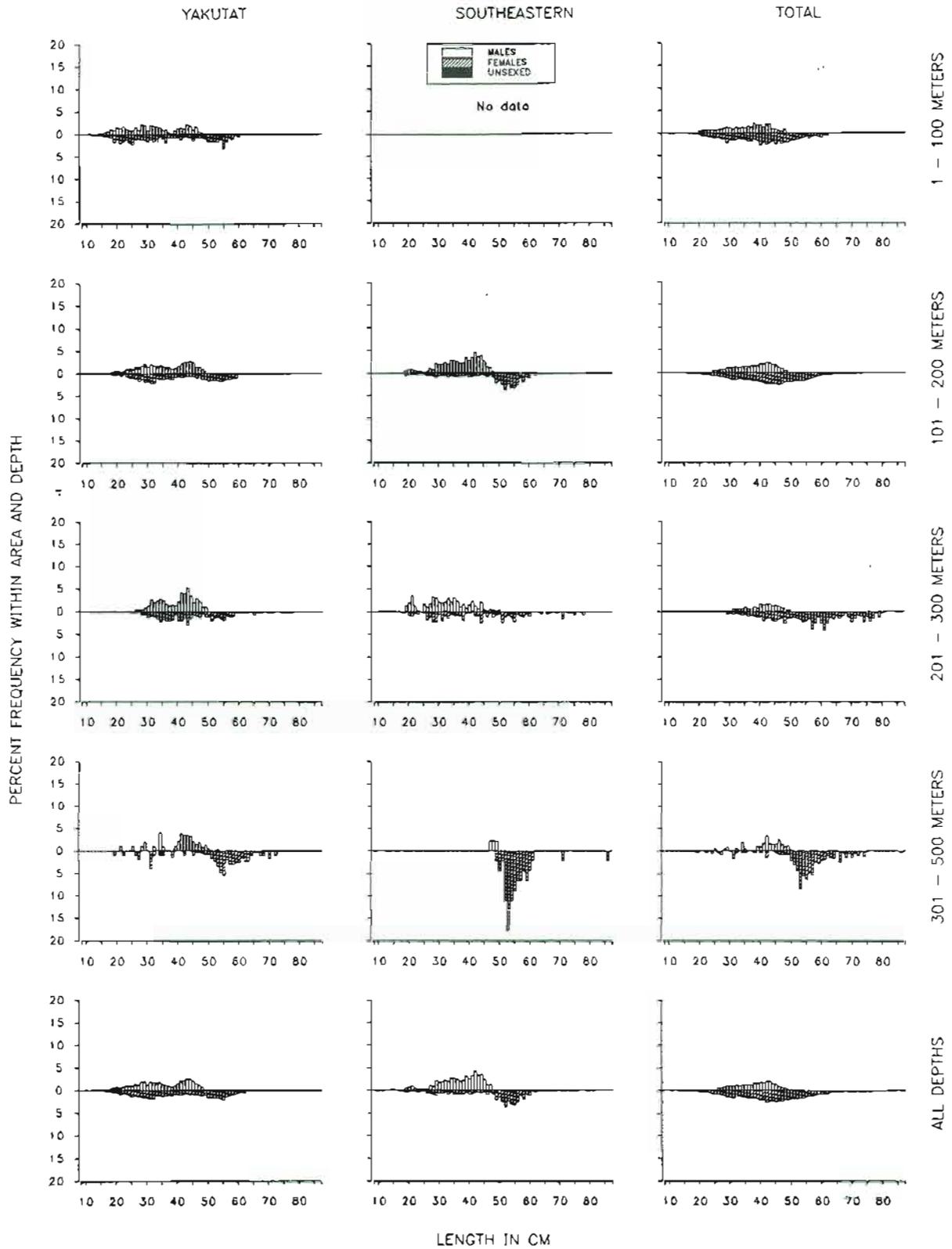


Figure 6.--continued.

Pacific halibut--The highest abundance of Pacific halibut generally occurred in waters shallower than 200 m west of the Kenai Peninsula (Table 4, Fig. 7). Halibut was not found deeper than 300 m, except in the Yakutat and Southeastern deep gullies and slope strata at low abundance levels. Halibut size increased and abundance decreased with increasing depth in every area. The highest halibut catch rates occurred in the shallow (<100 m) Semidi Bank (4,500 kg/km²), Albatross Banks (3,200 kg/km²), Lower Alaska Peninsula (2,800 kg/km²), Portlock Flats (2,300 kg/km²) and exceeded 1,000 kg/km² on most banks west of Kodiak Island.

Halibut was the longest of any measured species and averaged 63 cm. The catch of large halibut (over 50 cm in length) increased from west to east, with the largest fish averaging 10 kg and 85 cm in the Southeastern INPFC area (Fig. 8).

Table 4.--Total number of survey hauls, hauls containing Pacific halibut, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	73	1,481	65,700	2.9	54.5
	101 - 200	46	40	1,208	17,562	6.0	71.2
	201 - 300	9	2	74	202	10.1	93.3
	301 - 500	7	0	0	0	--	---
	All depths	137	115	1,301	83,464	3.3	56.4
Chirikof	1 - 100	28	25	2,262	60,124	3.9	60.6
	101 - 200	106	96	1,122	26,651	7.2	78.1
	201 - 300	16	9	630	7,247	10.0	88.8
	301 - 500	4	0	0	0	---	---
	All depths	154	130	1,482	94,021	4.7	64.8
Kodiak	1 - 100	51	43	1,639	65,313	3.5	59.0
	101 - 200	129	99	1,103	47,642	9.3	83.8
	201 - 300	29	12	725	8,368	15.3	100.4
	301 - 500	6	0	0	0	---	---
	All depths	215	154	1,244	121,322	5.0	65.2
Yakutat	1 - 100	17	14	717	12,068	4.1	63.6
	101 - 200	56	35	383	11,150	6.0	72.7
	201 - 300	36	8	162	791	15.4	91.8
	301 - 500	25	3	57	169	8.4	85.1
	All depths	134	60	449	24,177	5.0	67.5
Southeastern	1 - 100	0	0	0	0	---	---
	101 - 200	23	8	376	3,716	9.4	80.4
	201 - 300	27	5	196	988	10.2	92.3
	301 - 500	18	3	117	338	21.8	122.2
	All depths	68	16	283	5,042	9.9	84.0
All areas	1 - 100	171	155	1,592	203,204	3.4	57.9
	101 - 200	360	278	886	106,721	7.6	78.1
	201 - 300	117	36	493	17,596	12.2	93.6
	301 - 500	60	6	39	506	14.2	101.3
	All depths	708	475	1,105	328,027	4.4	62.4

All areas biomass, 95% confidence interval: 274,566 - 381,488 metric tons (t)

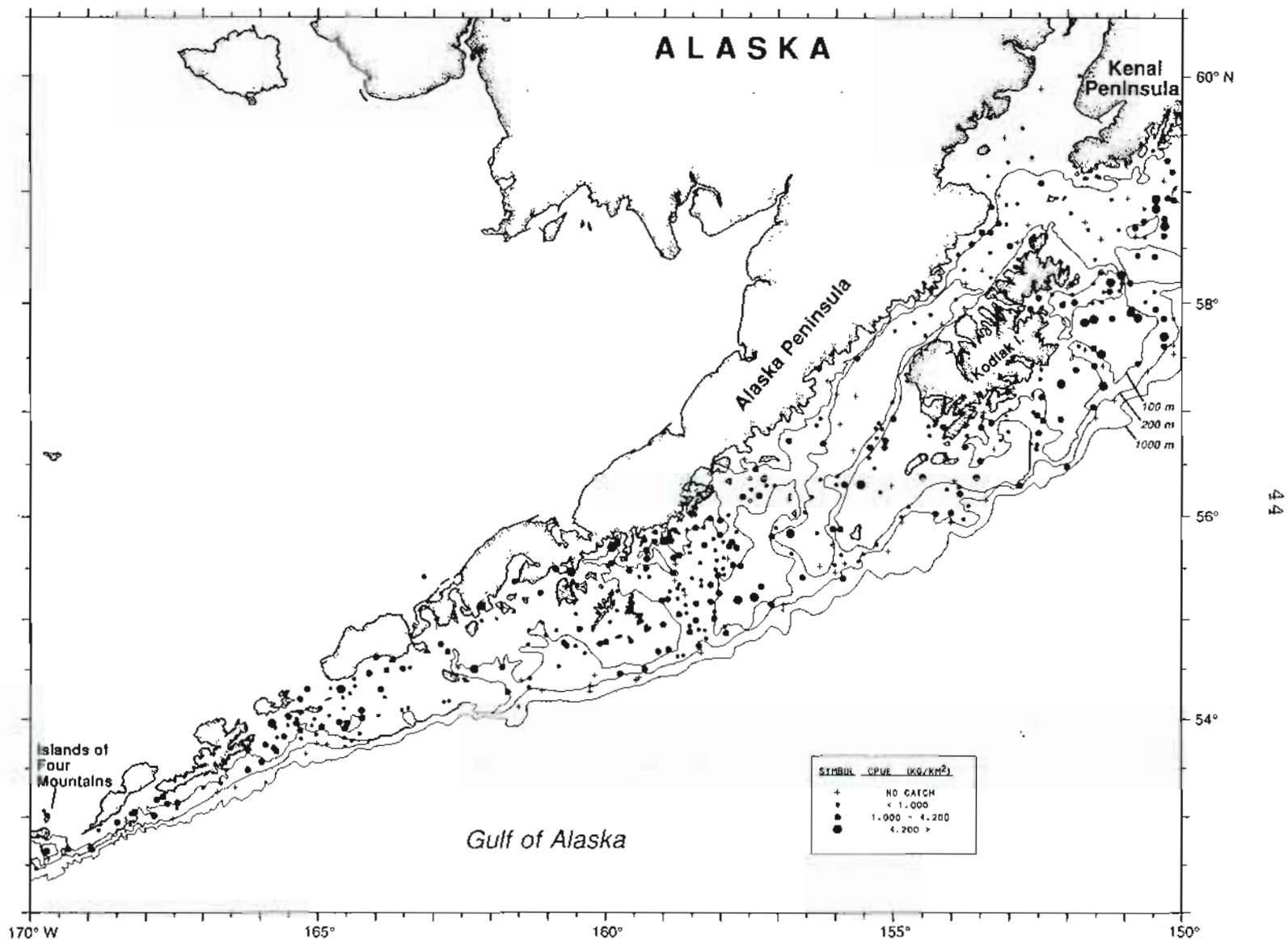


Figure 7.--Pacific halibut catch distribution and relative abundance during the NMFS 1990 Gulf of Alaska groundfish survey. Catch abundance categories are: 1) none, 2) less than the mean (1,000 kg/km²), 3) between the mean and two standard deviations and 4) greater than two standard deviations above the mean.

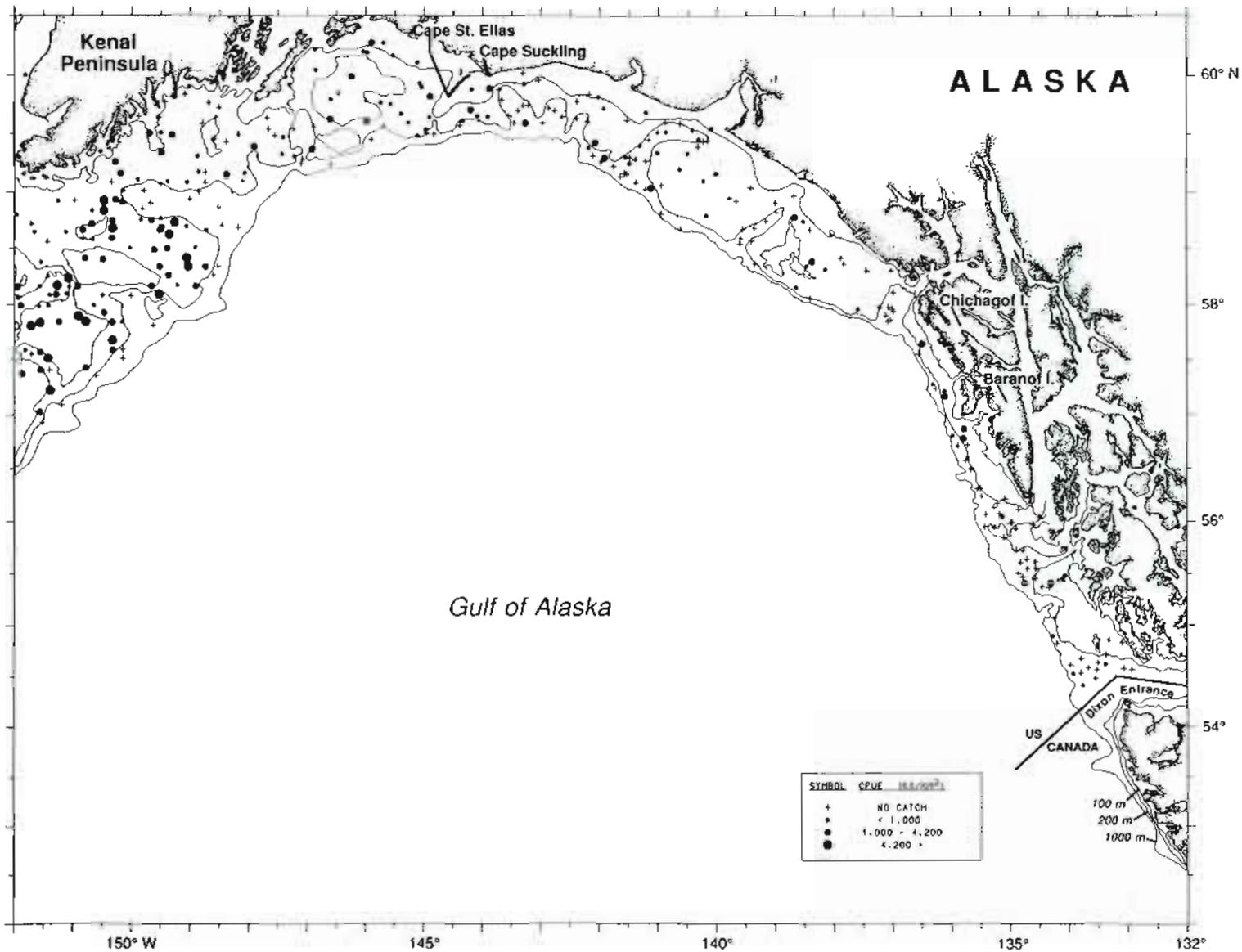


Figure 7.--continued.

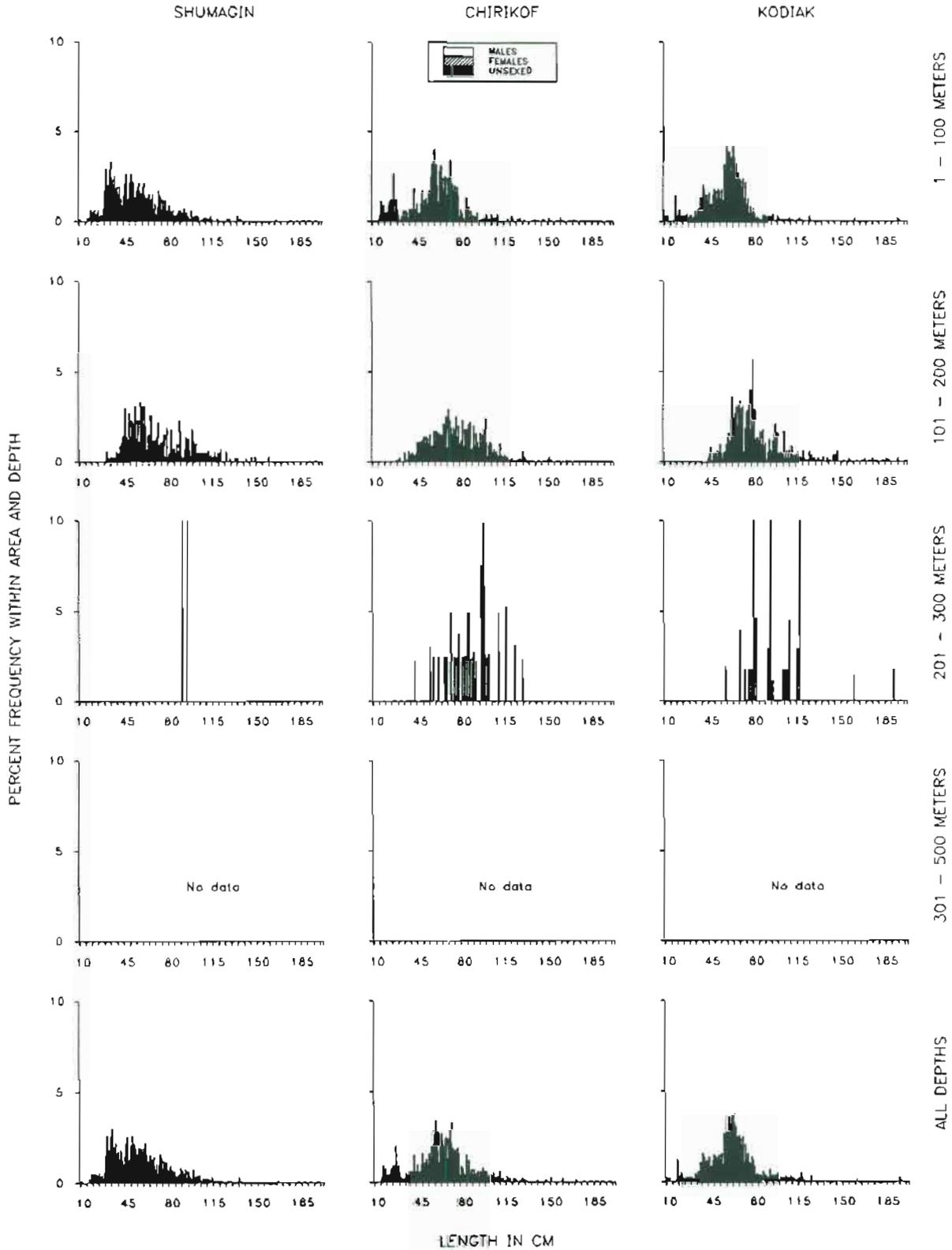


Figure 8.--Pacific halibut length composition during the NMFS 1990 Gulf of Alaska groundfish survey by International North Pacific Fisheries Commission statistical area and depth.

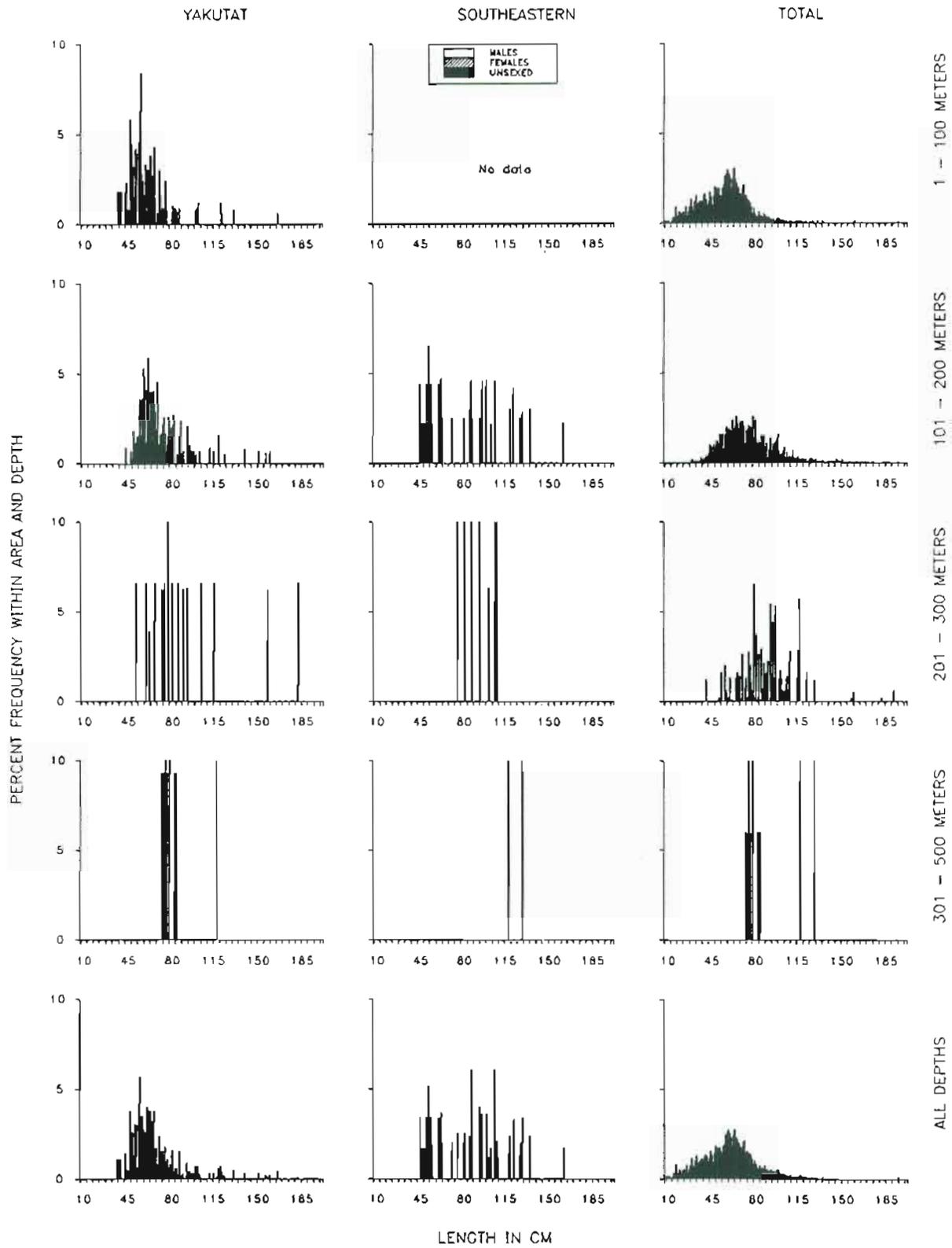


Figure 8.--continued.

Flathead sole--Flathead sole abundance totaled 255,700 t and was distributed primarily (90%) west of Montague Island in depths shallower than 200 m (Table 5; Fig. 9). Areas of highest flathead abundance were the Kodiak INPFC area's Albatross Shallows (8,900 kg/km²; 54,600 t), Chirikof Bank (2,000 kg/km²; 22,300 t) and the Lower Alaska Peninsula (4,100 kg/km²; 30,500 t). Abundance averaged approximately 7,000 t in the gullies and shelf areas adjacent to the Albatross Banks.

Flathead sole ranged in length from approximately 9 to 47 cm (Fig. 10). The largest fish occurred primarily in shallow depths (< 100 m) in the Kodiak INPFC area and in depths over 200 m in the Chirikof and Yakutat INPFC areas.

Table 5.--Total number of survey hauls, hauls containing flathead sole, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	39	1,123	49,817	0.3	30.9
	101 - 200	46	32	826	12,006	0.3	29.5
	201 - 300	9	5	42	114	0.5	—
	301 - 500	7	0	0	0	—	—
	All depths	137	76	965	61,938	0.3	30.6
Chirikof	1 - 100	28	17	1,177	31,288	0.3	30.9
	101 - 200	106	88	773	18,368	0.3	31.2
	201 - 300	16	12	435	5,005	0.4	33.3
	301 - 500	4	0	0	0	—	—
	All depths	154	117	861	54,661	0.3	31.2
Kodiak	1 - 100	51	26	1,879	74,850	0.4	33.4
	101 - 200	129	104	809	34,955	0.3	32.2
	201 - 300	29	20	304	3,506	0.3	30.7
	301 - 500	6	1	2	5	0.1	—
	All depths	215	151	1,162	113,315	0.4	32.9
Yakutat	1 - 100	17	14	817	13,763	0.4	32.1
	101 - 200	56	38	372	10,841	0.3	31.1
	201 - 300	36	23	231	1,126	0.4	34.8
	301 - 500	25	2	10	29	0.5	—
	All depths	134	77	479	25,760	0.4	31.8
Southeastern	1 - 100	0	0	0	0	—	—
	101 - 200	23	2	1	7	0.1	—
	201 - 300	27	3	7	33	0.2	—
	301 - 500	18	0	0	0	—	—
	All depths	68	5	2	40	0.2	—
All areas	1 - 100	171	96	1,330	169,718	0.4	32.0
	101 - 200	360	264	632	76,177	0.3	31.3
	201 - 300	117	63	274	9,786	0.3	32.4
	301 - 500	60	3	3	34	0.3	—
	All depths	708	426	862	255,714	0.3	31.8

All areas biomass, 95% confidence interval: 192,209 - 319,220 metric tons (t)

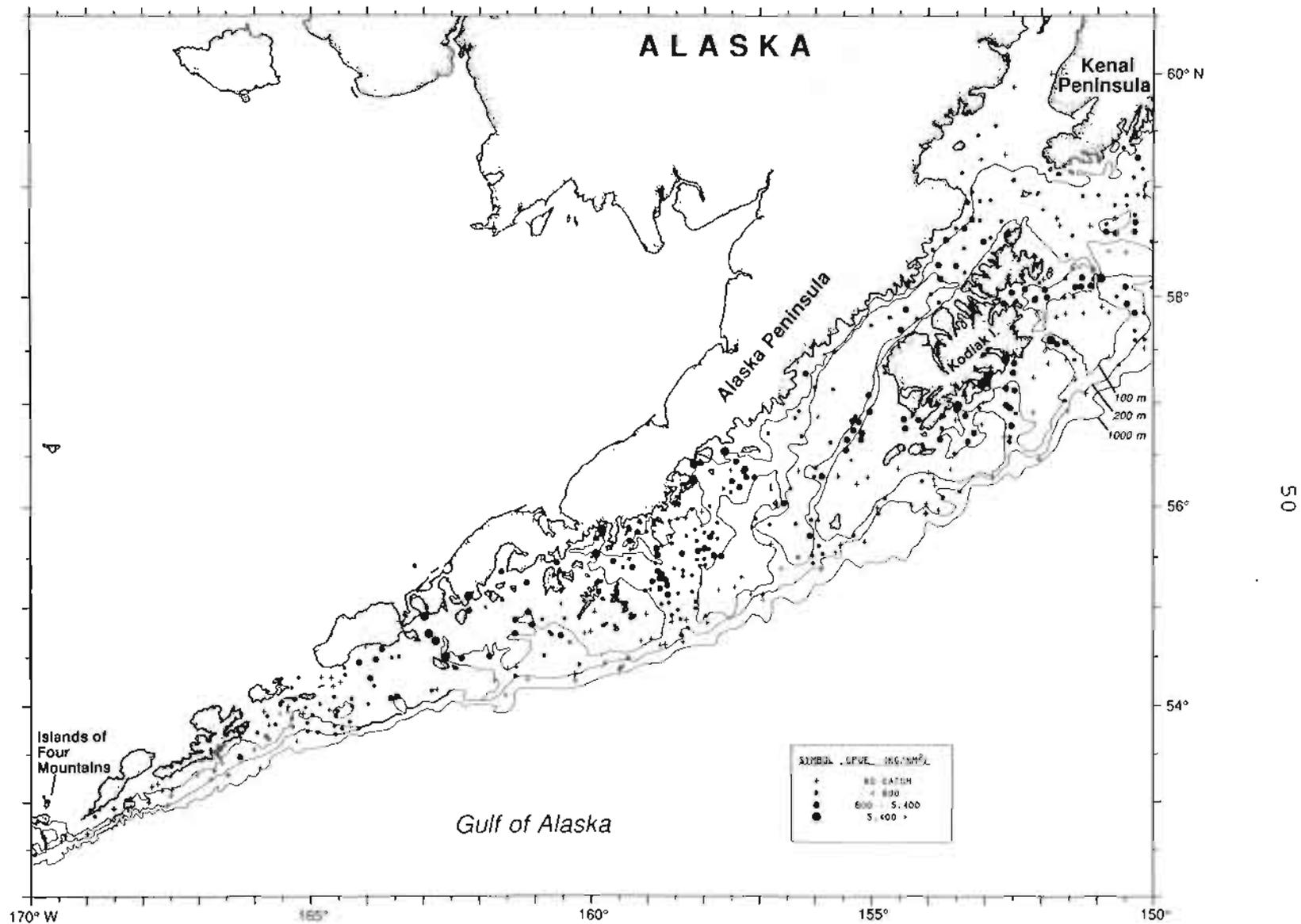


Figure 9.--Flathead sole catch distribution and relative abundance during the NMFS 1990 Gulf of Alaska groundfish survey. Catch abundance categories are: 1) none, 2) less than the mean (800 kg/km²), 3) between the mean and two standard deviations and 4) greater than two standard deviations above the mean.

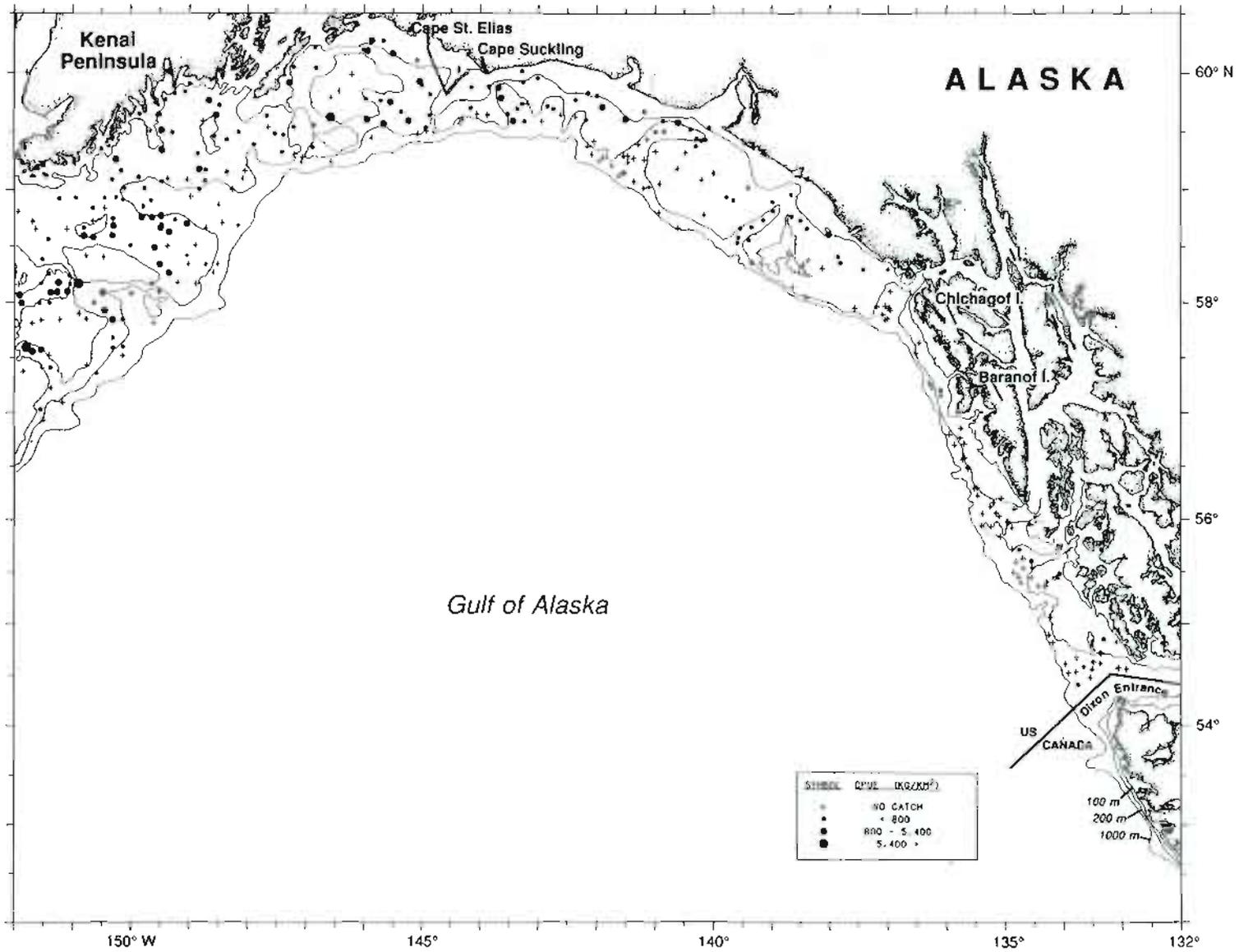


Figure 9.--continued.

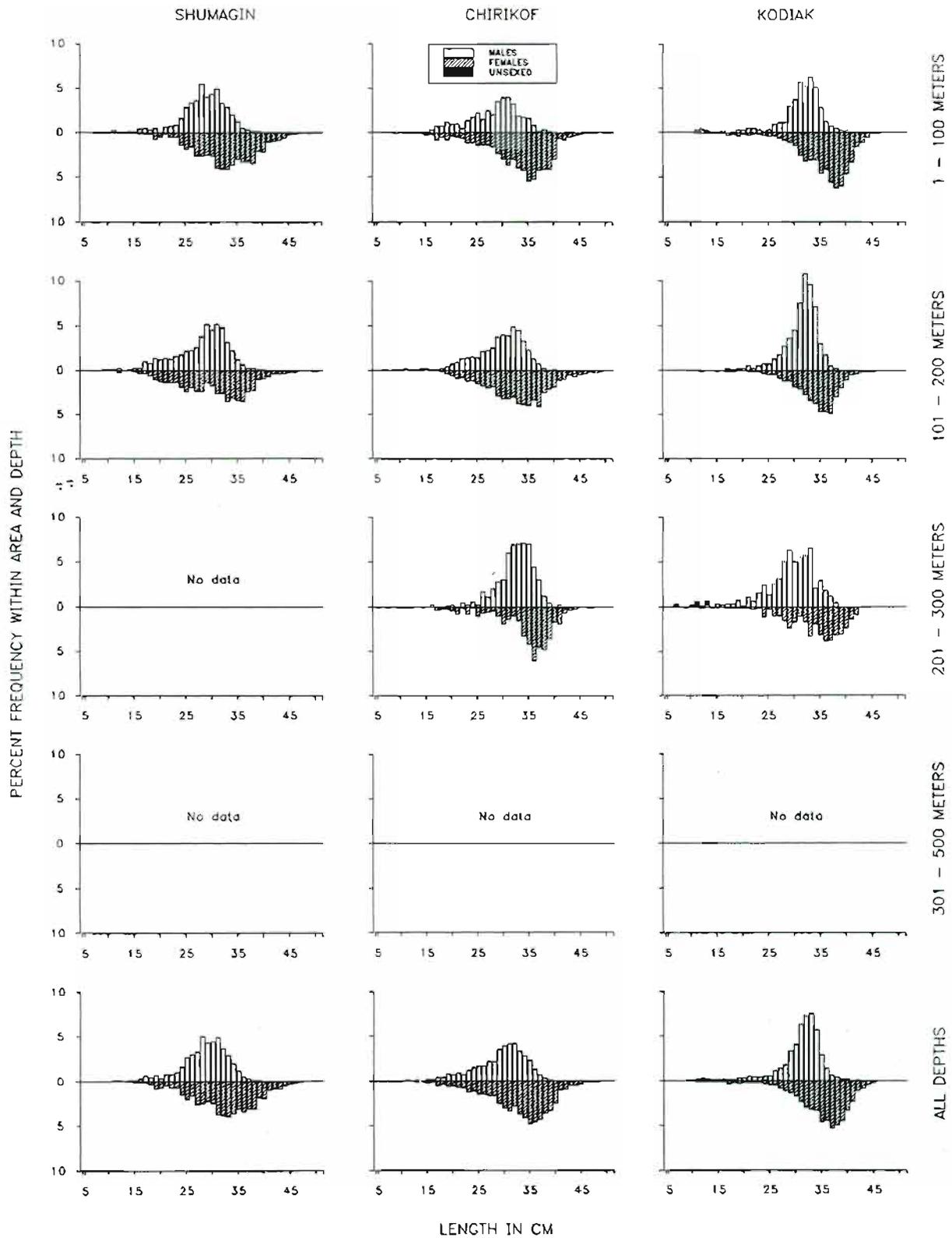


Figure 10.--Flathead sole length composition during the NMFS 1990 Gulf of Alaska groundfish survey by International North Pacific Fisheries Commission statistical area and depth.

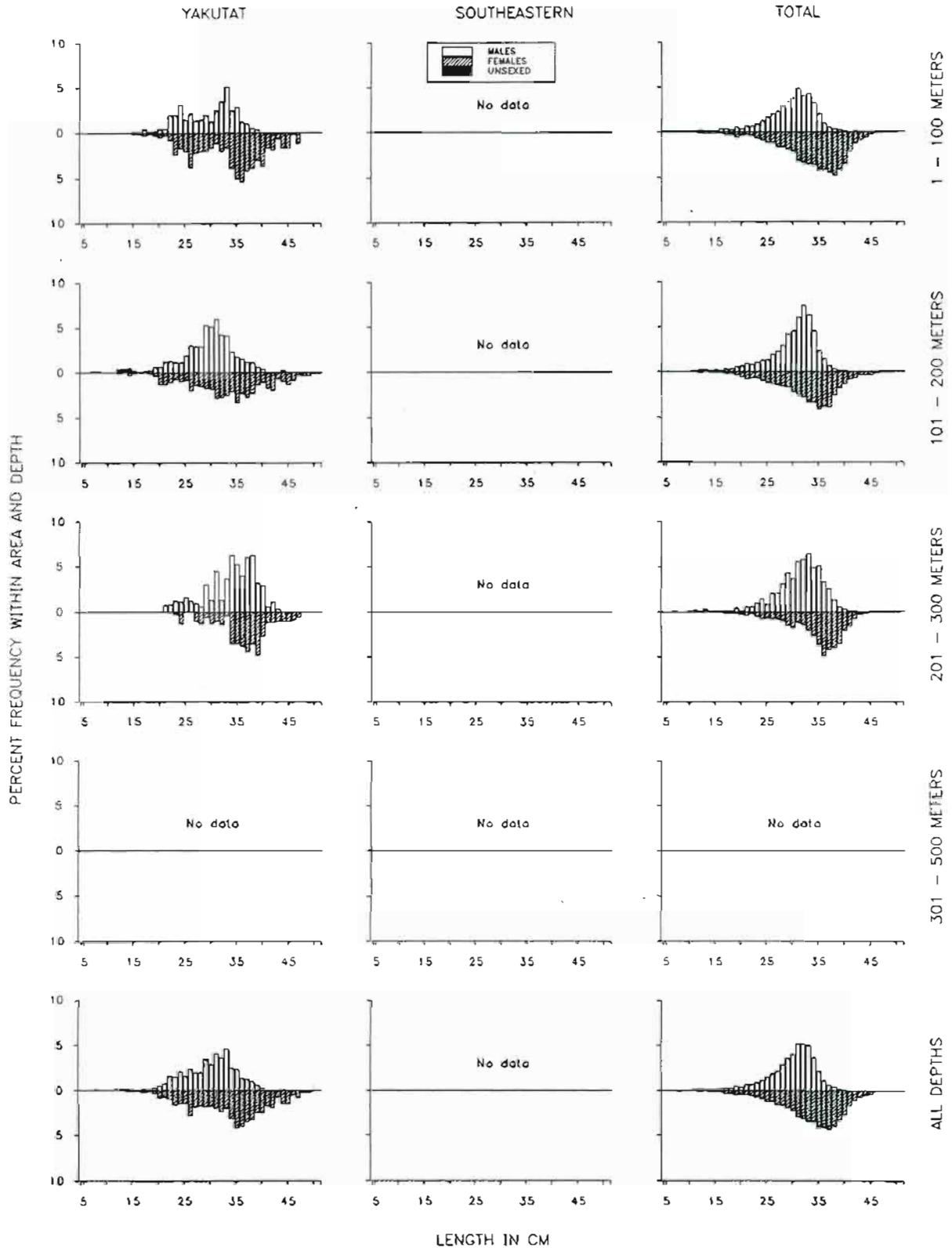


Figure 10.--continued.

Rock sole--The rock sole total biomass of 160,700 t (Table 6) was concentrated (80%) in depths under 100 m from the Fox Islands (18,500 t) eastward to the Albatross Banks (34,800 t), with catch rates exceeding 1,000 kg/km² throughout most of these areas (Fig. 11). In waters deeper than 100 m, half of the available rock sole biomass of 16,800 t occurred on the Shumagin outer shelf.

The total rock sole length composition (Fig. 12) had a bimodal distribution ranging between 17-34 cm and 35-47 cm. The Chirikof INPFC area had the lowest proportion of 17-34 cm rock sole. Over the survey area, rock sole averaged 32 cm in length.

Table 6.--Total number of survey hauls, hauls containing rock sole, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	70	1,641	72,786	0.5	32.3
	101 - 200	46	34	628	9,125	0.6	34.4
	201 - 300	9	2	5	14	0.4	---
	301 - 500	7	0	0	0	---	---
	All depths	137	106	1,277	81,925	0.5	32.5
Chirikof	1 - 100	28	20	735	19,526	0.6	34.5
	101 - 200	106	33	109	2,592	0.5	34.0
	201 - 300	16	1	7	79	0.4	---
	301 - 500	4	0	0	0	---	---
	All depths	154	54	350	22,196	0.6	34.4
Kodiak	1 - 100	51	46	1,235	49,194	0.4	31.4
	101 - 200	129	33	107	4,619	0.5	33.1
	201 - 300	29	0	0	0	---	---
	301 - 500	6	0	0	0	---	---
	All depths	215	79	552	53,812	0.4	31.5
Yakutat	1 - 100	17	4	138	2,322	0.6	34.5
	101 - 200	56	3	10	302	0.9	---
	201 - 300	36	0	0	0	---	---
	301 - 500	25	0	0	0	---	---
	All depths	134	7	49	2,624	0.6	34.5
Southeastern	1 - 100	0	0	0	0	---	---
	101 - 200	23	2	13	129	0.7	---
	201 - 300	27	0	0	0	---	---
	301 - 500	18	0	0	0	---	---
	All depths	68	2	7	129	0.7	---
All areas	1 - 100	171	140	1,127	143,827	0.5	32.2
	101 - 200	360	105	139	16,767	0.5	34.0
	201 - 300	117	3	3	93	0.4	---
	301 - 500	60	0	0	0	---	---
	All depths	708	248	541	160,687	0.5	32.4

All areas biomass, 95% confidence interval: 119,787 - 201,587 metric tons (t)

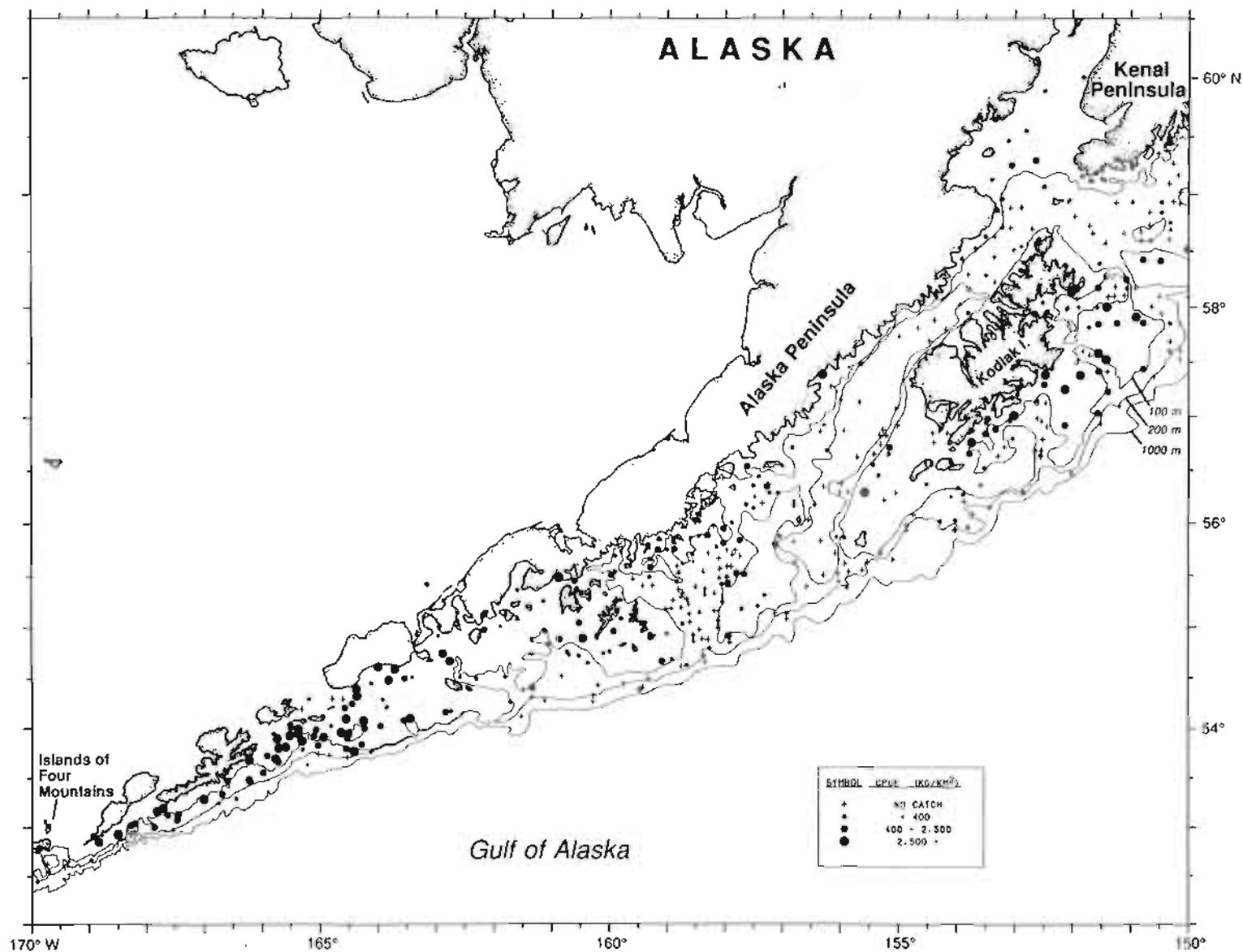


Figure 11.--Rock sole catch distribution and relative abundance during the NMFS 1990 Gulf of Alaska groundfish survey. Catch abundance categories are: 1) none, 2) less than the mean (400 kg/km²), 3) between the mean and two standard deviations and 4) greater than two standard deviations above the mean.

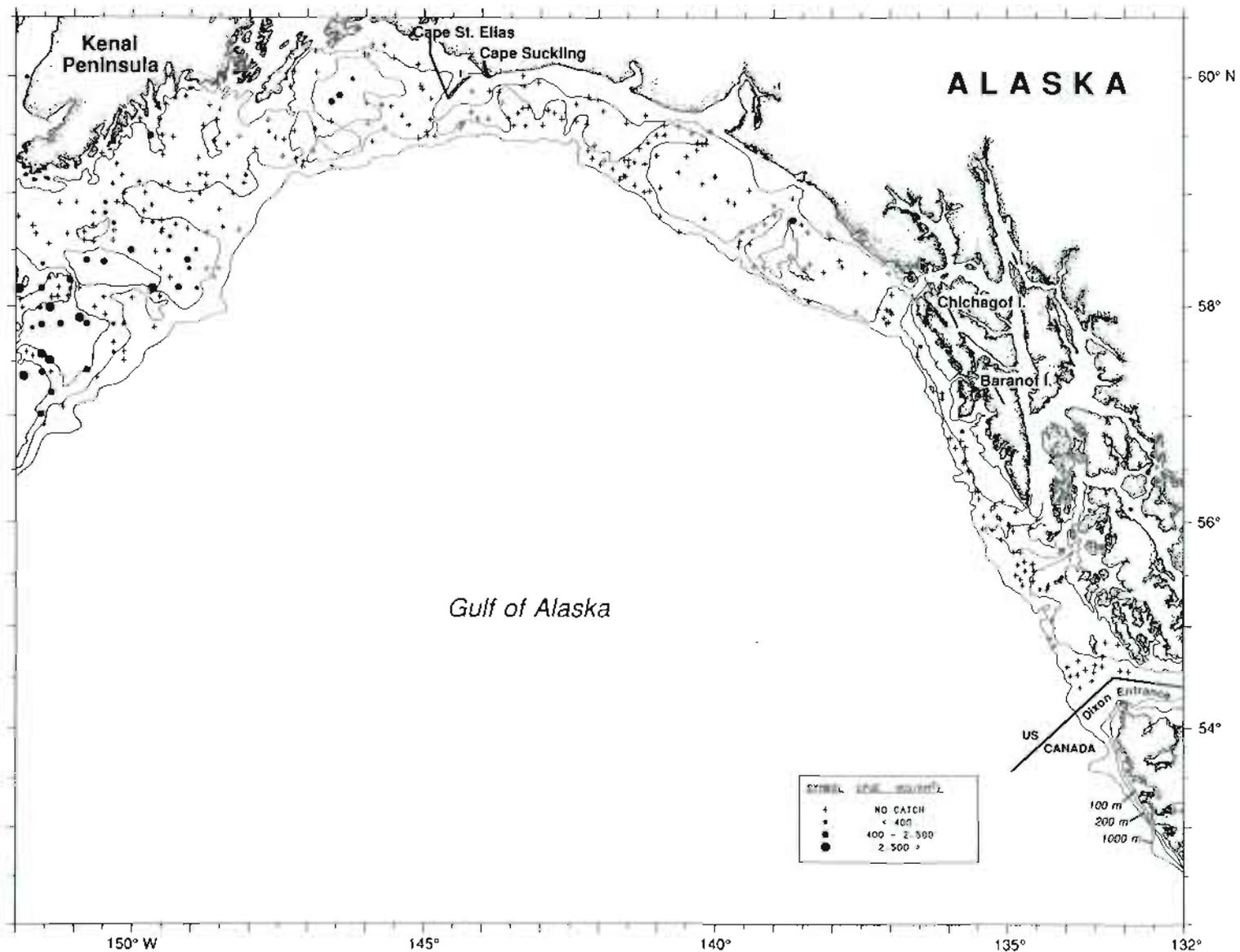


Figure 11.--continued.

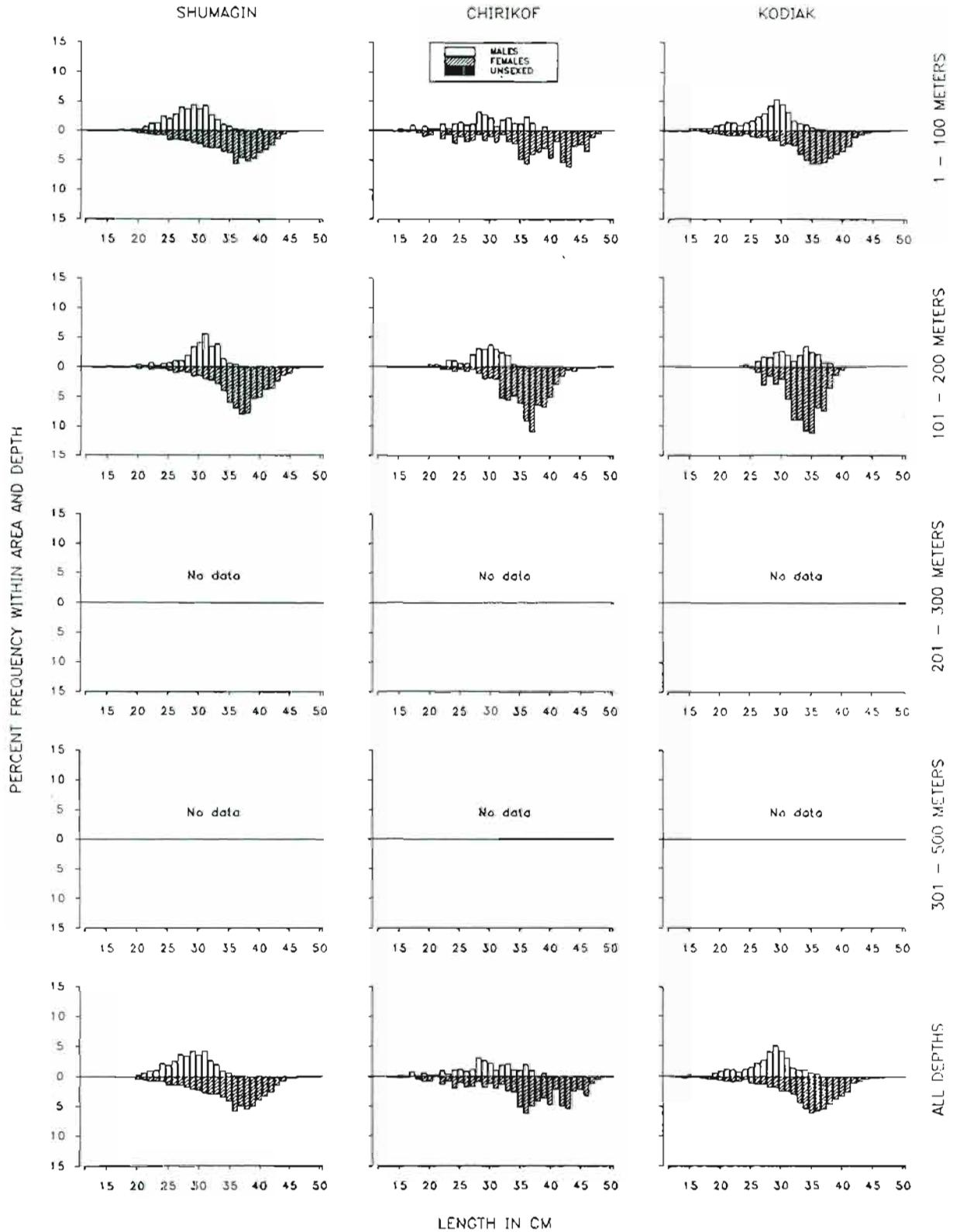


Figure 12.--Rock sole length composition during the NMFS 1990 Gulf of Alaska groundfish survey by International North Pacific Fisheries Commission statistical area and depth.

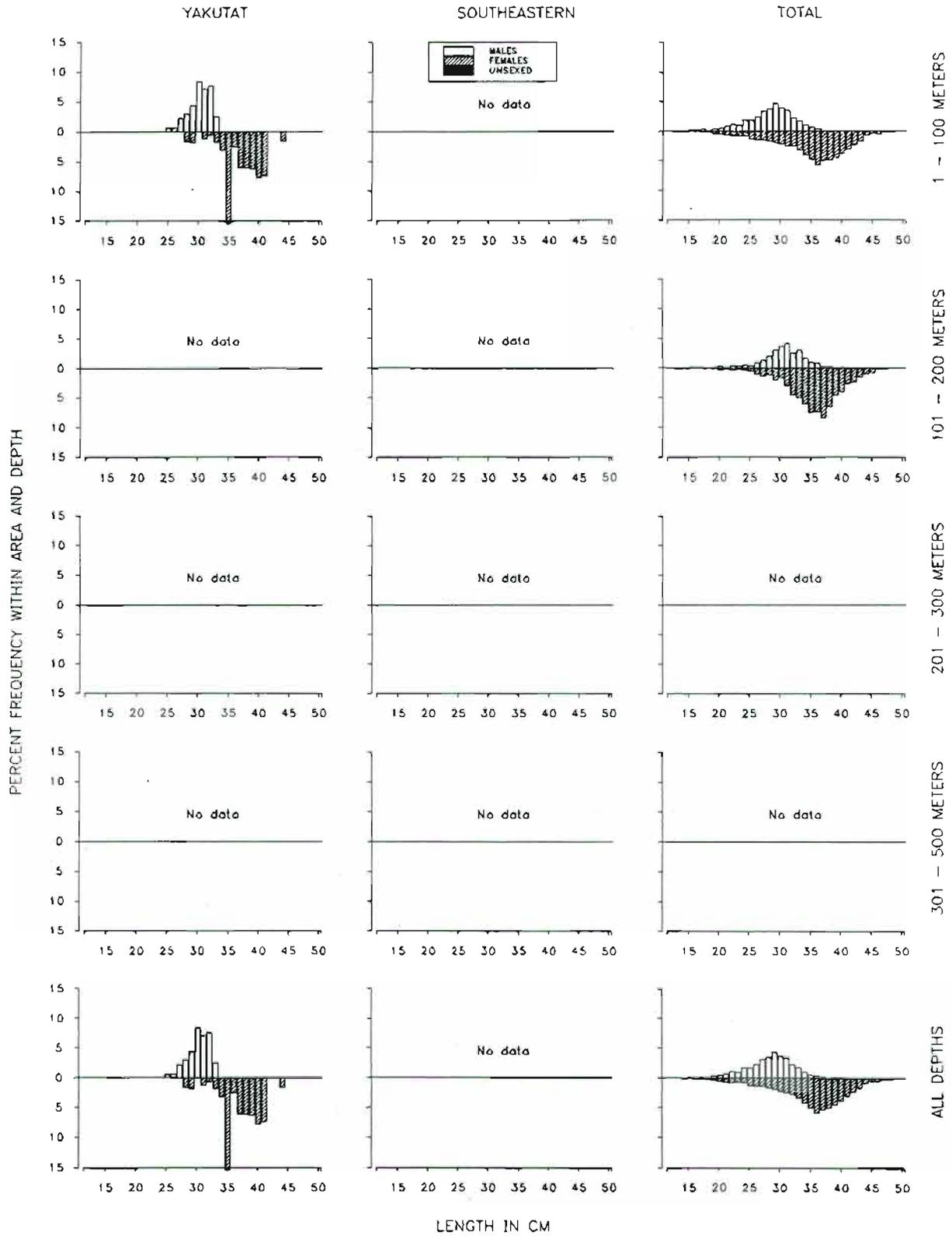


Figure 12.--continued.

Rex sole--Rex sole catch rates exceeded 1,000 kg/km² in the Albatross Gullies, Portlock Flats and Lower Shelikof Gully (Fig. 13). Rex sole abundance over all areas and depths totaled 97,300 t (Table 7), of which 80% occurred in the Kodiak and Chirikof INPFC area's 101-200 m and 201-300 m depth intervals.

The largest rex sole occurred on the Chirikof Bank averaging 42 cm and 0.6 kg. The total Kodiak INPFC area rex sole length distributions were normally distributed (Fig. 14) from approximately 20 cm to 50 cm. The length distribution of Shumagin INPFC area rex sole formed approximately 2 modes 30-50 cm and a narrow 26-29 cm mode. The Southeastern INPFC area's length distribution had a very low proportion under 30 cm in length. Over 50% of the Yakutat INPFC area's rex sole were 32-37 cm in length.

Table 7.--Total number of survey hauls, hauls containing rex sole, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	25	29	1,302	0.4	34.5
	101 - 200	46	33	251	3,654	0.5	38.5
	201 - 300	9	7	551	1,508	0.4	38.1
	301 - 500	7	2	21	52	0.4	37.0
	All depths	137	67	102	6,516	0.4	37.5
Chirikof	1 - 100	28	11	181	4,814	0.6	41.8
	101 - 200	106	89	610	14,482	0.5	40.1
	201 - 300	16	14	1,095	12,596	0.5	40.2
	301 - 500	4	2	93	152	0.3	---
	All depths	154	116	505	32,044	0.5	40.3
Kodiak	1 - 100	51	15	106	4,220	0.3	35.5
	101 - 200	129	108	777	33,568	0.4	37.2
	201 - 300	29	26	432	4,982	0.3	35.2
	301 - 500	6	5	81	240	0.3	37.6
	All depths	215	154	441	43,010	0.4	36.8
Yakutat	1 - 100	17	12	279	4,695	0.2	31.0
	101 - 200	56	47	226	6,581	0.2	32.4
	201 - 300	36	32	170	831	0.2	31.7
	301 - 500	25	18	67	199	0.2	32.5
	All depths	134	109	229	12,305	0.2	31.8
Southeastern	1 - 100	0	0	0	0	---	---
	101 - 200	23	20	165	1,633	0.2	31.6
	201 - 300	27	25	263	1,324	0.2	31.6
	301 - 500	18	14	169	486	0.2	33.9
	All depths	68	59	194	3,443	0.2	31.9
All areas	1 - 100	171	63	118	15,030	0.3	34.4
	101 - 200	360	297	497	59,917	0.4	36.9
	201 - 300	117	104	595	21,241	0.4	37.1
	301 - 500	60	41	87	1,129	0.3	34.4
	All depths	708	505	328	97,317	0.4	36.5

All areas biomass, 95% confidence interval: 76,686 - 117,948 metric tons (t)

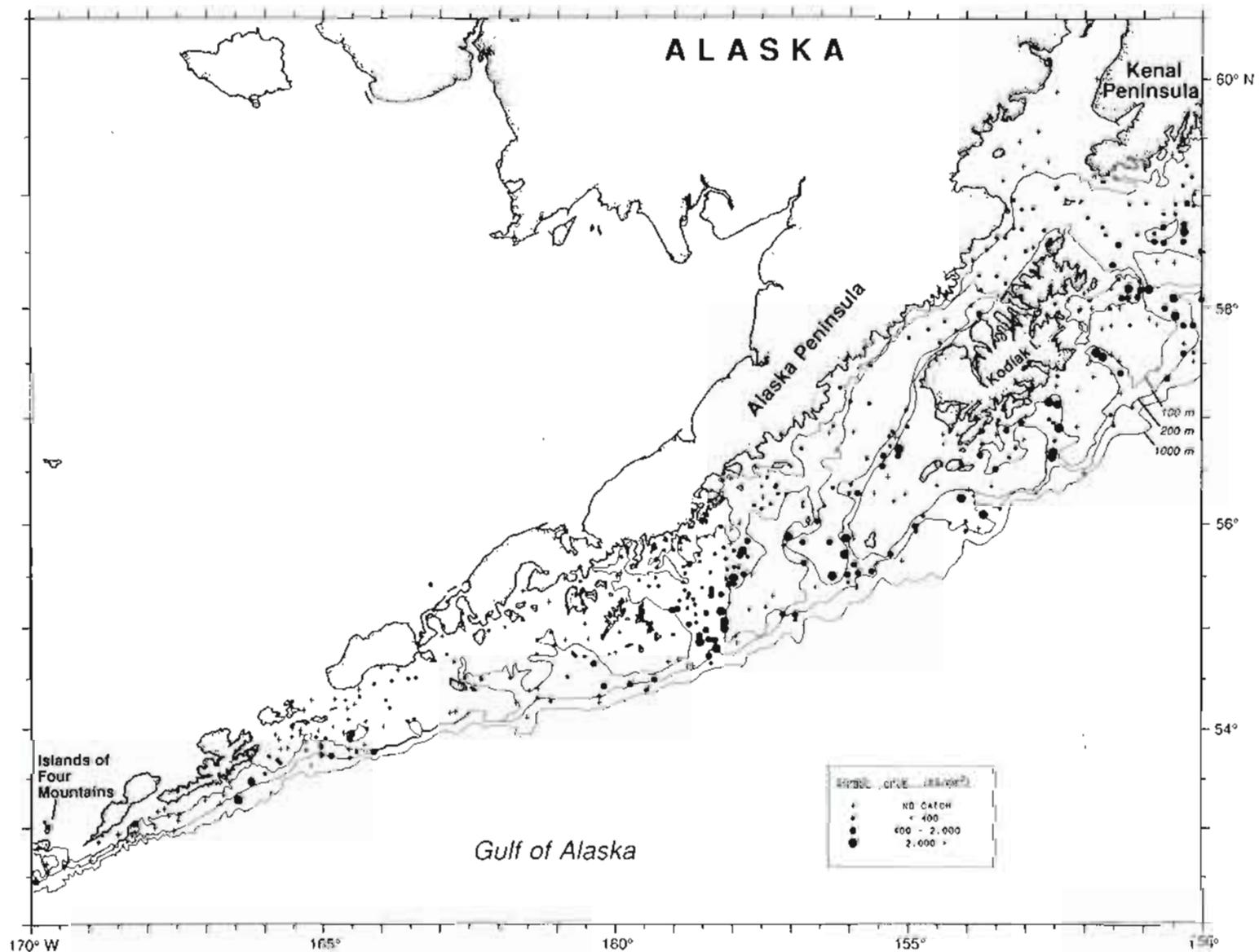


Figure 13.--Rex sole catch distribution and relative abundance during the NMFS 1990 Gulf of Alaska groundfish survey. Catch abundance categories are: 1) none, 2) less than the mean (400 kg/km²), 3) between the mean and two standard deviations and 4) greater than two standard deviations above the mean.

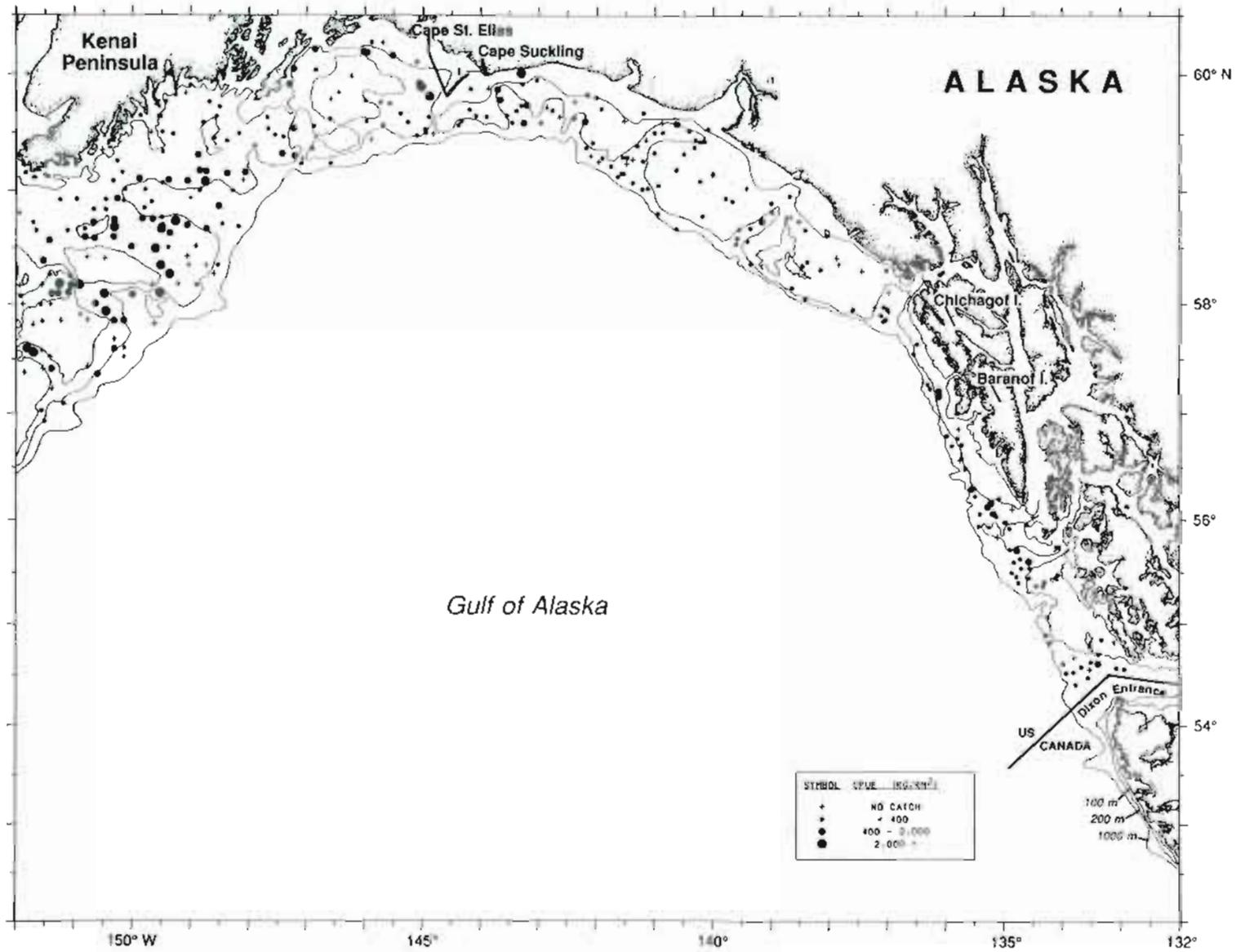


Figure 13.--continued.

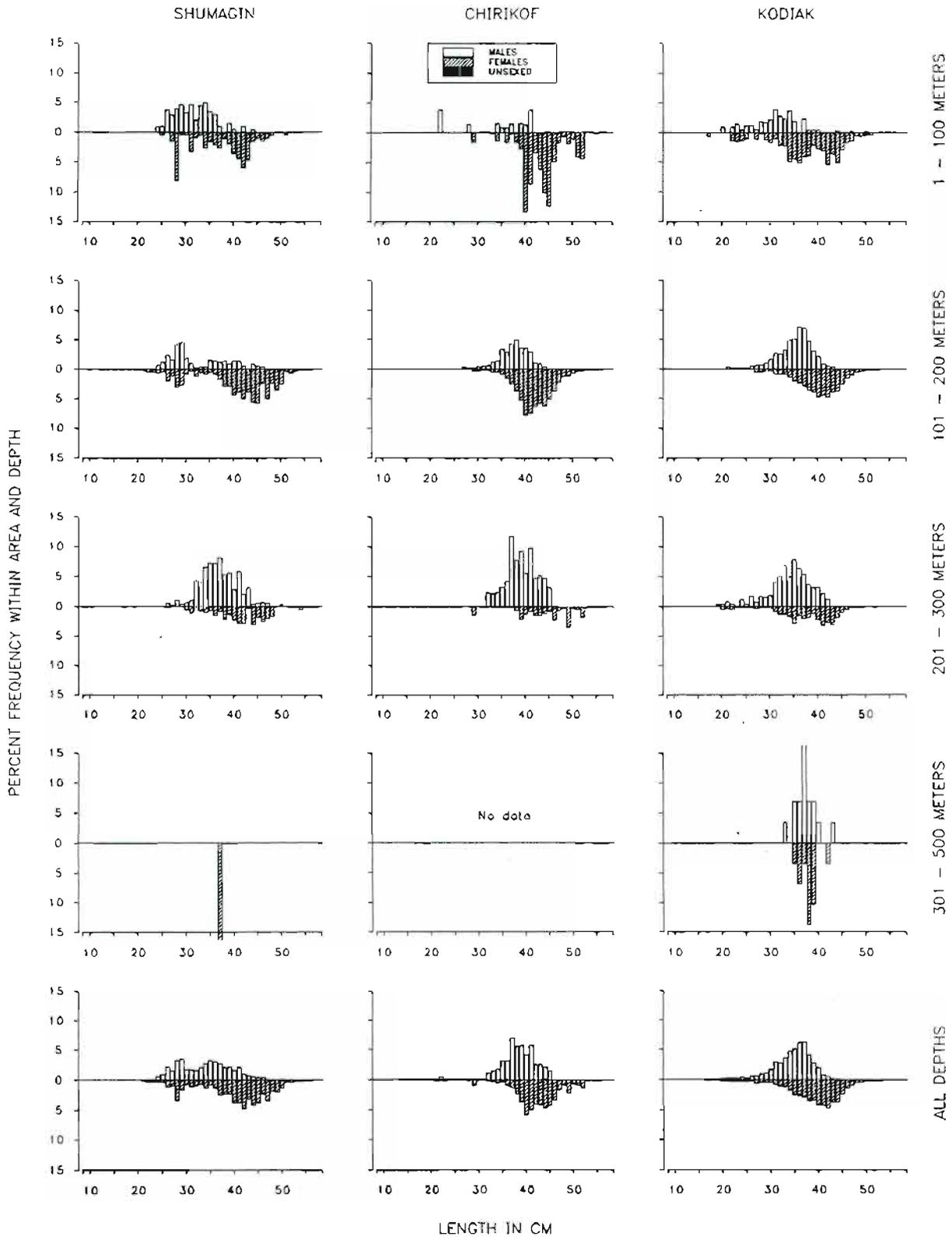


Figure 14.--Rex sole length composition during the NMFS 1990 Gulf of Alaska groundfish survey by International North Pacific Fisheries Commission statistical area and depth.

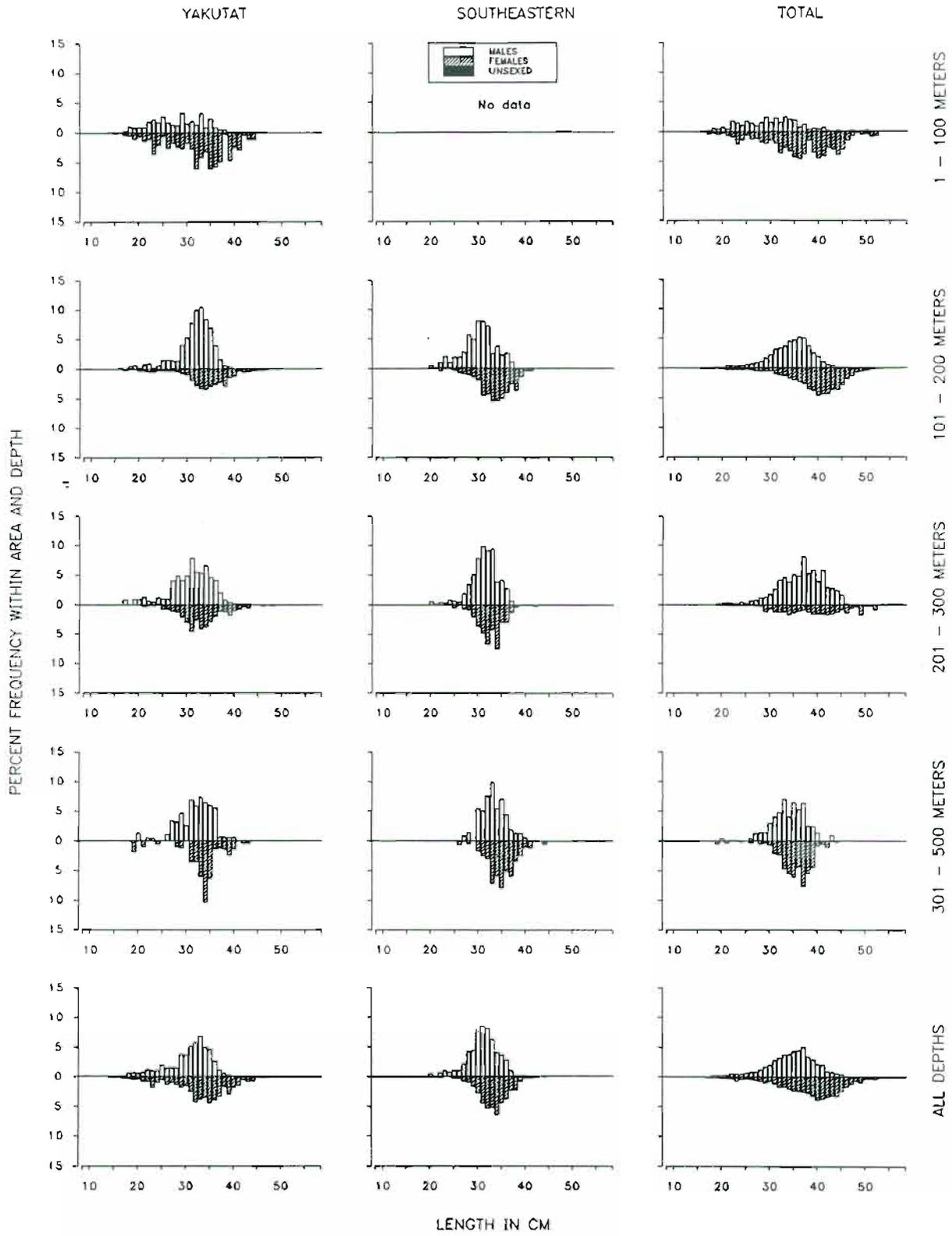


Figure 14.--continued.

Dover sole--Approximately 50% of the total Dover sole biomass of 97,100 t was found in the Kodiak INPFC area (Table 8). The remaining biomass was primarily divided between the Chirikof and Yakutat INPFC areas. Dover sole shared some of the same high abundance areas as rex sole, including the 101-200 m shelf and gully areas adjacent to Kodiak Island (Fig. 15). Dover sole were more abundant than rex sole on the shallow (1-100 m) bank surrounding Chirikof Island and less abundant in adjacent deeper waters than rex sole.

Dover sole ranged in length from approximately 25 to 57 cm and averaged 42 cm overall. The Chirikof INPFC area had the highest proportion of large Dover sole averaging 45 cm overall (Fig. 16). Female abundance approximated that of males in all areas except the Southeastern INPFC area (approximately 20% female). Small (30 cm) Dover sole had low abundance in all areas.

Table 8.—Total number of survey hauls, hauls containing Dover sole, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	3	4	188	0.6	---
	101 - 200	46	15	48	698	0.9	44.5
	201 - 300	9	4	18	50	0.7	---
	301 - 500	7	5	281	711	0.7	40.9
	All depths	137	27	26	1,646	0.8	42.4
Chirikof	1 - 100	28	9	356	9,449	1.3	47.3
	101 - 200	106	72	221	5,242	0.9	43.7
	201 - 300	16	14	921	10,587	0.8	43.8
	301 - 500	4	4	375	612	0.9	43.4
	All depths	154	99	408	25,891	1.0	44.7
Kodiak	1 - 100	51	13	50	1,988	0.9	44.5
	101 - 200	129	105	854	36,898	0.8	42.7
	201 - 300	29	23	397	4,583	0.8	40.7
	301 - 500	6	6	481	1,425	0.7	41.9
	All depths	215	147	460	44,894	0.8	42.5
Yakutat	1 - 100	17	10	50	844	0.4	32.9
	101 - 200	56	46	493	14,354	0.7	41.1
	201 - 300	36	32	501	2,442	0.8	42.3
	301 - 500	25	23	706	2,091	0.8	41.1
	All depths	134	111	367	19,730	0.7	41.0
Southeastern	1 - 100	0	0	0	0	---	---
	101 - 200	23	17	99	976	0.5	---
	201 - 300	27	26	409	2,058	0.5	36.1
	301 - 500	18	18	654	1,886	0.8	40.8
	All depths	68	61	277	4,920	0.6	37.7
All areas	1 - 100	171	35	98	12,469	1.0	45.5
	101 - 200	360	255	483	58,167	0.8	42.4
	201 - 300	117	99	553	19,721	0.8	41.6
	301 - 500	60	56	519	6,725	0.8	41.3
	All depths	708	445	327	97,081	0.8	42.4

All areas biomass, 95% confidence interval: 72,543 - 121,620 metric tons (t)

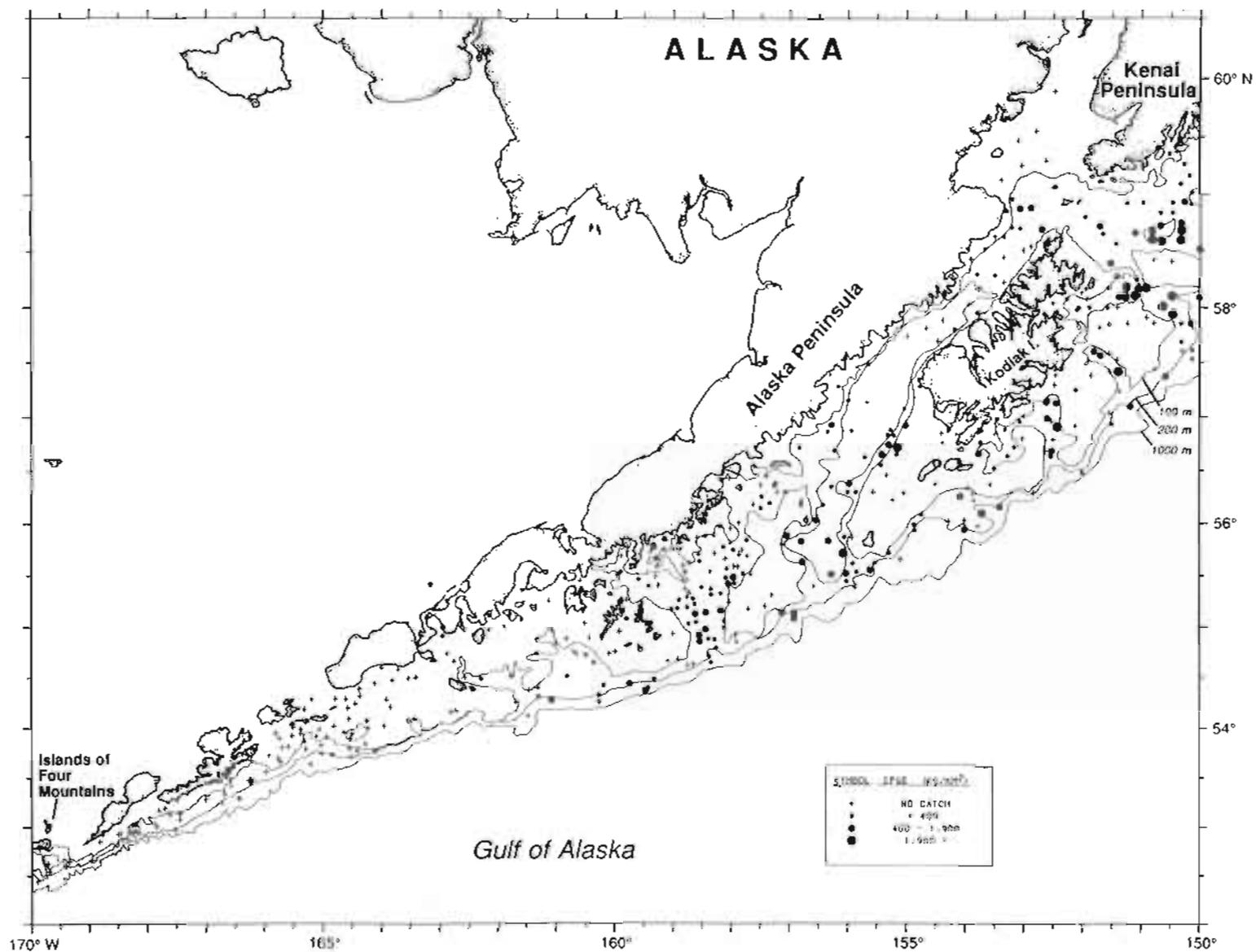


Figure 15.--Dover sole catch distribution and relative abundance during the NMFS 1990 Gulf of Alaska groundfish survey. Catch abundance categories are: 1) none, 2) less than the mean, 3) between the mean (400 kg/km²) and two standard deviations and 4) greater than two standard deviations above the mean.

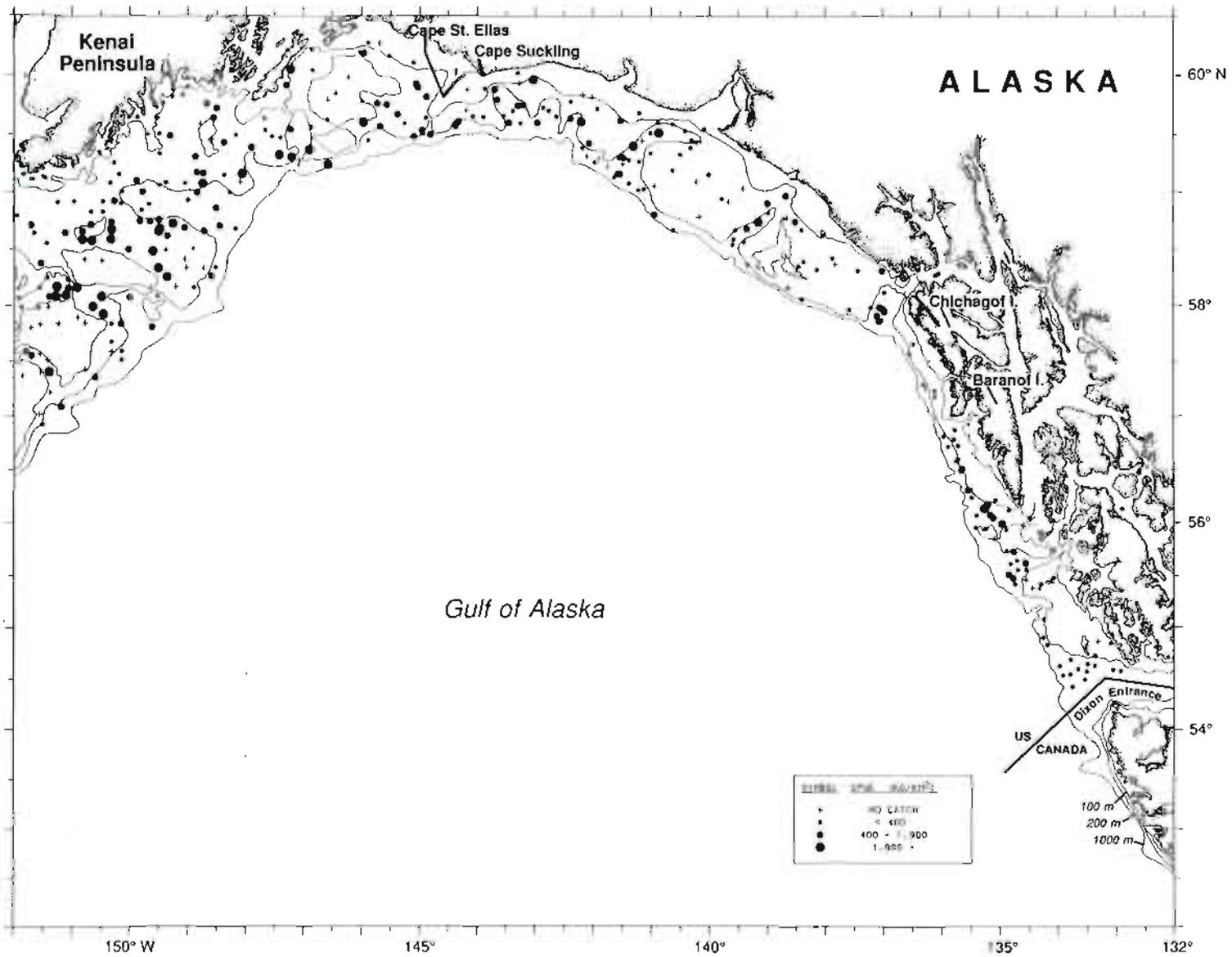


Figure 15.--continued.

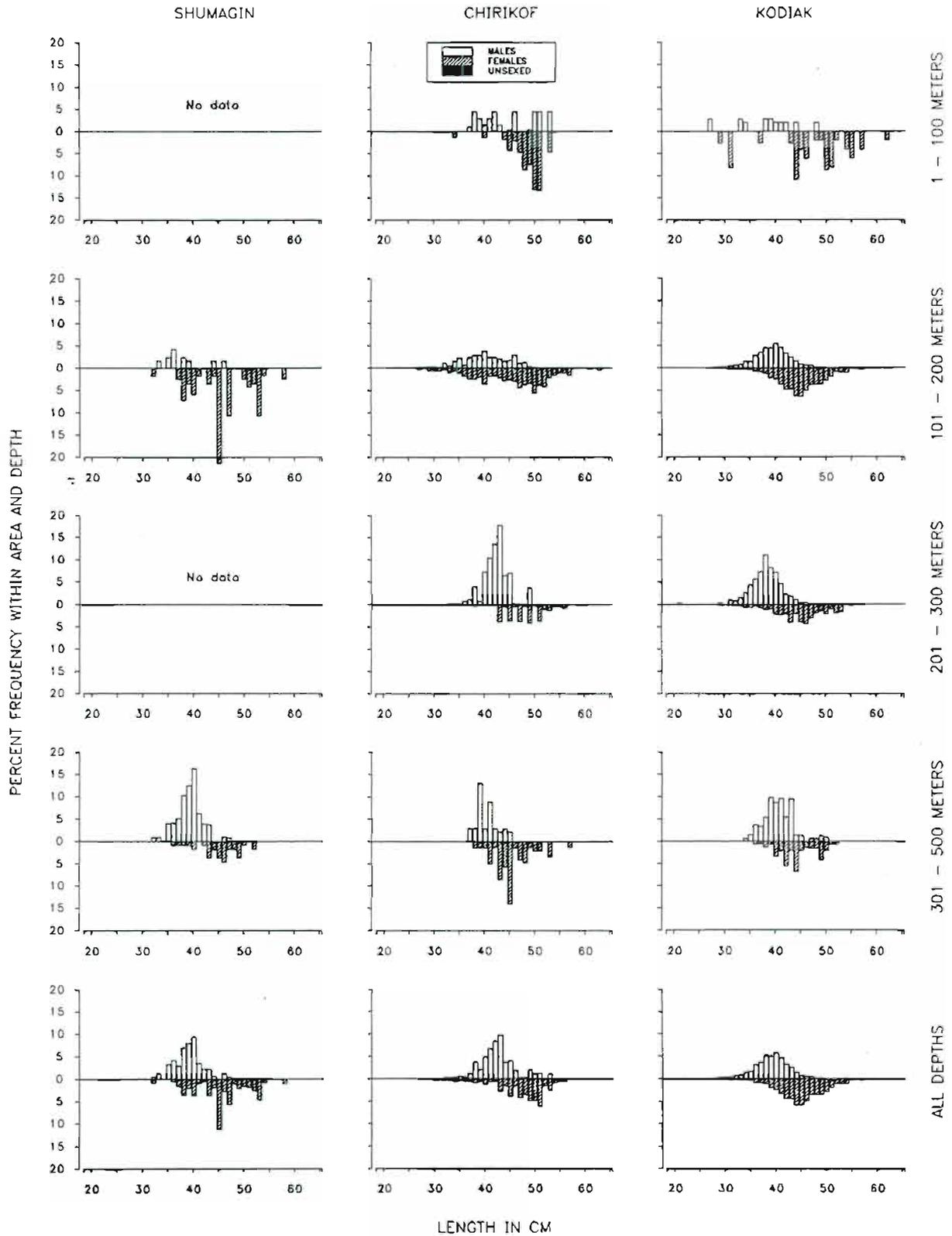


Figure 16.--Dover sole length composition during the NMFS 1990 Gulf of Alaska groundfish survey by International North Pacific Fisheries Commission statistical area and depth.

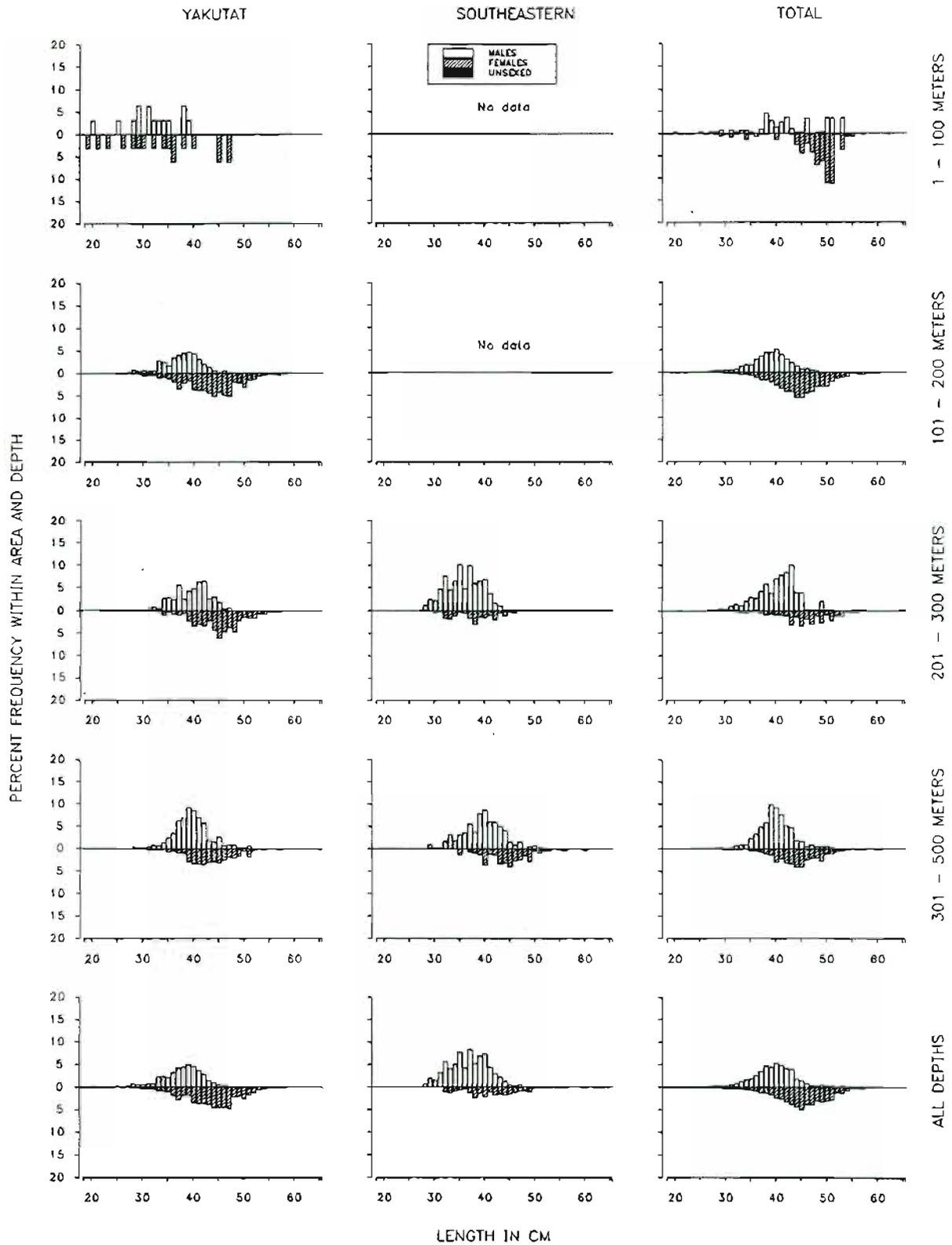


Figure 16.--continued.

Yellowfin sole--Yellowfin sole had the most limited distribution of the principal flatfish (Fig. 17, Table 9) with 75% of the total biomass (61,800 t) occurring on the shallow (1-100 m) Alaska Peninsula shelf in the Shumagin INPFC area. Other high abundance areas were the Upper Alaska Peninsula (1,700 t), adjacent lower Cook Inlet (5,300 t), Davidson Bank (2,600 t), Shumagin Bank (2,200 t) and Chirikof Bank (1,700 t). The only occurrence in waters deeper than 100 m was in the Shumagin Gully (900 t).

The yellowfin sole had a narrow length distribution (Fig. 18). Approximately 70% of the Shumagin INPFC area's yellowfin sole ranged between 29 and 36 cm. Small yellowfin sole (under 29 cm) comprised approximately 50% of the total for the Chirikof and Kodiak INPFC areas.

Table 9.--Total number of survey hauls, hauls containing yellowfin sole, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	12	1,137	50,426	0.4	31.7
	101 - 200	46	3	53	764	0.7	36.6
	201 - 300	9	0	0	0	---	---
	301 - 500	7	0	0	0	---	---
	All depths	137	15	798	51,190	0.4	31.7
Chirikof	1 - 100	28	8	128	3,412	0.3	26.3
	101 - 200	106	3	5	124	0.7	36.9
	201 - 300	16	0	0	0	---	---
	301 - 500	4	0	0	0	---	---
	All depths	154	11	56	3,536	0.3	26.5
Kodiak	1 - 100	51	8	177	7,045	0.3	28.4
	101 - 200	129	0	0	0	---	---
	201 - 300	29	0	0	0	---	---
	301 - 500	6	0	0	0	---	---
	All depths	215	8	72	7,045	0.3	28.4
Yakutat	1 - 100	17	0	0	0	---	---
	101 - 200	56	0	0	0	---	---
	201 - 300	36	0	0	0	---	---
	301 - 500	25	0	0	0	---	---
	All depths	134	0	0	0	---	---
Southeastern	1 - 100	0	0	0	0	---	---
	101 - 200	23	0	0	0	---	---
	201 - 300	27	0	0	0	---	---
	301 - 500	18	0	0	0	---	---
	All depths	68	0	0	0	---	---
All areas	1 - 100	171	28	477	60,884	0.4	30.7
	101 - 200	360	6	7	888	0.7	36.7
	201 - 300	117	0	0	0	---	---
	301 - 500	60	0	0	0	---	---
	All depths	708	34	208	61,771	0.4	30.8

All areas biomass, 95% confidence interval: 1,510 - 122,033 metric tons (t)

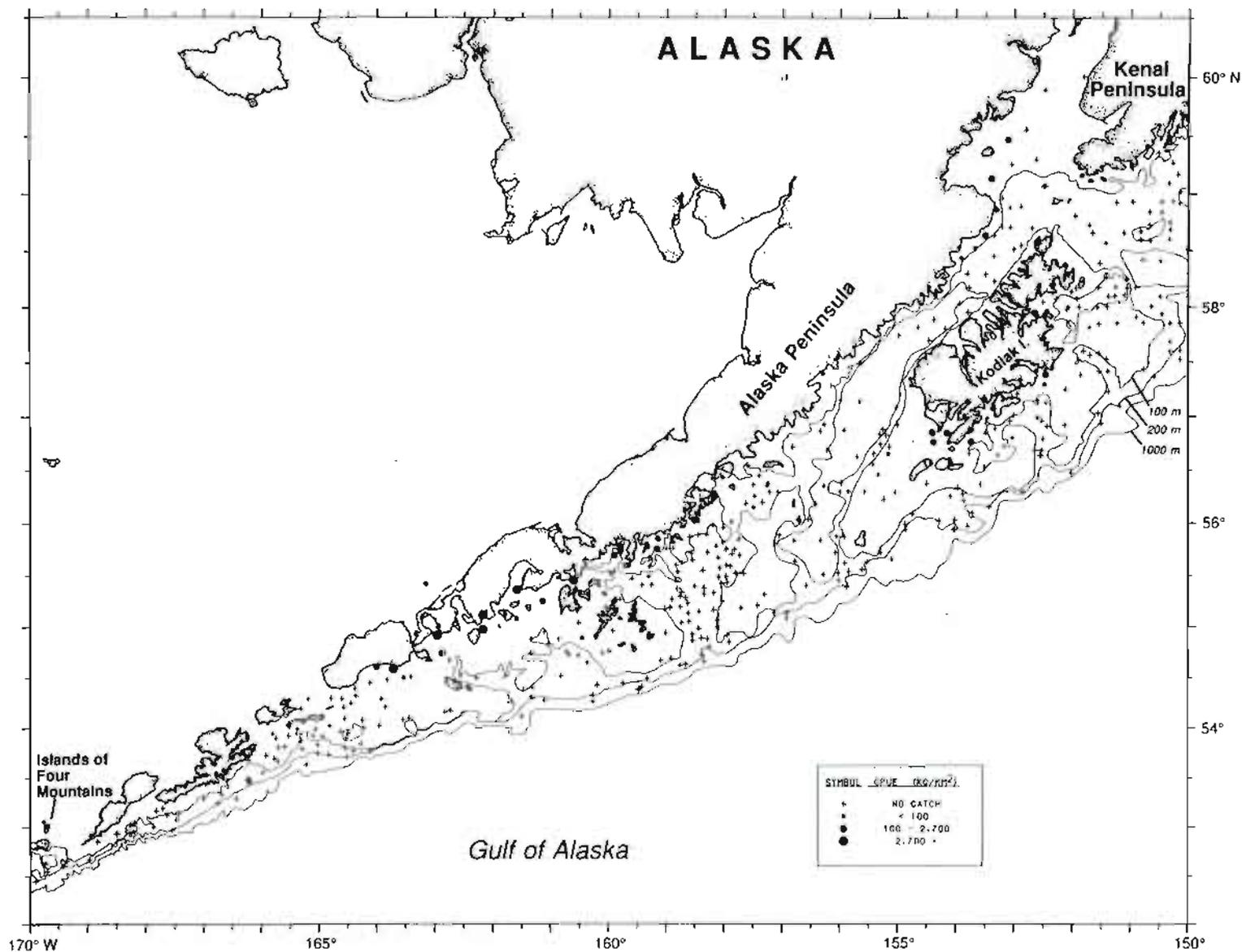


Figure 17.--Yellowfin sole catch distribution and relative abundance during the NMFS 1990 Gulf of Alaska groundfish survey. Catch abundance categories are: 1) none, 2) less than the mean (100 kg/km²), 3) between the mean and two standard deviations and 4) greater than two standard deviations above the mean.

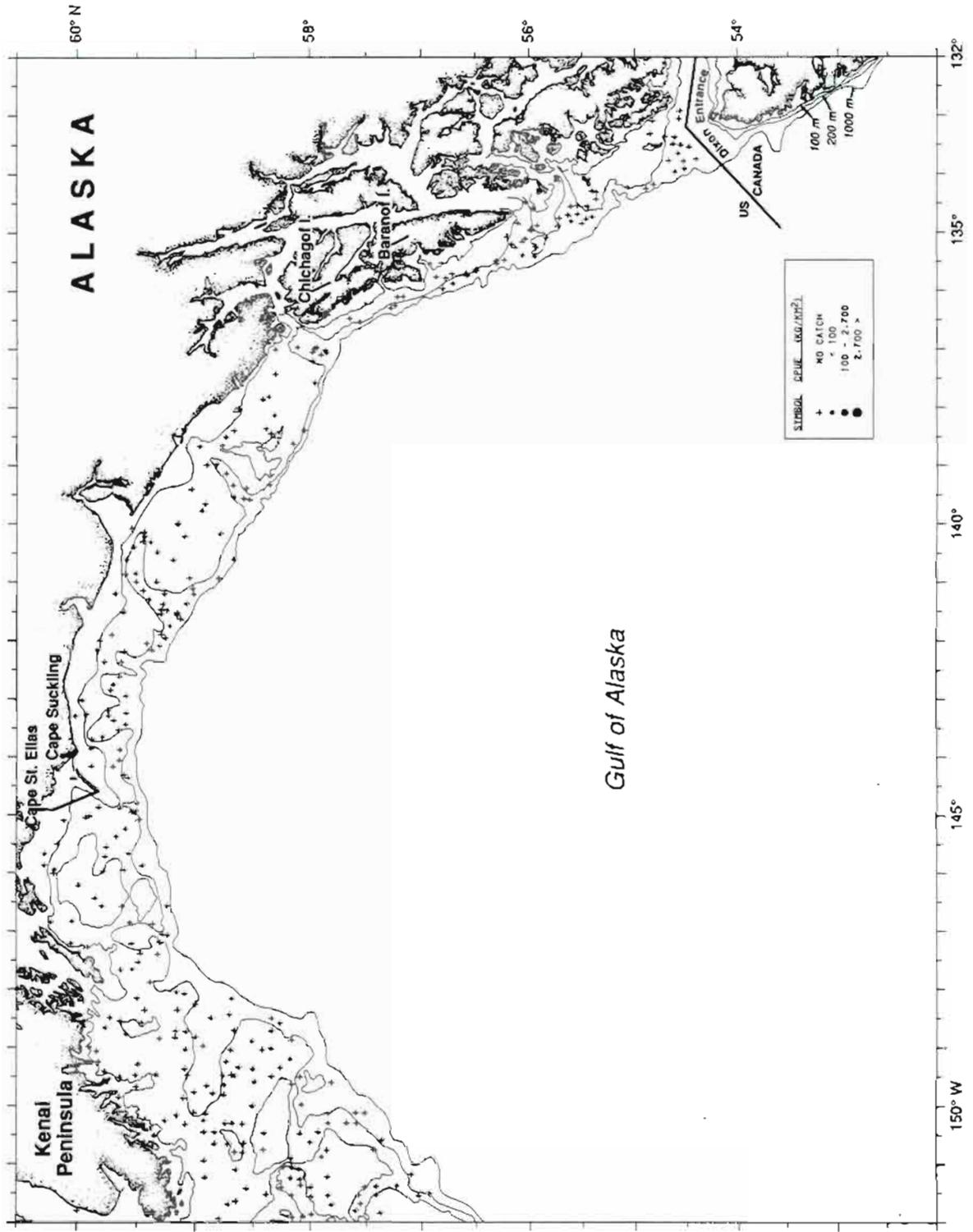


Figure 17.--continued.

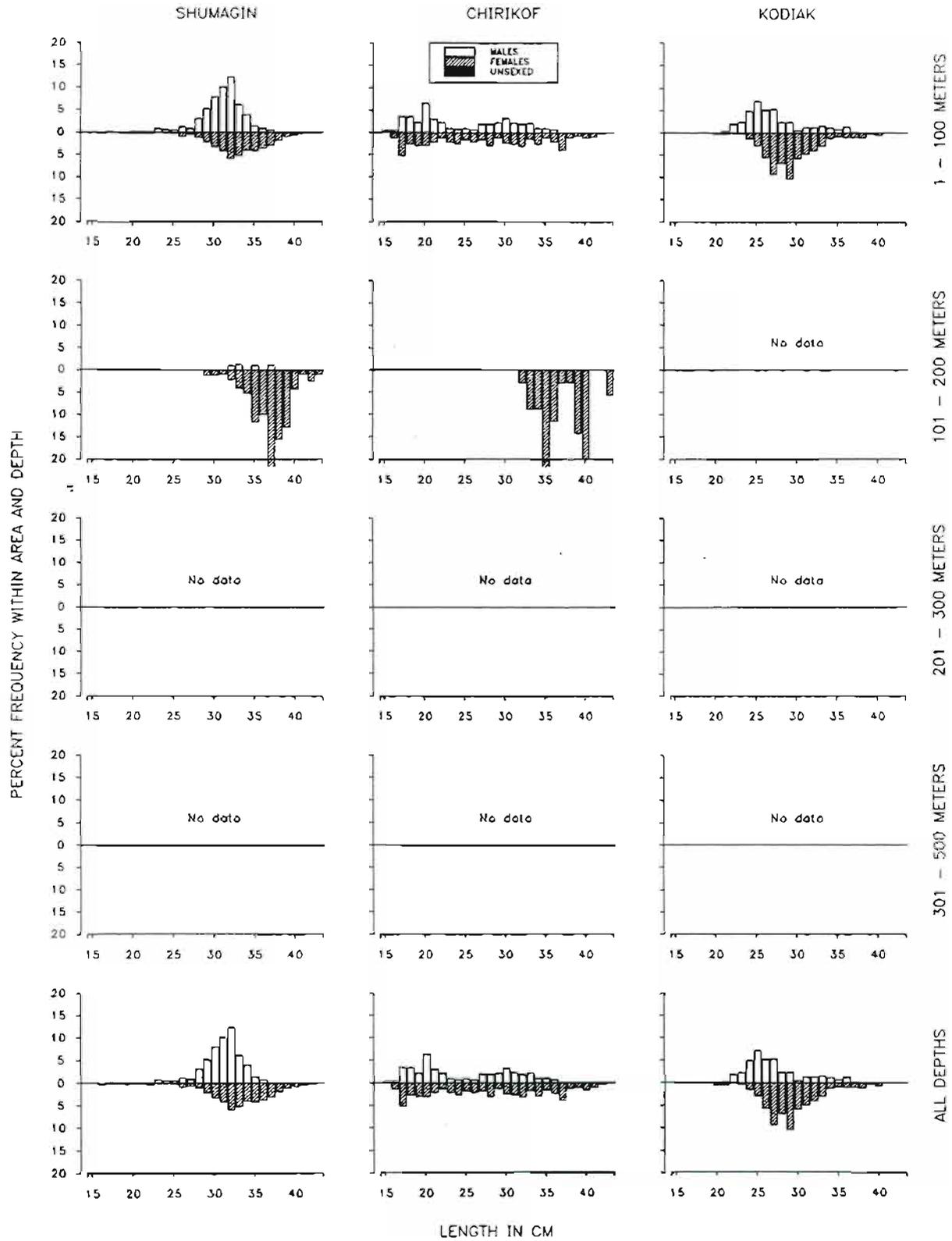


Figure 18.--Yellowfin sole length composition during the NMFS 1990 Gulf of Alaska groundfish survey by International North Pacific Fisheries Commission statistical area and depth.

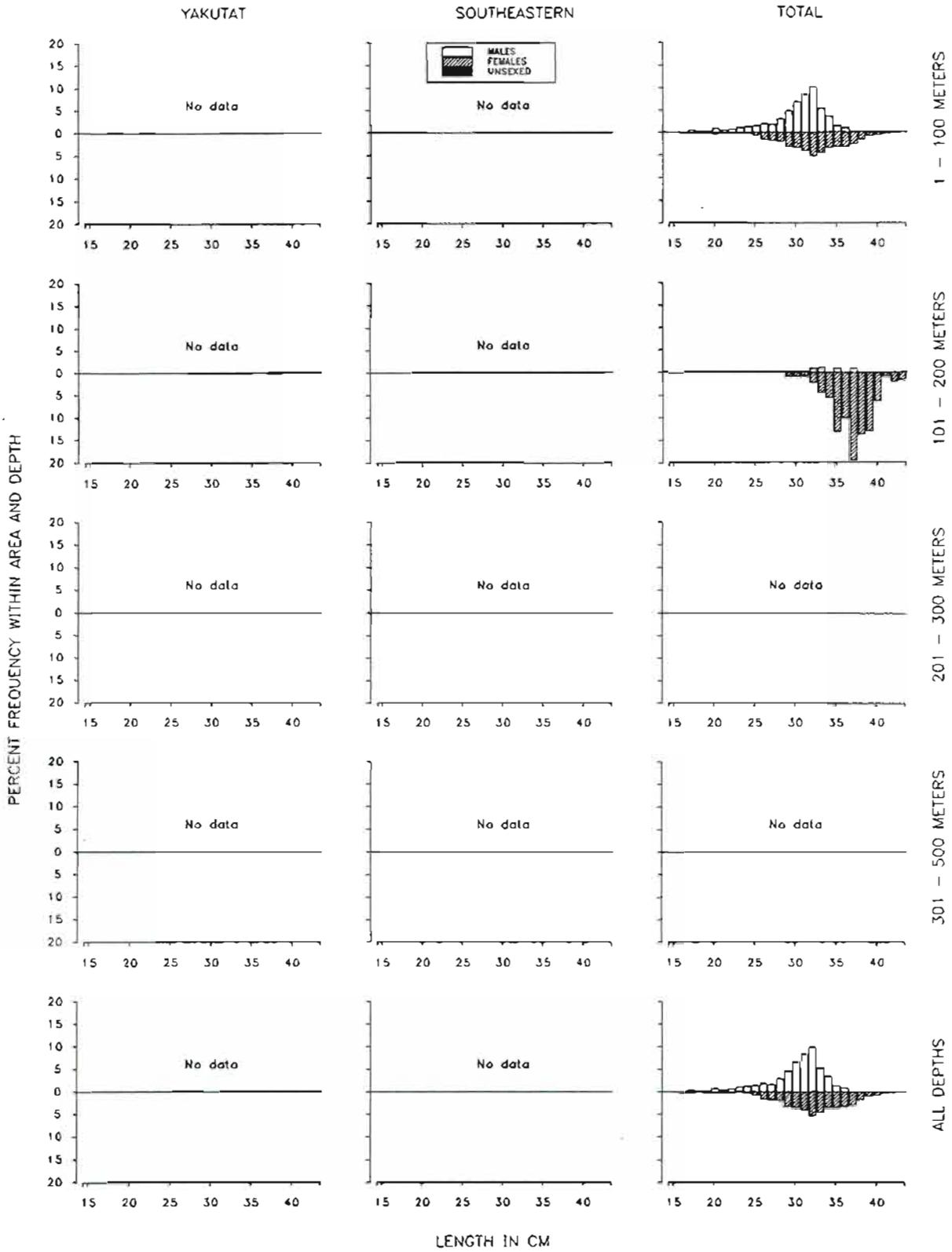


Figure 18.--continued.

Walleye pollock--Walleye pollock was the second most abundant species (857,100 t) occurring over all GOA areas and depths (Table 10, Fig. 19). Pollock biomass was primarily concentrated on the shelf in the Kodiak (50%), Chirikof (20%) and Shumagin (20%) INPFC areas. The Kodiak INPFC area's pollock occurred principally in the 101-200 m deep Barnabus, Chiniak and Marmot Gullies (23,230 kg/km²; 182,100 t), Albatross Banks (2,500 kg/km²; 38,700 t) and adjacent shallows (1-100 m depth; 6,400 kg/km²; 39,200 t). The primary Chirikof INPFC areas were the shallow (1-100 m) Chirikof Bank (5,700 kg/km²; 62,200 t) and off the upper Alaska Peninsula (5,500 kg/km²; 45,700 t). Shumagin INPFC area pollock occurred primarily (80%) in the shallow (1-100 m) depths off the lower Alaska Peninsula (7,900 kg/km²; 58,800 t) and on the Davidson Bank (4,300 kg/km²; 58,500 t). East of the Kenai Peninsula, pollock abundance declined to 46,500 t (900 kg/km²) in the Yakutat INPFC area and 13,300 t (700 kg/km²) in the Southeastern area.

The pollock length distribution ranged from 8 to 67 cm and was comprised of three prominent modes (Fig. 20). The largest mode contained 40-60 cm fish while smaller groups of 20-30 cm and 5-10 cm were recorded throughout the survey area.

Table 10.--Total number of survey hauls, hauls containing walleye pollock, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	49	2,765	122,674	0.7	43.0
	101 - 200	46	34	2,697	39,201	0.9	48.5
	201 - 300	9	8	1,485	4,063	1.0	52.2
	301 - 500	7	4	19	48	0.7	—
	All depths	137	95	2,587	165,986	0.7	44.2
Chirikof	1 - 100	28	21	4,063	107,981	0.4	29.8
	101 - 200	106	78	2,580	61,283	0.8	46.1
	201 - 300	16	14	1,997	22,969	0.6	38.6
	301 - 500	4	1	29	48	0.8	—
	All depths	154	114	3,030	192,280	0.5	33.5
Kodiak	1 - 100	51	37	2,332	92,897	0.6	33.2
	101 - 200	129	109	6,166	266,267	0.9	47.5
	201 - 300	29	28	6,869	79,301	0.9	46.0
	301 - 500	6	3	219	647	0.8	46.4
	All depths	215	177	4,502	439,113	0.8	43.1
Yakutat	1 - 100	17	15	830	13,983	0.1	17.9
	101 - 200	56	54	867	25,271	0.4	36.7
	201 - 300	36	34	1,258	6,130	0.7	45.5
	301 - 500	25	17	358	1,062	1.0	47.9
	All depths	134	120	863	46,447	0.2	24.7
Southeastern	1 - 100	0	0	0	0	—	—
	101 - 200	23	16	700	6,909	0.5	41.0
	201 - 300	27	23	1,245	6,269	0.9	49.0
	301 - 500	18	4	27	78	1.0	—
	All depths	68	43	745	13,256	0.6	43.6
All areas	1 - 100	171	122	2,645	337,535	0.4	31.4
	101 - 200	360	291	3,311	398,931	0.8	45.8
	201 - 300	117	107	3,327	118,733	0.8	44.5
	301 - 500	60	29	145	1,882	0.9	47.2
	All depths	708	549	2,888	857,081	0.6	37.8

All areas biomass, 95% confidence interval: 666,395 - 1,047,768 metric tons (t)

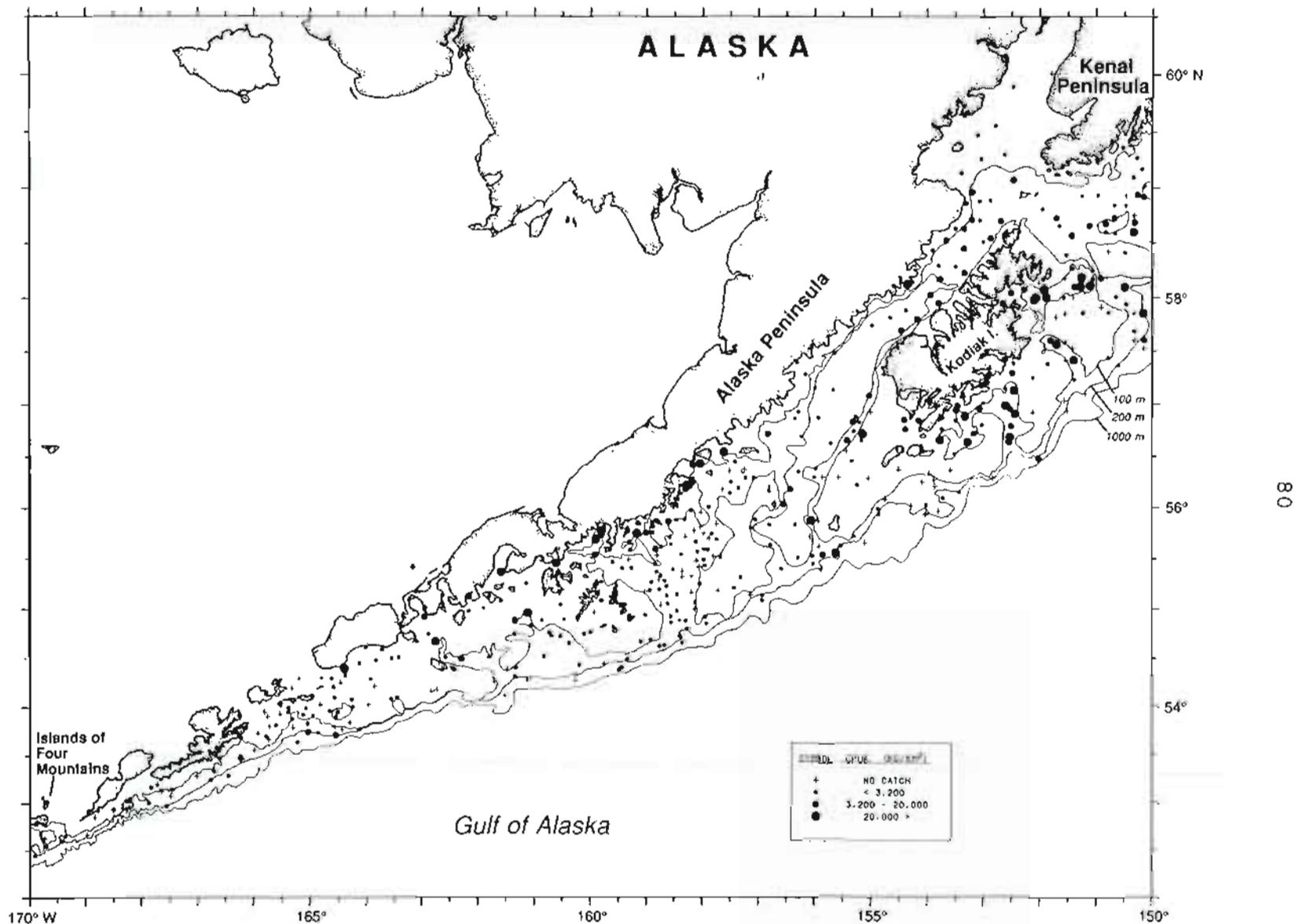


Figure 19.--Walleye pollock catch distribution and relative abundance during the NMFS 1990 Gulf of Alaska groundfish survey. Catch abundance categories are: 1) none, 2) less than the mean (3,200 kg/km²), 3) between the mean and two standard deviations and 4) greater than two standard deviations above the mean.

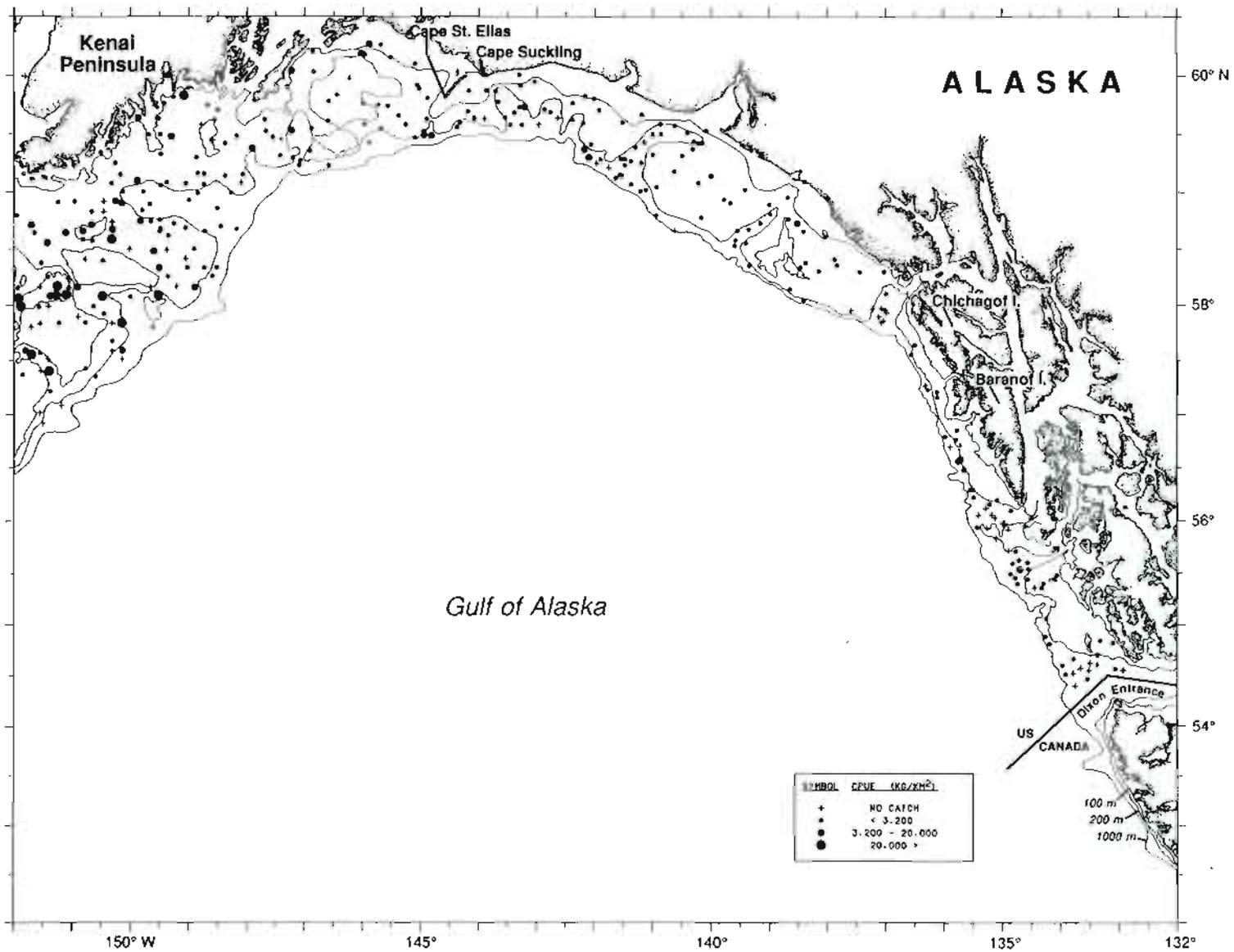


Figure 19.--continued.

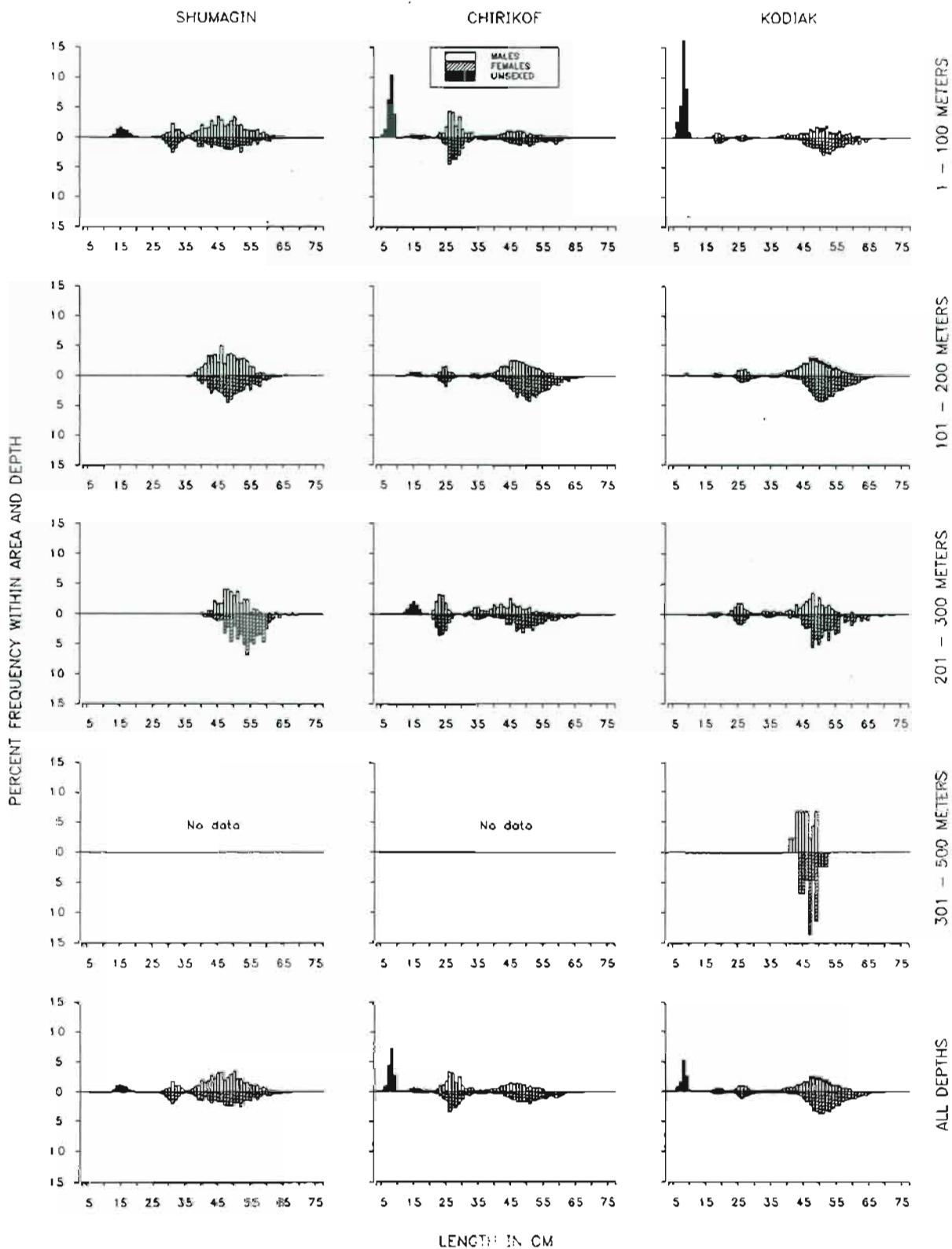


Figure 20.--Walleye pollock length composition during the NMFS 1990 Gulf of Alaska groundfish survey by International North Pacific Fisheries Commission statistical area and depth.

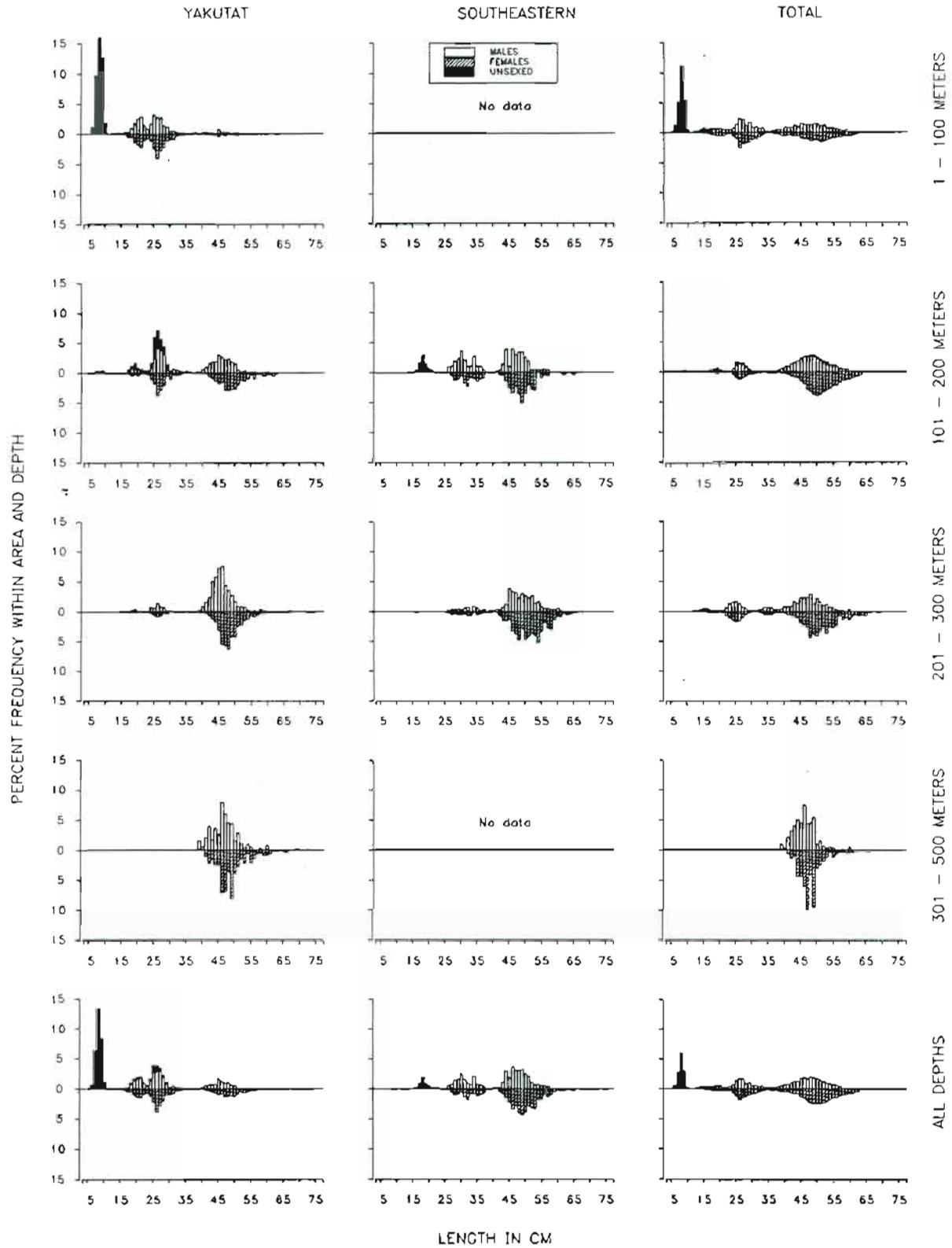


Figure 20.--continued.

Pacific cod--Pacific cod was most abundant on the shelf in areas west of Cape St. Elias and in depths shallower than 200 m (Table 11; Fig. 21). Cod catch rates exceeded 5,000 kg/km² in the Semidi Bank and Lower Alaska Peninsula areas and exceeded 2,000 kg/km² in the Davidson Bank, Fox Islands, Albatross Shallows, and Chirikof Bank areas. Over 90% of the total GOA Pacific cod biomass (414,100 t) occurred in depths less than 200 m. The principal shallow areas (1-100 m) included the Semidi Bank (48,300 t), Davidson Bank (40,100 t), Lower Alaska Peninsula (37,400 t), Chirikof Bank (27,000 t), Albatross Banks (22,100 t) and Fox Islands (20,600 t).

Pacific cod had the broadest length range (5-95 cm; Fig. 22) of any roundfish taken during the survey and averaged 52 cm overall. The Kodiak INPFC area's length distribution was dominated by four prominent length modes (10 cm, 25 cm, 45 cm, and 62 cm). Small cod, under 40 cm in length, were most abundant in the Kodiak INPFC area and least abundant in the Chirikof INPFC area. The largest cod, averaging 2.9 kg, occurred in the 201-300 m depth interval primarily in the lower Shelikof Gully (11,400 t), Prince of Wales shelf (4,700 t) and slope (3,000 t) and Kenai Gullies (2,400 t).

Table 11.--Total number of survey hauls, hauls containing Pacific cod, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	63	2,360	104,709	2.6	55.4
	101 - 200	46	42	1,930	28,054	2.5	58.6
	201 - 300	9	5	342	937	2.2	65.2
	301 - 500	7	1	6	16	1.8	—
	All depths	137	111	2,084	133,715	2.6	56.1
Chirikof	1 - 100	28	24	2,926	77,762	1.6	52.9
	101 - 200	106	93	2,705	64,250	2.2	57.7
	201 - 300	16	13	1,169	13,440	3.0	63.9
	301 - 500	4	0	0	0	—	—
	All depths	154	130	2,450	155,452	1.9	55.3
Kodiak	1 - 100	51	41	1,048	41,767	1.1	36.6
	101 - 200	129	111	1,240	53,565	2.2	56.8
	201 - 300	29	18	415	4,789	3.0	63.8
	301 - 500	6	0	0	0	—	—
	All depths	215	170	1,027	100,121	1.6	44.9
Yakutat	1 - 100	17	16	490	8,251	1.7	48.1
	101 - 200	56	33	206	5,993	2.9	62.5
	201 - 300	36	6	49	238	1.9	—
	301 - 500	25	0	0	0	—	—
	All depths	134	55	269	14,482	2.1	51.2
Southeastern	1 - 100	0	0	0	0	—	—
	101 - 200	23	19	701	6,921	1.8	55.2
	201 - 300	27	20	666	3,352	2.5	62.1
	301 - 500	18	3	10	29	1.7	—
	All depths	68	42	579	10,303	2.0	56.9
All areas	1 - 100	171	144	1,822	232,489	1.8	48.8
	101 - 200	360	298	1,318	158,784	2.3	57.5
	201 - 300	117	62	638	22,755	2.9	63.6
	301 - 500	60	4	3	44	1.7	—
	All depths	708	508	1,395	414,072	2.0	52.3

All areas biomass, 95% confidence interval: 289,070 - 539,074 metric tons (t)

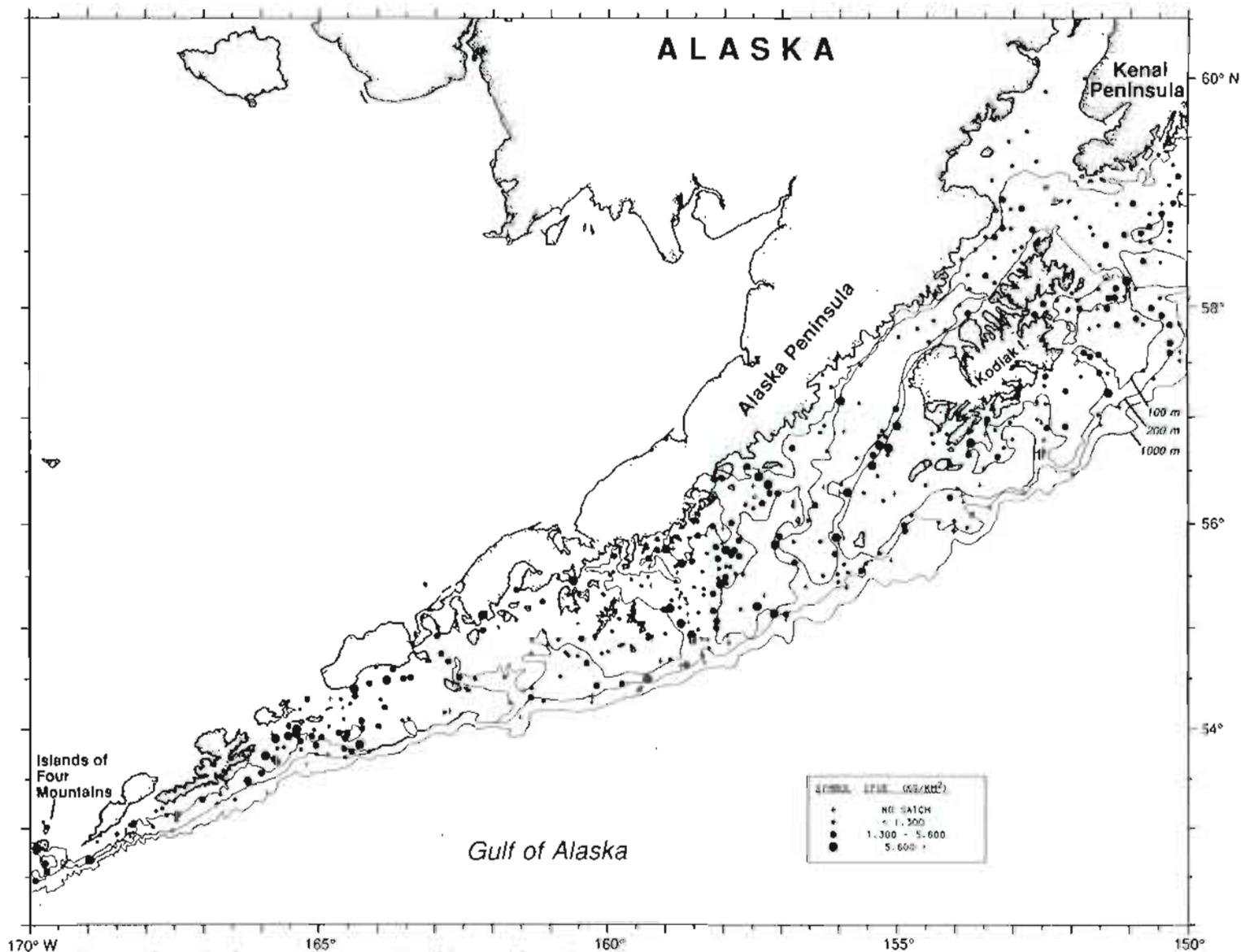


Figure 21.--Pacific cod catch distribution and relative abundance during the NMFS 1990 Gulf of Alaska groundfish survey. Catch abundance categories are: 1) none, 2) less than the mean (1,300 kg/km²), 3) between the mean and two standard deviations and 4) greater than two standard deviations above the mean.

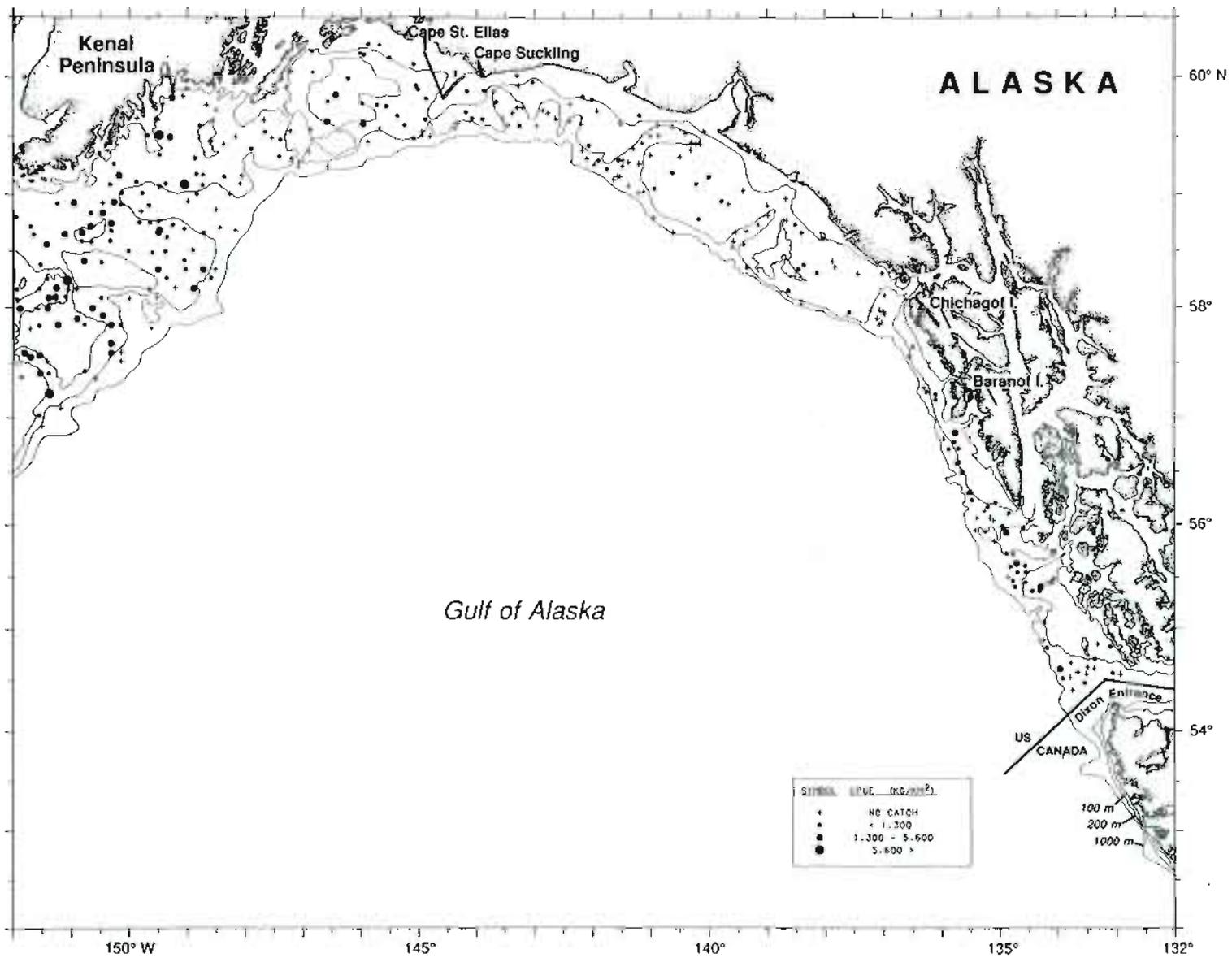


Figure 21.--continued.

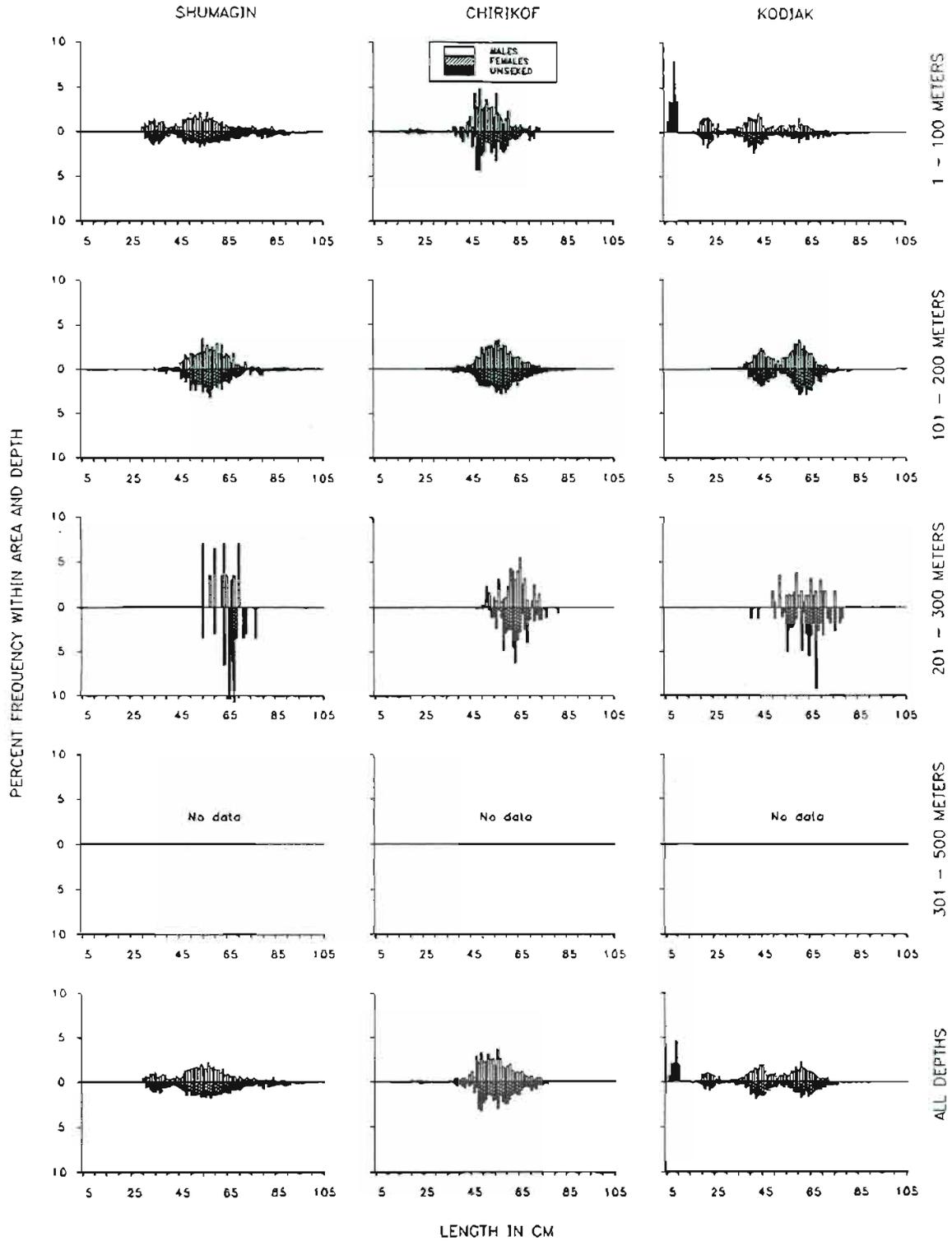


Figure 22.--Pacific cod length composition during the NMFS 1990 Gulf of Alaska groundfish survey by International North Pacific Fisheries Commission statistical area and depth.

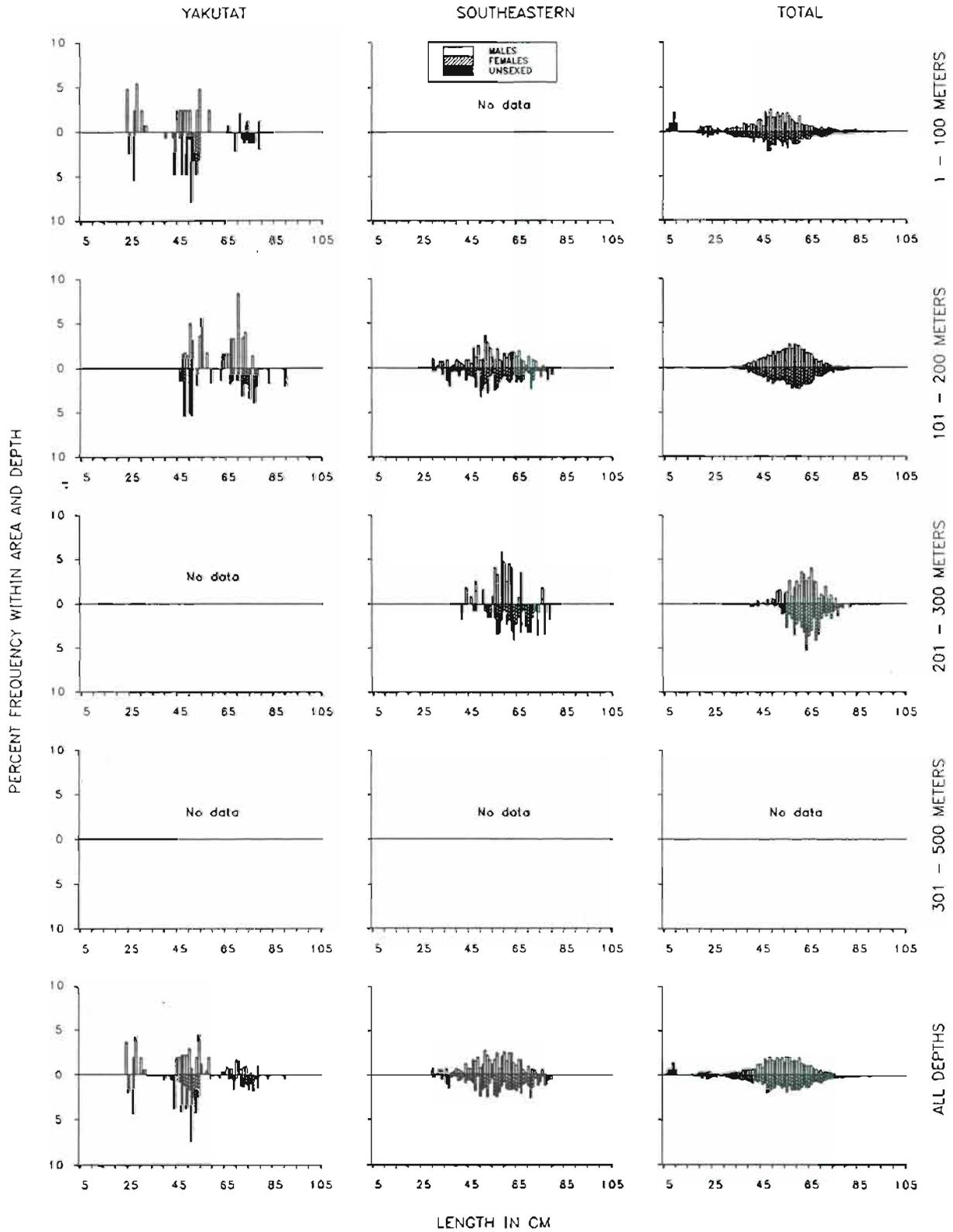


Figure 22.--continued.

Sablefish--An estimated 85% of the total sablefish² biomass (211,300 t) occurred in the Kodiak and Chirikof INPFC areas (Table 12; Fig. 23). The highest catch densities occurred off the Kenai Peninsula in depths of 101-200 m (5,600 kg/km²) and 201-300 m (8,000 kg/km²). Catch rates exceeded 3,000 kg/km² in the lower Shelikof Gully (201-300 m depth) and surpassed 2,000 kg/km² in the deep gullies (301-500 m) of the Yakutat and Southeastern INPFC areas. The catch was low in the Shumagin INPFC area and limited primarily to the Shumagin Outer Shelf (760 kg/km² CPUE). Sablefish were approximately 50% heavier in the central GOA (average 3 kg) than in the western and eastern GOA (average 2 kg).

The highest proportion of small sablefish occurred in the Yakutat INPFC area (Fig. 24), where half the population was less than 54 cm in length. Small (54 cm) sablefish represented less than 10% of the population in the central GOA Chirikof and Kodiak INPFC areas. An intermediate number of small sablefish occurred in the Southeastern INPFC area, which had a prominent 9-17 cm length mode. Over all areas, the majority of sablefish averaged between 60 and 75 cm.

² This species was not adequately assessed because a large proportion of the population is distributed in depths deeper than 500 m. Refer to the section entitled Overall Abundance and Distribution of Major Fish Groups.

Table 12.--Total number of survey hauls, hauls containing sablefish, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	1	< 1	1	0.1	---
	101 - 200	46	6	410	5,960	2.2	57.8
	201 - 300	9	6	202	553	2.0	65.7
	301 - 500	7	3	253	640	2.8	63.8
	All depths	137	16	111	7,154	2.2	58.9
Chirikof	1 - 100	28	4	9	239	1.0	---
	101 - 200	106	45	443	10,516	2.3	59.1
	201 - 300	16	14	3,273	37,639	3.5	66.3
	301 - 500	4	2	824	1,345	3.1	65.5
	All depths	154	65	784	49,739	3.1	64.2
Kodiak	1 - 100	51	8	110	4,381	2.0	57.1
	101 - 200	129	90	1,600	69,081	2.8	63.3
	201 - 300	29	23	4,806	55,488	3.3	66.3
	301 - 500	6	2	369	1,092	3.6	66.2
	All depths	215	123	1,333	130,042	3.0	64.2
Yakutat	1 - 100	17	6	25	426	0.7	---
	101 - 200	56	36	287	8,362	1.4	50.5
	201 - 300	36	30	509	2,479	2.3	56.6
	301 - 500	25	20	1,692	5,015	2.8	62.7
	All depths	134	92	303	16,281	1.7	53.9
Southeastern	1 - 100	0	0	0	0	---	---
	101 - 200	23	14	285	2,814	1.8	53.9
	201 - 300	27	19	224	1,128	1.9	31.4
	301 - 500	18	16	1,436	4,141	2.4	62.3
	All depths	68	49	454	8,084	2.1	55.1
All areas	1 - 100	171	19	40	5,047	1.7	57.1
	101 - 200	360	191	803	96,733	2.5	60.2
	201 - 300	117	92	2,726	97,287	3.3	65.4
	301 - 500	60	43	943	12,233	2.7	63.1
	All depths	708	345	712	211,299	2.8	62.4

All areas biomass, 95% confidence interval: 138,401 - 284,198 metric tons (t)

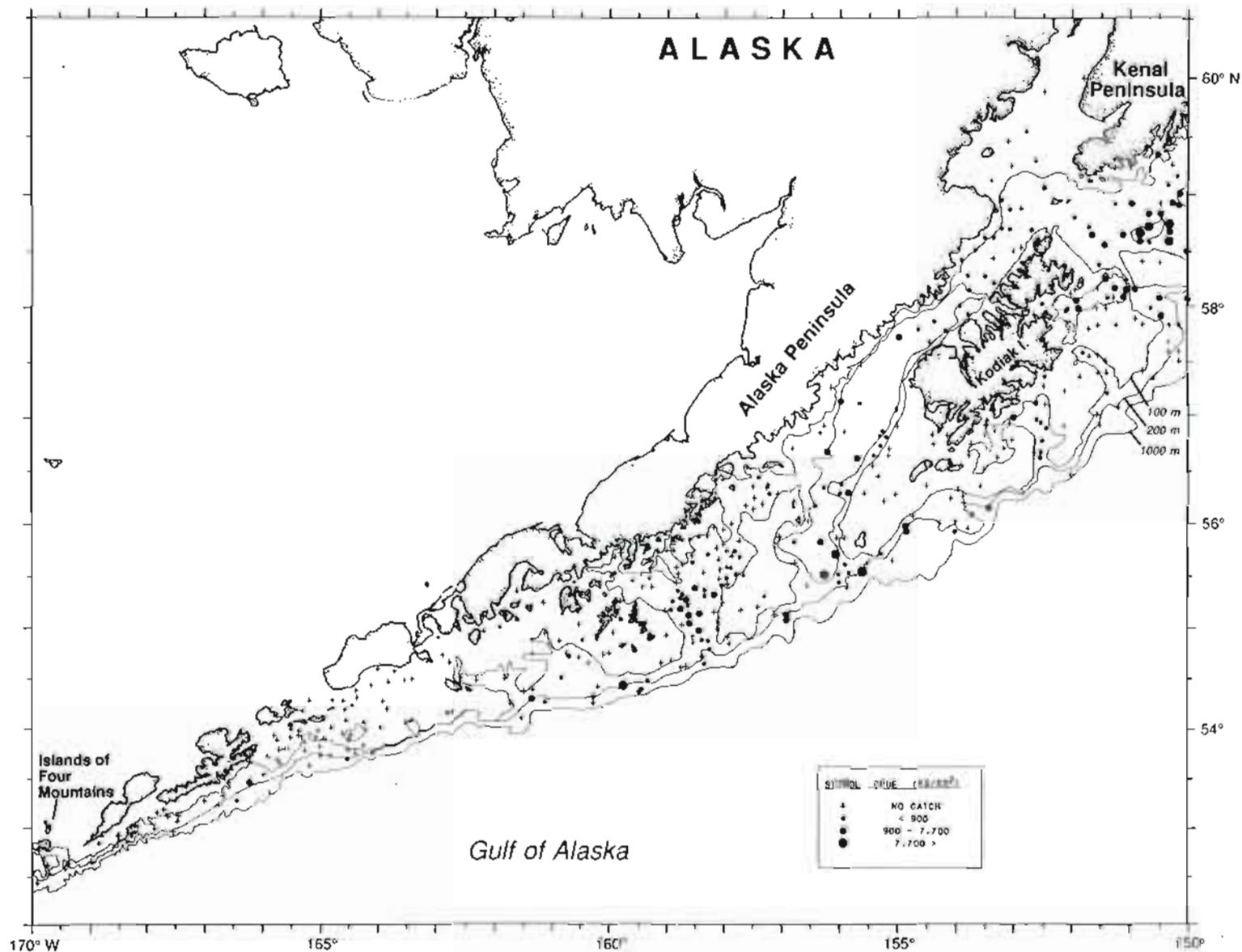


Figure 23.--Sablefish catch distribution and relative abundance during the NMFS 1990 Gulf of Alaska groundfish survey. Catch abundance categories are: 1) none, 2) less than the mean (900 kg/km²), 3) between the mean and two standard deviations and 4) greater than two standard deviations above the mean.

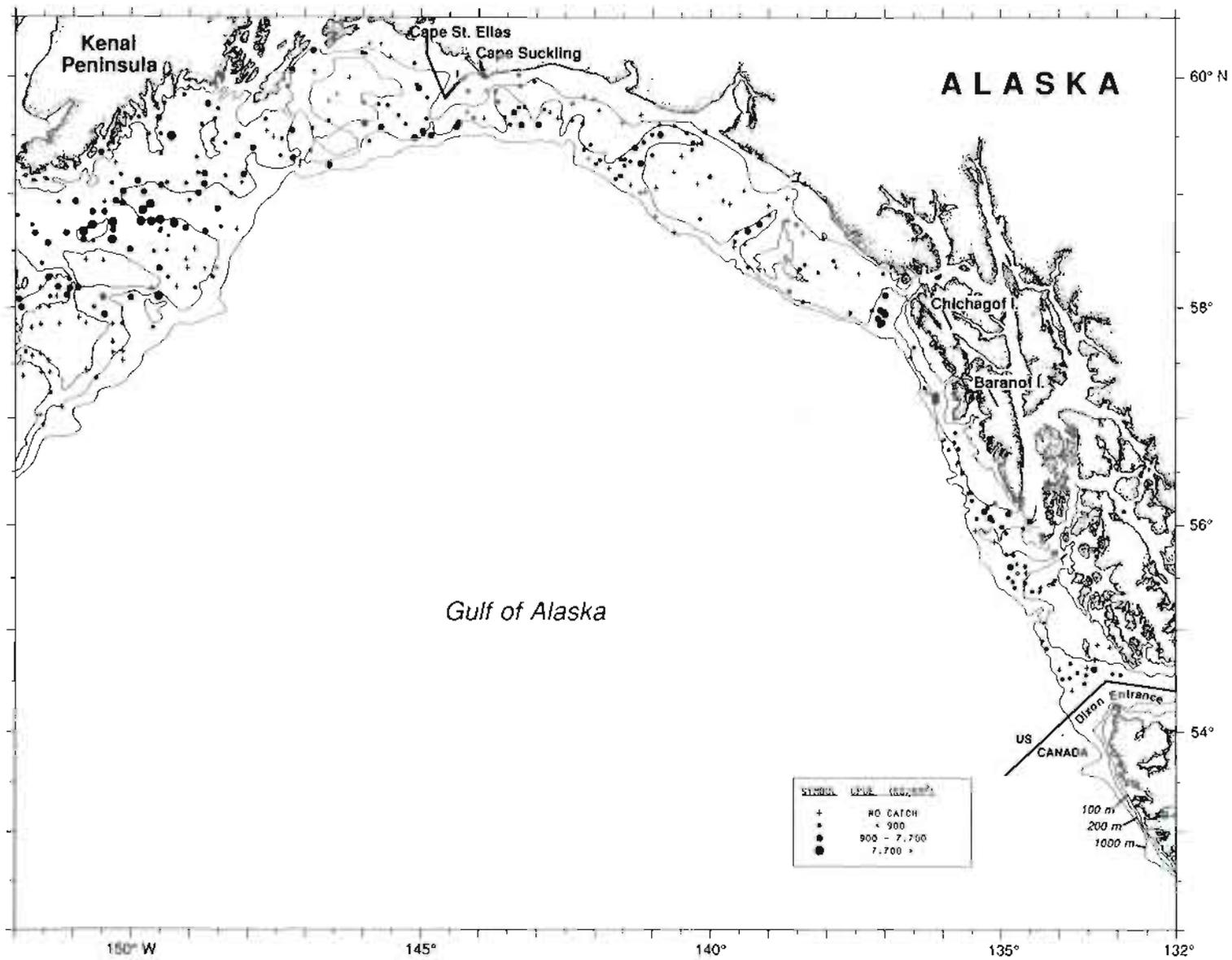


Figure 23.--continued.

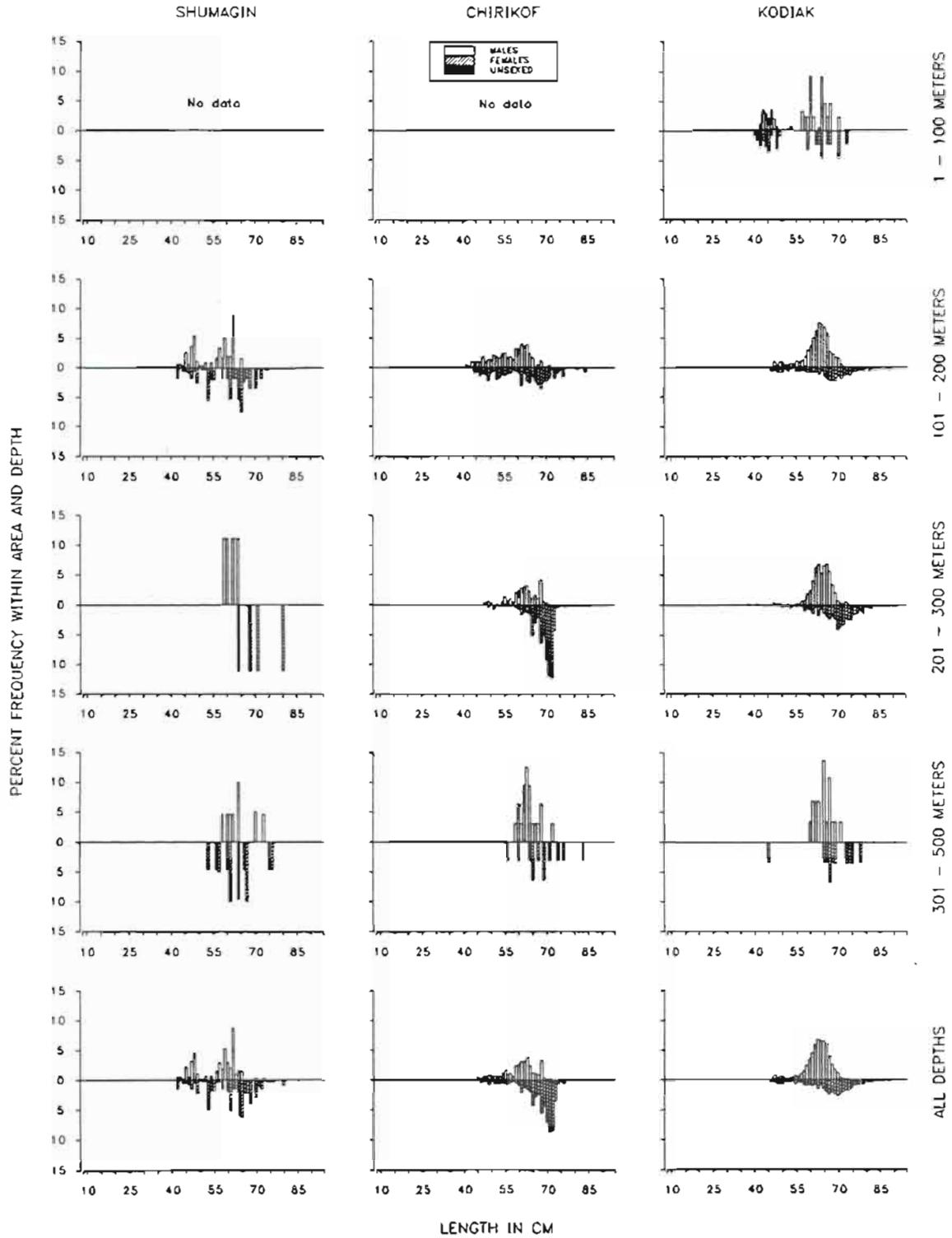


Figure 24.--Sablefish length composition during the NMFS 1990 Gulf of Alaska groundfish survey by International North Pacific Fisheries Commission statistical areas and depth.

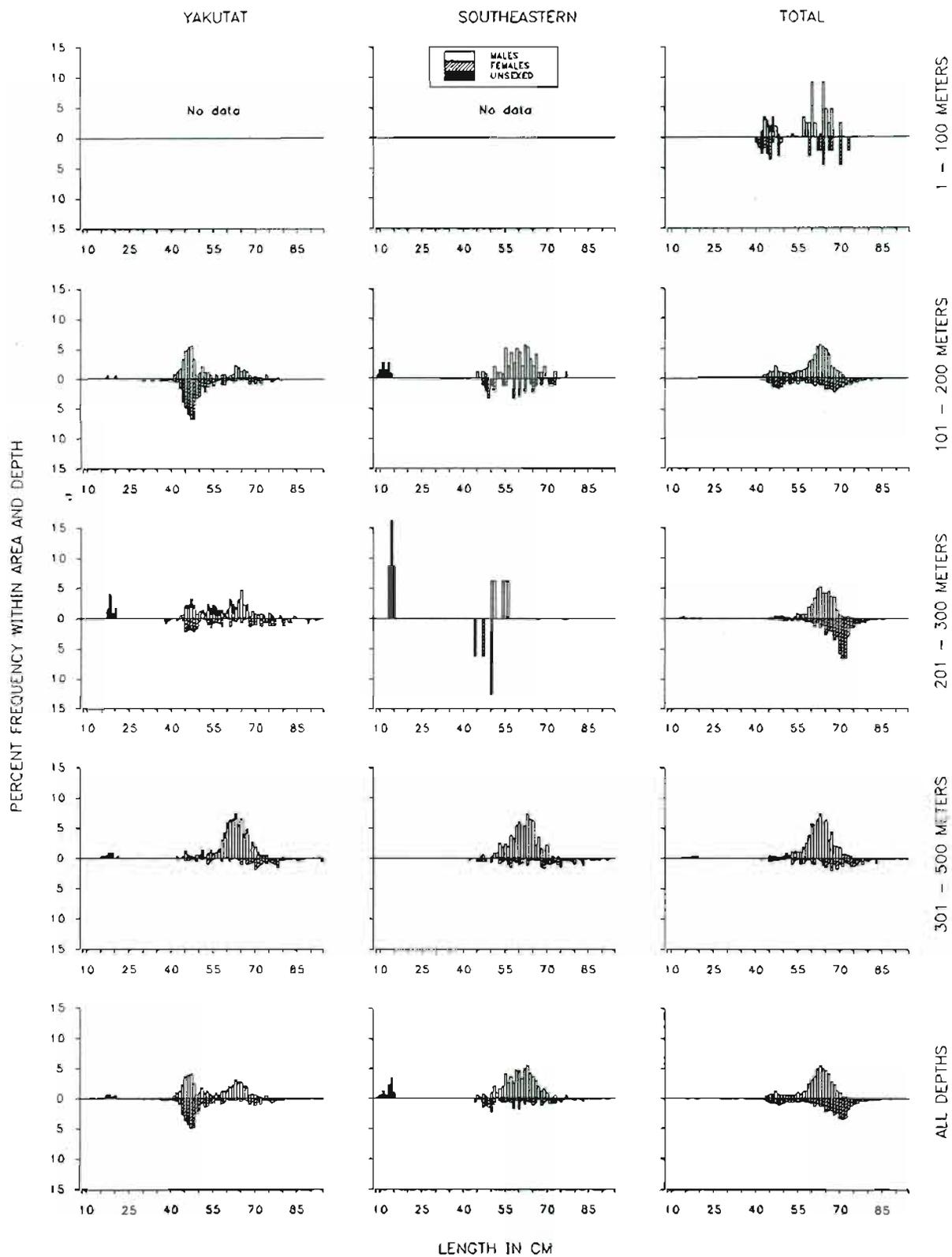


Figure 24.--continued.

Pacific ocean perch--Pacific ocean perch was the dominant rockfish in the GOA and its' biomass totaled 138,000 t in 1990 (Table 13). The areas of highest Pacific ocean perch catch densities and biomass (Fig. 25) occurred in 201-300 m depths on the slope areas of the Yakutat INPFC area (21,900 kg/km²; 28,000 t), Baranof-Chichagof Island (6,200 kg/km²; 6,400 t), Prince of Wales Island (5,000 kg/km²; 20,000 t) and Chirikof Island (2,500 kg/km²; 3,900 t). Deep water (301-500 m) catch rates and biomass were highest on the Southeastern INPFC area's gullies (3,300 kg/km²; 6,900 t) and slope (2,200 kg/km²; 1,800 t) and the Yakutat INPFC area's slope (1,700 kg/km²; 2,000 t). The highest catches and densities shallower than 200 m in depth occurred on the outer shelves of the Shumagin Islands (2,200 kg/km²; 18,100 t) and Baranof-Chichagof Island group (2,200 kg/km²; 9,100 t).

The largest average Pacific ocean perch occurred in the 301-500 m depths of the Southeastern (38 cm) and Yakutat (37 cm) INPFC areas (Fig. 26). The overall length distribution was dominated by two modes of approximately 29-30 cm and 33-42 cm.

Table 13.--Total number of survey hauls, hauls containing Pacific ocean perch, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	15	52	2,315	0.2	22.3
	101 - 200	46	16	1,254	18,224	0.3	27.4
	201 - 300	9	7	1,397	3,823	0.5	33.0
	301 - 500	7	1	5	14	0.8	—
	All depths	137	39	380	24,375	0.3	27.0
Chirikof	1 - 100	28	4	7	192	0.2	21.6
	101 - 200	106	58	383	9,094	0.4	30.6
	201 - 300	16	5	582	6,688	0.7	35.0
	301 - 500	4	2	11	17	0.6	—
	All depths	154	69	252	15,991	0.5	31.7
Kodiak	1 - 100	51	5	2	95	0.1	18.2
	101 - 200	129	48	245	10,562	0.5	31.0
	201 - 300	29	16	358	4,135	0.5	32.7
	301 - 500	6	3	145	429	0.6	34.1
	All depths	215	72	156	15,221	0.5	31.1
Yakutat	1 - 100	17	0	0	0	—	—
	101 - 200	56	26	102	2,976	0.2	24.1
	201 - 300	36	31	6,218	30,307	0.7	35.8
	301 - 500	25	13	794	2,352	0.8	37.2
	All depths	134	70	662	35,635	0.6	33.2
Southeastern	1 - 100	0	0	0	0	—	—
	101 - 200	23	20	1,187	11,720	0.4	30.8
	201 - 300	27	27	5,230	26,331	0.5	32.2
	301 - 500	18	12	3,026	8,729	0.7	38.3
	All depths	68	59	2,629	46,780	0.5	32.5
All areas	1 - 100	171	24	20	2,601	0.2	22.1
	101 - 200	360	168	436	52,576	0.4	28.8
	201 - 300	117	86	1,997	71,285	0.6	33.8
	301 - 500	60	31	890	11,541	0.7	37.9
	All depths	708	309	465	138,003	0.5	30.9

All areas biomass, 95% confidence interval: 70,993 - 205,013 metric tons (t)

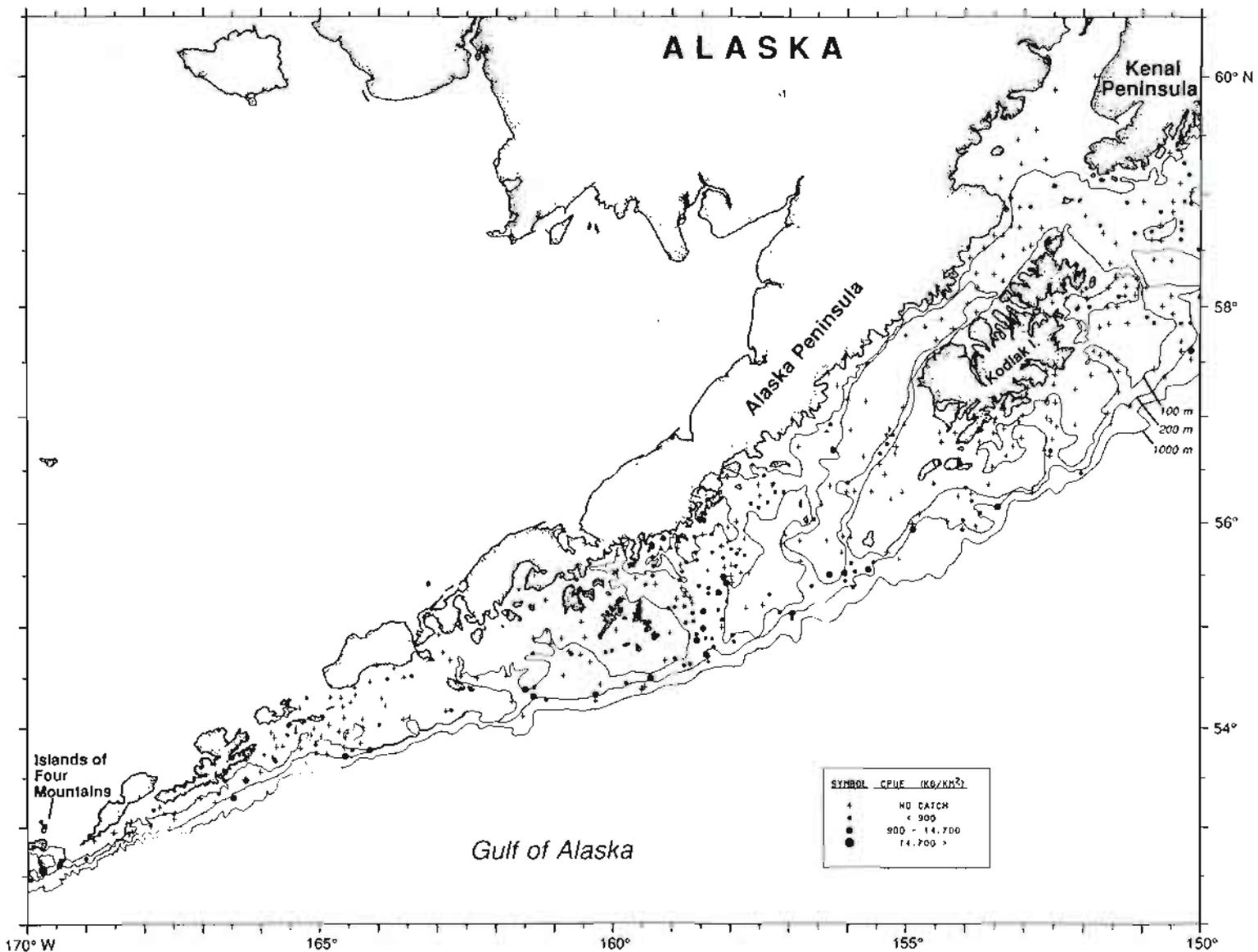


Figure 25.--Pacific ocean perch catch distribution and relative abundance during the NMFS 1990 Gulf of Alaska groundfish survey. Catch abundance categories are: 1) none, 2) less than the mean (900 kg/km²), 3) between the mean and two standard deviations and 4) greater than two standard deviations above the mean.

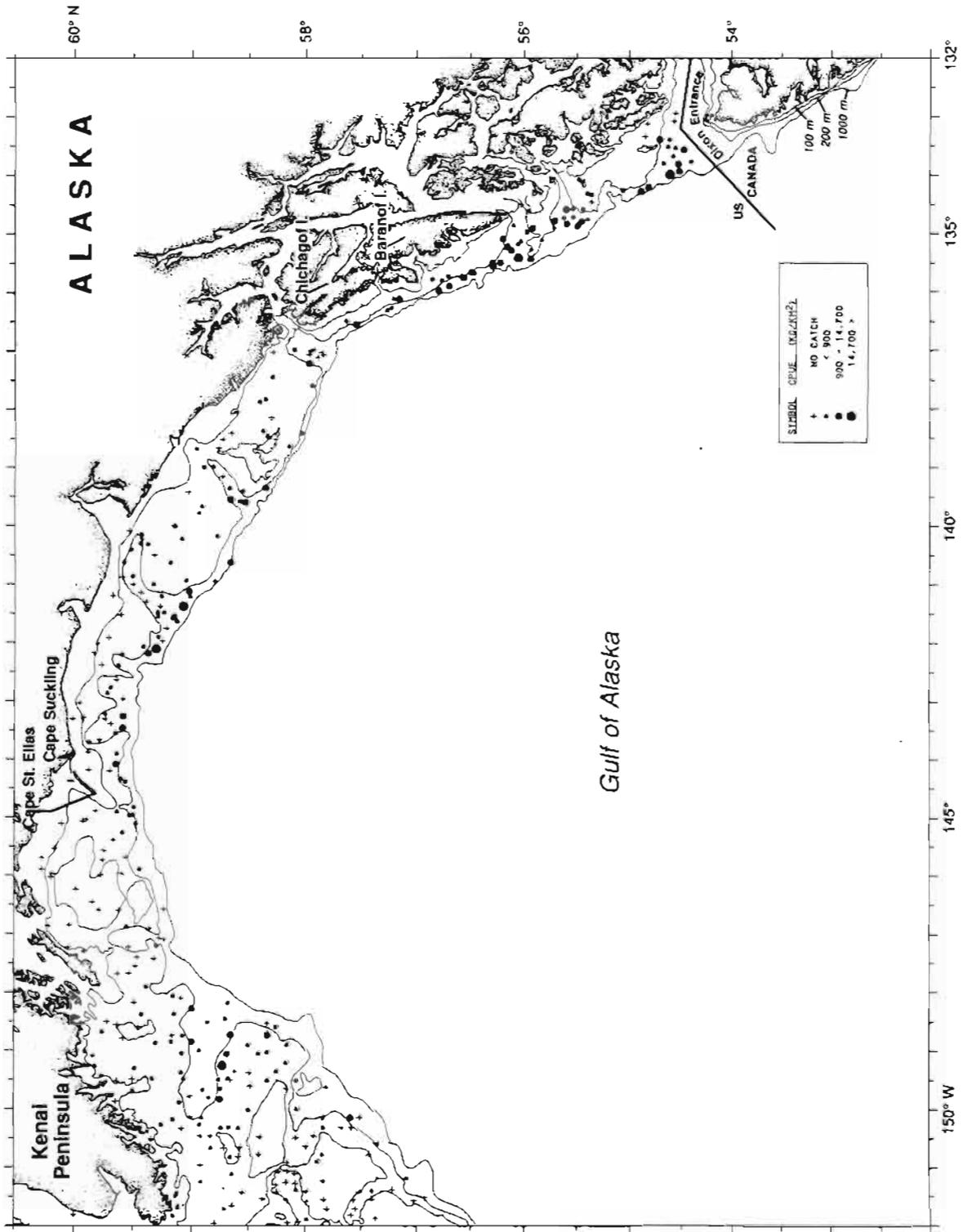


Figure 25.--continued.

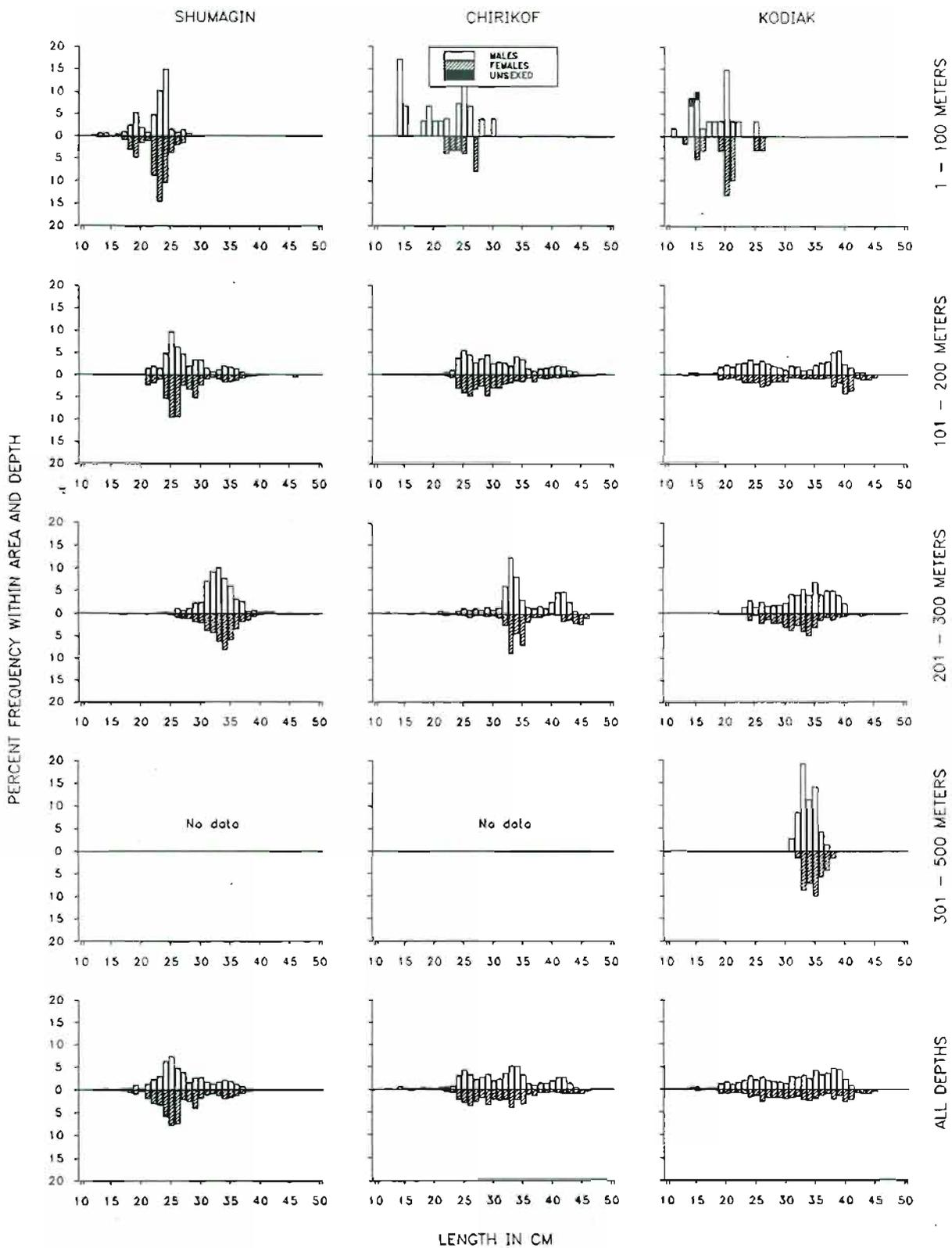


Figure 26.--Pacific ocean perch length composition during the NMFS 1990 Gulf of Alaska groundfish survey by International North Pacific Fisheries Commission statistical area and depth.

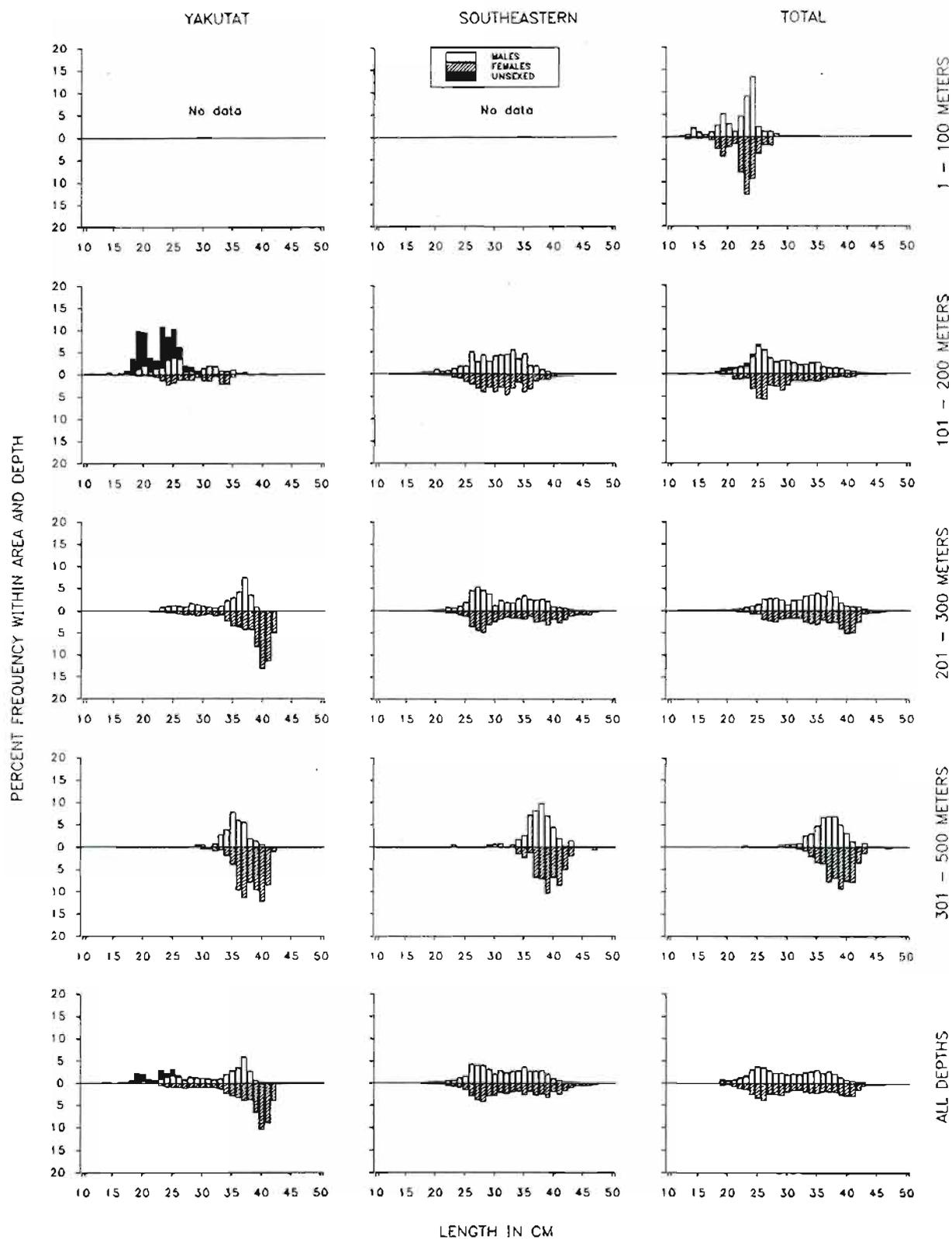


Figure 26.--continued.

Northern rockfish--Northern rockfish overall abundance totaled 113,000 t (Table 14). Northern rockfish occurred in areas west of Yakutat Bay (142°W long.) and was generally found on the shelf in depths shallower than 200 m, inshore from the areas of highest Pacific ocean perch densities. The highest catches and 90% of the biomass of northern rockfish occurred on the outer shelf of the Kodiak INPFC area (10,600 kg/km²; 53,700 t), the flats west of Portlock Bank (2,000 kg/km²; 14,400 t), and the Shumagin outer shelf (1,700 kg/km²; 13,400 t) and Shumagin Bank (1,600 kg/km²; 23,600 t; Fig. 27).

The largest northern rockfish, averaging 39 cm, were found in depths of 101-200 m on the Shumagin outer shelf (Fig. 28). The Shumagin length distribution was comprised of two nearly equal modes of 19-30 cm and 31-47 cm. Fewer small (<30 cm) northern rockfish occurred in the Chirikof INPFC area and were nearly absent in the Kodiak INPFC area.

Table 14.--Total number of survey hauls, hauls containing northern rockfish, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	17	543	24,083	0.4	25.2
	101 - 200	46	14	933	13,566	0.9	41.5
	201 - 300	9	5	49	135	0.5	29.7
	301 - 500	7	0	0	0	—	—
	All depths	137	36	589	37,785	0.5	30.5
Chirikof	1 - 100	28	3	11	292	0.3	34.4
	101 - 200	106	41	217	5,142	0.6	39.0
	201 - 300	16	4	37	430	0.6	29.3
	301 - 500	4	1	1	1	—	—
	All depths	154	49	92	5,865	0.5	33.4
Kodiak	1 - 100	51	1	6	225	0.7	27.6
	101 - 200	129	28	1,590	68,681	0.6	33.8
	201 - 300	29	5	3	32	0.7	—
	301 - 500	6	0	0	0	—	—
	All depths	215	34	707	68,938	0.6	35.1
Yakutat	1 - 100	17	1	< 1	5	0.2	—
	101 - 200	56	7	12	347	0.8	33.1
	201 - 300	36	3	2	7	0.6	—
	301 - 500	25	0	0	0	—	—
	All depths	134	11	7	360	0.7	35.9
Southeastern	1 - 100	0	0	0	0	—	—
	101 - 200	23	0	0	0	—	—
	201 - 300	27	0	0	0	—	—
	301 - 500	18	0	0	0	—	—
	All depths	68	0	0	0	—	—
All areas	1 - 100	171	22	193	24,606	0.4	32.9
	101 - 200	360	90	728	87,736	0.7	34.4
	201 - 300	117	17	17	605	0.6	35.7
	301 - 500	60	1	< 1	1	—	—
	All depths	708	130	381	112,948	0.6	35.7

All areas biomass, 95% confidence interval: 16,890 - 209,006 metric tons (t)

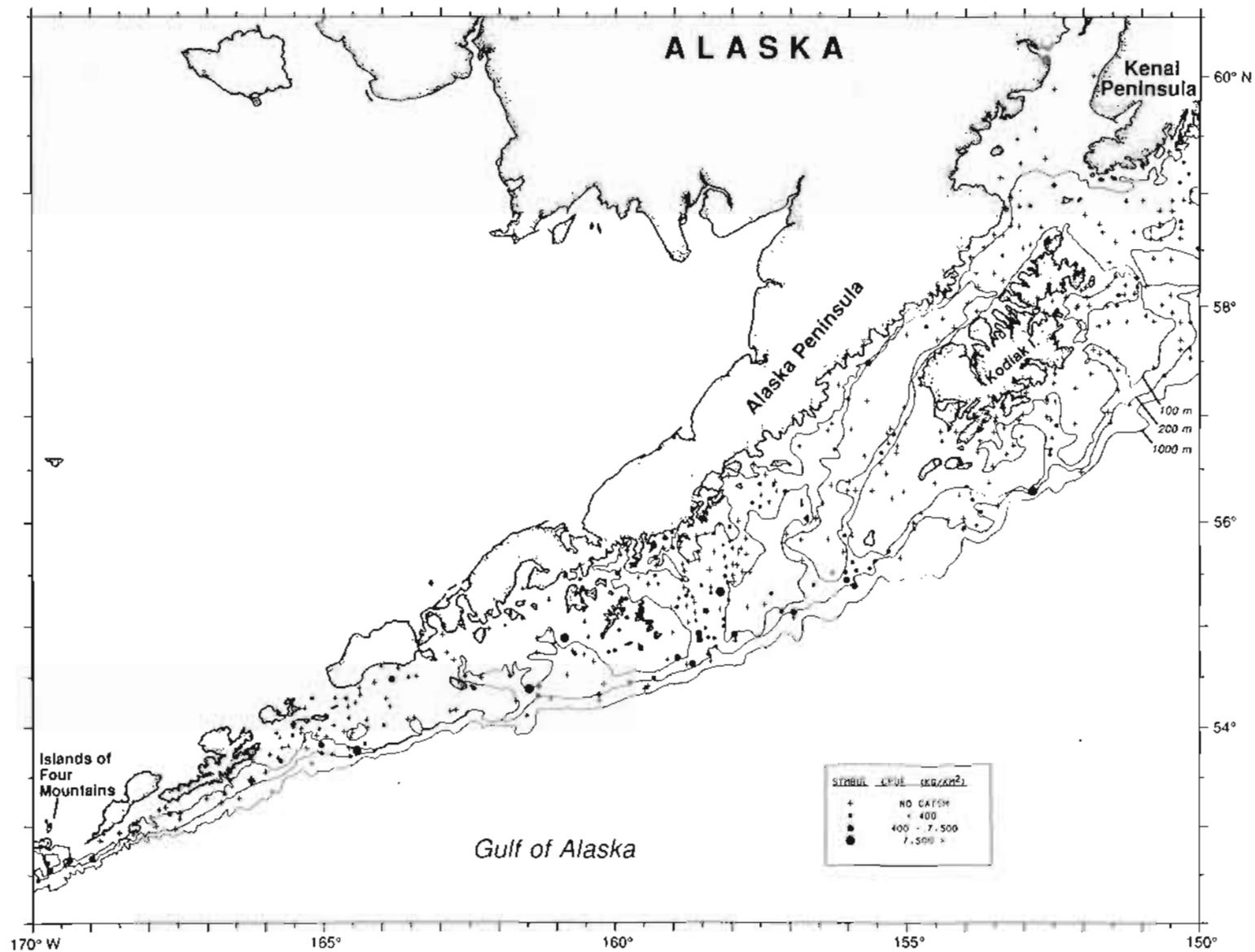


Figure 27.--Northern rockfish catch distribution and relative abundance during the NMFS 1990 Gulf of Alaska groundfish survey. Catch abundance categories are: 1) none, 2) less than the mean (400 kg/km²), 3) between the mean and two standard deviations and 4) greater than two standard deviations above the mean.

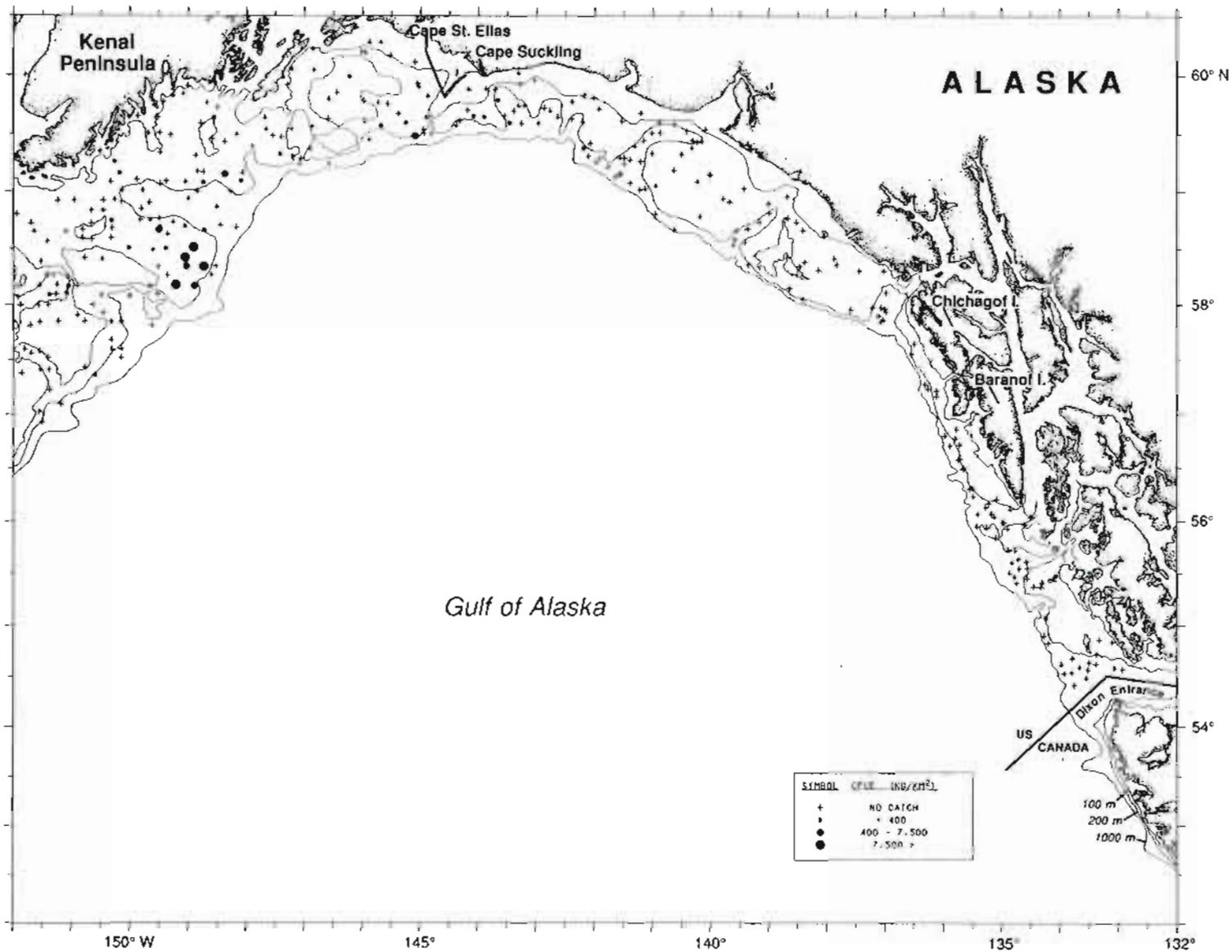


Figure 27.--continued.

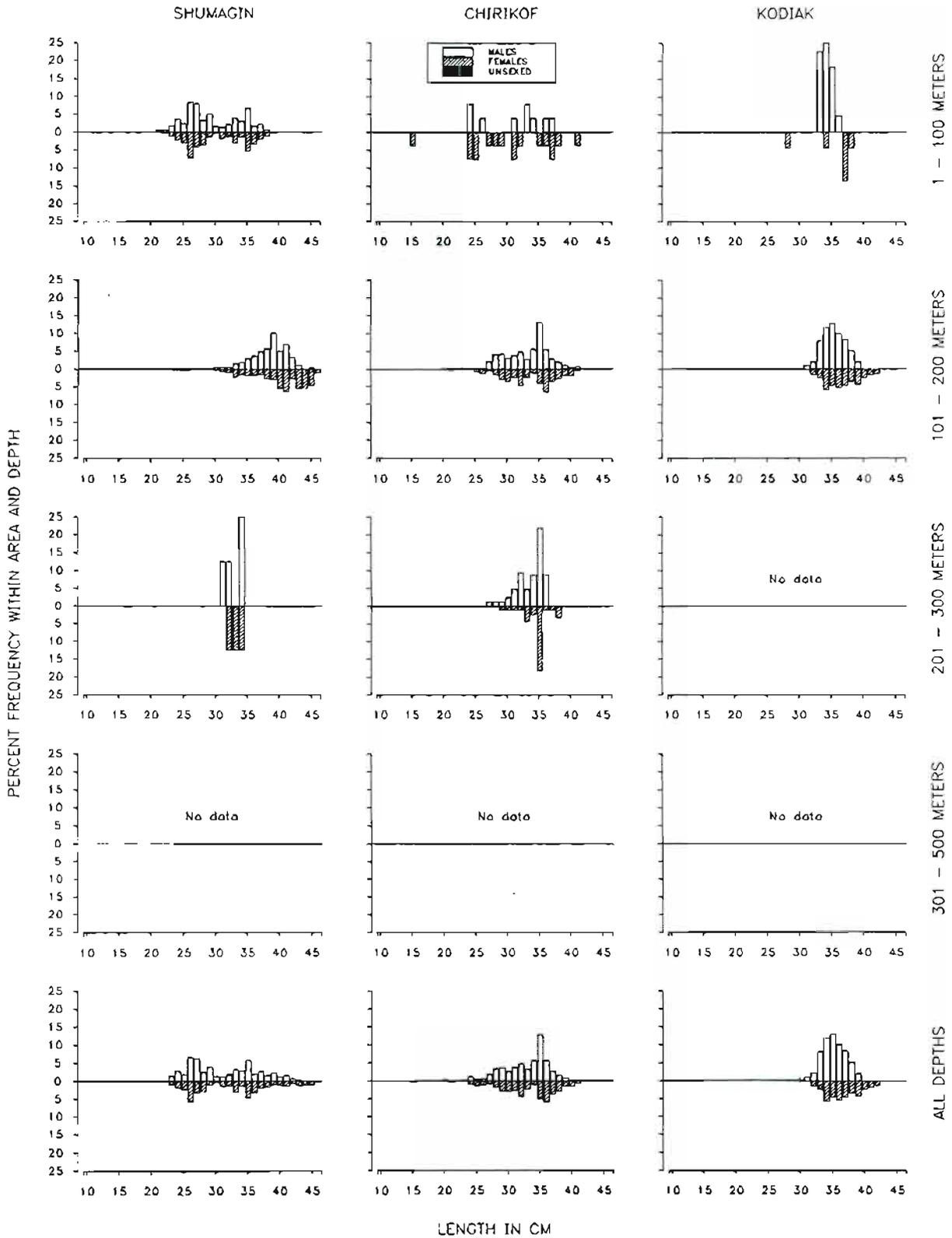


Figure 28.--Northern rockfish length composition during the NMFS 1990 Gulf of Alaska groundfish survey by International North Pacific Fisheries Commission statistical area and depth.

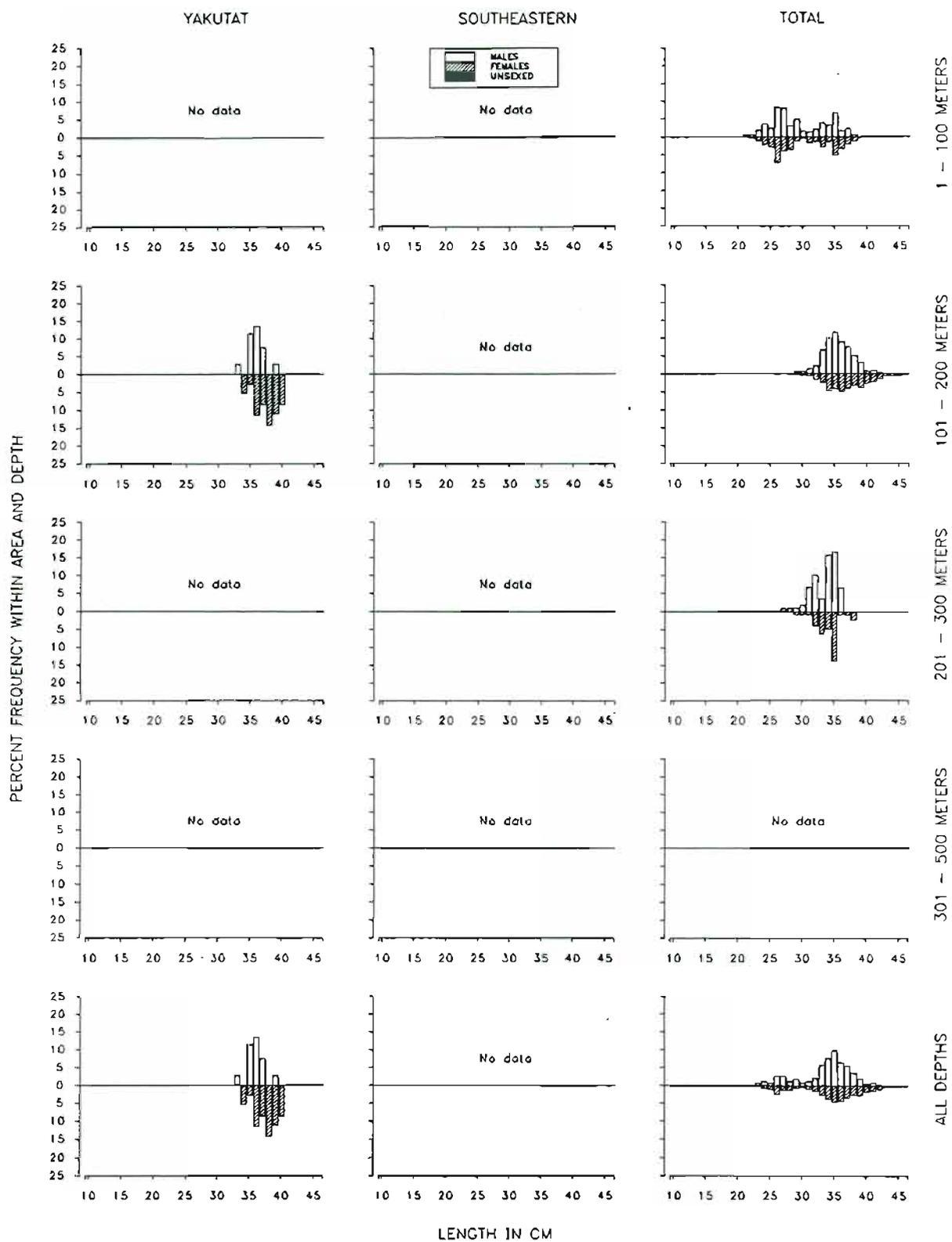


Figure 28.--continued.

Rougheye rockfish--Rougheye rockfish was found in all areas and depths (Table 15, Fig. 29). Large adults were distributed primarily on the slope and gullies in depths deeper than 200 m. The highest rougheye rockfish CPUE was found on the slope in depths exceeding 300 m and averaged over 3,000 kg/km² in the central GOA, nearly 1,000 kg/km² in the eastern gulf and less than 500 kg/km² in the far western GOA. Shallow water (1-100 m) rougheye rockfish catches only exceeded 50 kg/km² off the Kenai Peninsula (900 kg/km²) and the Upper Alaska Peninsula (300 kg/km²). Significant catches occurred in the 101-200 m depth interval off the Kenai Peninsula (500 kg/km²), the adjacent shelf off Montague Island (200 kg/km²) and in gullies off the Albatross Banks (200 kg/km²). The Kodiak INPFC area contained an estimated 60% of the total rougheye rockfish biomass (46,000 t).

Similar overall length compositions were found in the Chirikof and Kodiak INPFC areas dominated by two modes of 35 to 40 and 44 to 48 cm. Large rougheye predominated in the Chirikof INPFC area's deepwater (301 to 500 m) slope off the Semidi Islands averaging 40 cm (Fig. 30). Small (under 40 cm) rougheye rockfish comprised 80% of the population in the Yakutat INPFC area.

Table 15.—Total number of survey hauls, hauls containing rougheye rockfish, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	2	9	414	0.8	35.7
	101 - 200	46	9	8	112	0.7	—
	201 - 300	9	5	222	609	0.9	37.9
	301 - 500	7	2	176	444	1.3	41.6
	All depths	137	18	25	1,579	0.9	38.0
Chirikof	1 - 100	28	2	93	2,472	0.9	33.7
	101 - 200	106	40	53	1,261	0.7	34.6
	201 - 300	16	11	149	1,708	1.2	40.4
	301 - 500	4	3	3,567	5,824	1.7	47.5
	All depths	154	56	178	11,264	1.2	40.0
Kodiak	1 - 100	51	10	127	5,069	1.0	36.3
	101 - 200	129	60	194	8,391	0.9	35.2
	201 - 300	29	20	149	1,722	0.7	33.7
	301 - 500	6	6	3,591	10,630	1.6	45.8
	All depths	215	96	265	25,813	1.1	38.2
Yakutat	1 - 100	17	3	5	84	0.5	—
	101 - 200	56	29	68	1,993	0.5	30.4
	201 - 300	36	24	259	1,263	0.7	34.0
	301 - 500	25	21	797	2,362	1.2	39.1
	All depths	134	77	106	5,702	0.7	34.1
Southeastern	1 - 100	0	0	0	0	—	—
	101 - 200	23	2	9	91	1.0	—
	201 - 300	27	5	14	70	0.6	—
	301 - 500	18	15	563	1,623	0.9	42.8
	All depths	68	22	100	1,785	0.9	42.8
All areas	1 - 100	171	17	63	8,039	0.9	35.4
	101 - 200	360	140	98	11,849	0.8	34.2
	201 - 300	117	65	151	5,372	0.8	35.7
	301 - 500	60	47	1,610	20,883	1.5	44.8
	All depths	708	269	155	46,142	1.0	38.1

All areas biomass, 95% confidence interval: 25,840 - 66,445 metric tons (t)

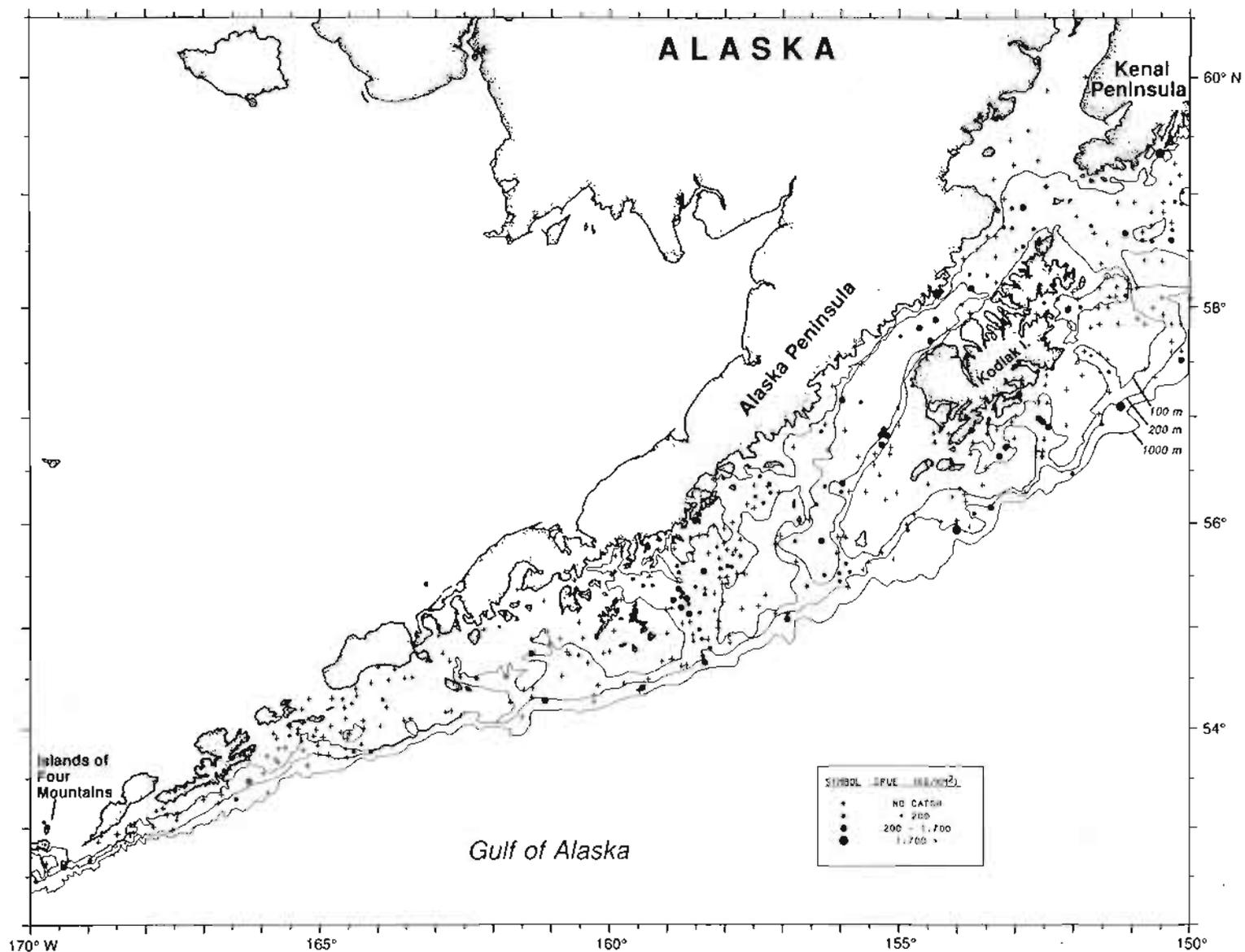


Figure 29.--Rougheye rockfish catch distribution and relative abundance during the NMFS 1990 Gulf of Alaska groundfish survey. Catch abundance categories are: 1) none, 2) less than the mean (200 kg/km²), 3) between the mean and two standard deviations and 4) greater than two standard deviations above the mean.

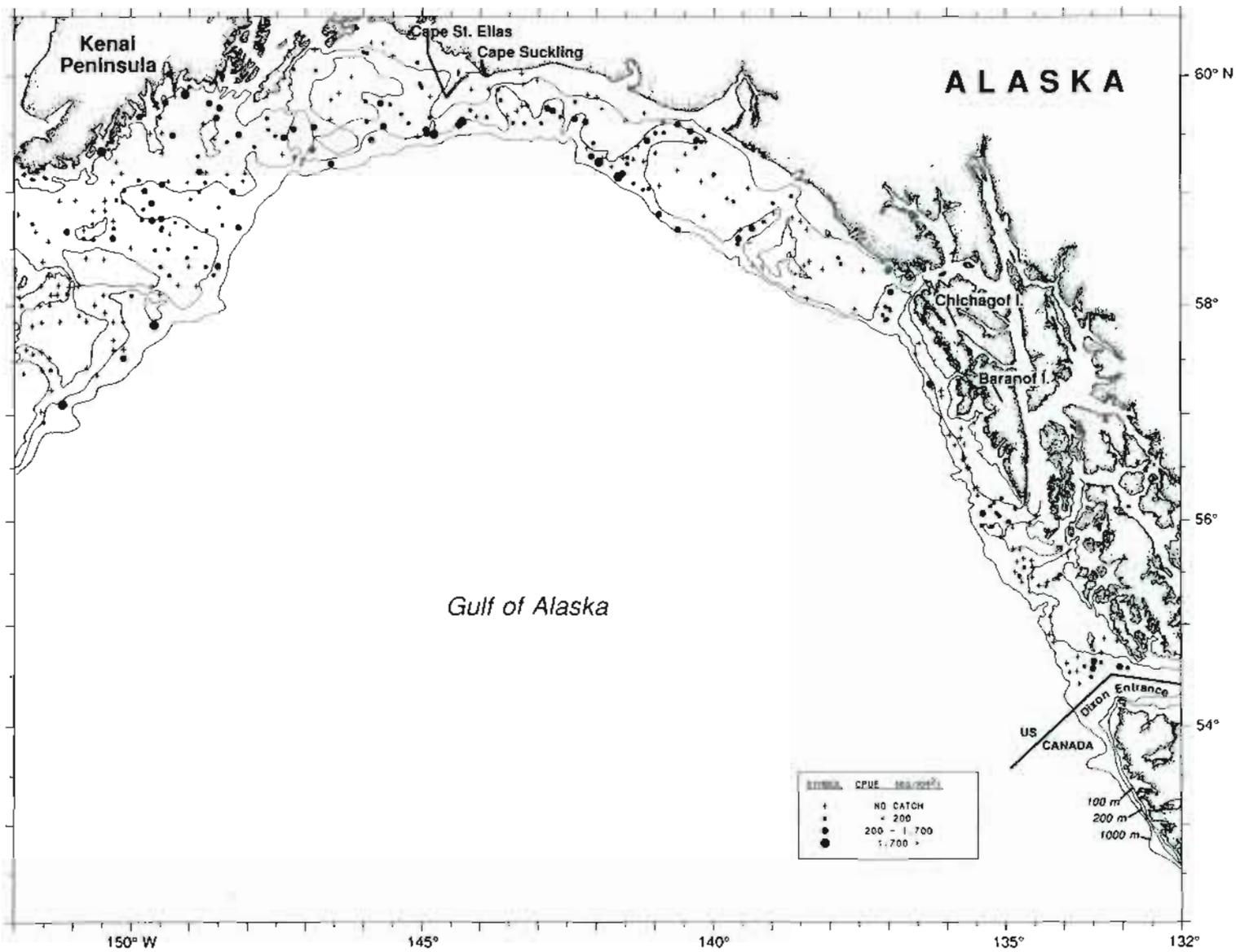


Figure 29.--continued.

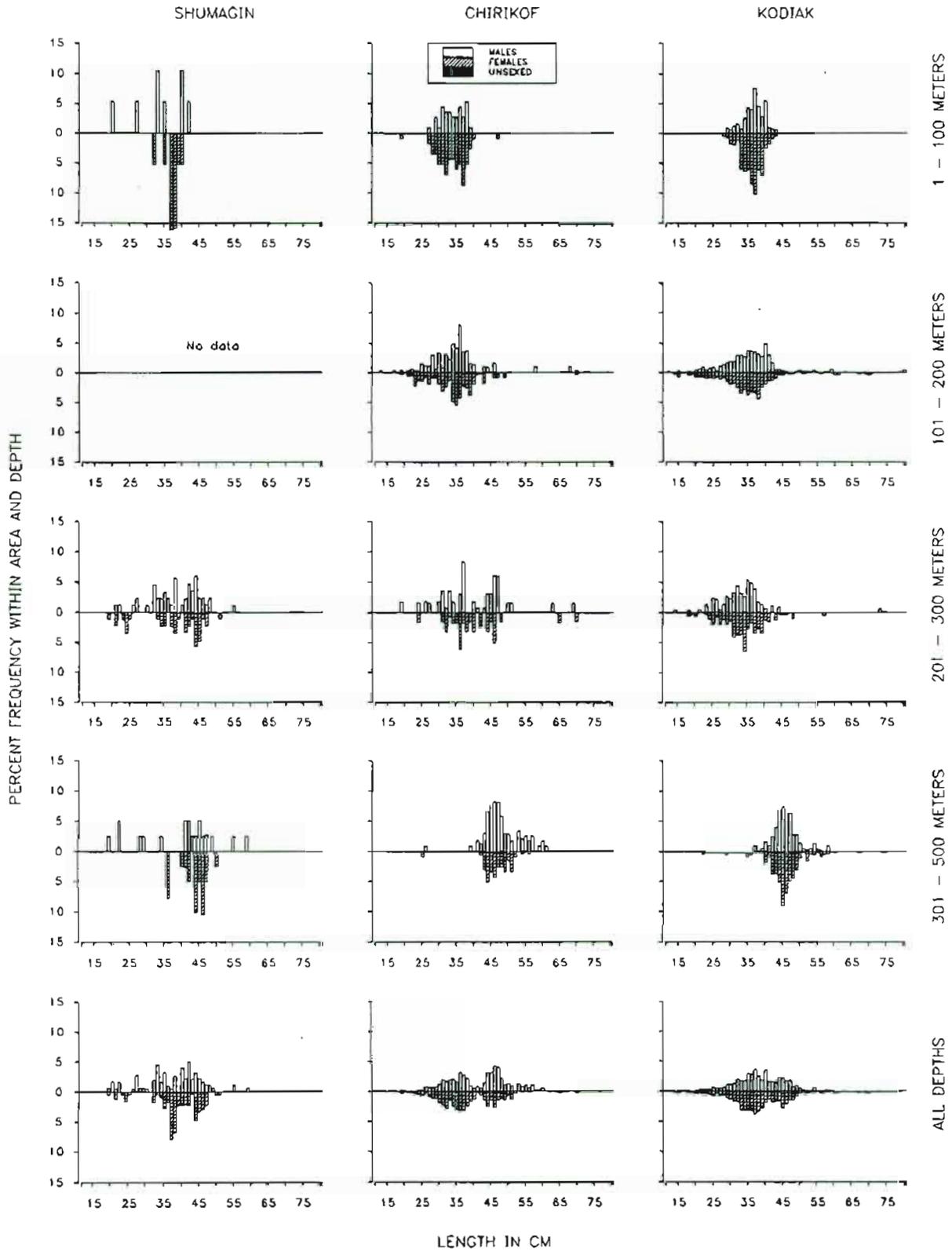


Figure 30.--Roughey rockfish length composition during the NMFS 1990 Gulf of Alaska groundfish survey by International North Pacific Fisheries Commission statistical area and depth.

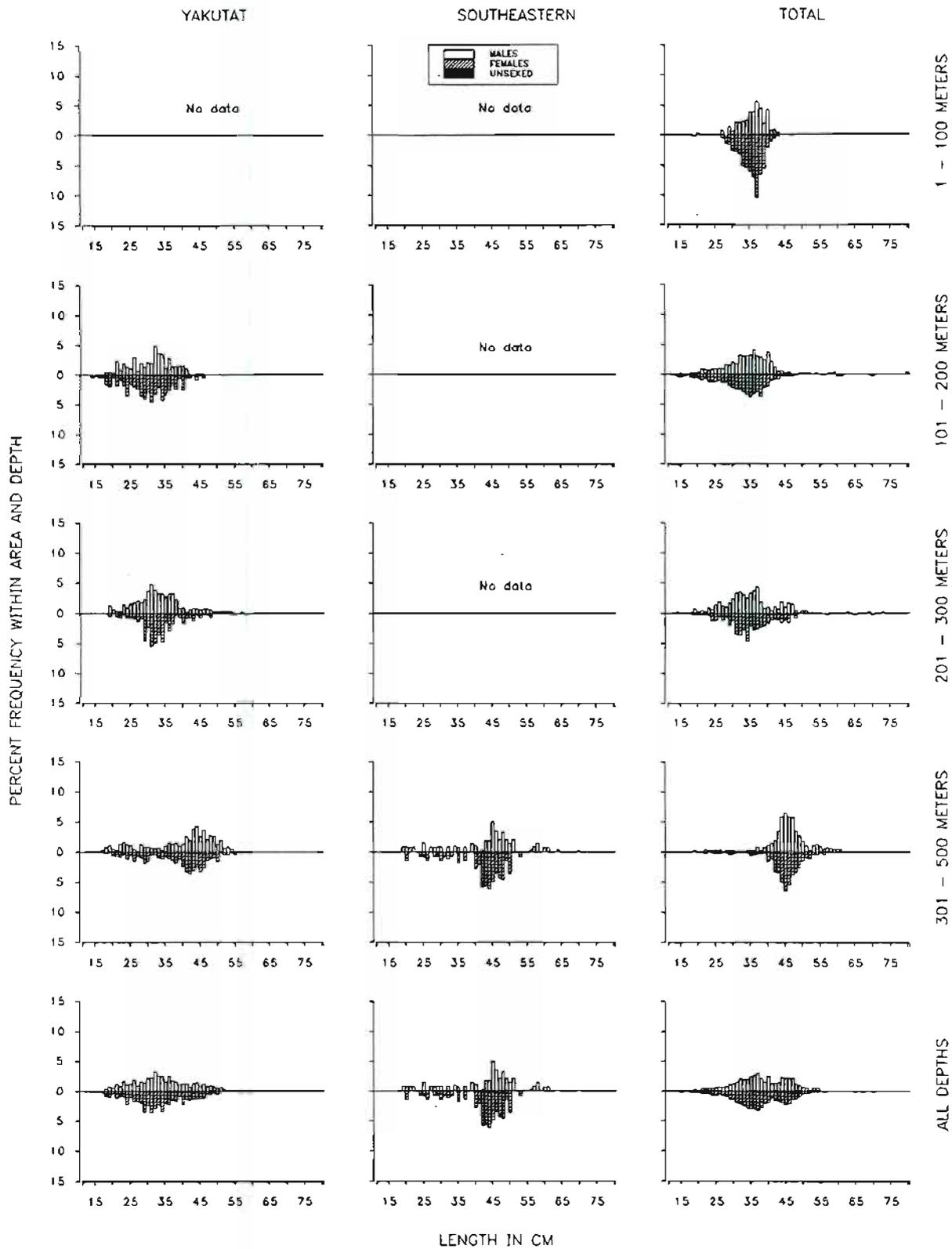


Figure 30.--continued.

Dusky rockfish--The majority (90%) of the total GOA dusky rockfish (biomass 27,700 t; Table 16) occurred in the 101-200 m depth interval, and none were found in depths deeper than 300 m. Highest catch rates occurred on the outer continental shelf in 101-200 m depths off Kodiak Island (1,800 kg/km², Fig. 31), east of Portlock Bank (900 kg/km²), off Montague Island (500 kg/km²) and off the Shumagin Islands (200 kg/km²). Most of the dusky rockfish biomass (58%) occurred in the Kodiak INPFC area.

Dusky rockfish length composition was adequately determined only in the depth interval of highest abundance (101-200 m) and averaged 44 cm over all areas (Fig. 32). The proportion of small (<40 cm) dusky rockfish was moderate (30%) in the Chirikof INPFC area and low in the other areas.

Table 16.--Total number of survey hauls, hauls containing dusky rockfish, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	10	27	1,196	0.3	27.0
	101 - 200	46	6	120	1,739	1.7	45.0
	201 - 300	9	2	10	28	1.8	---
	301 - 500	7	0	0	0	---	---
	All depths	137	18	46	2,963	0.5	36.5
Chirikof	1 - 100	28	1	2	52	0.2	---
	101 - 200	106	20	47	1,123	1.4	42.1
	201 - 300	16	4	5	58	1.3	---
	301 - 500	4	0	0	0	---	---
	All depths	154	25	19	1,233	1.1	42.1
Kodiak	1 - 100	51	2	3	105	0.7	---
	101 - 200	129	34	380	16,404	1.6	44.0
	201 - 300	29	6	23	270	1.7	---
	301 - 500	6	0	0	0	---	---
	All depths	215	42	172	16,779	1.6	44.0
Yakutat	1 - 100	17	2	11	192	1.1	---
	101 - 200	56	12	191	5,571	1.4	43.8
	201 - 300	36	6	9	45	1.4	---
	301 - 500	25	0	0	0	---	---
	All depths	134	20	108	5,808	1.4	43.8
Southeastern	1 - 100	0	0	0	0	---	---
	101 - 200	23	3	96	945	1.4	---
	201 - 300	27	2	1	7	1.2	---
	301 - 500	18	0	0	0	---	---
	All depths	68	5	54	953	1.4	---
All areas	1 - 100	171	15	12	1,545	0.3	27.0
	101 - 200	360	75	214	25,782	1.5	44.0
	201 - 300	117	20	11	407	1.6	---
	301 - 500	60	0	0	0	---	---
	All depths	708	110	93	27,735	1.3	43.0

All areas biomass, 95% confidence interval: 9,801 - 45,670 metric tons (t)

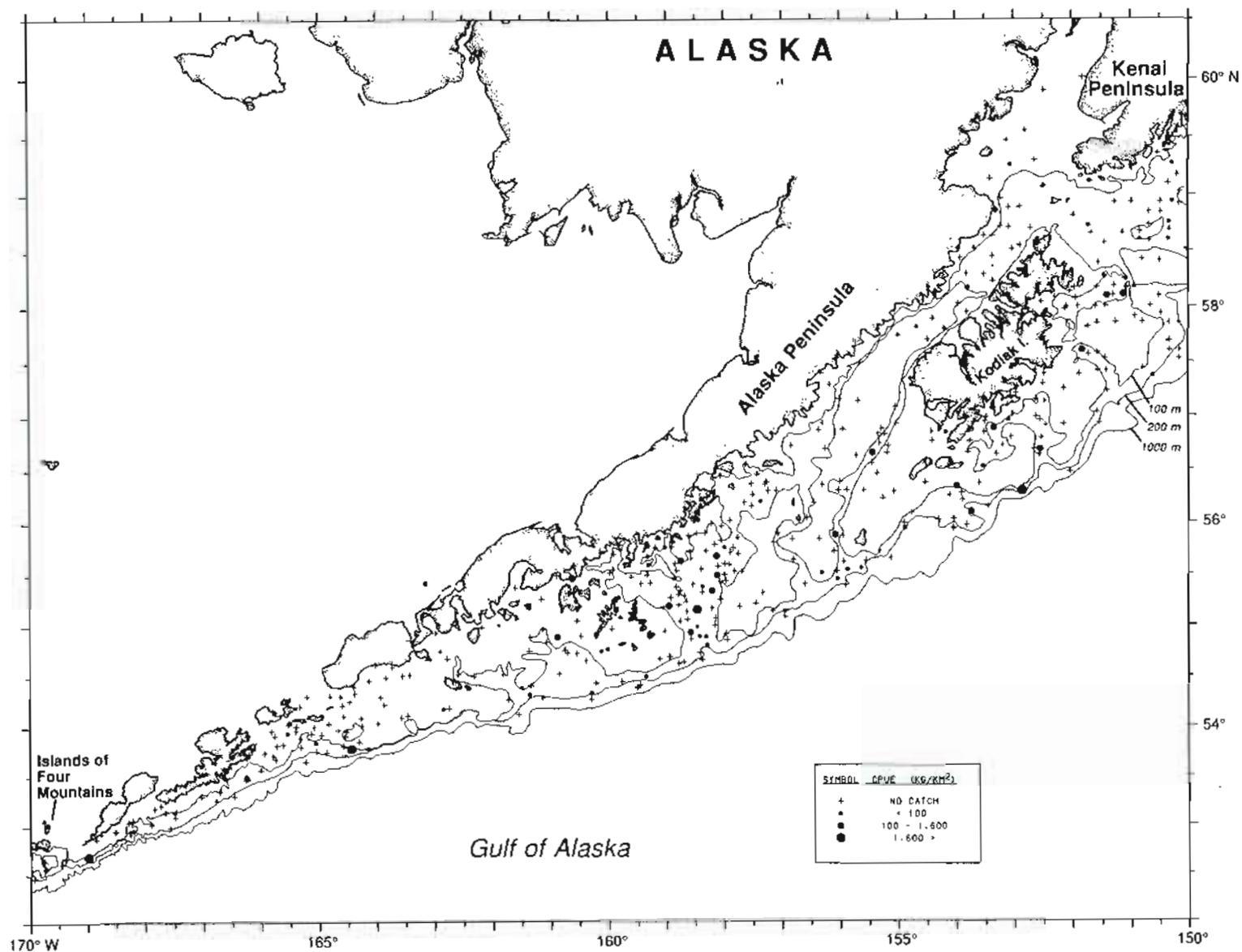


Figure 31.--Dusky rockfish catch distribution and relative abundance during the NMFS 1990 Gulf of Alaska groundfish survey. Catch abundance categories are: 1) none, 2) less than or equal to the mean (100 kg/km²), 3) between the mean and two standard deviations and 4) greater than two standard deviations above the mean.

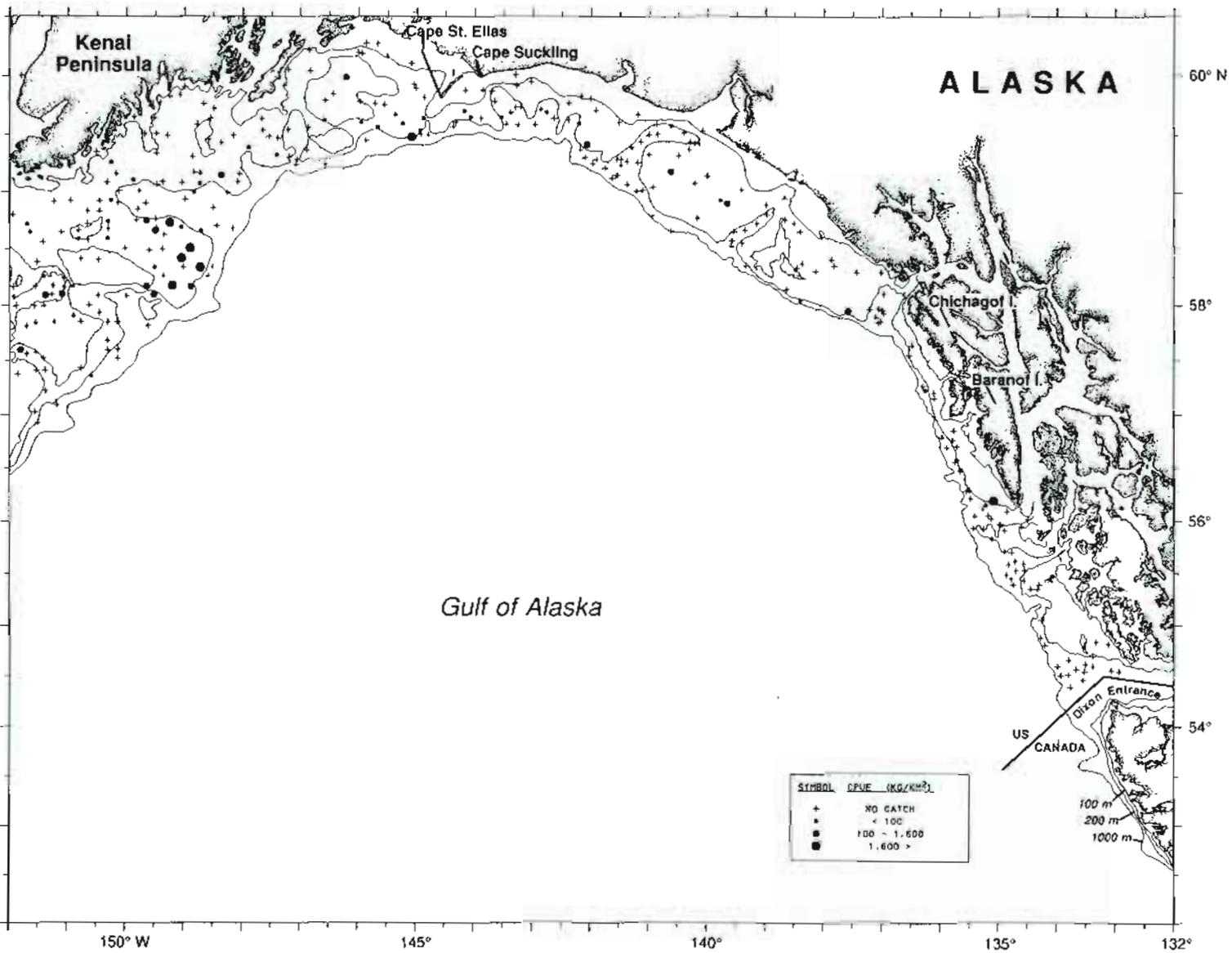


Figure 31.--continued.

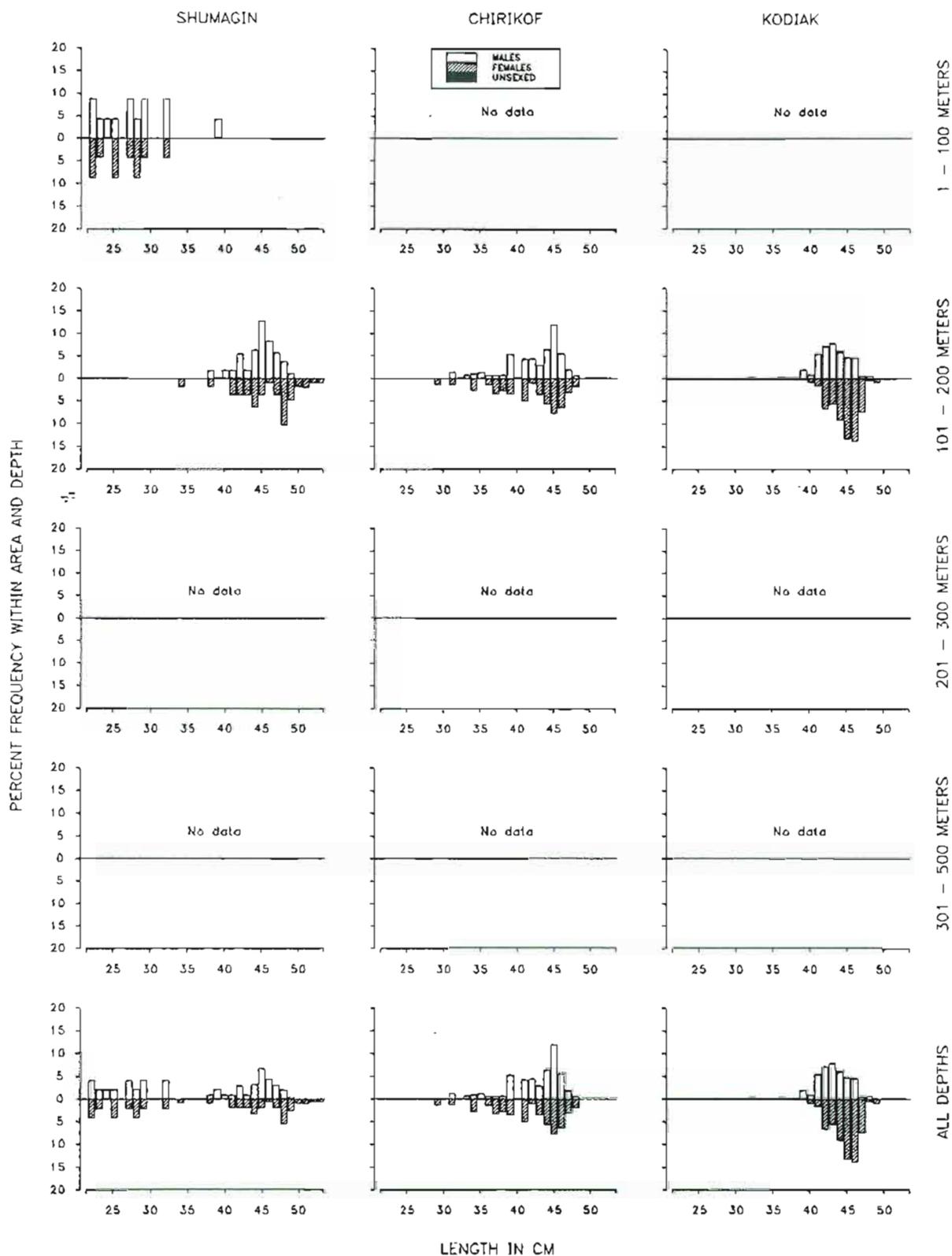


Figure 32.--Dusky rockfish length composition during the NMFS 1990 Gulf of Alaska groundfish survey by International North Pacific Fisheries Commission statistical area and depth.

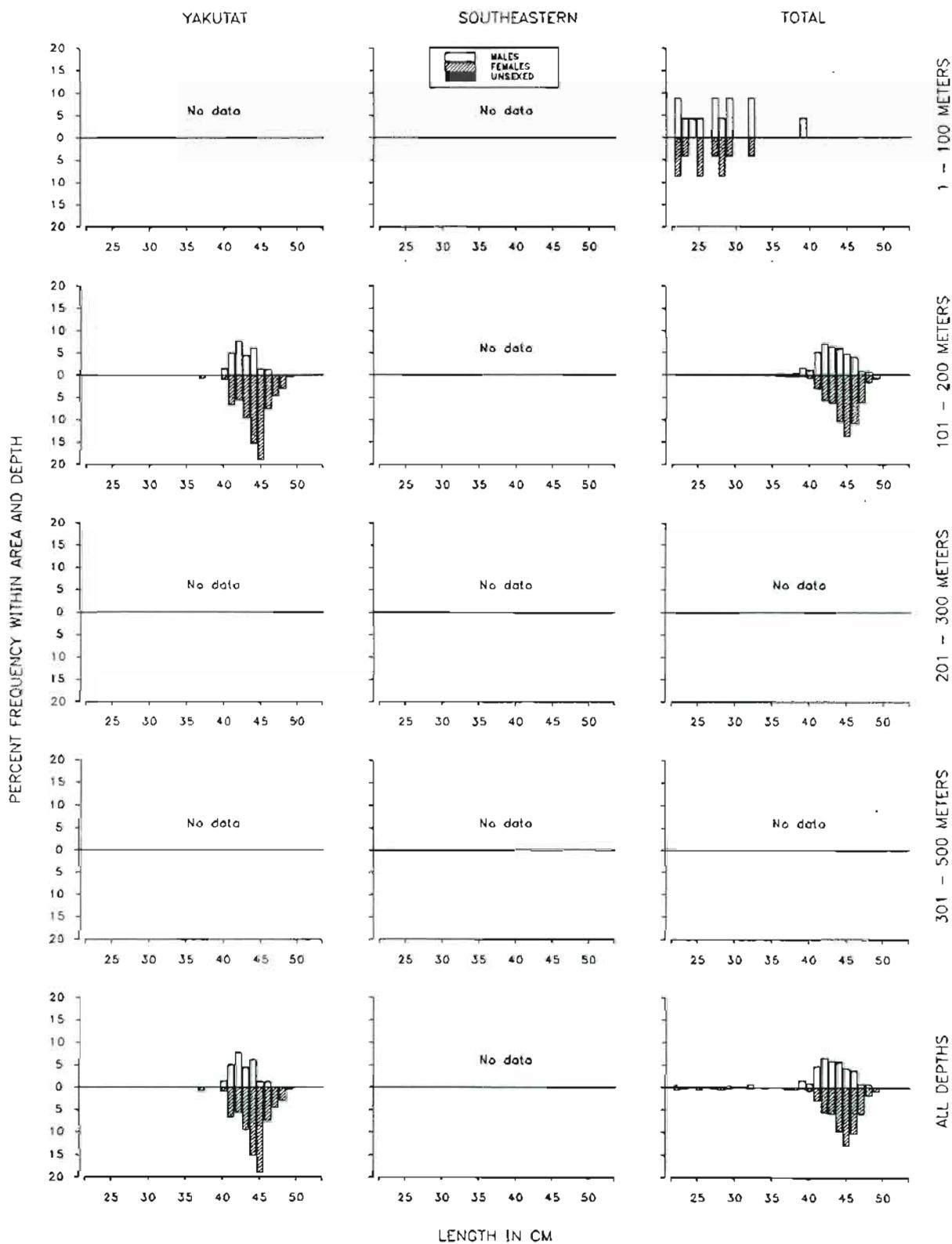


Figure 32.--continued.

Sharpchin rockfish--The sharpchin rockfish total biomass (37,000 t, Table 17) was concentrated (85%) in the Southeastern INPFC area, most of which (99%) was caught in the 101-200 m and 201-300 m strata off Prince of Wales and Baranof Islands (Fig. 33). West of the lower Cook Inlet area sharpchin rockfish abundance was negligible.

Most (90%) of the sharpchin rockfish were less than 30 cm in length and averaged 26 cm (Fig. 34).

Table 17.—Total number of survey hauls, hauls containing sharpchin rockfish, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	0	0	0	---	---
	101 - 200	46	0	0	0	---	---
	201 - 300	9	1	1	2	0.1	---
	301 - 500	7	0	0	0	---	---
	All depths	137	1	< 1	2	0.1	---
Chirikof	1 - 100	28	0	0	0	---	---
	101 - 200	106	0	0	0	---	---
	201 - 300	16	0	0	0	---	---
	301 - 500	4	1	2	3	0.2	---
	All depths	154	1	< 1	3	0.2	---
Kodiak	1 - 100	51	0	0	0	---	---
	101 - 200	129	24	73	3,149	0.2	21.1
	201 - 300	29	3	1	14	0.2	---
	301 - 500	6	2	3	10	0.4	---
	All depths	215	29	33	3,172	0.2	17.7
Yakutat	1 - 100	17	0	0	0	---	---
	101 - 200	56	9	46	1,328	0.1	25.0
	201 - 300	36	12	246	1,201	0.3	22.6
	301 - 500	25	4	1	4	0.1	---
	All depths	134	25	47	2,533	0.2	24.1
Southeastern	1 - 100	0	0	0	0	---	---
	101 - 200	23	17	848	8,370	0.2	24.1
	201 - 300	27	19	4,560	22,960	0.3	21.5
	301 - 500	18	3	4	12	0.1	---
	All depths	68	39	1,762	31,341	0.3	21.6
All areas	1 - 100	171	0	0	0	---	---
	101 - 200	360	50	107	12,846	0.2	27.2
	201 - 300	117	35	677	24,176	0.3	24.7
	301 - 500	60	10	2	28	0.2	---
	All depths	708	95	125	37,050	0.3	24.7

All areas biomass, 95% confidence interval: 7,486 - 66,614 metric tons (t)

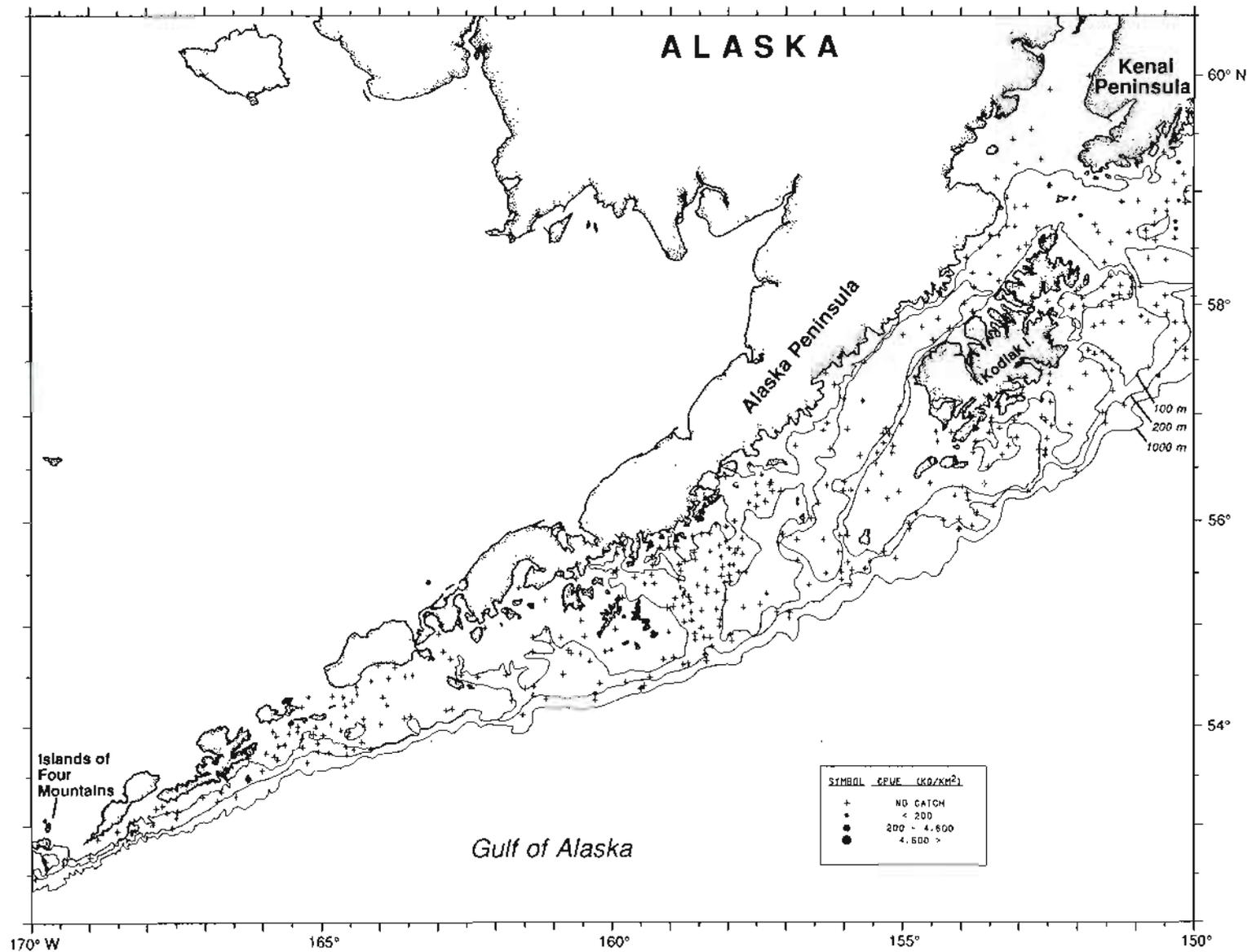


Figure 33.--Sharpchin rockfish catch distribution and relative abundance during the NMFS 1990 Gulf of Alaska groundfish survey. Catch abundance categories are: 1) none, 2) less than the mean (200 kg/km²), 3) between the mean and two standard deviations and 4) greater than two standard deviations above the mean.

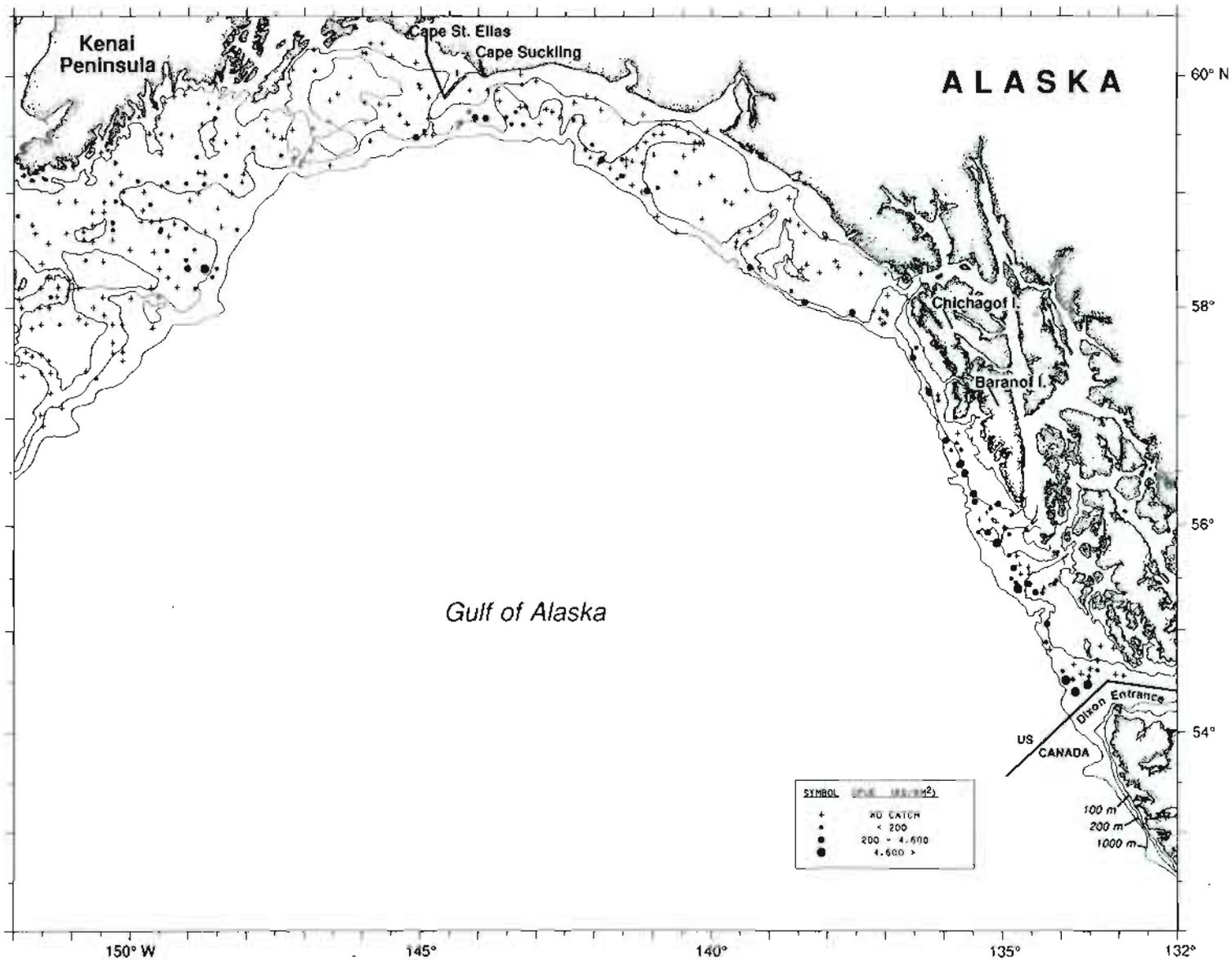


Figure 33.--continued.

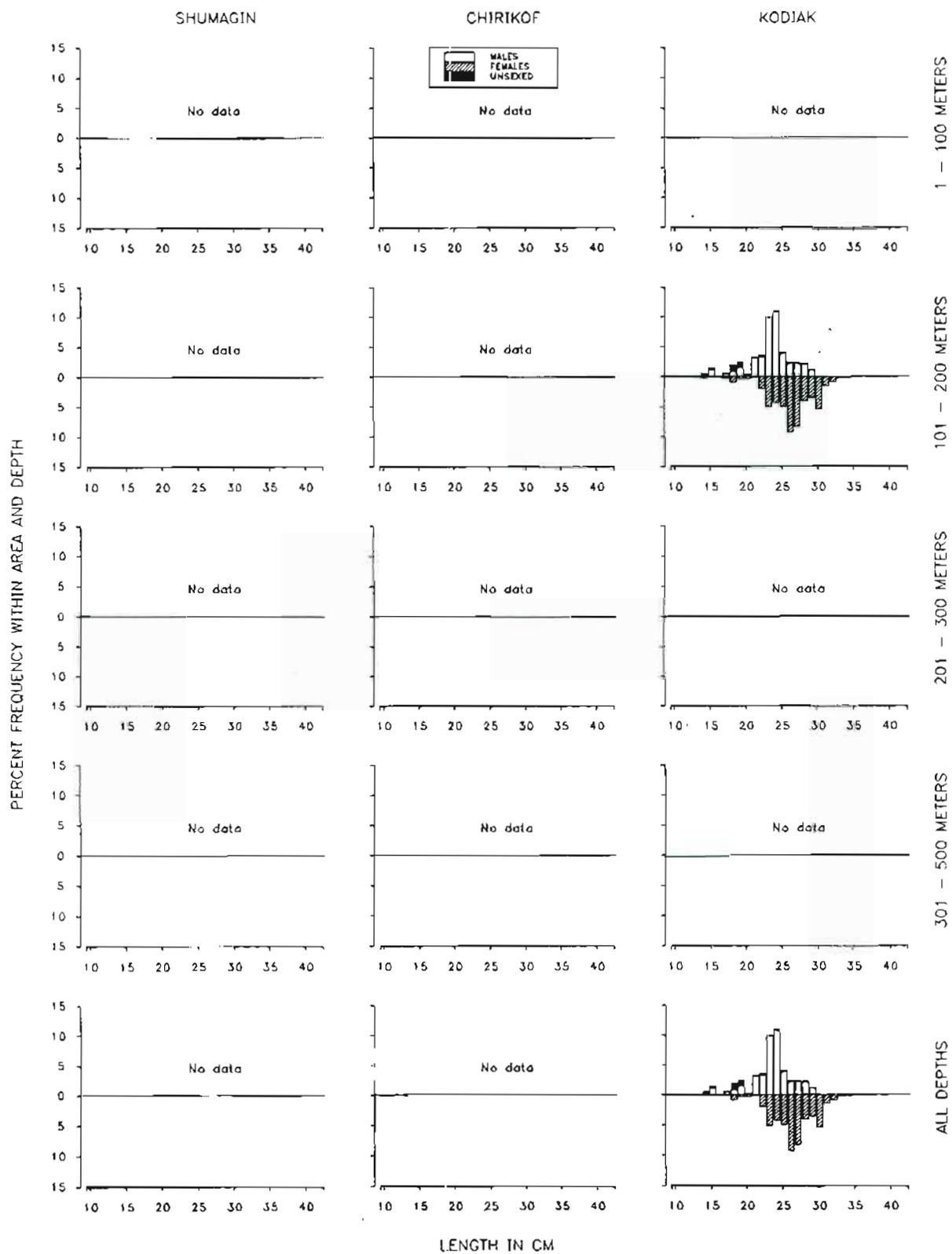


Figure 34.--Sharpchin rockfish length composition during the NMFS 1990 Gulf of Alaska groundfish survey by International North Pacific Fisheries Commission statistical area and depth.

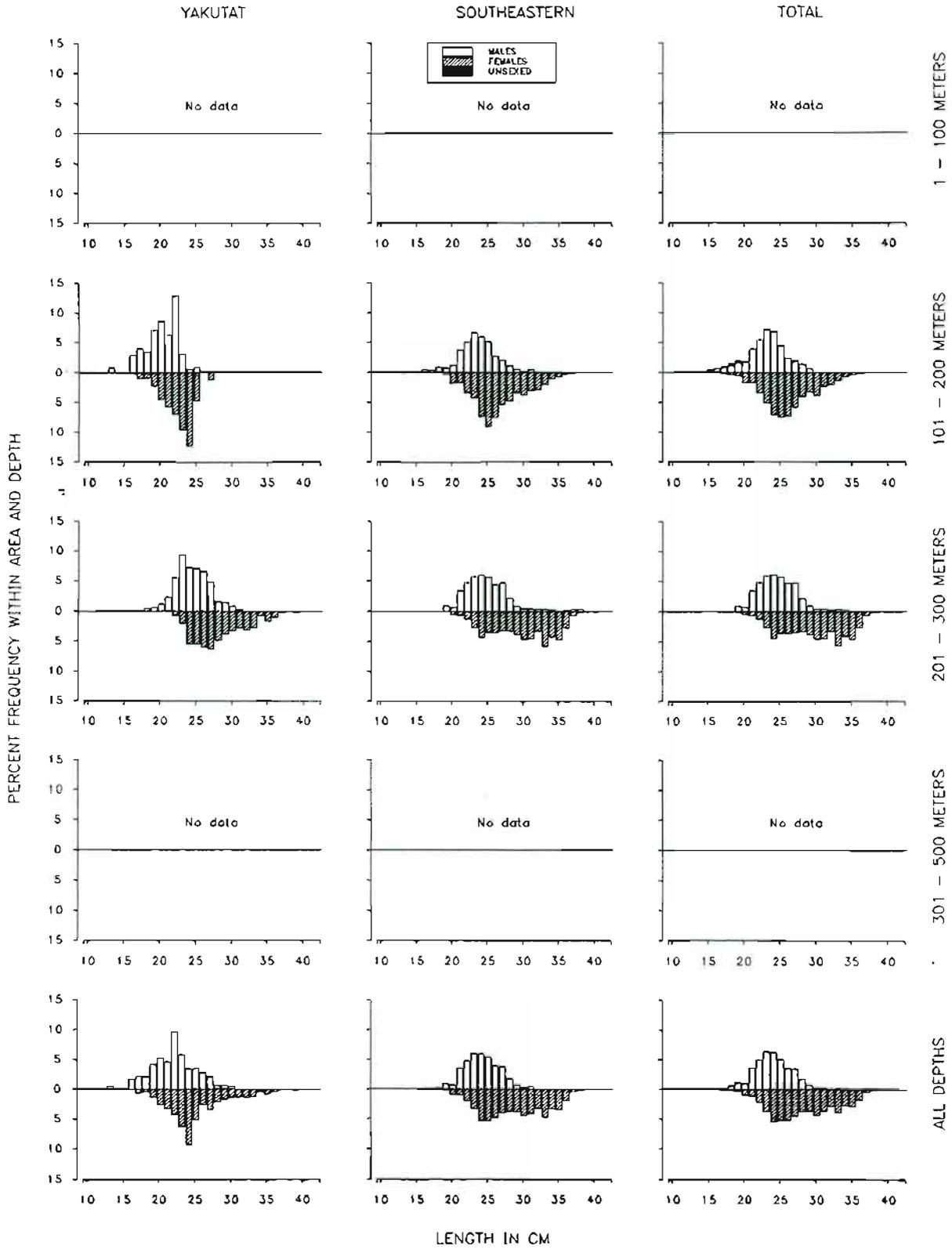


Figure 34.--continued.

Shortraker rockfish-- Shortraker rockfish distribution was the deepest and most depth restricted of any major rockfish with 90% of the total biomass (10,800 t; Table 18) centered on the upper slope (301-500 m). High catch rates occurred on the Yakutat INPFC area's slope (3,100 kg/km², Fig. 35), Spencer Gully (1,200 kg/km²) and the Chirikof and Kodiak INPFC area's slopes (each exceeded 700 kg/km²). Largest of the GOA rockfish, shortraker rockfish averaged 61 cm in length and 4 kg in weight during the 1990 survey.

Shortraker rockfish ranged in length from approximately 21 to 88 cm over all areas (Fig. 36), although few were less than 45 cm.

Table 18.--Total number of survey hauls, hauls containing shortraker rockfish, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	0	0	0	---	---
	101 - 200	46	0	0	0	---	---
	201 - 300	9	1	28	78	3.4	24.7
	301 - 500	7	3	113	285	3.2	24.6
	All depths	137	4	6	363	3.2	27.1
Chirikof	1 - 100	28	0	0	0	---	---
	101 - 200	106	0	0	0	---	---
	201 - 300	16	1	14	166	5.0	---
	301 - 500	4	3	898	1,467	3.1	26.2
	All depths	154	4	26	1,633	3.3	24.6
Kodiak	1 - 100	51	0	0	0	---	---
	101 - 200	129	1	1	56	2.4	---
	201 - 300	29	1	2	19	3.2	---
	301 - 500	6	3	756	2,237	4.0	27.1
	All depths	215	5	24	2,311	3.9	26.0
Yakutat	1 - 100	17	0	0	0	---	---
	101 - 200	56	3	14	421	4.0	---
	201 - 300	36	4	39	190	5.8	---
	301 - 500	25	19	1,454	4,309	4.2	26.0
	All depths	134	26	91	4,920	4.2	59.3
Southeastern	1 - 100	0	0	0	0	---	---
	101 - 200	23	1	4	35	3.5	---
	201 - 300	27	0	0	0	---	---
	301 - 500	18	10	536	1,547	4.6	57.4
	All depths	68	11	89	1,582	4.5	56.0
All areas	1 - 100	171	0	0	0	---	---
	101 - 200	360	5	4	512	3.7	---
	201 - 300	117	7	13	452	4.8	57.8
	301 - 500	60	38	759	9,846	4.0	56.0
	All depths	708	50	36	10,809	4.0	56.0

All areas biomass, 95% confidence interval: 4,976 - 16,642 metric tons (t)

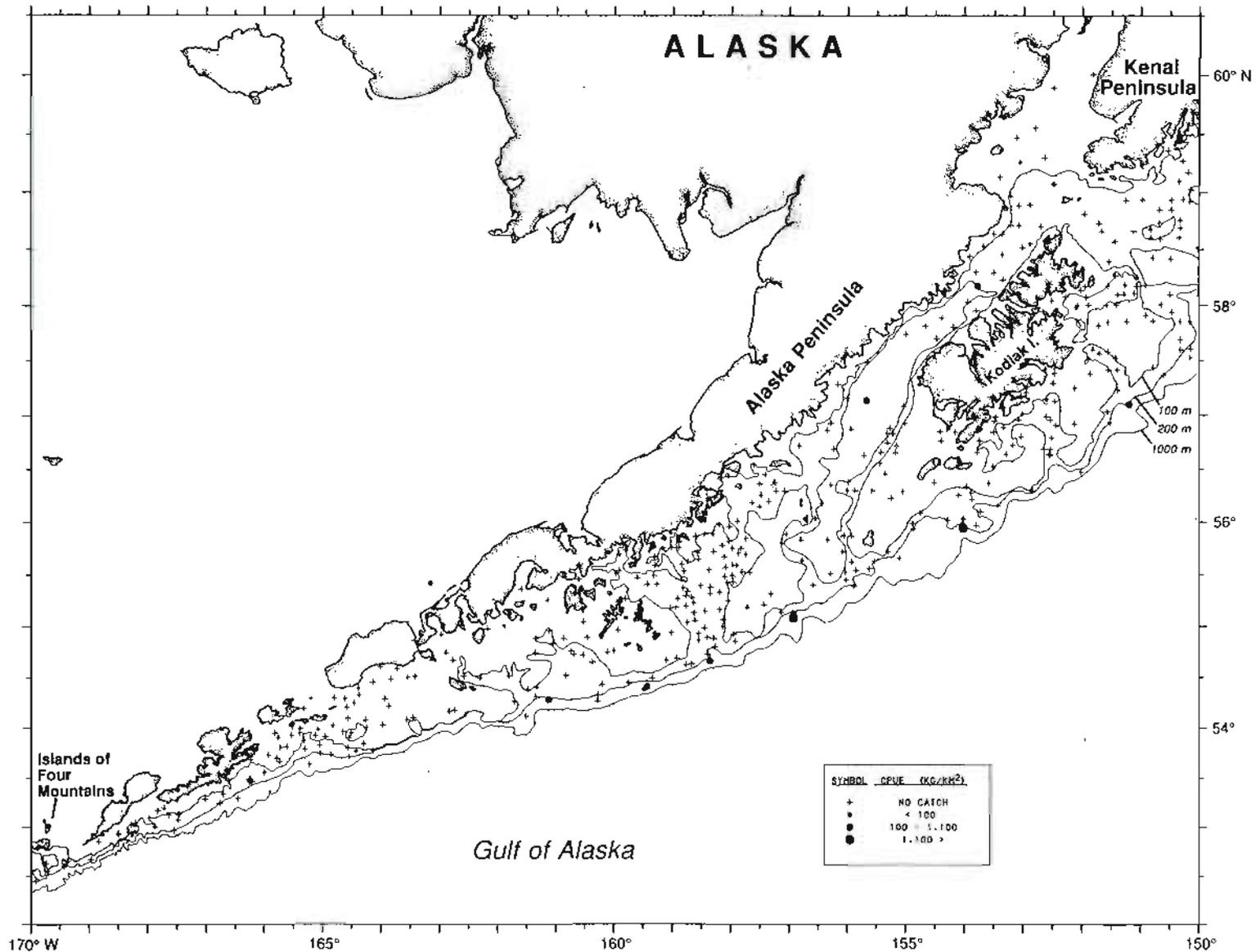


Figure 35.--Shortraker rockfish catch distribution and relative abundance during the NMFS 1990 Gulf of Alaska groundfish survey. Catch abundance categories are: 1) none, 2) less than the mean (100 kg/km²), 3) between the mean and two standard deviations and 4) greater than two standard deviations above the mean.

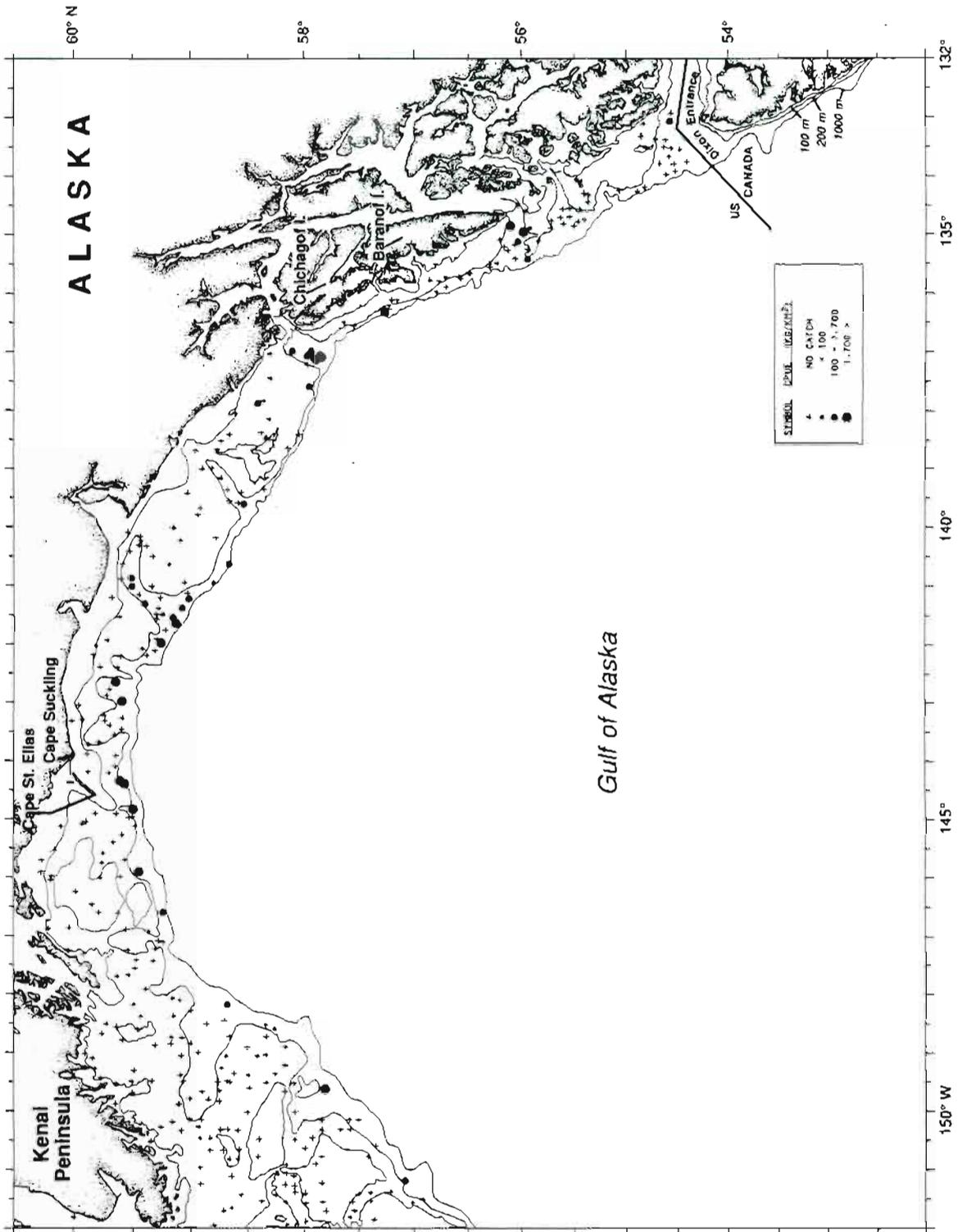


Figure 35.-- (continued)

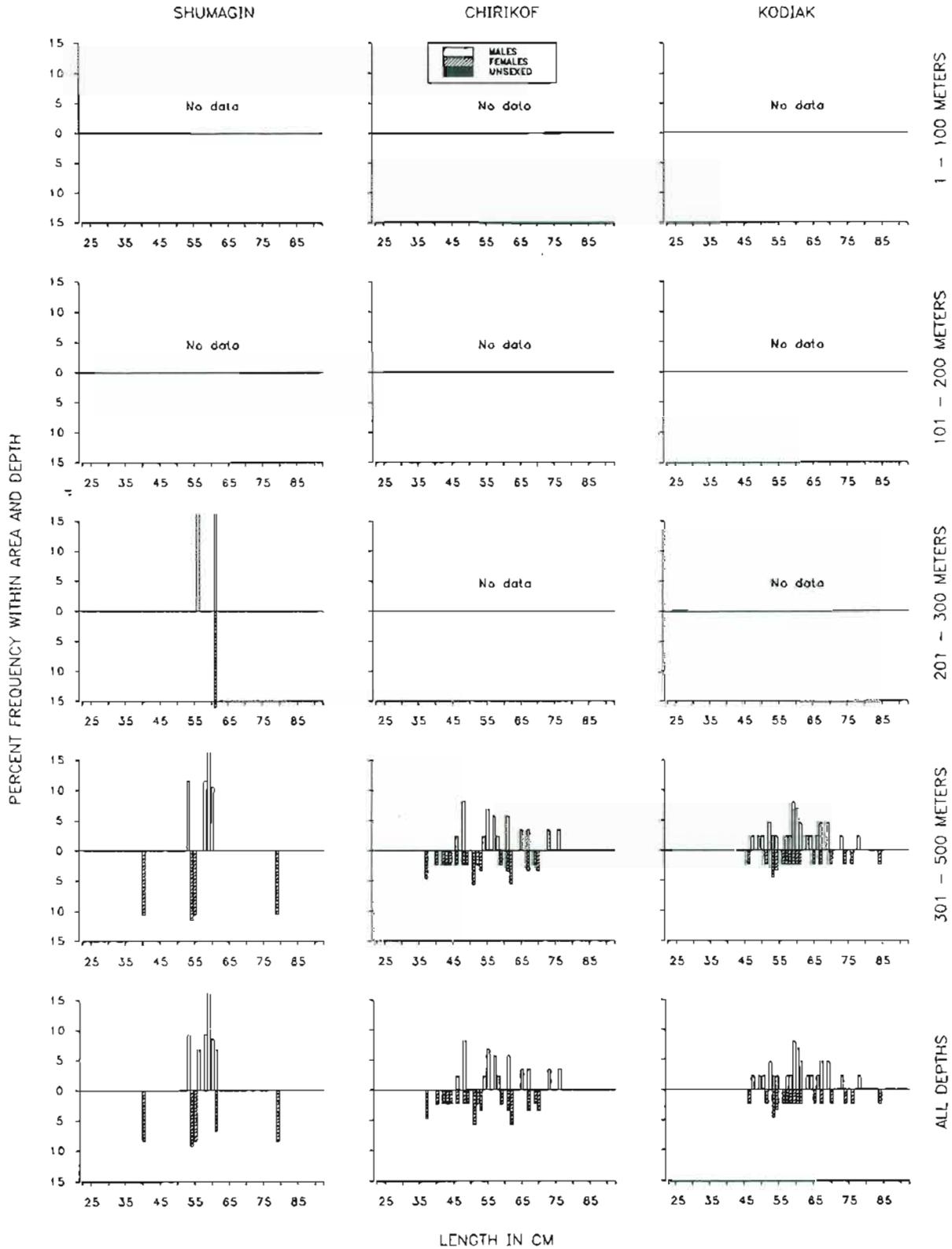


Figure 36.--Shortraker rockfish length composition during the NMFS 1990 Gulf of Alaska groundfish survey by International North Pacific Fisheries Commission statistical area and depth.

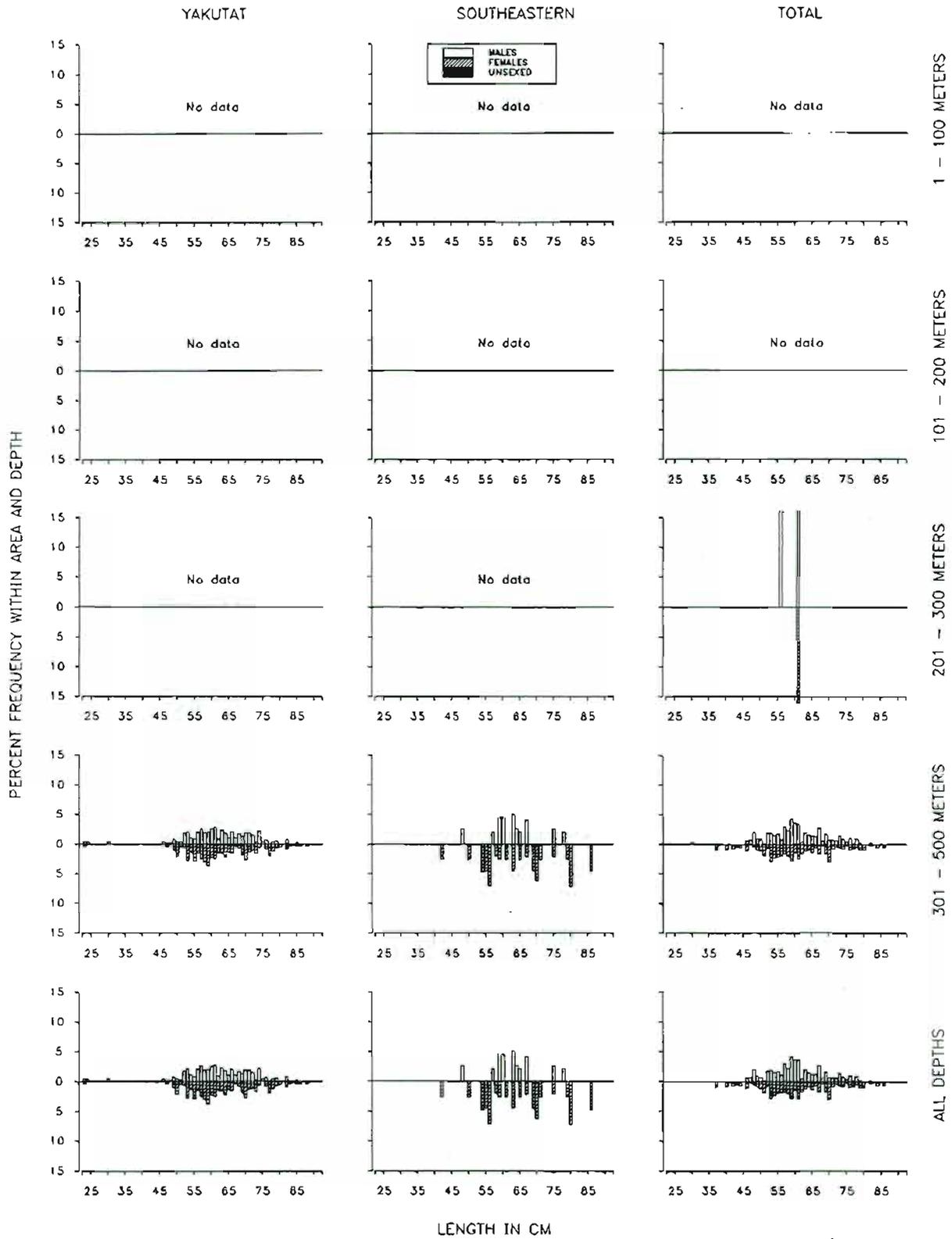


Figure 36.--(continued)

Shortspine thornyhead--Shortspine thornyhead abundance declined across the GOA from a biomass of 7,600 t in the Southeastern INPFC area to 1,700 t in the Shumagin INPFC area (Table 19). Highest shortspine thornyhead catches averaged approximately 1,000 kg/km² on the Southeastern INPFC area's deep (301-500 m) southeastern slope and gullies (Fig. 37) and the Baranof-Chichagof slope (101-200 m) and on the Chirikof INPFC area's deep (301-500 m) slope.

Shortspine thornyhead lengths ranged from approximately 5 to 45 cm, although over 50% of the fish did not exceed 25 cm (Fig. 38).

Table 19.--Total number of survey hauls, hauls containing shortspine thornyhead, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	0	0	0	—	—
	101 - 200	46	1	< 1	5	0.7	—
	201 - 300	9	7	269	737	0.4	22.5
	301 - 500	7	5	394	996	0.2	25.3
	All depths	137	13	27	1,739	0.2	28.8
Chirikof	1 - 100	28	0	0	0	—	—
	101 - 200	106	0	0	0	—	—
	201 - 300	16	1	48	551	0.4	24.7
	301 - 500	4	4	908	1,483	0.2	21.6
	All depths	154	5	32	2,034	0.3	23.7
Kodiak	1 - 100	51	0	0	0	—	—
	101 - 200	129	4	3	111	0.3	22.3
	201 - 300	29	18	184	2,126	0.3	22.3
	301 - 500	6	5	530	1,569	0.2	21.5
	All depths	215	27	39	3,805	0.3	22.0
Yakutat	1 - 100	17	0	0	0	—	—
	101 - 200	56	12	47	1,371	0.3	26.7
	201 - 300	36	33	287	1,399	0.2	29.0
	301 - 500	25	25	487	1,444	0.2	22.9
	All depths	134	70	78	4,214	0.2	25.0
Southeastern	1 - 100	0	0	0	0	—	—
	101 - 200	23	13	146	1,443	0.2	26.7
	201 - 300	27	25	541	2,725	0.1	29.0
	301 - 500	18	18	1,171	3,379	0.2	22.6
	All depths	68	56	424	7,547	0.2	24.7
All areas	1 - 100	171	0	0	0	—	—
	101 - 200	360	30	24	2,929	0.2	14.6
	201 - 300	117	84	211	7,538	0.2	14.6
	301 - 500	60	57	684	8,871	0.2	14.6
	All depths	708	171	65	19,338	0.2	14.6

All areas biomass, 95% confidence interval: 15,200 - 23,476 metric tons (t)

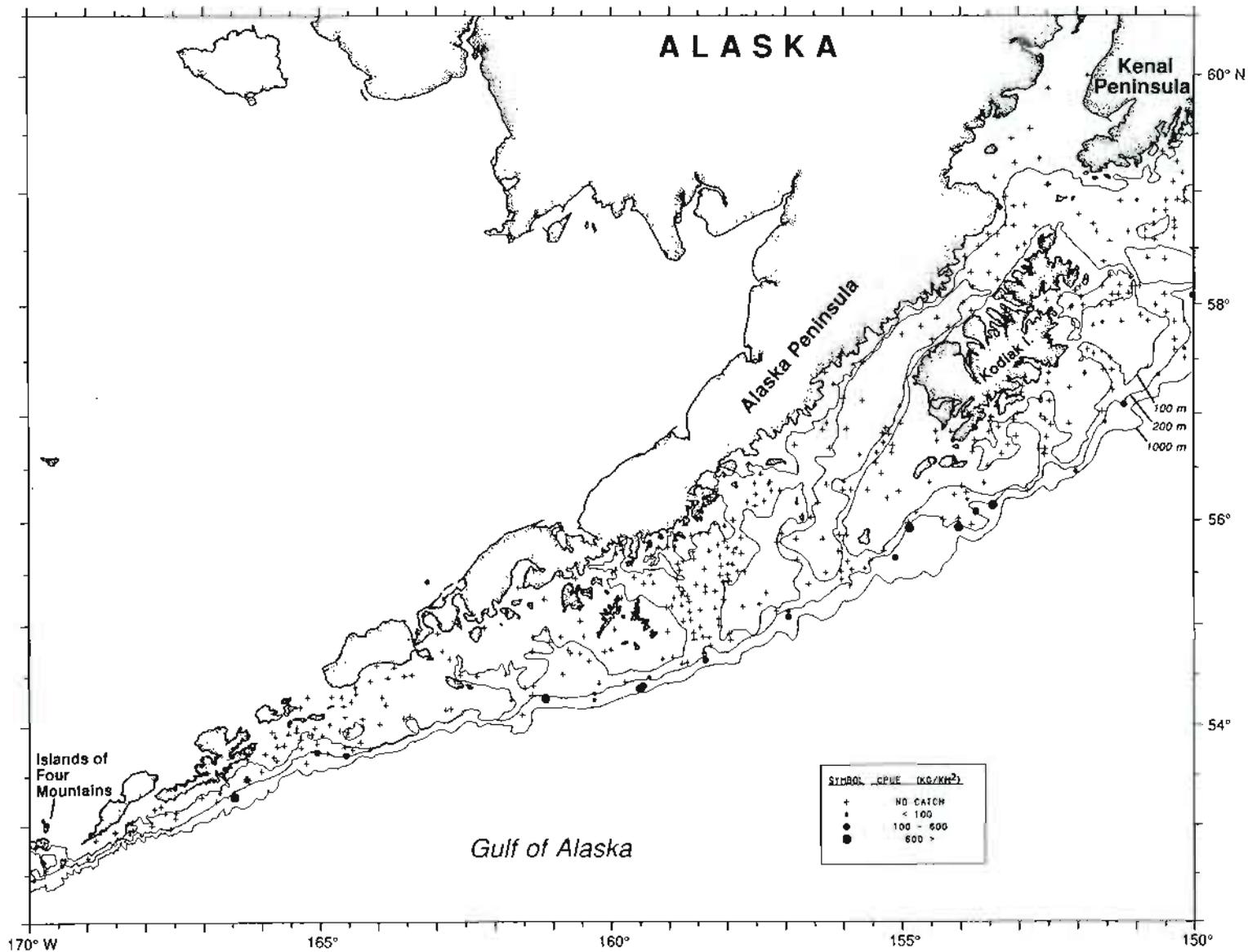


Figure 37.--Shortspine thornyhead catch distribution and relative abundance during the NMFS 1990 Gulf of Alaska groundfish survey. Catch abundance categories are: 1) none, 2) less than the mean (100 kg/km²), 3) between the mean and two standard deviations and 4) greater than two standard deviations above the mean.

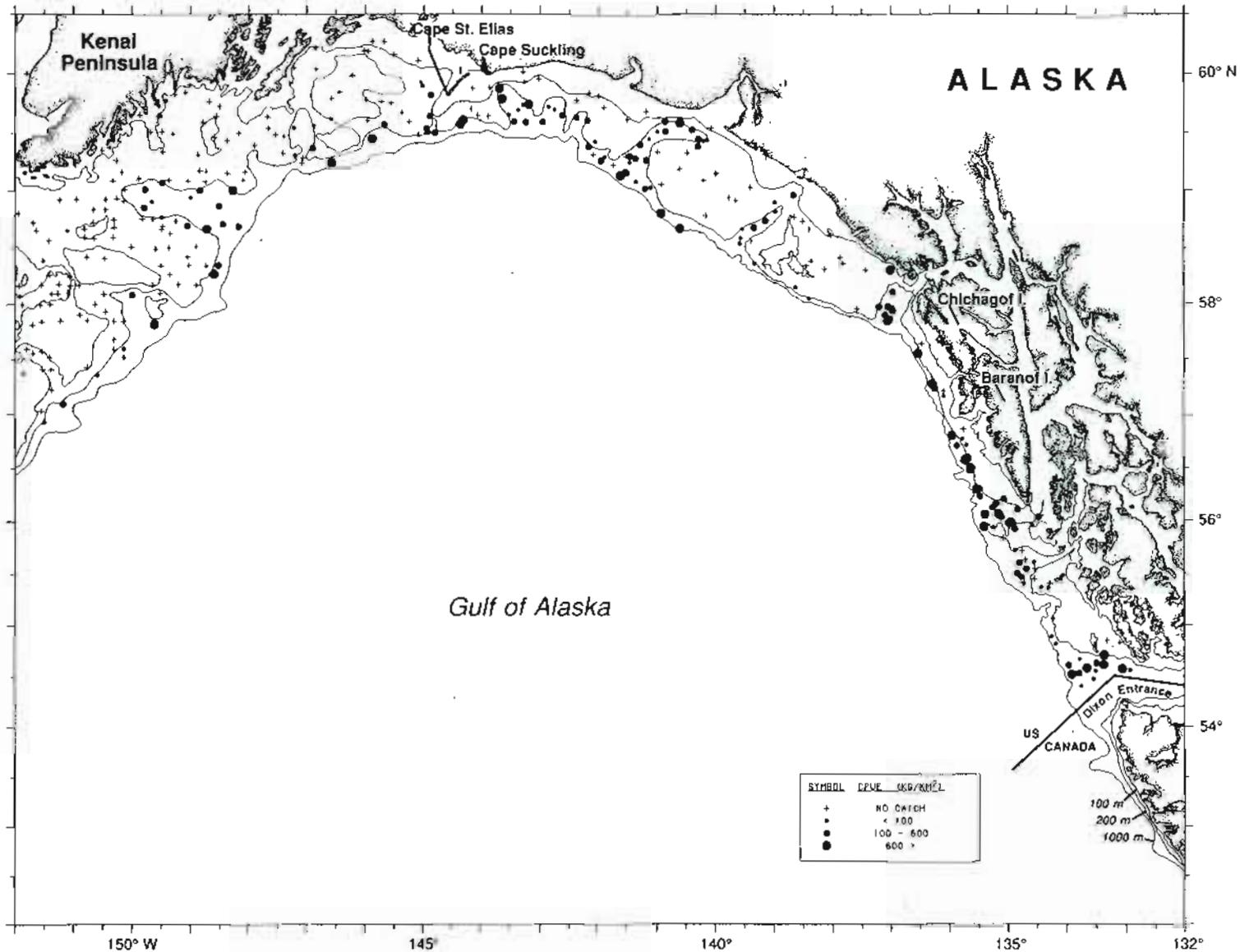


Figure 37.-- (continued)

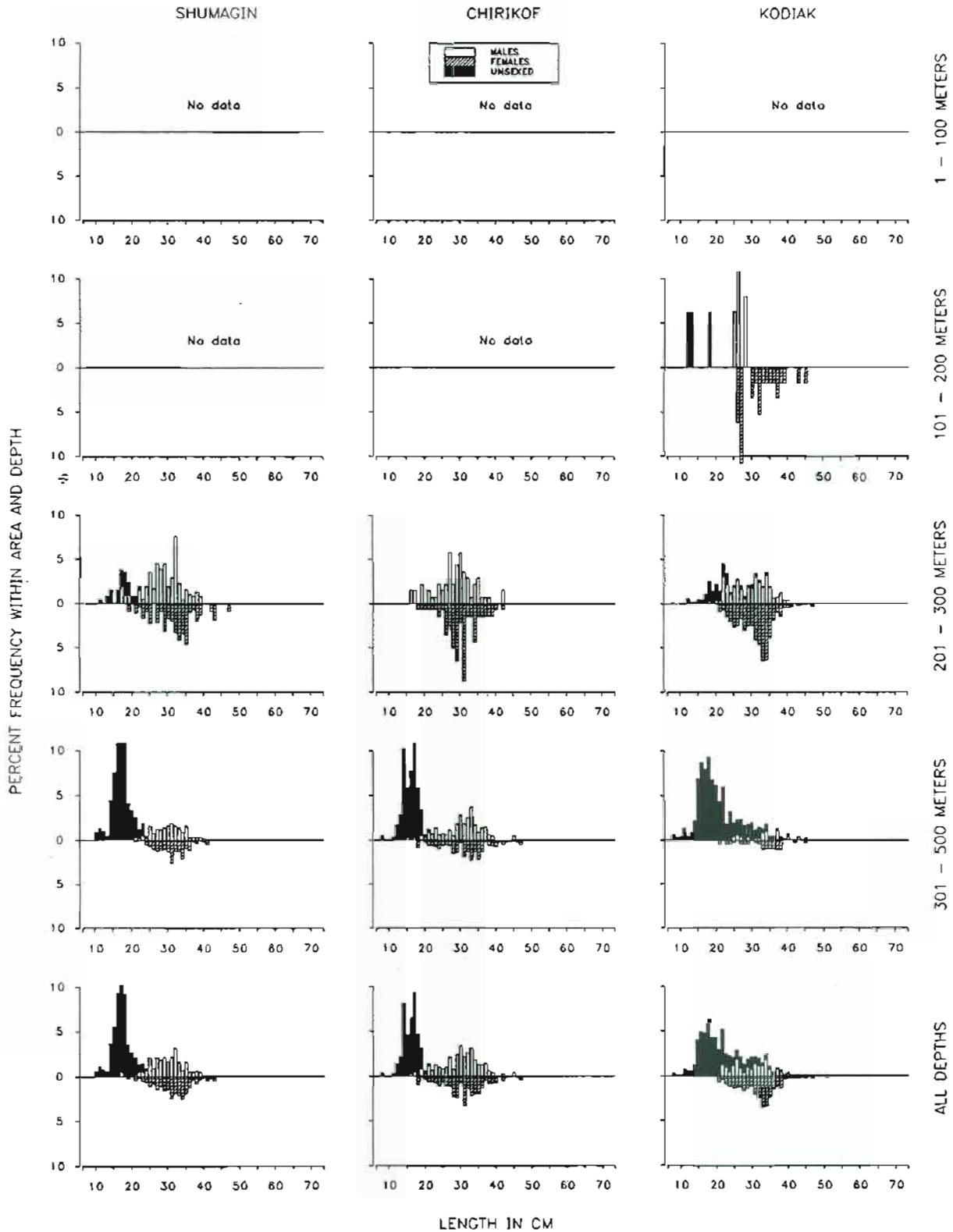


Figure 38.--Shortspine thornyhead length composition during the NMFS 1990 Gulf of Alaska groundfish survey by International North Pacific Fisheries Commission statistical area and depth.

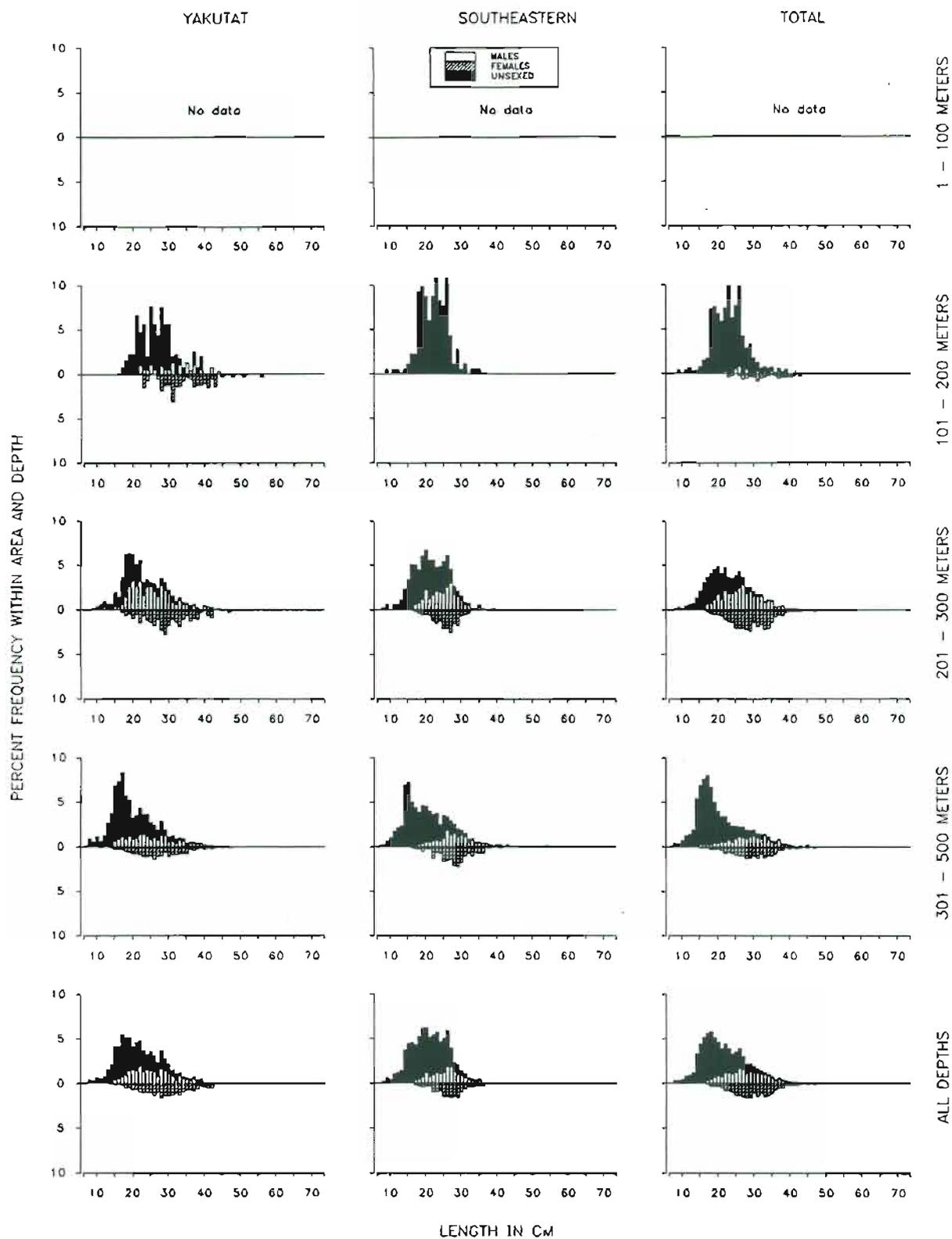


Figure 38.--(continued)

Other rockfish--Seven other rockfish species were prominent during the 1990 GOA survey: redstripe rockfish (Sebastes proriger), harlequin rockfish (Sebastes variegatus), silvergray rockfish (Sebastes brevispinis), redbanded rockfish (Sebastes babcocki), yellowmouth rockfish (Sebastes reedi), yelloweye rockfish (Sebastes ruberrimus), and rosethorn rockfish (Sebastes helvomaculatus).

Redstripe rockfish abundance totaled 24,700 t and was concentrated (80%) in the Prince of Wales lower Baranof Island shelf area in depths of 101-200 m. Redstripe rockfish had high catch abundance on the contiguous shelf areas of Prince of Wales Island (2,400 kg/km²) to the southern tip of Baranof Island (1,200 kg/km²) in the 101-200 m depth interval (Table 20) and did not occur west of Cook Inlet. Lower catch rates occurred on the slope areas off Prince of Wales Island (700 kg/km²) and Baranof Island (10 kg/km²). A second area of abundance occurred over 400 nmi to the northwest along the shelf off Montague Island in two depth intervals, 101-200 m (400 kg/km²) and 1-100 m (50 kg/km²). Between Prince of Wales and Middleton Islands, catch rates did not exceed 15 kg/km².

The majority of the harlequin rockfish catch and 70% of the total biomass (17,200 t) occurred off the Kenai Peninsula in depths of 101-200 m on the outer shelf (1,500 kg/km²; 7,800 t) and Portlock Flats (500 kg/km²; 3,800 t; Table 21). Prince of Wales Island was another important harlequin rockfish area on the shelf (200 kg/km²; 1,400 t) in depths of 101-200 m and on the

slope (200 kg/km²; 1,000 t) in depths of 201-300 m.

Silvergray rockfish did not occur west of Cook Inlet, except for a single catch in Shelikof Strait at less than 1 kg/km² (Table 22). Catch rates averaged 700 kg/km² on the Prince of Wales and Middleton Island shelf areas in depths of 101-200 m and exceeded 900 kg/km² on the Prince of Wales slope in depths of 201-300 m. Approximately 95% of the total silvergray rockfish biomass (13,800 t) occurred on the shelves off Prince of Wales Island and Montague Island. Silvergray rockfish had the second largest average length (47 cm) of any rockfish encountered in the GOA.

The majority of the redbanded rockfish catch occurred between Cape Fairweather and Dixon Entrance on the outer shelf and slope in depths of 101-300 m. Total biomass of redbanded rockfish was only 3,200 t (Table 23) and distributed primarily on the Yakutat INPFC area's Fairweather shelf (1,200 t) and the Southeastern INPFC area's Prince of Wales shelf (600 t) and Baranof-Chichagof shelf (300 t). Two other prominent areas for redbanded rockfish biomass were found in the Southeastern INPFC area's Prince of Wales slope (400 t) in depths of 201-300 m and deep gullies (200 t) in depths of 301-500 m.

Yellowmouth rockfish was taken in only three catches during the 1990 GOA survey (Table 24) and over 95% of the total yellowmouth rockfish biomass (1,900 t) can be attributed to a single catch in Dixon Entrance near the U.S.-Canada border. A trace catch was reported in the far western Shumagin INPFC area.

Yelloweye rockfish total biomass (1,000 t, Table 25) was primarily (90%) distributed on the shelf in depths of 101-200 m at an average density of 200 t in each of the following areas: the Kenai Peninsula, Baranof and Chichagof Islands, Cape St. Elias and Prince of Wales Island.

Rosethorn rockfish, total biomass (700 t; Table 26) was predominately (99%) located off Prince of Wales Island in depths of 201-300 m (400 t) and 101-200 m (300 t). . This species did not occur west of Baranof Island.

Table 20.--Total number of survey hauls, hauls containing redstripe rockfish, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	0	0	0	---	---
	101 - 200	46	0	0	0	---	---
	201 - 300	9	0	0	0	---	---
	301 - 500	7	0	0	0	---	---
	All depths	137	0	0	0	---	---
Chirikof	1 - 100	28	0	0	0	---	---
	101 - 200	106	0	0	0	---	---
	201 - 300	16	0	0	0	---	---
	301 - 500	4	0	0	0	---	---
	All depths	154	0	0	0	---	---
Kodiak	1 - 100	51	0	0	0	---	---
	101 - 200	129	2	< 1	15	0.2	---
	201 - 300	29	0	0	0	---	---
	301 - 500	6	0	0	0	---	---
	All depths	215	2	< 1	15	0.2	---
Yakutat	1 - 100	17	1	23	384	0.1	29.7
	101 - 200	56	2	103	3,003	0.6	35.9
	201 - 300	36	0	0	0	---	---
	301 - 500	25	0	0	0	---	---
	All depths	134	3	63	3,387	0.4	33.6
Southeastern	1 - 100	0	0	0	0	---	---
	101 - 200	23	13	1,859	18,355	0.4	34.0
	201 - 300	27	11	581	2,924	0.5	36.9
	301 - 500	18	0	0	0	---	---
	All depths	68	24	1,196	21,279	0.4	36.9
All areas	1 - 100	171	1	3	384	0.1	34.0
	101 - 200	360	17	177	21,373	0.4	18.0
	201 - 300	117	11	82	2,924	0.5	34.8
	301 - 500	60	0	0	0	---	---
	All depths	708	29	83	24,681	0.4	33.6

All areas biomass, 95% confidence interval: 0 - 50,045 metric tons (t)

Table 21.—Total number of survey hauls, hauls containing harlequin rockfish, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	1	< 1	5	0.2	—
	101 - 200	46	2	8	121	0.4	44.9
	201 - 300	9	0	0	0	—	—
	301 - 500	7	0	0	0	—	—
	All depths	137	3	2	126	0.4	44.9
Chirikof	1 - 100	28	1	< 1	11	0.5	—
	101 - 200	106	3	< 1	7	0.2	—
	201 - 300	16	1	46	527	0.2	44.9
	301 - 500	4	0	0	0	—	—
	All depths	154	5	9	545	0.2	44.9
Kodiak	1 - 100	51	1	< 1	4	0.1	—
	101 - 200	129	25	293	12,642	0.3	44.9
	201 - 300	29	3	3	37	0.4	17.7
	301 - 500	6	0	0	0	—	—
	All depths	215	29	130	12,682	0.3	32.2
Yakutat	1 - 100	17	1	29	493	0.1	27.0
	101 - 200	56	6	25	719	0.1	20.1
	201 - 300	36	9	10	50	0.2	—
	301 - 500	25	3	1	3	0.3	—
	All depths	134	19	23	1,264	0.1	26.6
Southeastern	1 - 100	0	0	0	0	—	—
	101 - 200	23	16	168	1,662	0.2	25.1
	201 - 300	27	9	181	911	0.1	19.8
	301 - 500	18	2	1	3	0.2	—
	All depths	68	27	145	2,576	0.2	23.5
All areas	1 - 100	171	4	4	513	0.1	17.7
	101 - 200	360	52	126	15,150	0.2	20.6
	201 - 300	117	22	43	1,525	0.2	19.0
	301 - 500	60	5	< 1	6	0.2	—
	All depths	708	83	58	17,194	0.2	23.5

All areas biomass, 95% confidence interval: 0 - 34,961 metric tons (t)

Table 22.—Total number of survey hauls, hauls containing silvergray rockfish, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	0	0	0	—	—
	101 - 200	46	0	0	0	—	—
	201 - 300	9	0	0	0	—	—
	301 - 500	7	0	0	0	—	—
	All depths	137	0	0	0	—	—
Chirikof	1 - 100	28	0	0	0	—	—
	101 - 200	106	1	< 1	4	0.5	—
	201 - 300	16	0	0	0	—	—
	301 - 500	4	0	0	0	—	—
	All depths	154	1	< 1	4	0.5	—
Kodiak	1 - 100	51	0	0	0	—	—
	101 - 200	129	7	7	293	0.8	36.9
	201 - 300	29	0	0	0	—	—
	301 - 500	6	0	0	0	—	—
	All depths	215	7	3	293	0.8	36.9
Yakutat	1 - 100	17	1	< 1	7	0.3	—
	101 - 200	56	8	184	5,349	1.2	44.0
	201 - 300	36	4	14	69	2.2	—
	301 - 500	25	1	2	7	2.2	—
	All depths	134	14	101	5,432	1.3	44.0
Southeastern	1 - 100	0	0	0	0	—	—
	101 - 200	23	13	440	4,342	1.7	51.8
	201 - 300	27	13	735	3,703	1.7	49.9
	301 - 500	18	0	0	0	—	—
	All depths	68	26	452	8,045	1.7	50.9
All areas	1 - 100	171	1	< 1	7	0.3	—
	101 - 200	360	29	83	9,989	1.4	46.4
	201 - 300	117	17	106	3,772	1.7	49.9
	301 - 500	60	1	1	7	2.2	—
	All depths	708	48	46	13,774	1.4	47.2

All areas biomass, 95% confidence interval: 1,480 - 26,068 metric tons (t)

Table 23.—Total number of survey hauls, hauls containing redbanded rockfish, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	0	0	0	—	—
	101 - 200	46	0	0	0	—	—
	201 - 300	9	0	0	0	—	—
	301 - 500	7	0	0	0	—	—
	All depths	137	0	0	0	—	—
Chirikof	1 - 100	28	0	0	0	—	—
	101 - 200	106	3	1	31	0.9	—
	201 - 300	16	0	0	0	—	—
	301 - 500	4	0	0	0	—	—
	All depths	154	3	< 1	31	0.9	—
Kodiak	1 - 100	51	0	0	0	—	—
	101 - 200	129	7	1	62	0.6	—
	201 - 300	29	5	11	126	1.1	—
	301 - 500	6	0	0	0	—	—
	All depths	215	12	2	188	0.9	—
Yakutat	1 - 100	17	0	0	0	—	—
	101 - 200	56	4	42	1,233	2.1	31.3
	201 - 300	36	18	40	195	0.8	—
	301 - 500	25	5	2	6	0.3	—
	All depths	134	27	27	1,434	1.6	32.8
Southeastern	1 - 100	0	0	0	0	—	—
	101 - 200	23	13	85	837	0.8	30.6
	201 - 300	27	25	96	485	0.5	—
	301 - 500	18	9	69	199	0.8	—
	All depths	68	47	85	1,521	0.6	30.6
All areas	1 - 100	171	0	0	0	—	—
	101 - 200	360	27	18	2,163	1.2	41.5
	201 - 300	117	48	23	806	0.6	—
	301 - 500	60	14	16	204	0.7	—
	All depths	708	89	11	3,173	0.9	41.5

All areas biomass, 95% confidence interval: 705 - 5,641 metric tons (t)

Table 24.—Total number of survey hauls, hauls containing yellowmouth rockfish, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	0	0	0	—	—
	101 - 200	46	1	< 1	5	0.3	—
	201 - 300	9	0	0	0	—	—
	301 - 500	7	0	0	0	—	—
	All depths	137	1	< 1	5	0.3	—
Chirikof	1 - 100	28	0	0	0	—	—
	101 - 200	106	0	0	0	—	—
	201 - 300	16	0	0	0	—	—
	301 - 500	4	0	0	0	—	—
	All depths	154	0	0	0	—	—
Kodiak	1 - 100	51	0	0	0	—	—
	101 - 200	129	0	0	0	—	—
	201 - 300	29	0	0	0	—	—
	301 - 500	6	0	0	0	—	—
	All depths	215	0	0	0	—	—
Yakutat	1 - 100	17	0	0	0	—	—
	101 - 200	56	0	0	0	—	—
	201 - 300	36	0	0	0	—	—
	301 - 500	25	0	0	0	—	—
	All depths	134	0	0	0	—	—
Southeastern	1 - 100	0	0	0	0	—	—
	101 - 200	23	1	6	61	1.4	—
	201 - 300	27	1	364	1,834	1.5	62.2
	301 - 500	18	0	0	0	—	—
	All depths	68	2	106	1,895	1.5	62.2
All areas	1 - 100	171	0	0	0	—	—
	101 - 200	360	2	1	66	1.0	—
	201 - 300	117	1	51	1,834	1.5	58.5
	301 - 500	60	0	0	0	—	—
	All depths	708	3	6	1,900	1.4	58.5

All areas biomass, 95% confidence interval: 0 - 5,772 metric tons (t)

Table 25.—Total number of survey hauls, hauls containing yelloweye rockfish, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	0	0	0	—	—
	101 - 200	46	1	< 1	6	0.6	—
	201 - 300	9	0	0	0	—	—
	301 - 500	7	0	0	0	—	—
	All depths	137	1	< 1	6	0.6	—
Chirikof	1 - 100	28	0	0	0	—	—
	101 - 200	106	4	1	24	0.8	—
	201 - 300	16	0	0	0	—	—
	301 - 500	4	0	0	0	—	—
	All depths	154	4	< 1	24	0.8	—
Kodiak	1 - 100	51	0	0	0	—	—
	101 - 200	129	7	6	269	1.8	18.0
	201 - 300	29	1	2	24	2.7	—
	301 - 500	6	0	0	0	—	—
	All depths	215	8	3	293	1.8	34.8
Yakutat	1 - 100	17	1	8	137	5.1	—
	101 - 200	56	2	6	179	2.2	—
	201 - 300	36	0	0	0	—	—
	301 - 500	25	0	0	0	—	—
	All depths	134	3	6	316	2.9	—
Southeastern	1 - 100	0	0	0	0	—	—
	101 - 200	23	6	39	389	3.4	—
	201 - 300	27	0	0	0	—	—
	301 - 500	18	0	0	0	—	—
	All depths	68	6	22	389	3.4	—
All areas	1 - 100	171	1	1	137	5.1	—
	101 - 200	360	20	7	866	2.2	18.0
	201 - 300	117	1	1	24	2.7	—
	301 - 500	60	0	0	0	—	—
	All depths	708	22	3	1,027	2.4	31.3

All areas biomass, 95% confidence interval: 422 - 1,632 metric tons (t)

Table 26.—Total number of survey hauls, hauls containing rosehorn rockfish, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	0	0	0	---	---
	101 - 200	46	0	0	0	---	---
	201 - 300	9	0	0	0	---	---
	301 - 500	7	0	0	0	---	---
	All depths	137	0	0	0	---	---
Chirikof	1 - 100	28	0	0	0	---	---
	101 - 200	106	0	0	0	---	---
	201 - 300	16	0	0	0	---	---
	301 - 500	4	0	0	0	---	---
	All depths	154	0	0	0	---	---
Kodiak	1 - 100	51	0	0	0	---	---
	101 - 200	129	0	0	0	---	---
	201 - 300	29	0	0	0	---	---
	301 - 500	6	0	0	0	---	---
	All depths	215	0	0	0	---	---
Yakutat	1 - 100	17	0	0	0	---	---
	101 - 200	56	0	0	0	---	---
	201 - 300	36	2	1	5	0.5	---
	301 - 500	25	0	0	0	---	---
	All depths	134	2	< 1	5	0.5	---
Southeastern	1 - 100	0	0	0	0	---	---
	101 - 200	23	9	27	267	0.2	---
	201 - 300	27	17	81	407	0.2	---
	301 - 500	18	2	5	13	0.2	---
	All depths	68	28	39	687	0.2	---
All areas	1 - 100	171	0	0	0	---	---
	101 - 200	360	9	2	267	0.2	---
	201 - 300	117	19	12	412	0.2	---
	301 - 500	60	2	1	13	0.2	---
	All depths	708	30	2	692	0.2	---

All areas biomass, 95% confidence interval: 307 - 1,077 metric tons (t)

Other flatfish--Four other prominent flatfish species of the GOA survey included the Alaska plaice (Pleuronectes quadrituberculatus), English sole (Pleuronectes vetulus), butter sole (Pleuronectes isolepis) and starry flounder (Platichthys stellatus).

Over 95% of the total Alaska plaice biomass (6,100 t; Table 27) came from the 1-100 m depth interval in the Shumagin and Chirikof INPFC areas. None were taken east of Albatross Banks in the Kodiak INPFC area.

English sole was caught throughout the GOA primarily at low levels in depths less than 100 m. The majority (80%) of the total biomass (6,800 t; Table 28) was taken from the Yakutat INPFC area.

Approximately 80% of the butter sole biomass (17,000 t, Table 29) occurred in three Kodiak INPFC area locations less than 100 m in depth, the Albatross Banks (9,600 t), lower Cook Inlet (2,200 t) and Albatross Shallows (1,500 t).

Starry flounder abundance totaled 11,200 t (Table 30), of which 80% occurred in three areas, the Kodiak INPFC area's Lower Cook Inlet (3,600 t) and Albatross Banks (1,900 t) and the Yakutat INPFC area's Middleton Shallows (3,800 t). None were available in depths deeper than 100 m. Starry flounder was the second largest flatfish taken during the survey and averaged 1.7 kg in weight and 46.8 cm in length.

Table 27.--Total number of survey hauls, hauls containing Alaska plaice, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	7	67	2,952	1.3	41.9
	101 - 200	46	2	8	114	1.9	--
	201 - 300	9	0	0	0	--	--
	301 - 500	7	0	0	0	--	--
	All depths	137	9	48	3,066	1.3	41.9
Chirikof	1 - 100	28	6	84	2,242	1.2	42.4
	101 - 200	106	1	1	18	1.8	--
	201 - 300	16	1	2	23	1.2	--
	301 - 500	4	0	0	0	--	--
	All depths	154	8	36	2,283	1.2	42.4
Kodiak	1 - 100	51	2	19	756	1.3	47.3
	101 - 200	129	0	0	0	--	--
	201 - 300	29	0	0	0	--	--
	301 - 500	6	0	0	0	--	--
	All depths	215	2	8	756	1.3	47.3
Yakutat	1 - 100	17	0	0	0	--	--
	101 - 200	56	0	0	0	--	--
	201 - 300	36	0	0	0	--	--
	301 - 500	25	0	0	0	--	--
	All depths	134	0	0	0	--	--
Southeastern	1 - 100	0	0	0	0	--	--
	101 - 200	23	0	0	0	--	--
	201 - 300	27	0	0	0	--	--
	301 - 500	18	0	0	0	--	--
	All depths	68	0	0	0	--	--
All areas	1 - 100	171	15	47	5,951	1.2	42.7
	101 - 200	360	3	1	132	1.9	--
	201 - 300	117	1	1	23	1.2	--
	301 - 500	60	0	0	0	--	--
	All depths	708	19	21	6,106	1.2	42.7

All areas biomass, 95% confidence interval: 1,458 - 10,753 metric tons (t)

Table 28.—Total number of survey hauls, hauls containing English sole, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	3	20	903	0.6	39.1
	101 - 200	46	3	2	31	1.1	---
	201 - 300	9	0	0	0	---	---
	301 - 500	7	0	0	0	---	---
	All depths	137	6	15	934	0.7	39.1
Chirikof	1 - 100	28	1	6	169	0.9	---
	101 - 200	106	1	1	15	1.3	---
	201 - 300	16	0	0	0	---	---
	301 - 500	4	0	0	0	---	---
	All depths	154	2	3	185	1.0	---
Kodiak	1 - 100	51	3	3	139	0.6	---
	101 - 200	129	8	3	141	1.0	---
	201 - 300	29	1	< 1	4	0.7	---
	301 - 500	6	0	0	0	---	---
	All depths	215	12	3	284	0.7	---
Yakutat	1 - 100	17	10	234	3,932	0.5	36.3
	101 - 200	56	10	46	1,341	0.8	42.1
	201 - 300	36	0	0	0	---	---
	301 - 500	25	0	0	0	---	---
	All depths	134	20	98	5,273	0.6	37.3
Southeastern	1 - 100	0	0	0	0	---	---
	101 - 200	23	4	7	74	0.5	---
	201 - 300	27	1	1	5	1.0	---
	301 - 500	18	0	0	0	---	---
	All depths	68	5	4	78	0.5	---
All areas	1 - 100	171	17	40	5,144	0.5	36.7
	101 - 200	360	26	13	1,602	0.8	42.1
	201 - 300	117	2	< 1	9	0.8	---
	301 - 500	60	0	0	0	---	---
	All depths	708	45	23	6,755	0.6	37.5

All areas biomass, 95% confidence interval: 760 - 12,749 metric tons (t)

Table 29.—Total number of survey hauls, hauls containing butter sole, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	9	28	1,247	0.5	31.7
	101 - 200	46	0	0	0	—	—
	201 - 300	9	0	0	0	—	—
	301 - 500	7	0	0	0	—	—
	All depths	137	9	19	1,247	0.5	31.7
Chirikof	1 - 100	28	7	40	1,066	0.4	34.1
	101 - 200	106	0	0	0	—	—
	201 - 300	16	0	0	0	—	—
	301 - 500	4	0	0	0	—	—
	All depths	154	7	17	1,066	0.4	34.1
Kodiak	1 - 100	51	18	333	13,261	0.3	29.3
	101 - 200	129	1	1	28	0.8	—
	201 - 300	29	0	0	0	—	—
	301 - 500	6	0	0	0	—	—
	All depths	215	19	136	13,289	0.3	29.3
Yakutat	1 - 100	17	3	110	1,847	0.3	28.7
	101 - 200	56	0	0	0	—	—
	201 - 300	36	0	0	0	—	—
	301 - 500	25	0	0	0	—	—
	All depths	134	3	34	1,847	0.3	28.7
Southeastern	1 - 100	0	0	0	0	—	—
	101 - 200	23	0	0	0	—	—
	201 - 300	27	0	0	0	—	—
	301 - 500	18	0	0	0	—	—
	All depths	68	0	0	0	—	—
All areas	1 - 100	171	37	137	17,420	0.3	29.5
	101 - 200	360	1	< 1	28	0.8	—
	201 - 300	117	0	0	0	—	—
	301 - 500	60	0	0	0	—	—
	All depths	708	38	59	17,448	0.3	29.5

All areas biomass, 95% confidence interval: 3,455 - 31,441 metric tons (t)

Table 30.--Total number of survey hauls, hauls containing starry flounder, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	4	38	1,674	2.0	51.0
	101 - 200	46	0	0	0	--	--
	201 - 300	9	0	0	0	--	--
	301 - 500	7	0	0	0	--	--
	All depths	137	4	26	1,674	2.0	51.0
Chirikof	1 - 100	28	2	7	183	2.8	--
	101 - 200	106	0	0	0	--	--
	201 - 300	16	0	0	0	--	--
	301 - 500	4	0	0	0	--	--
	All depths	154	2	3	183	2.8	--
Kodiak	1 - 100	51	10	139	5,545	2.3	53.3
	101 - 200	129	0	0	0	--	--
	201 - 300	29	0	0	0	--	--
	301 - 500	6	0	0	0	--	--
	All depths	215	10	57	5,545	2.3	53.3
Yakutat	1 - 100	17	2	224	3,777	1.1	41.4
	101 - 200	56	0	0	0	--	--
	201 - 300	36	0	0	0	--	--
	301 - 500	25	0	0	0	--	--
	All depths	134	2	70	3,777	1.1	41.4
Southeastern	1 - 100	0	0	0	0	--	--
	101 - 200	23	0	0	0	--	--
	201 - 300	27	0	0	0	--	--
	301 - 500	18	0	0	0	--	--
	All depths	68	0	0	0	--	--
All areas	1 - 100	171	18	88	11,179	1.7	46.6
	101 - 200	360	0	0	0	--	--
	201 - 300	117	0	0	0	--	--
	301 - 500	60	0	0	0	--	--
	All depths	708	18	38	11,179	1.7	46.6

All areas biomass, 95% confidence interval: 938 - 21,420 metric tons (t)

Skates--Skates were grouped into one category for analysis because of the uncertain taxonomy for many skate species. Skates biomass totaled 49,400 t (Table 31) and 90% occurred in depths shallower than 200 m. The INPFC areas of highest abundance were respectively Kodiak (19,900 t), Yakutat (14,100 t) and Chirikof (11,900 t). The Southeastern INPFC areas skate abundance was underrepresented due to the lack of sampling in depths shallower than 100 m. Skates had the highest average weight (8 kg) of all species and the largest occurred in depths shallower than 200 m. No skate length data were collected.

Table 31.—Total number of survey hauls, hauls containing skates combined, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	8	46	2,047	17.4	---
	101 - 200	46	9	67	967	14.2	---
	201 - 300	9	1	< 1	1	0.2	---
	301 - 500	7	1	5	13	1.4	---
	All depths	137	19	47	3,028	15.1	---
Chirikof	1 - 100	28	9	261	6,923	7.2	---
	101 - 200	106	31	142	3,369	9.4	---
	201 - 300	16	8	136	1,569	7.4	---
	301 - 500	4	0	0	0	---	---
	All depths	154	48	187	11,861	7.8	---
Kodiak	1 - 100	51	20	369	14,695	11.5	---
	101 - 200	129	52	103	4,454	4.5	---
	201 - 300	29	15	62	712	3.0	---
	301 - 500	6	1	< 1	1	0.1	---
	All depths	215	88	204	19,862	7.9	---
Yakutat	1 - 100	17	8	458	7,719	8.7	---
	101 - 200	56	27	206	5,998	7.2	---
	201 - 300	36	11	58	282	4.5	---
	301 - 500	25	6	27	80	2.3	---
	All depths	134	52	262	14,080	7.8	---
Southeastern	1 - 100	0	0	0	0	---	---
	101 - 200	23	5	30	295	4.6	---
	201 - 300	27	4	29	146	5.6	---
	301 - 500	18	8	43	123	1.5	---
	All depths	68	17	32	563	3.3	---
All areas	1 - 100	171	45	246	31,385	9.7	---
	101 - 200	360	124	125	15,083	6.5	---
	201 - 300	117	39	76	2,710	5.0	---
	301 - 500	60	16	17	217	1.6	---
	All depths	708	224	166	49,394	7.9	---

All areas biomass, 95% confidence interval: 35,465 - 63,323 metric tons (t)

The following four species form dense aggregations and tend to occur off bottom, and consequently these species were inadequately sampled by the bottom trawl survey and catch estimates are probably low.

Smelt--All smelt (Family Osmeridae) species combined had a total biomass of 28,500 t, 70% of which was in the 101-200 m depth interval (Table 32). Highest smelt abundance centered on the inner shelf areas off the Kenai Peninsula including the Kenai Flats (3,900 t), Portlock Flats (3,700 t) and Barren Islands (2,300 t) of the Kodiak INPFC area, and high concentrations extended east to Alsek Valley (Yakutat INPFC area) and west along the Chirikof INPFC area's Shelikof Edge (1,400 t) and just into the Shumagin Gully (1,600 t).

Pacific herring--Approximately 90% of the Pacific herring (Clupea pallasii) biomass (15,300 t) occurred in depths shallower than 100 m in the Chirikof and Yakutat INPFC areas (Table 33). Important herring areas included the upper Alaska Peninsula (5,800 t) and Chirikof Bank (2,900 t) in the Chirikof INPFC area, and the Yakutat INPFC area's shallows (5,600 t) extending from Cape St. Elias to Cape Fairweather.

Atka mackerel--Over 95% of the total Atka mackerel (Pleurogrammus monopterygius) biomass (30,500 t) was distributed in the Shumagin INPFC area's far western Fox Islands area in depths shallower than 100 m (Table 34).

Red squid--Widely distributed in most areas and depths, red squid (Berryteuthis magister) catch rates were low. The overall

biomass (4,200 t) was centered (60%) within the Kodiak INPFC area (Table 35). Abundance appeared to decrease in shallow depths (1-100 m) and in the outer GOA in the Shumagin INPFC area and Southeastern INPFC area.

Table 32.—Total number of survey hauls, hauls containing smelt combined, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	3	< 1	17	---	---
	101 - 200	46	11	27	397	---	---
	201 - 300	9	0	0	0	---	---
	301 - 500	7	0	0	0	---	---
	All depths	137	14	6	414	---	---
Chirikof	1 - 100	28	10	19	512	---	---
	101 - 200	106	35	130	3,083	---	---
	201 - 300	16	12	271	3,116	0.1	---
	301 - 500	4	0	0	0	---	---
	All depths	154	57	106	6,711	---	---
Kodiak	1 - 100	51	29	38	1,520	---	---
	101 - 200	129	62	232	10,024	---	---
	201 - 300	29	19	114	1,311	---	---
	301 - 500	6	0	0	0	---	---
	All depths	215	110	132	12,855	---	---
Yakutat	1 - 100	17	10	22	371	---	---
	101 - 200	56	52	200	5,834	---	---
	201 - 300	36	28	85	416	---	---
	301 - 500	25	8	8	24	---	---
	All depths	134	98	123	6,645	---	---
Southeastern	1 - 100	0	0	0	0	---	---
	101 - 200	23	9	134	1,325	---	---
	201 - 300	27	13	115	581	0.1	---
	301 - 500	18	5	3	9	---	---
	All depths	68	27	108	1,915	---	---
All areas	1 - 100	171	52	19	2,420	---	---
	101 - 200	360	169	172	20,663	---	---
	201 - 300	117	72	152	5,424	---	---
	301 - 500	60	13	3	33	---	---
	All depths	708	306	96	28,540	---	---

All areas biomass, 95% confidence interval: 20,979 - 36,100 metric tons (t)

Table 33.--Total number of survey hauls, hauls containing Pacific herring, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	0	0	0	---	---
	101 - 200	46	0	0	0	---	---
	201 - 300	9	0	0	0	---	---
	301 - 500	7	0	0	0	---	---
	All depths	137	0	0	0	---	---
Chirikof	1 - 100	28	8	327	8,684	0.1	---
	101 - 200	106	2	14	329	0.1	---
	201 - 300	16	0	0	0	---	---
	301 - 500	4	0	0	0	---	---
	All depths	154	10	142	9,012	0.1	---
Kodiak	1 - 100	51	5	2	69	0.1	---
	101 - 200	129	19	1	46	0.1	---
	201 - 300	29	1	< 1	2	0.1	---
	301 - 500	6	0	0	0	---	---
	All depths	215	25	1	117	0.1	---
Yakutat	1 - 100	17	12	346	5,819	0.1	---
	101 - 200	56	11	12	357	0.1	---
	201 - 300	36	7	1	6	0.1	---
	301 - 500	25	0	0	0	---	---
	All depths	134	30	115	6,182	0.1	---
Southeastern	1 - 100	0	0	0	0	---	---
	101 - 200	23	2	< 1	4	0.2	---
	201 - 300	27	0	0	0	---	---
	301 - 500	18	0	0	0	---	---
	All depths	68	2	< 1	4	0.2	---
All areas	1 - 100	171	25	114	14,571	0.1	---
	101 - 200	360	34	6	736	0.1	---
	201 - 300	117	8	< 1	8	0.1	---
	301 - 500	60	0	0	0	---	---
	All depths	708	67	52	15,315	0.1	---

All areas biomass, 95% confidence interval: 0 - 32,053 metric tons (t)

Table 34.--Total number of survey hauls, hauls containing Atka mackerel, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	5	686	30,450	0.8	23.1
	101 - 200	46	2	1	13	0.9	--
	201 - 300	9	0	0	0	--	--
	301 - 500	7	0	0	0	--	--
	All depths	137	7	475	30,462	0.8	33.5
Chirikof	1 - 100	28	0	0	0	--	--
	101 - 200	106	1	< 1	11	1.4	--
	201 - 300	16	0	0	0	--	--
	301 - 500	4	0	0	0	--	--
	All depths	154	1	< 1	11	1.4	--
Kodiak	1 - 100	51	0	0	0	--	--
	101 - 200	129	0	0	0	--	--
	201 - 300	29	0	0	0	--	--
	301 - 500	6	0	0	0	--	--
	All depths	215	0	0	0	--	--
Yakutat	1 - 100	17	0	0	0	--	--
	101 - 200	56	0	0	0	--	--
	201 - 300	36	0	0	0	--	--
	301 - 500	25	0	0	0	--	--
	All depths	134	0	0	0	--	--
Southeastern	1 - 100	0	0	0	0	--	--
	101 - 200	23	0	0	0	--	--
	201 - 300	27	0	0	0	--	--
	301 - 500	18	0	0	0	--	--
	All depths	68	0	0	0	--	--
All areas	1 - 100	171	5	239	30,450	0.8	28.7
	101 - 200	360	3	< 1	24	1.1	--
	201 - 300	117	0	0	0	--	--
	301 - 500	60	0	0	0	--	--
	All depths	708	8	103	30,473	0.8	29.3

All areas biomass, 95% confidence interval: 0 - 92,488 metric tons (t)

Table 35.--Total number of survey hauls, hauls containing red squid, estimated CPUE, biomass, mean weight and mean length based on the 1990 Gulf of Alaska groundfish survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

Area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	75	0	0	0	---	---
	101 - 200	46	2	1	9	0.6	---
	201 - 300	9	2	5	15	0.2	---
	301 - 500	7	2	49	124	0.2	---
	All depths	137	6	2	148	0.2	---
Chirikof	1 - 100	28	2	5	127	0.5	---
	101 - 200	106	4	4	106	0.5	---
	201 - 300	16	8	16	190	0.4	---
	301 - 500	4	2	35	57	0.1	---
	All depths	154	16	8	479	0.3	---
Kodiak	1 - 100	51	4	20	800	0.3	---
	101 - 200	129	10	22	954	0.2	---
	201 - 300	29	12	43	493	0.3	---
	301 - 500	6	3	65	193	0.3	---
	All depths	215	29	25	2,440	0.2	---
Yakutat	1 - 100	17	0	0	0	---	---
	101 - 200	56	6	10	286	0.4	---
	201 - 300	36	15	30	144	0.1	---
	301 - 500	25	23	91	271	0.1	---
	All depths	134	44	13	701	0.2	---
Southeastern	1 - 100	0	0	0	0	---	---
	101 - 200	23	2	1	8	0.3	---
	201 - 300	27	12	24	121	0.4	---
	301 - 500	18	17	90	260	0.2	---
	All depths	68	31	22	389	0.2	---
All areas	1 - 100	171	6	7	927	0.3	---
	101 - 200	360	24	11	1,362	0.2	---
	201 - 300	117	49	27	963	0.3	---
	301 - 500	60	47	70	905	0.2	---
	All depths	708	126	14	4,157	0.2	---

All areas biomass, 95% confidence interval: 2,665 - 5,649 metric tons (t)

Age Composition Data

At the time of this report, the age composition was available only for walleye pollock and Pacific ocean perch. The walleye pollock age data results were determined for 3,300 pollock and did not include a large proportion of crystallized otoliths which do not have distinct annuli and are consequently unageable. The overall walleye pollock age distribution ranged from 2 to 18 years and averaged 7 years (Fig. 39). The 1984 pollock year class (age 6) was dominant in the Shumagin, Kodiak and Southeastern INPFC areas. Pollock populations in the Chirikof and Yakutat INPFC areas were dominated by the 1987 year class (age 3) and had a prominent 1988 (age 2) year class. The most prominent older pollock were the 1978 year class (age 12) in each area.

Pacific ocean perch age composition was determined from 1,766 fish (Fig. 40). The age distribution over all areas and depths ranged from 2 to 75 years and averaged 10 years, dominated by the 1984 and 1986 year classes (ages 6 and 4). Overall, no older (>age 10) Pacific ocean perch were prominent, except for the 1976 year class (age 14) that represented 6% of the total population. Young Pacific ocean perch (<age 10) were only dominant (87%) in the INPFC Shumagin area. The oldest population, with 42% of the fish older than age 10, was found in the Yakutat INPFC area. In this area, Pacific ocean perch averaged 13 years of age over all depths.

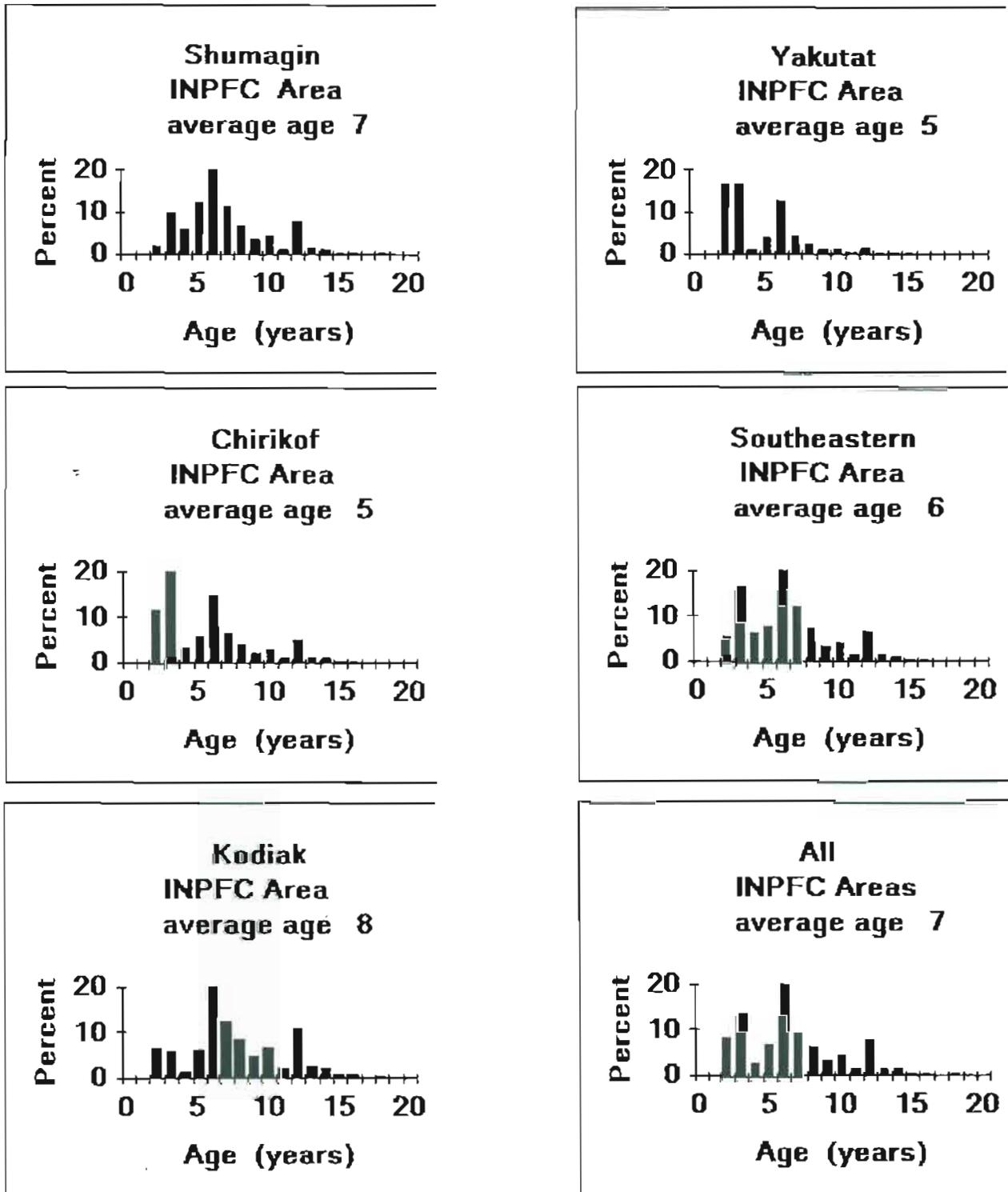


Figure 39.- Walleye pollock population proportioned by age, using age and length data from the NMFS 1990 Gulf of Alaska survey by International North Pacific Fisheries Commission statistical area.

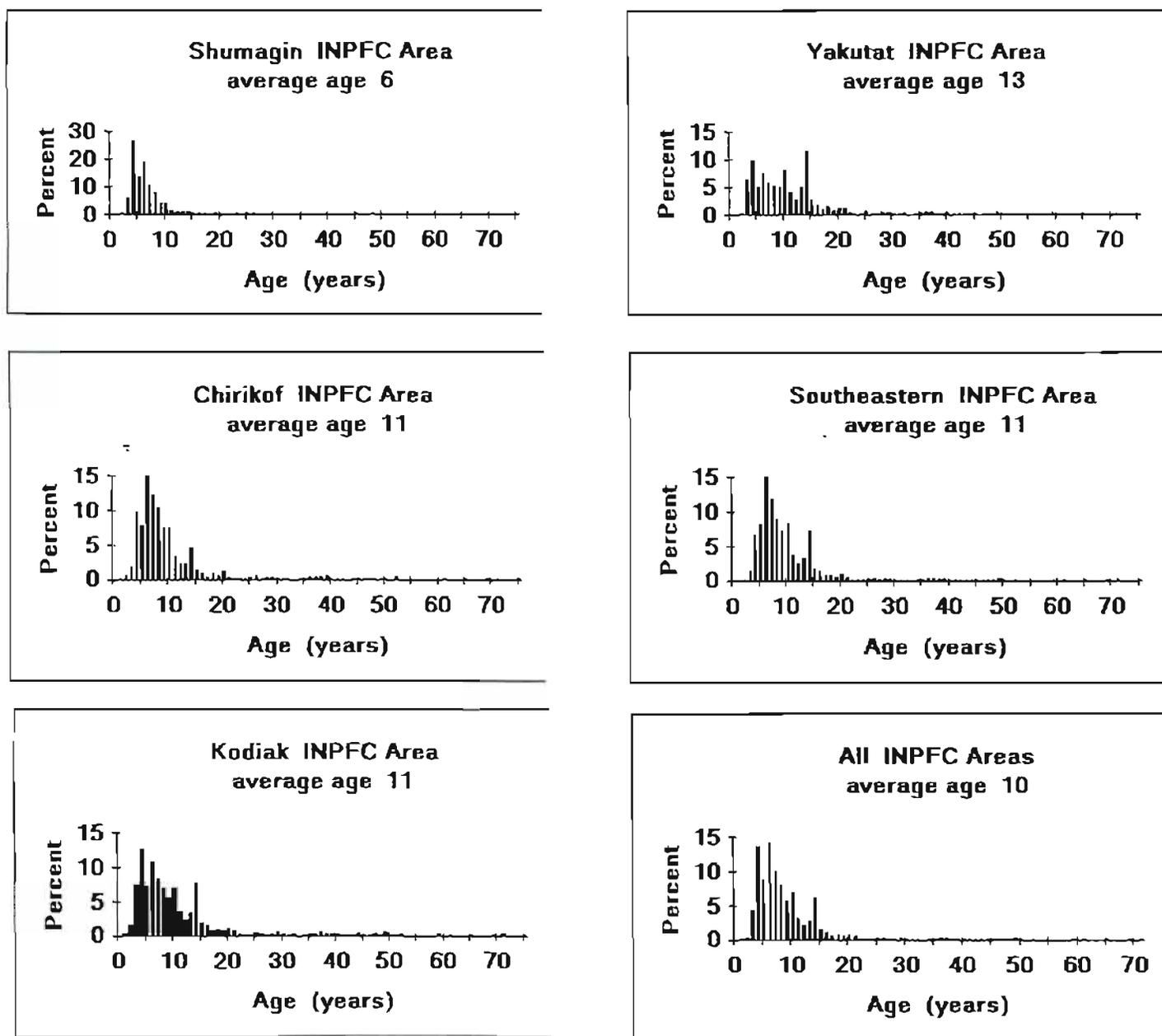


Figure 40.- -Pacific ocean perch population proportioned by age, using age and length data from the NMFS 1990 Gulf of Alaska survey by International North Pacific Fisheries Commission statistical area.

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APPENDIX A

Gear Specifications and Diagram

Figure A illustrates the Poly-Nor' eastern high-opening bottom trawl and roller gear used during the 1990 Gulf of Alaska groundfish survey.

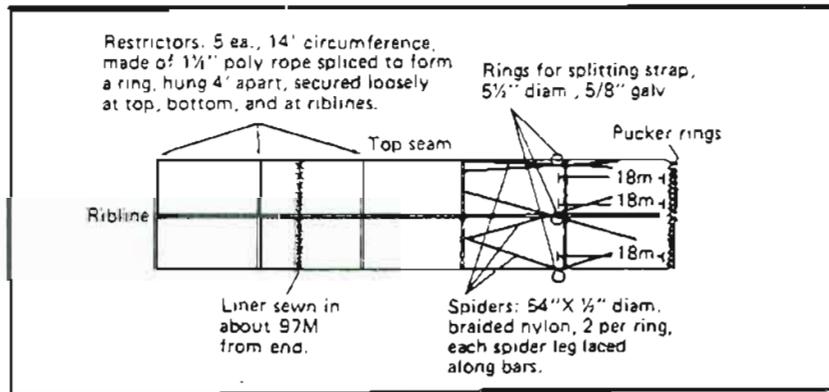
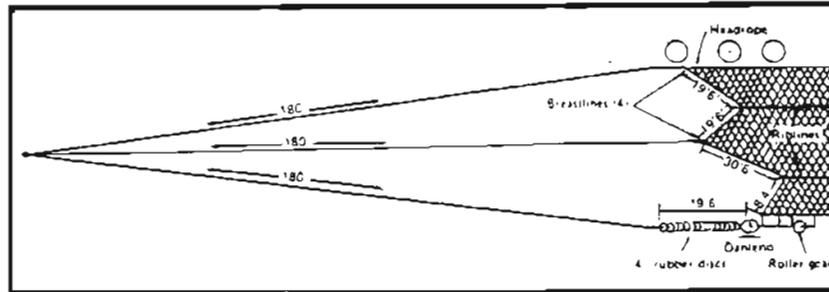
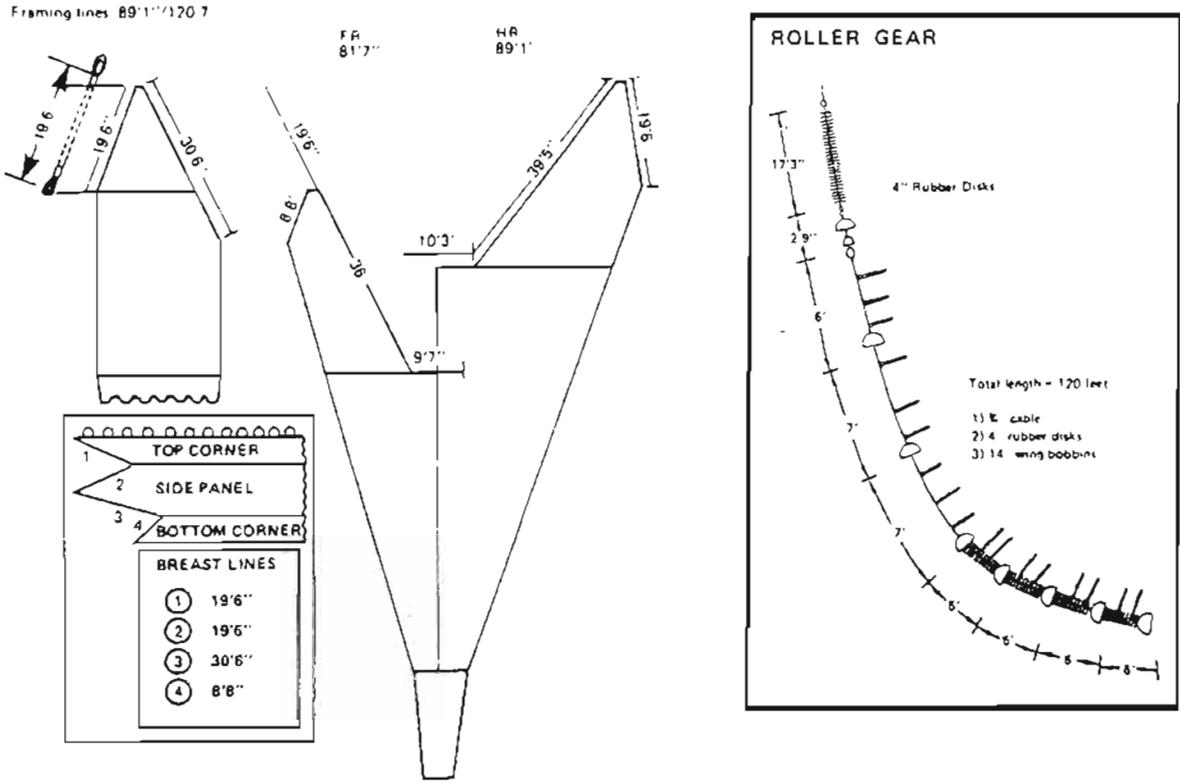


Figure A.- -Schematic diagram of the 90-105 polyethylene Nor'eastern bottom trawl, roller gear and accessory gear used during the 1990 Gulf of Alaska bottom trawl survey from 4 June to 9 September 1990.

APPENDIX B

Strata Specifications and Charts

Tables B-1 and B-2 and Figures B-1 through B-5 present survey strata of the Gulf of Alaska (170-132°W long.) used during triennial groundfish surveys of the shelf and upper slope.

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Table B-1.- Survey strata of the Gulf of Alaska (170-132°W long.) by depth, code, name and area.

Depth (m)	Code	Name	Area (nmi ²)	Area (km ²)	
1-100	10	Fox Islands	2,512	8,616	
	11	Davidson Bank	3,988	13,678	
	12	Lower Alaska Peninsula	2,170	7,443	
	13	Shumagin Bank	4,264	14,625	
	20	Upper Alaska Peninsula	2,415	8,283	
	21	Semidi Bank	2,128	7,299	
	22	Chirikof Bank	3,205	10,993	
	30	Albatross Shallows	1,784	6,119	
	31	Albatross Banks	4,472	15,339	
	32	Lower Cook Inlet	3,053	10,471	
	33	Kenai Peninsula	1,607	5,512	
	35	Northern Kodiak Shallows	700	2,401	
	40	Yakutat Shallows	2,438	8,362	
	41	Middleton Shallows	2,471	8,475	
	50	Southeastern Shallows	1,098	3,766	
		991	subtotal	38,305	131,382
101-200	110	Sanak Gully	1,234	4,232	
	111	Shumagin Outer Shelf	2,343	8,036	
	112	West Shumagin Gully	661	2,267	
	120	East Shumagin Gully	3,231	11,082	
	121	Shelikof Edge	2,237	7,673	
	122	Chirikof Outer Shelf	1,456	4,994	
	130	Albatross Gullies	2,285	7,873	
	131	Portlock Flats	2,134	7,319	
	132	Barren Islands	3,192	10,948	
	133	Kenai Flats	3,499	12,001	
	134	Kodiak Outer Shelf	1,480	5,076	
	140	Middleton Shelf	2,274	7,800	
	141	Yakataga Shelf	1,566	5,371	
	142	Yakutat Flats	2,441	8,372	
	143	Fairweather Shelf	2,213	7,590	
	150	Baranof-Chichagof Shelf	1,196	4,102	
	151	Prince of Wales Shelf	1,682	5,769	
		992	subtotal	35,124	120,469

Table B-1.- - (continued) Survey strata of the Gulf of Alaska (170-132°W long.) by depth, code, name and area.

Depth (m)	Code	Name	Area (nmi ²)	Area (kg ²)
201-300	210	Shumagin Slope	798	2,737
	220	Lower Shelikof Gully	2,906	9,967
	221	Chirikof Slope	447	1,533
	230	Kenai Gullies	1,962	6,729
	231	Kodiak Slope	474	1,626
	232	Upper Shelikof Gully	930	3,190
	240	Yakutat Gullies	1,049	3,598
	241	Yakutat Slope	372	1,276
	250	Baranof-Chichagof Slope	302	1,036
	251	Prince of Wales Slope	1,166	3,999
-	993	subtotal	10,406	35,691
301-500	310	Shumagin Slope	737	2,528
	320	Chirikof Slope	476	1,633
	330	Kodiak Slope	863	2,960
	340	Yakutat Deep Gullies	507	1,739
	341	Yakutat Slope	357	1,224
	350	Southeastern Deep Gullies	605	2,075
	351	Southeastern Slope	236	809
	994	subtotal	3,781	12,969
501-700	410	Shumagin Slope	586	2,010
	420	Chirikof Slope	553	1,897
	430	Kodiak Slope	452	1,550
	440	Yakutat Slope	393	1,348
	450	Southeastern Slope	293	1,005
		995	subtotal	2,277
701-1,000	510	Shumagin Slope	546	1,873
	520	Chirikof Slope	880	3,018
	530	Kodiak Slope	1,004	3,444
	540	Yakutat Slope	652	2,236
	550	Southeastern Slope	512	1,756
		996	subtotal	3,594
1-1,000		Grand total	93,487	320,648

Table B-2.- Survey strata of the Gulf of Alaska (170-132°W long.) by depth, code, INPFC statistical areas and area.

Depth (m)	Code Name	INPFC statistical areas	Area (nmi ²)	Area (km ²)	Subareas included
1-100	911	Shumagin	12,934	44,362	10 - 13
101-200	912		4,238	14,535	110 - 112
201-300	913		798	2,737	210
301-500	914		737	2,526	310
501-700	915		586	2,010	410
701-1,000	916		546	1,873	510
1-1,000	919		19,839	68,045	
1-100	921	Chirikof	7,748	26,575	20 - 22
101-200	922		6,924	23,749	120 - 122
201-300	923		3,353	11,500	220, 221
301-500	924		476	1,633	320
501-700	925		553	1,897	420
701-1,000	926		880	3,018	520
1-1,000	929		19,934	68,372	
1-100	931	Kodiak	11,616	39,842	30 - 33, 35
101-200	932		12,590	43,181	130 - 134
201-300	933		3,366	11,545	230, 231, 232
301-500	934		863	2,960	330
501-700	935		452	1,550	430
701-1,000	936		1,004	3,444	530
1-1,000	939		29,891	102,522	
1-100	941	Yakutat	4,909	16,837	40, 41
101-200	942		8,494	29,133	140 - 143
201-300	943		1,421	4,874	240, 241
301-500	944		864	2,964	340, 341
501-700	945		393	1,348	440
701-1,000	946		652	2,236	540
1-1,000	949		16,733	57,392	
1-100	951	Southeastern	1,098	3,766	50
101-200	952		2,878	9,871	150, 151
201-300	953		1,468	5,035	250, 251
301-500	954		841	2,884	350, 351
501-700	955		293	1,005	450
701-1,000	956		512	1,756	550
1-1,000	959		7,090	24,317	
1-1,000	Total	All areas	93,487	320,648	

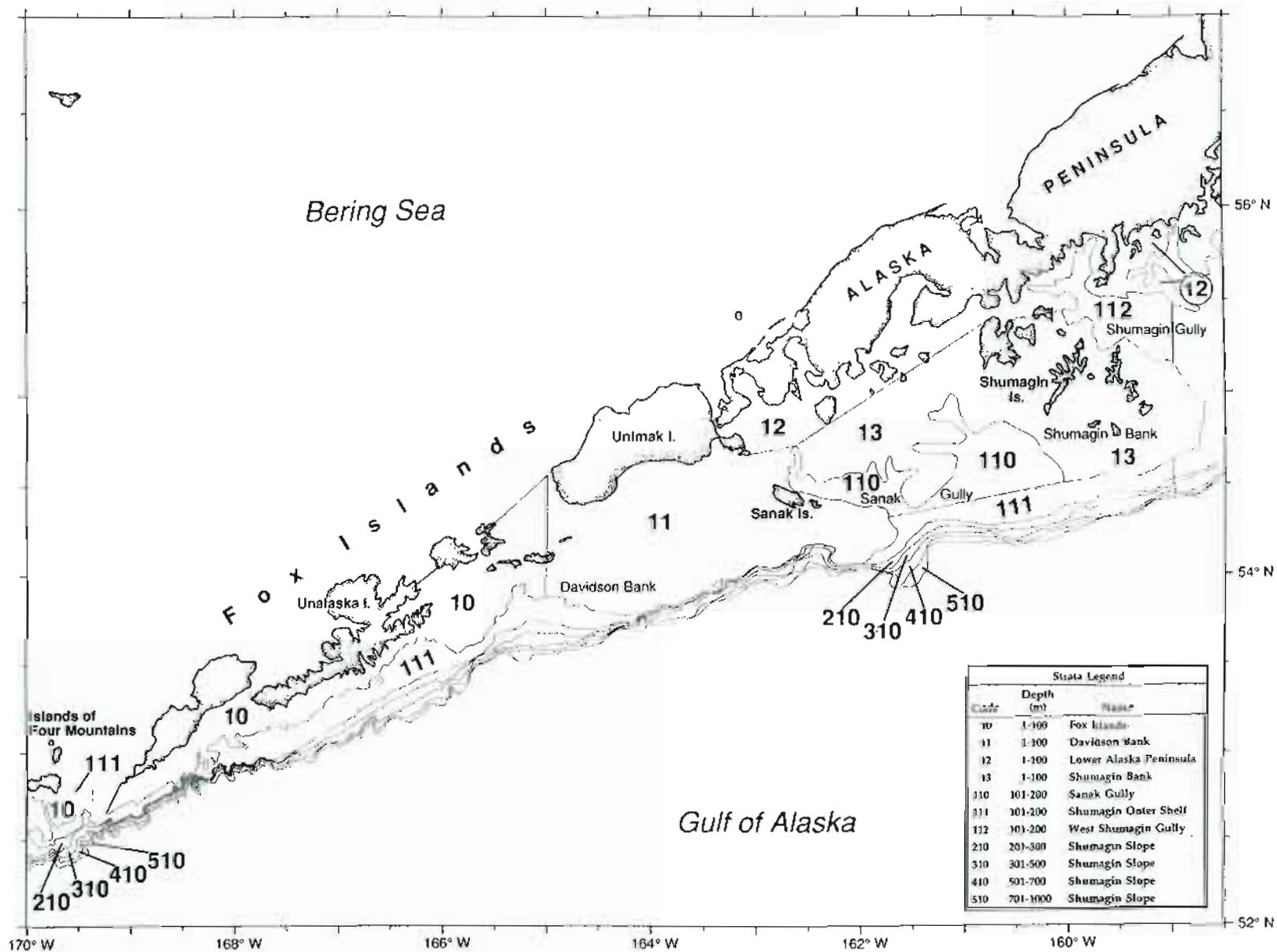


Figure B-1.- Survey strata of the Shumagin INPFC statistical area shelf and upper slope in depths 1-1,000 m used during the 1990 National Marine Fisheries Service triennial groundfish survey.

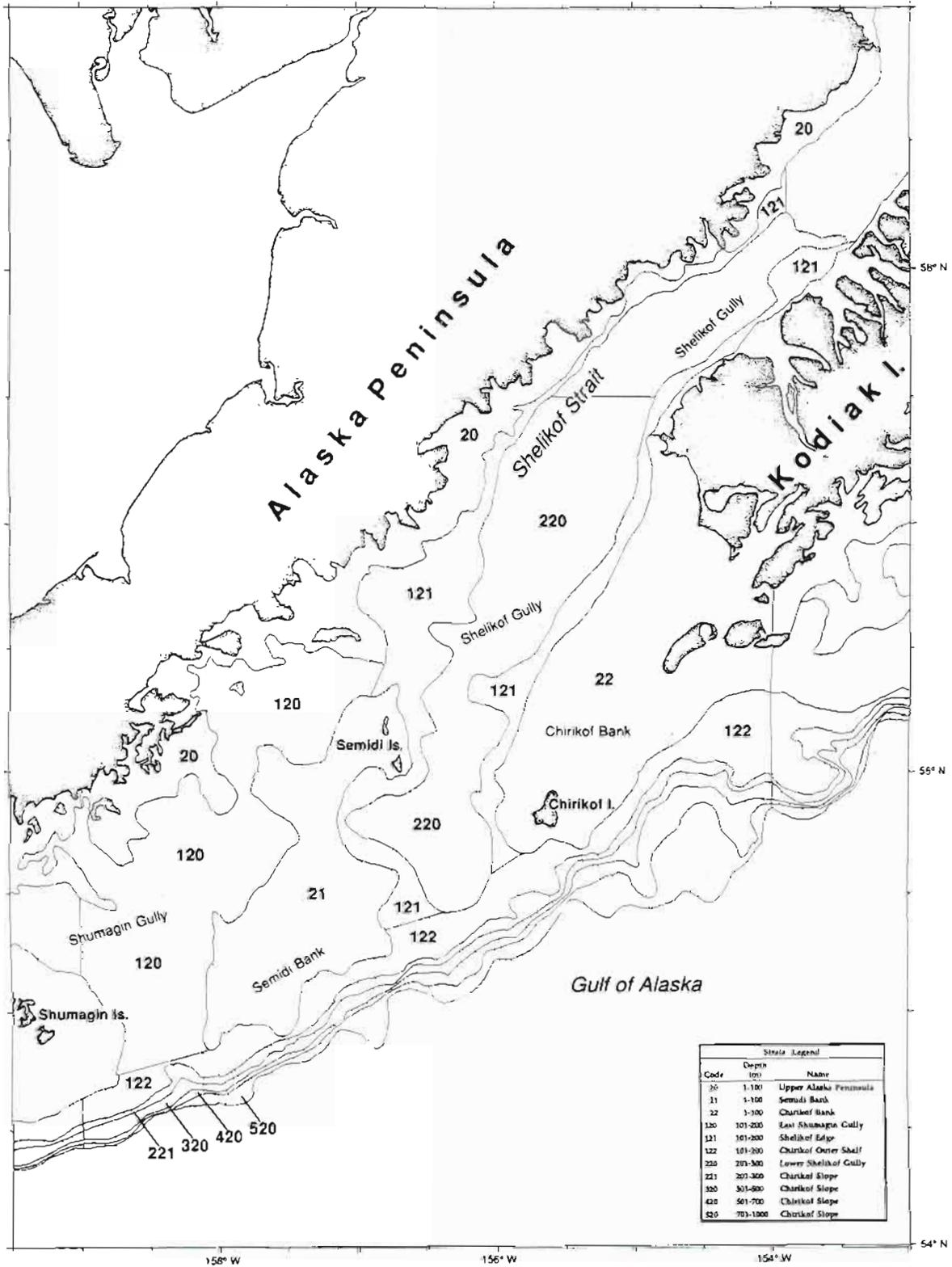


Figure B-2.- -Survey strata of the Chirikof INPFC statistical area shelf and upper slope in depths 1-1,000 m used during the 1990 National Marine Fisheries Service triennial groundfish survey.

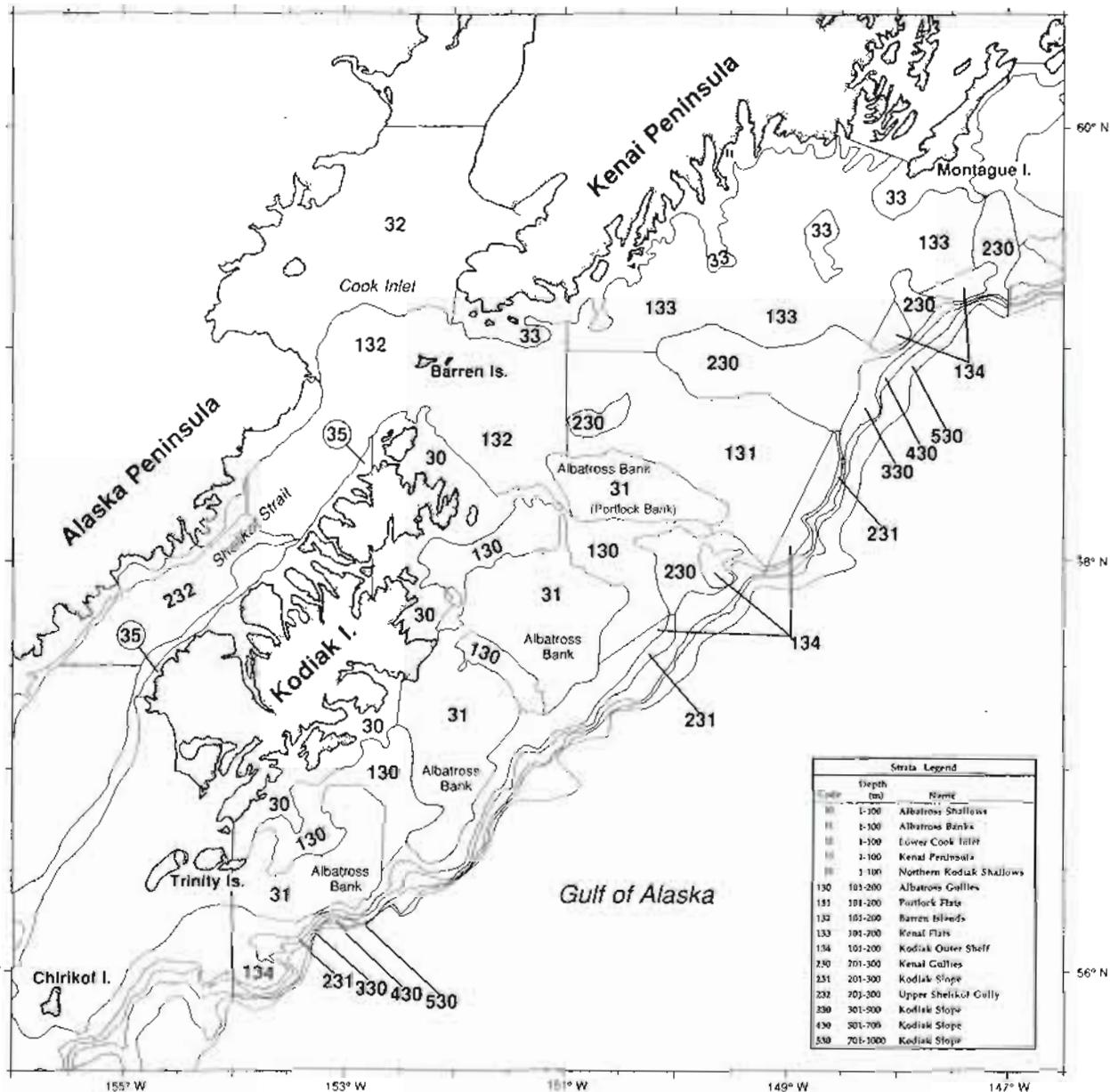


Figure B-3.- Survey strata of the Kodiak INPFC statistical area shelf and upper slope in depths 1-1,000 m used during the 1990 National Marine Fisheries Service triennial groundfish survey.

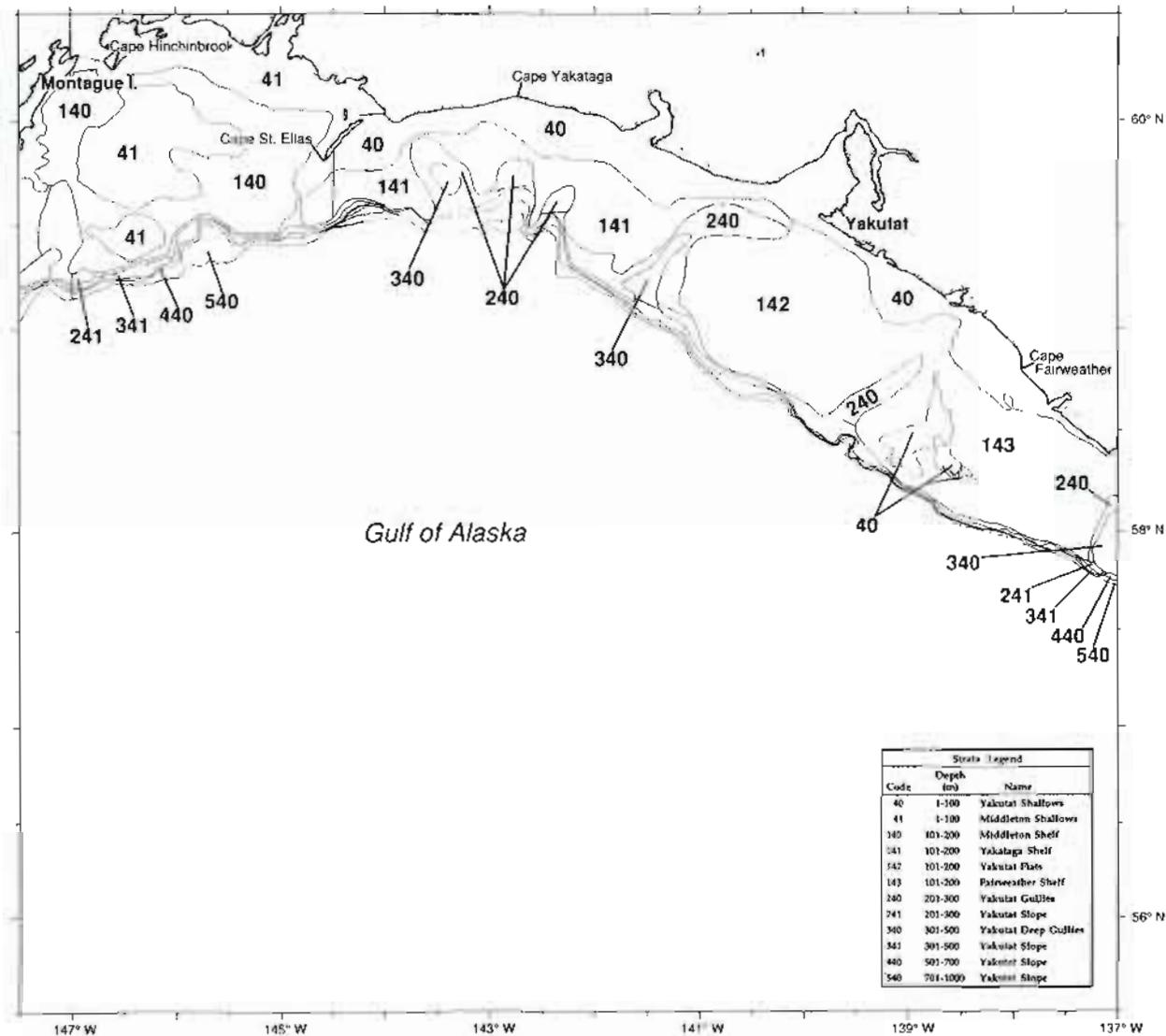
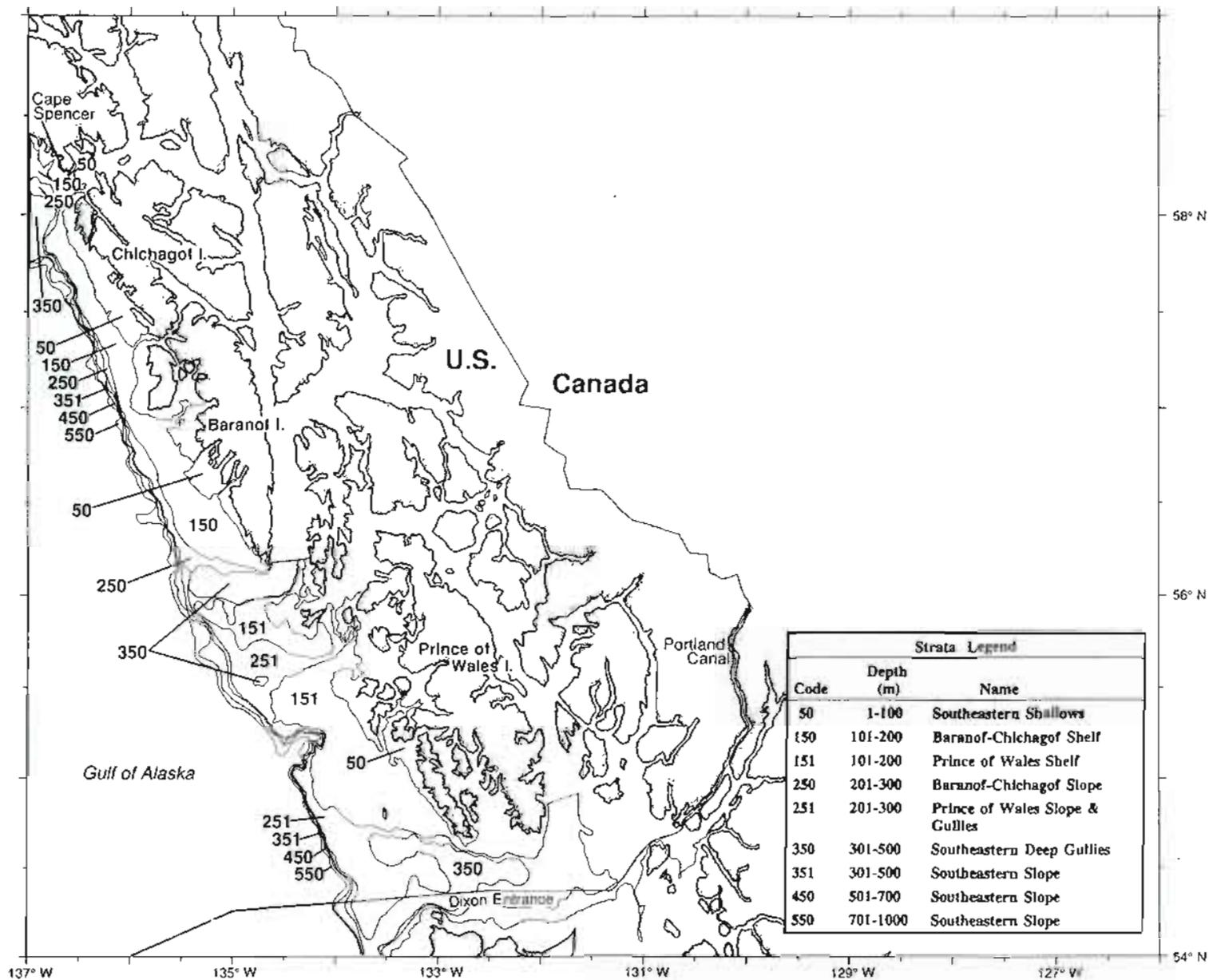


Figure B-4.- Survey strata of the Yakutat INPFC statistical area shelf and upper slope in depths 1-1,000 m used during the 1990 National Marine Fisheries Service triennial groundfish survey.



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Figure B-5.- Survey strata of the Southeastern INPFC statistical area shelf and upper slope in depths 1-1,000 m used during the 1990 National Marine Fisheries Service triennial groundfish survey.

APPENDIX C

List of Animal Species Encountered

Tables C-1 and C-2 list fish and invertebrate species encountered and identified during the 1990 Gulf of Alaska triennial groundfish survey. Fish are listed in phylogenetic order. Most common and scientific names are from Robins et al. (1991). Invertebrates are listed in phylogenetic order by phylum. Order of listings and common names used are for convenience and do not imply adherence to a particular phylogenetic system.

Table CI.- - List of fish species encountered during the 1990 Gulf of Alaska triennial trawl survey,
4 June - 9 September 1990.

Family	Scientific name	Common name
Petromyzontidae	unidentified	lampreys
Chimaeridae	<u>Hydrolagus colliei</u>	spotted rattfish
Squalidae	<u>Squalus acanthias</u>	spiny dogfish
	<u>Somniosus pacificus</u>	Pacific sleeper shark
Lamnidae	<u>Lamna ditropis</u>	salmon shark
Rajidae	<u>Raja binoculata</u>	big skate
	<u>Raja rhina</u>	longnose skate
	<u>Bathyraja aleutica</u>	Aleutian skate
	<u>Bathyraja parmifera</u>	Alaska skate
Bathylagidae	<u>Bathyraja interrupta</u>	Bering skate
	<u>Leuroglossus schmidti</u>	northern smoothtongue
Osmeridae	<u>Leuroglossus stilbius</u>	California smoothtongue
	<u>Thaleichthys pacificus</u>	eulachon
Salmonidae	<u>Mallotus villosus</u>	capelin
	<u>Spirinchus starksi</u>	night smelt
	<u>Oncorhynchus tshawytscha</u>	chinook salmon
	<u>Oncorhynchus kisutch</u>	coho salmon
Stomiidae	<u>Oncorhynchus keta</u>	chum salmon
	<u>Oncorhynchus gorbuscha</u>	pink salmon
	<u>Oncorhynchus nerka</u>	sockeye salmon
Myctophidae	<u>Tactostoma macropus</u>	longfin dragonfish
	<u>Chauliodus macouni</u>	Pacific viperfish
Gadidae	<u>Stenobranchius leucopsarus</u>	northern lampfish
	<u>Theragra chalcogramma</u>	walleye pollock
	<u>Gadus macrocephalus</u>	Pacific cod
Macrouridae	<u>Microgadus proximus</u>	Pacific tomcod
	<u>Albatrossia pectoralis</u>	giant grenadier
Scomberesocidae	<u>Coryphaenoides acrolepis</u>	Pacific grenadier
	<u>Cololabis salra</u>	Pacific saury
Scorpanenidae	<u>Sebastes alutus</u>	Pacific ocean perch
	<u>Sebastes babcocki</u>	redbanded rockfish
	<u>Sebastes borealis</u>	shortraker rockfish
	<u>Sebastes brevispinis</u>	silvergray rockfish
	<u>Sebastes ciliatus</u>	dusky rockfish
	<u>Sebastes crameri</u>	darkblotched rockfish

Table C1.- (continued) List of fish species encountered during the 1990 Gulf of Alaska triennial trawl survey, 4 June - 9 September 1990.

Family	Scientific name	Common name
Scorpanenidae	<u>Sebastes diploproa</u>	splitnose rockfish
	<u>Sebastes elongatus</u>	greenstriped rockfish
	<u>Sebastes entomelas</u>	widow rockfish
	<u>Sebastes helvomaculatus</u>	rosethorn rockfish
	<u>Sebastes maliger</u>	quillback rockfish
	<u>Sebastes mystinus</u>	blue rockfish
	<u>Sebastes melanops</u>	black rockfish
	<u>Sebastes nigrocinctus</u>	tiger rockfish
	<u>Sebastes paucispinis</u>	bocaccio
	<u>Sebastes pinniger</u>	canary rockfish
	<u>Sebastes polyspinis</u>	northern rockfish
	<u>Sebastes proriger</u>	redstripe rockfish
	<u>Sebastes reedi</u>	yellowmouth rockfish
	<u>Sebastes ruberrimus</u>	yelloweye rockfish
	<u>Sebastes variegatus</u>	harlequin rockfish
	<u>Sebastes wilsoni</u>	pygmy rockfish
<u>Sebastes zacentrus</u>	sharpchin rockfish	
	<u>Sebastolobus alascanus</u>	shortspine thornyhead
Anoplopomatidae	<u>Anoplopoma fimbria</u>	sablefish
Hexagrammidae	<u>Hexagrammos decagrammus</u>	kelp greenling
	<u>Hexagrammos stelleri</u>	whitespotted greenling
	<u>Ophiodon elongatus</u>	lingcod
	<u>Pleurogrammus monopterygius</u>	Atka mackerel
Cottidae	<u>Blepsias bilobus</u>	crested sculpin
	<u>Dasycottus setiger</u>	spinyhead sculpin
	<u>Gymnocanthus galeatus</u>	armorhead sculpin
	<u>Hemilepidotus</u>	red Irish lord
	<u>Hemilepidotus jordani</u>	yellow Irish lord
	<u>Hemilepidotus spinosus</u>	brown Irish lord
	<u>Hemitripteris bolini</u>	bigmouth sculpin
	<u>Icelus spiniger</u>	thorny sculpin
	<u>Leptocottus aramatus</u>	Pacific staghorn sculpin
	<u>Malacocottus kincaidi</u>	blackfin sculpin
	<u>Malacocottus zoonurus</u>	darkfin sculpin
	<u>Myoxocephalus jack</u>	plain sculpin

Table C1.- (continued) List of fish species encountered during the 1990 Gulf of Alaska triennial trawl survey, 4 June - 9 September 1990.

Family	Scientific name	Common name
Cottidae	<u>Mvxocephalus polyacanthocephalus</u>	great sculpin
	<u>Mvxocephalus verrucosus</u>	warty sculpin
	<u>Nautichthys oculofasciatus</u>	sailfin sculpin
	<u>Rhamphocottus richardsoni</u>	grunt sculpin
	<u>Triglops forficata</u>	scissortail sculpin
	<u>Triglops macellus</u>	roughspine sculpin
	<u>Triglops pingeli</u>	ribbed sculpin
	<u>Triglops szepticus</u>	spectacled sculpin
Agonidae	<u>Bathvagonus alascanus</u>	gray starsnout
	<u>Bathvagonus nigripinnis</u>	blackfin poacher
	<u>Bathvagonus pentacanthus</u>	bigeye poacher
	<u>Podothecus acipenserinus</u>	sturgeon poacher
	<u>Sarritor frenatus</u>	sawback poacher
Cyclopteridae	<u>Acantholiparis opercularis</u>	spiny snailfish
Cyclopteridae	<u>Aptocycclus ventricosus</u>	smooth lumpsucker
	<u>Careproctus melanurus</u>	blacktail snailfish
	<u>Eumicrotremus orbis</u>	Pacific spiny lumpsucker
	<u>Paraliparis dactylosus</u>	red snailfish
Bathymasteridae	<u>Bathvmaster signatus</u>	searcher
Zoarcidae	<u>Lycodapus fierasfer</u>	blackmouth eelpout
	<u>Lycodes brevipes</u>	shortfin eelpout
	<u>Lycodes cortezianus</u>	bigfin eelpout
	<u>Lycodes diapterus</u>	black eelpout
	<u>Lycodes pacificus</u>	blackbelly eelpout
	<u>Lycodes palearis</u>	wattled eelpout
Stichaeidae	<u>Brvoichthys marjorius</u>	pearly prickleback
	<u>Chitrolphis decoratus</u>	decorated warbonnet
	<u>Lumpenella longirostris</u>	longsnout prickleback
	<u>Lumpenus sagitta</u>	snake prickleback
	<u>Poroclinus rothrocki</u>	whitebarred prickleback
Cryptacanthodidae	<u>Delolepis gigantea</u>	giant wrymouth
	<u>Lyconectes aleutensis</u>	dwarf wrymouth
Anarhichadidae	<u>Anarhichas orientalis</u>	Bering wolffish
	<u>Anarrhichthys ocellatus</u>	wolf-eel
Zaproridae	<u>Zaprora silenus</u>	prowfish

Table C1.- (continued) List of fish species encountered during the 1990 Gulf of Alaska triennial trawl survey, 4 June - 9 September 1990.

Family	Scientific name	Common name
Trichodontoideae	<u>Trichodon</u>	Pacific sandfish
Clupeidae	<u>Clupea pallasi</u>	Pacific herring
Ammodytidae	<u>Ammodytes hexapterus</u>	Pacific sandlance
Pleuronectidae	<u>Atheresthes stornias</u>	arrowtooth flounder
	<u>Eopsetta exilis</u>	slender sole
	<u>Eopsetta jordani</u>	Petrale sole
	<u>Errex zachirus</u>	rex sole
	<u>Hippoglossoides elassodon</u>	flathead sole
	<u>Hippoglossus stenolepis</u>	Pacific halibut
	<u>Microstomus pacificus</u>	Dover sole
	<u>Platichthys stellatus</u>	starry flounder
	<u>Pleuronectes asper</u>	yellowfin sole
	<u>Pleuronectes bilineatus</u>	rock sole
	<u>Pleuronectes isolepis</u>	butter sole
	<u>Pleuronectes quadrituberculatus</u>	Alaska plaice
	<u>Pleuronectes vetulus</u>	English sole
	<u>Psettichthys melanostictus</u>	sand sole

Table C2.- List of invertebrates encountered during the 1990 Gulf of Alaska triennial trawl survey, 4 June - 9 September 1990.

Phylum	Scientific name	Common name
Porifera		unidentified sponges
	Class Hexactinellida	unidentified glass sponge
	<u>Mvxilla incrustans</u>	scallop sponge
	<u>Suberites ficus</u>	hermit sponge
Bryozoa		unidentified bryozoan
Brachiopoda		unidentified brachiopod
	<u>Terebratalia transversa</u>	not available
	<u>Lequeus californianus</u>	not available
Annelida	Class Polychaeta	sea mouse
Arthropoda		
barnacles	<u>Balanus</u> sp.	unidentified barnacles
	<u>Balanus evermanni</u>	giant barnacle
shrimp	<u>Argis crassa</u>	rough argid
	<u>Eualus suckleyi</u>	NA

Table C2.- - (continued) List of invertebrates encountered during the 1990 Gulf of Alaska triennial trawl survey, 4 June - 9 September 1990.

Phylum	Scientific name	Common name
Arthropoda	Crangonidae family	crangonid shrimp unidentified
	<u>Crangon</u> sp.	unidentified crangon
shrimp	<u>Crangon alaskensis</u>	shell shrimp
	<u>Crangon communis</u>	common crangon
	<u>Notostomus japonicus</u>	spinyridge shrimp
	Pandalidae family	Pandalid shrimp unidentified
	<u>Pandalus</u> sp.	Pandalid species unidentified
	<u>Pandalus borealis</u>	northern shrimp
	<u>Pandalus hypsiontus</u>	coonstripe sbrimp
	<u>Pandalus jordani</u>	ocean shrimp
	<u>Pandalus platyceros</u>	spot shrimp
	<u>Pandalus tridens</u>	yellowleg pandalid
	<u>Pandalopsis dispar</u>	sidestripe shrimp
	Pasiphaeidae family	Pasiphaeid shrimp unidentified
	<u>Pasiphaea pacifica</u>	glass shrimp
crab	<u>Acantholithodes hispidus</u>	fuzzy crab
	<u>Cancer magister</u>	Dungeness crab
	<u>Cancer oregonensis</u>	Oregon rock crab
	<u>Chionoecetes</u> sp.	Tanner crab unidentified
	<u>Chionoecetes bairdi</u>	Bairdi Tanner crab
	<u>Chionoecetes</u> hybrid	Tanner crab hybrid
	<u>Chionoecetes tanneri</u>	grooved Tanner crab
	<u>Chorilia longipes</u>	NA
	<u>Oregonia gracilis</u>	longhorned decorator crab
	<u>Hyas</u> sp.	hyas crab unidentified
	<u>Hyas lyratus</u>	North Pacific toad crab
	<u>Labidochirus splendescens</u>	NA
	<u>Lithodes aequispina</u>	golden king crab
	<u>Lithodidae</u> sp.	stone crab unidentified
	<u>Lopholithodes</u> sp.	box crab unidentified
	<u>Lopholithodes foraminatus</u>	NA
	<u>Munida quadrispina</u>	NA
	Paguridae family	hermit crab unidentified
	<u>Pagurus</u> sp.	bermit crab unidentified
	<u>Pagurus aleuticus</u>	Aleutian hermit

Table C2.- - (continued) List of invertebrates encountered during the 1990 Gulf of Alaska triennial trawl survey, 4 June - 9 September 1990.

Phylum	Scientific name	Common name
Arthropoda		
crab	<u>Pagurus brandti</u>	sponge hermit crab
	<u>Pagurus cornutus</u>	NA
	<u>Pagurus capillatus</u>	bairy hermit crab
	<u>Pagurus dalli</u>	NA
	<u>Pagurus trigonocheirus</u>	fuzzy hermit crab
	<u>Paralithodes camtschatica</u>	red king crab
	<u>Placetron wosnessenskii</u>	scaled crab
	<u>Pugettia</u> sp.	kelp crab
	<u>Rhinolithodes wosnessenskii</u>	rhinoceros crab
Mollusca		mollusks
gastropods	Order Nudibranchia	unidentified nudibranch
	<u>Tochuina tetraquetra</u>	giant orange tocbui nudibranch
	<u>Chlamylla</u> sp.	chlamylla nudibranch
	Family Acmaeidae	unidentified limpet
	Order Mega- & Neogastropoda	unidentified snail
	<u>Natica</u> sp.	unidentified moon snail
	Family Buccinidae	unidentified whelk
	<u>Arctomelon stearnsii</u>	Alaska volute
	<u>Beringius kennicotti</u>	NA
	<u>Buccinum plectrum</u>	sinuous whelk
	<u>Buccinum</u> sp.	unidentified whelk
	<u>Fusitriton oregonensis</u>	hairy triton
	<u>Fusitriton</u> sp.	triton unidentified
	<u>Neptunea lyrata</u>	ribbed Neptune
	<u>Neptunea Pribiloffensis</u>	Pribilof Neptune
	<u>Neptunea</u> sp.	unidentified Neptunea
	<u>Volutopsius harpa</u>	left-handed whelk
	<u>Volutopsius</u> sp.	unidentified melon snail
pelecypods (bivalves)	<u>Chlamys islandica</u>	Iceland scallop
	<u>Chlamys rubida</u>	Hinds Scallop
	<u>Chlamys</u> sp.	pink scallops
	F. Pectinidae	unidentified pectin scallop
	<u>Patinopecten caurinus</u>	weathervane scallop
	F. Mytilidae	unidentified mussel

Table C2.- - (continued) List of invertebrates encountered during the 1990 Gulf of Alaska triennial trawl survey, 4 June - 9 September 1990.

Phylum	Scientific name	Common name	
Mollusca			
pelecypods (bivalves)	<u>Mytilus</u> sp.	unidentified Mytilus mussel	
	F. Cardiidae	unidentified cockle	
	<u>Serripes groenlandicus</u>	Greenland cockle	
	F. Anomiidae	false jingles unidentified	
	<u>Pododesmus macroschisma</u>	Alaska false jingle	
	<u>Compressidens stearnsii</u>	Stearns toothshell	
	cephalopods	F. Octopodidae	octopus unidentified
		<u>Octopus dofleini</u>	giant octopus
		<u>Octopus leioderma</u>	smoothskin octopus
		Order teuthoidea	unidentified squid
<u>Berruteuthis magister</u>		magistrate armhook squid (red squid)	
<u>Rossia pacifica</u>		Pacific bobtailed squid	
Echinodermata			
starfish	<u>Crossaster papposus</u>	rose sea star	
	<u>Crossaster</u> sp.	NA	
	<u>Ctenodiscus</u> sp.	NA	
	<u>Ctenodiscus crispatus</u>	common mud star	
	<u>Hippasteria spinosa</u>	spiny red sea star	
	<u>Luidiaster dawsoni</u>	NA	
	<u>Pteraster</u> sp.	cushion sea stars	
	<u>Pycnopodia helianthoides</u>	twentyarm sea star	
	<u>Solaster</u> sp.	sun stars	
	<u>Solaster stimpsoni</u>	multicolored sun star	
	sea urchins & sand dollars	Subclass Regularia	unidentified sea urchin
		<u>Allocentrotus fragilis</u>	orange-pink sea urchin
		<u>Allocentrotus</u> sp.	fragile sea urchins
<u>Brisaster</u> sp.		unidentified heart urchin	
<u>Strongylocentrotus droebachiensis</u>		green sea urchin	
<u>Strongylocentrotus franciscanus</u>		red sea urchin	
<u>Strongylocentrotus purpuratus</u>		purple sea urchin	
Order Clypeastroida		unidentified sand dollar	
crinoids	Order Articulata	unidentified crinoid	
brittle stars	Class ophiuroidea	unidentified brittle star	

Table C2.- - (continued) List of invertebrates encountered during the 1990 Gulf of Alaska triennial trawl survey, 4 June - 9 September 1990.

Echinodermata		
brittle stars	<u>Gorgonocephalus caryi</u>	basket star
	<u>Ophiura sarsi</u>	notched brittle star
sea cucumbers	Class Holothuroidea	unidentified sea cucumber
	<u>Cucumaria fallax</u>	sea football
	<u>Parastichopus</u> sp.	NA
	<u>Psolus</u> sp.	redscaled sea cucumber
Chordata	Class Ascidiacea	unidentified tunicate
	<u>Boltenia</u> sp.	unidentified sea onion
	<u>Boltenia villosa</u>	NA
		unidentified compound ascidian
	<u>Halocynthia aurantium</u>	sea peach
	<u>Halocynthia</u> sp.	unidentified sea peach
	Class Thaliacea	unidentified salps

APPENDIX D

Length-Weight Regressions for Major Species

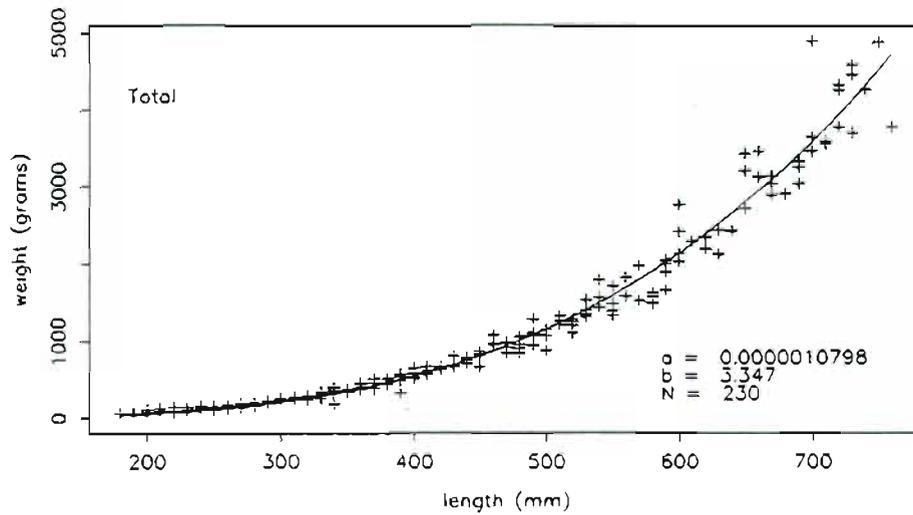
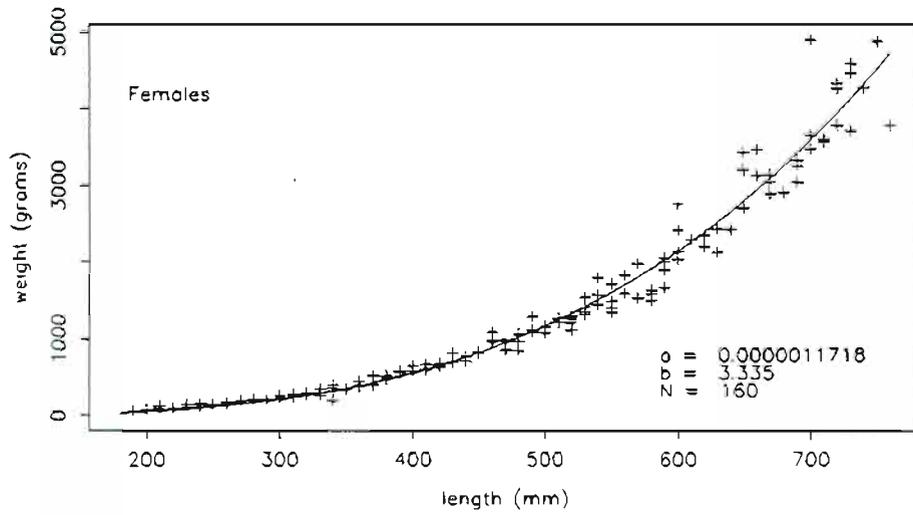
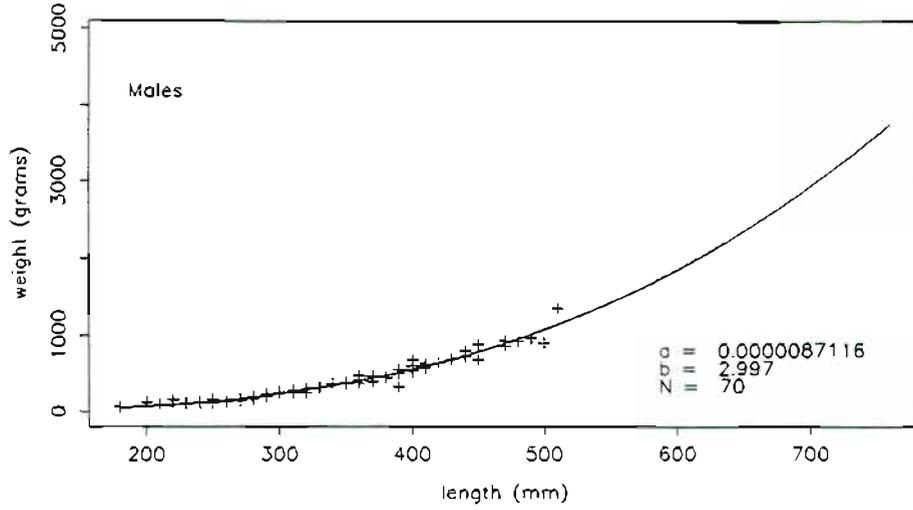
Length-weight relationships for major species were calculated using a non-linear least-squares regression algorithm. The equation used for the regression was

$$\text{Weight}_{(\text{grams})} = a * \text{Length}_{(\text{mm})}^b.$$

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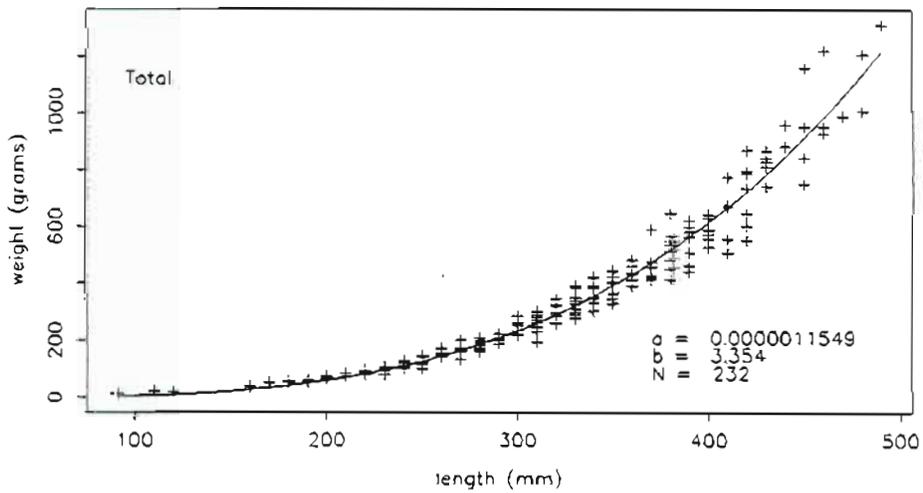
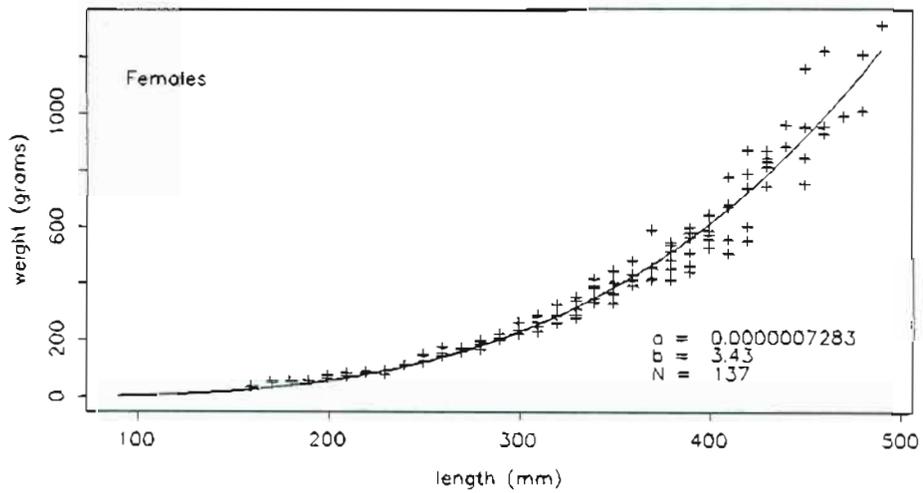
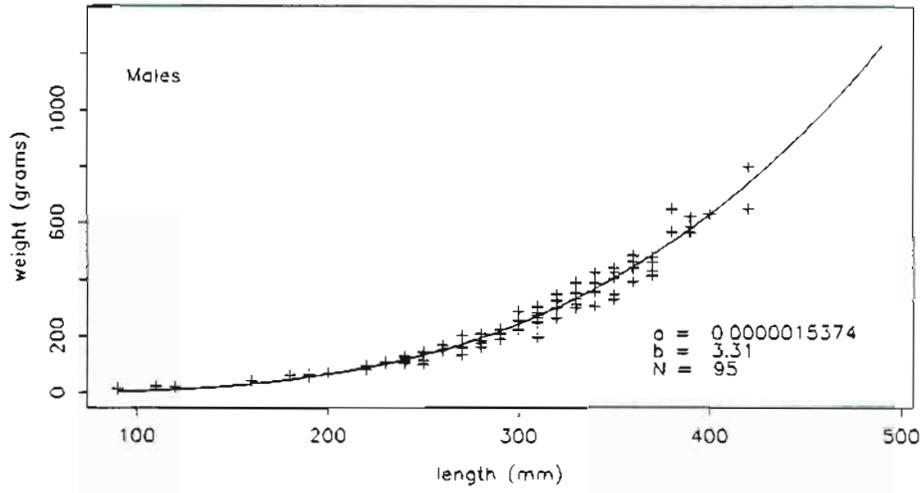
ARROWTOOTH FLOUNDER

length vs weight regression (weight_(grams) = a * length_(mm)^b)



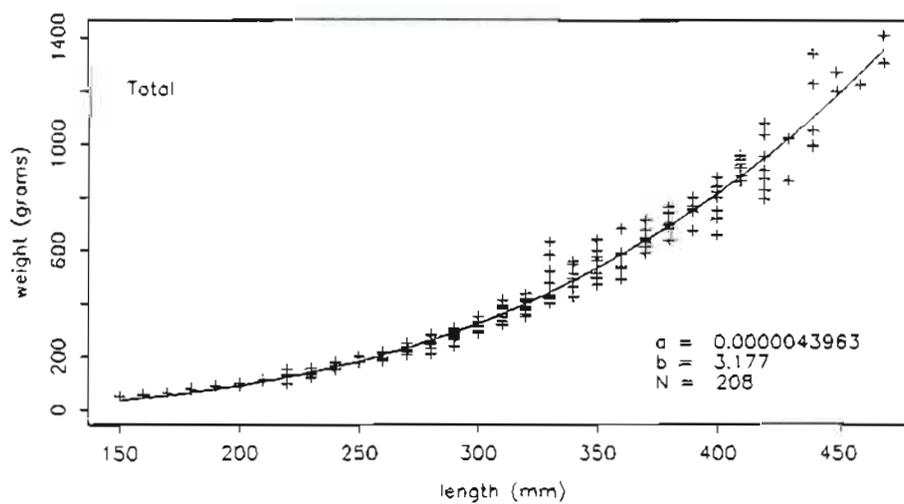
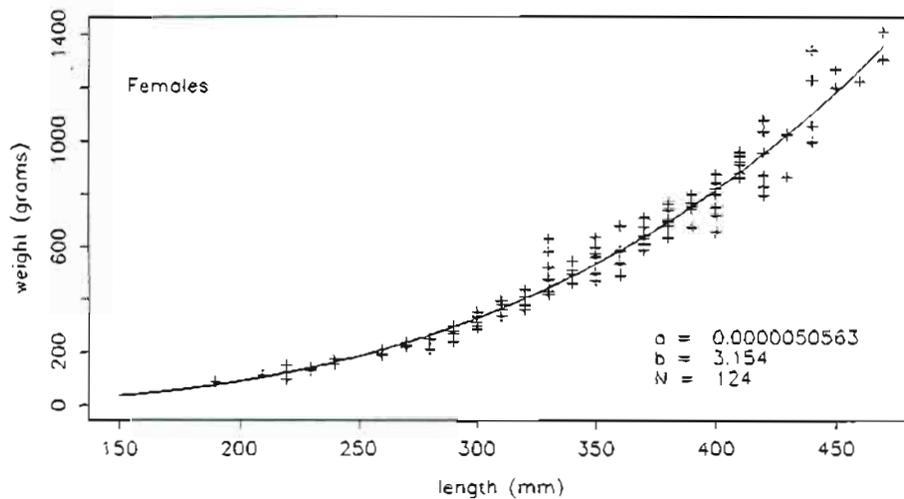
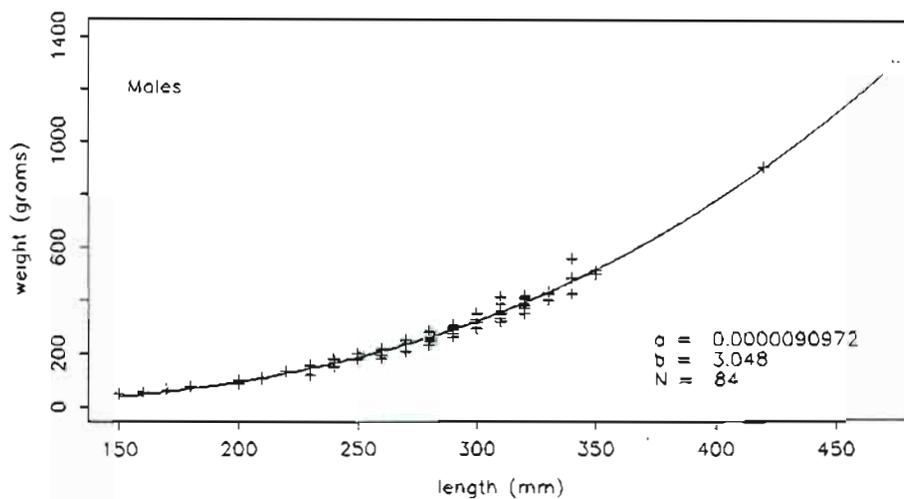
FLATHEAD SOLE

length vs weight regression (weight_(grams) = a * length_(mm)^b)



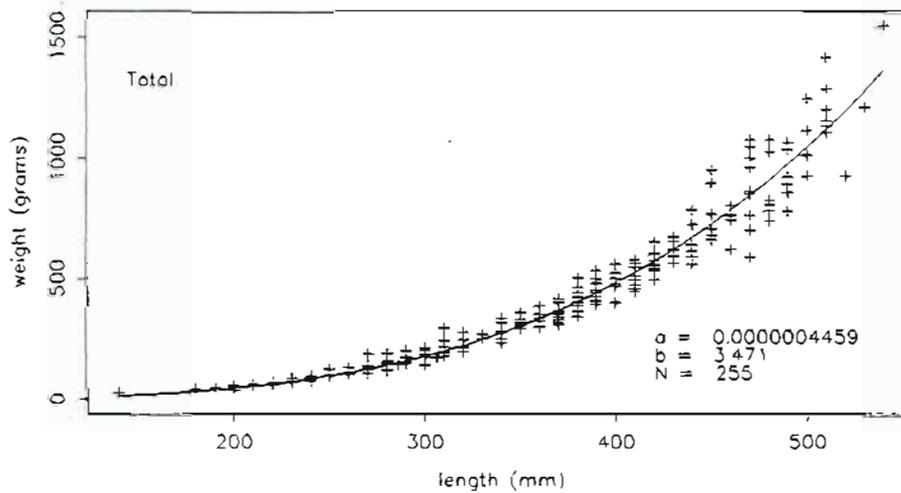
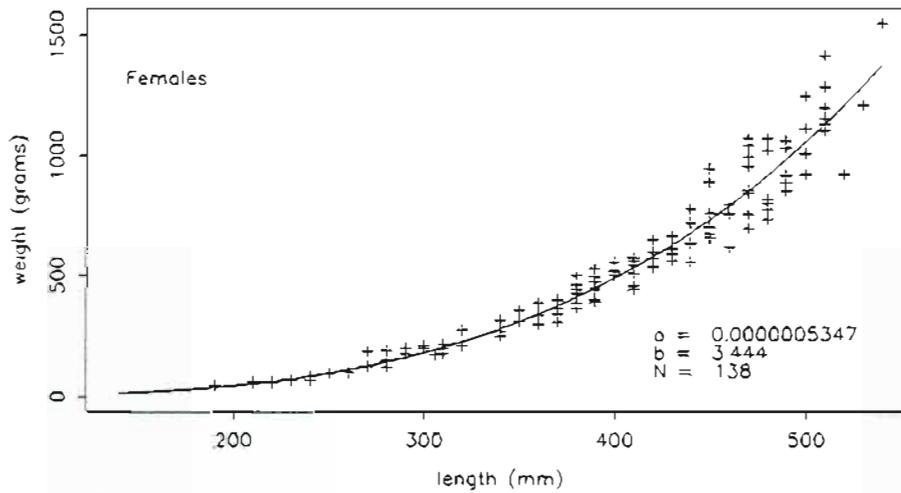
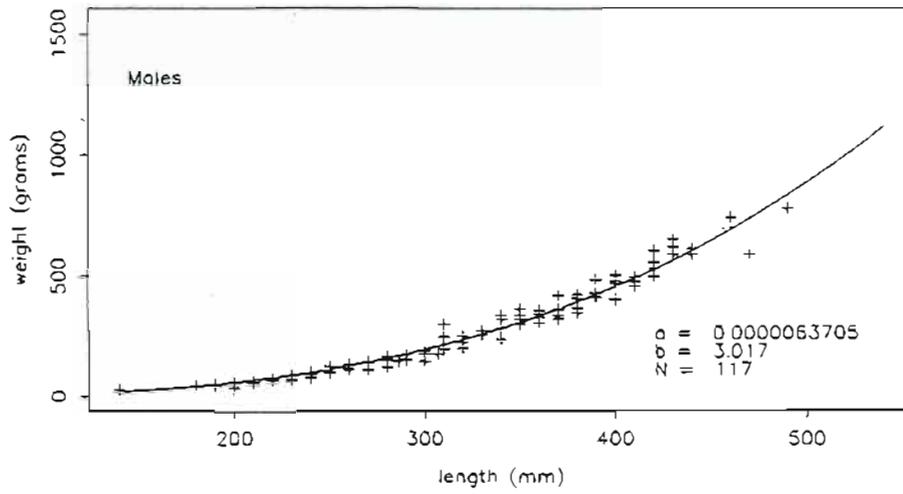
ROCK SOLE

length vs weight regression (weight_(grams) = a • length_(mm)^b)



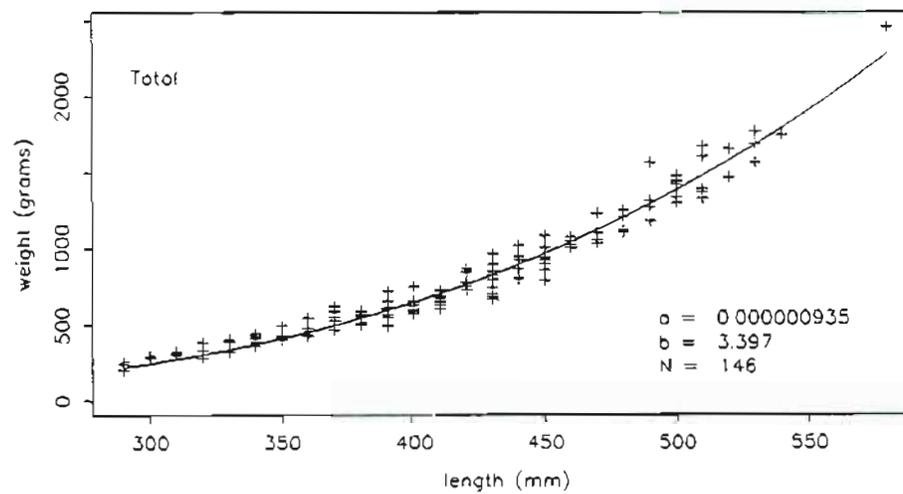
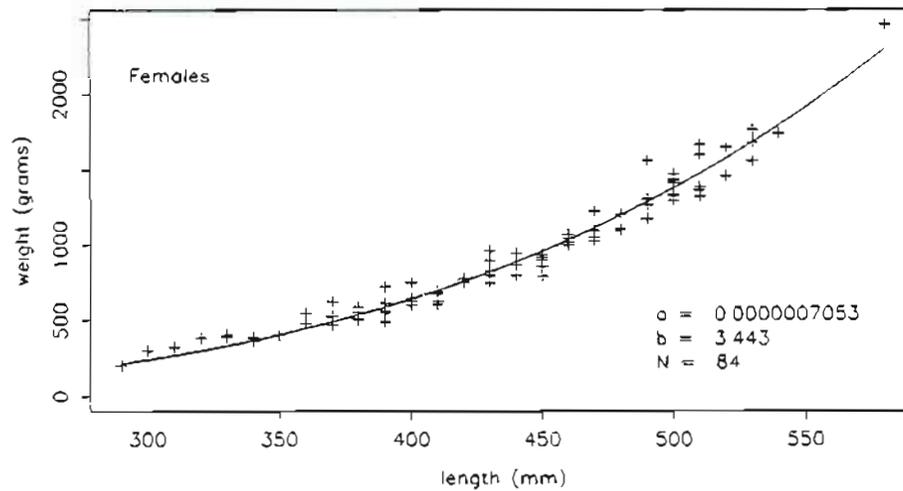
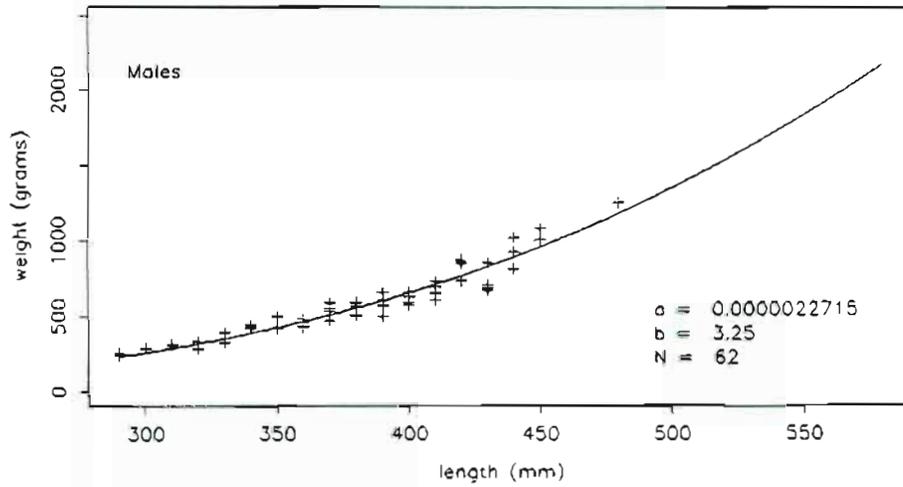
REX SOLE

length vs weight regression (weight_(grams) = a • length_(mm)^b)

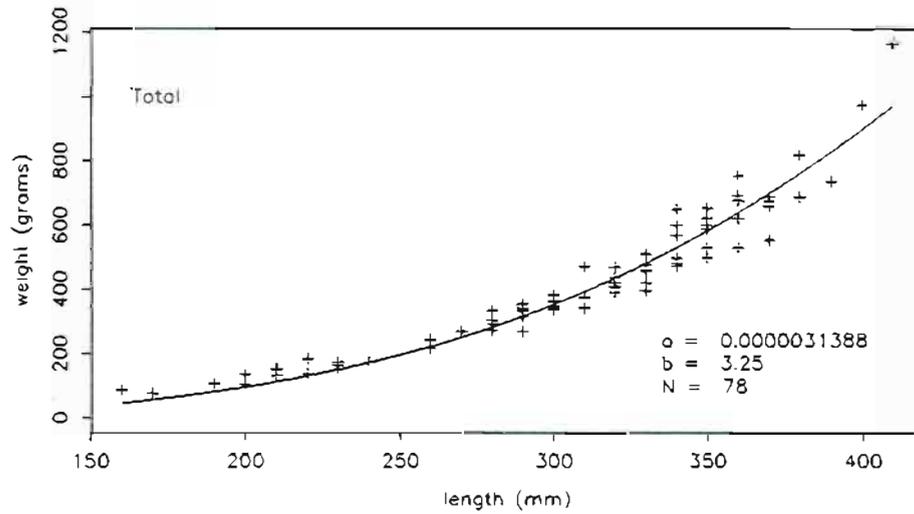
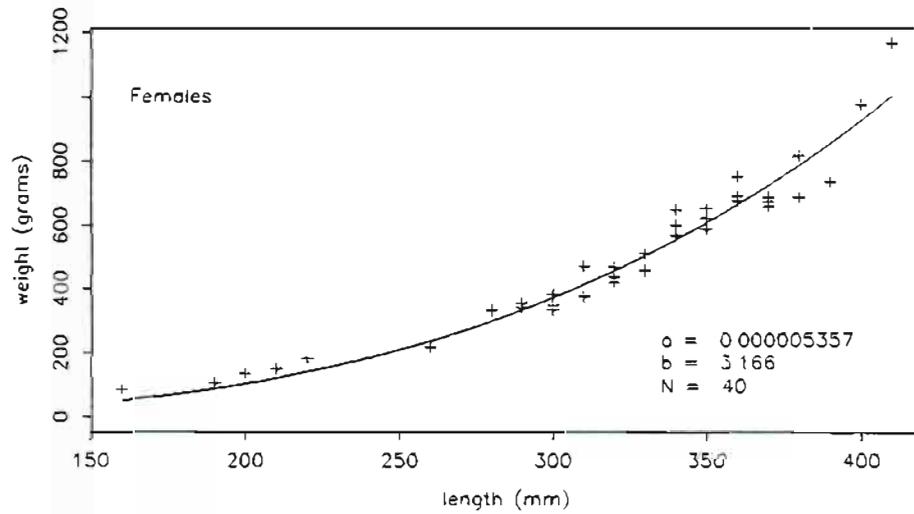
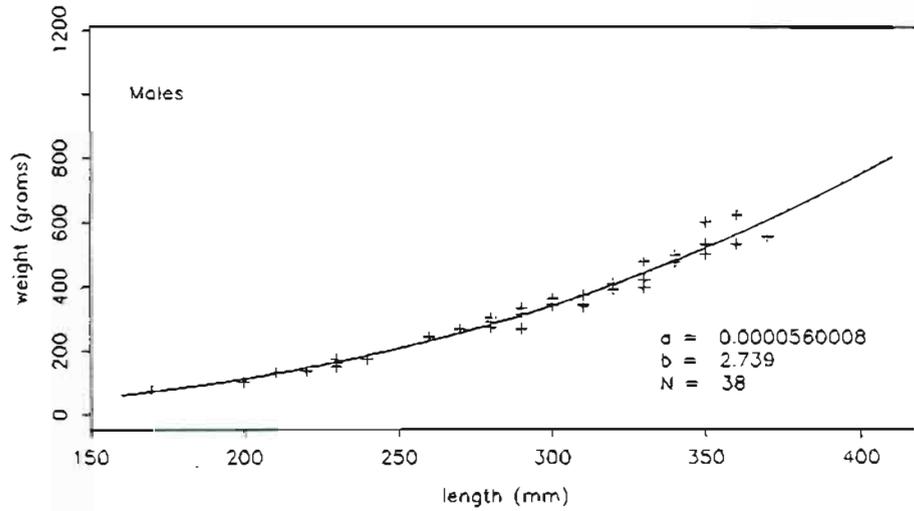


DOVER SOLE

length vs weight regression (weight_(grams) = a * length_(mm)^b)

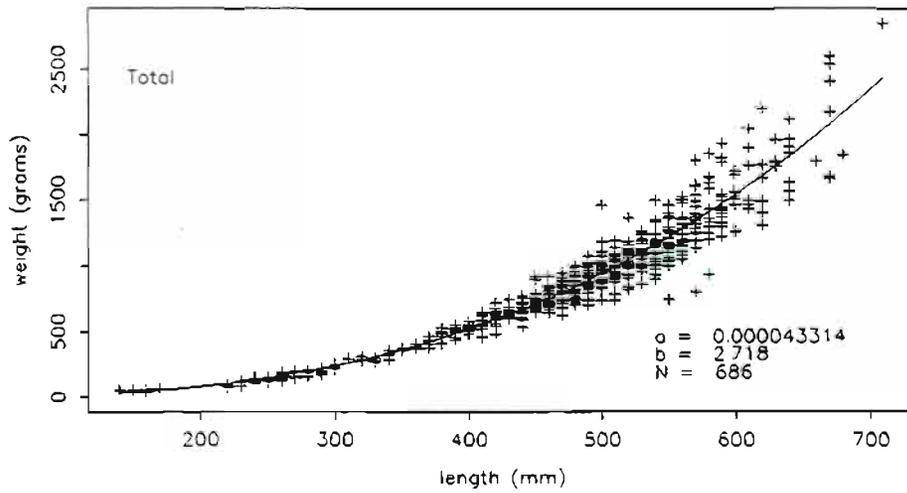
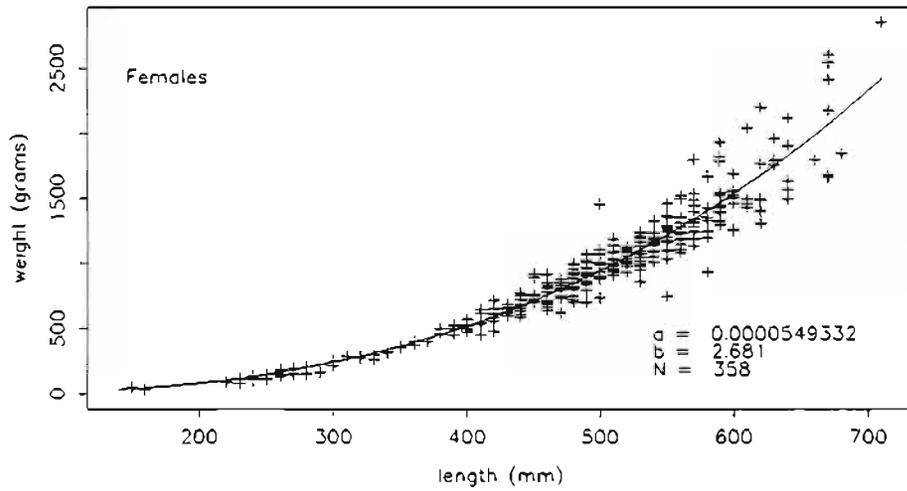
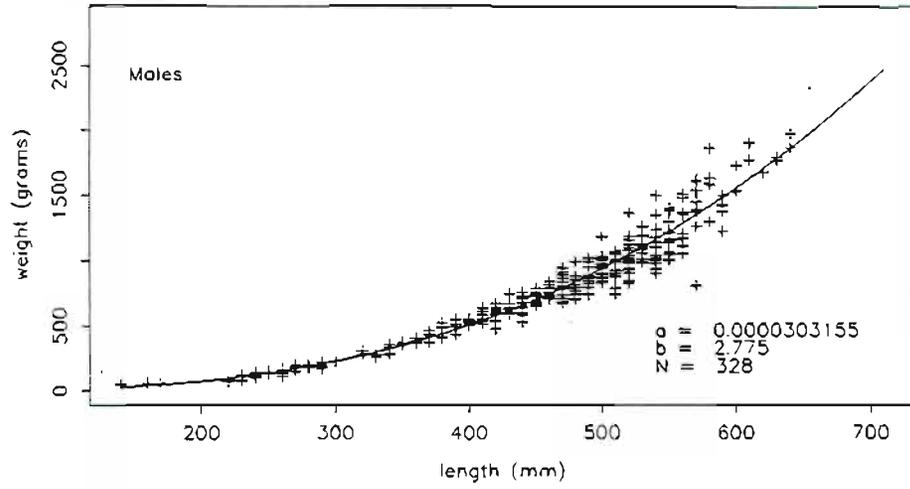


YELLOWFIN SOLE

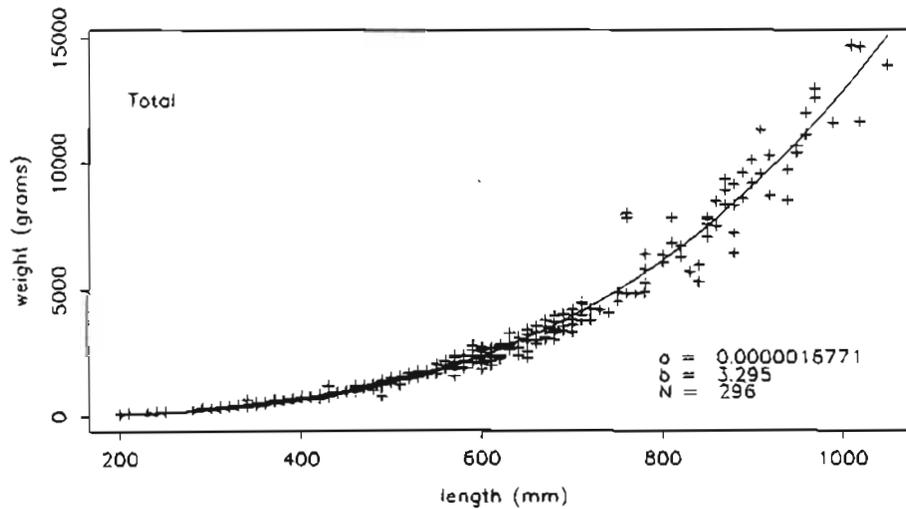
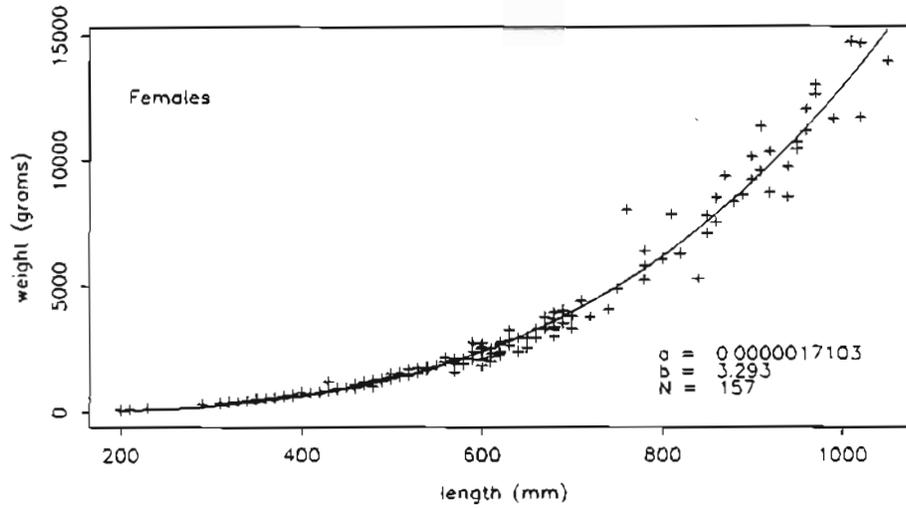
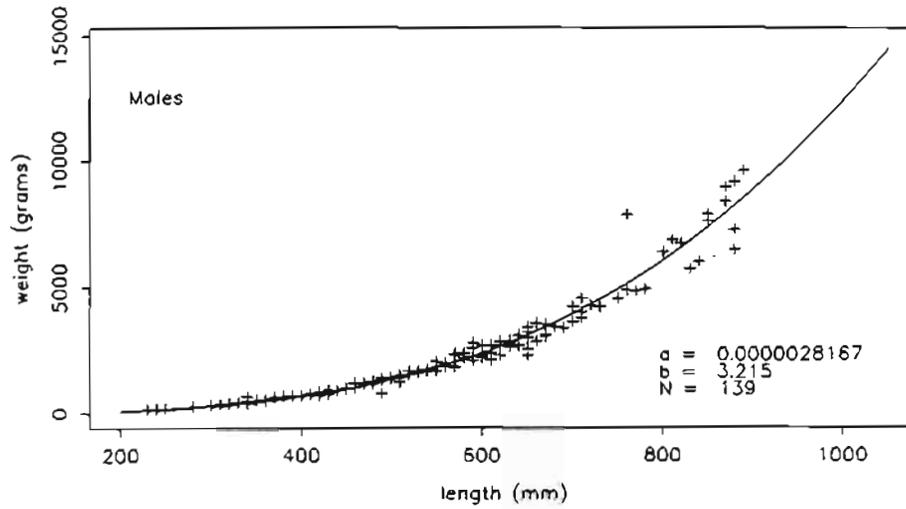
length vs weight regression (weight_(grams) = a • length_(mm)^b)

WALLEYE POLLOCK

length vs weight regression ($\text{weight}_{(\text{grams})} = a \cdot \text{length}_{(\text{mm})}^b$)

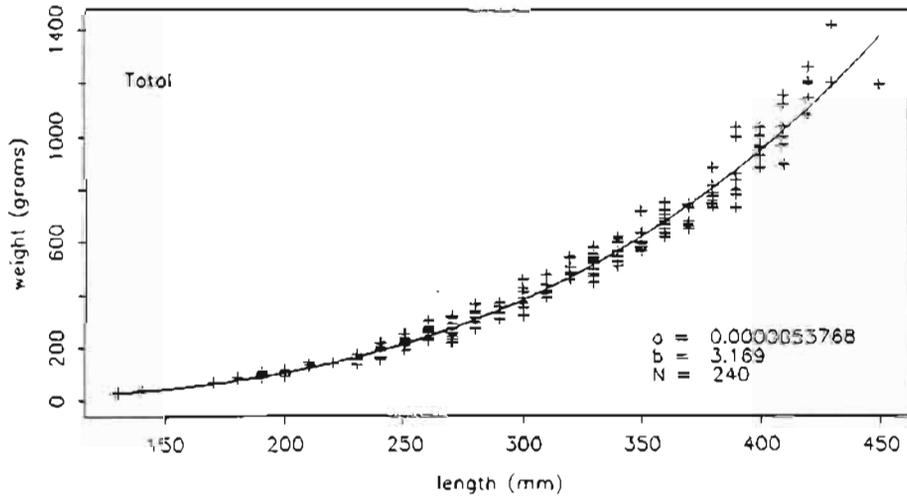
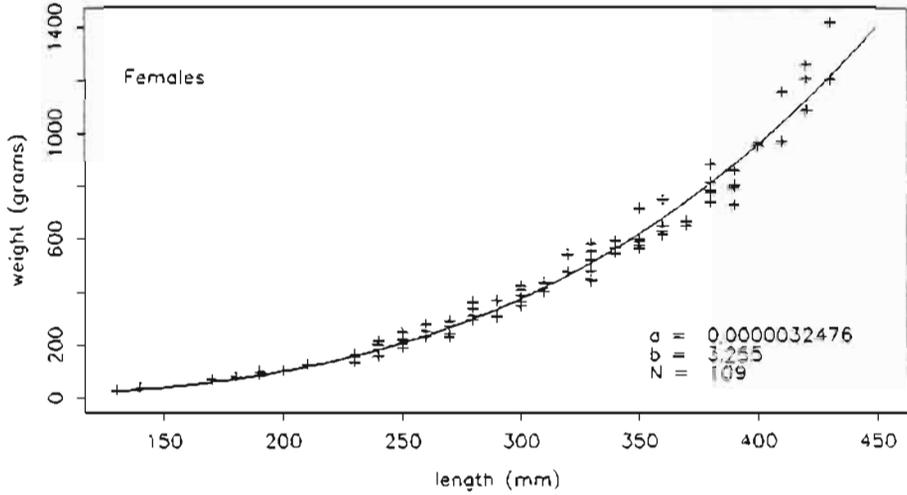
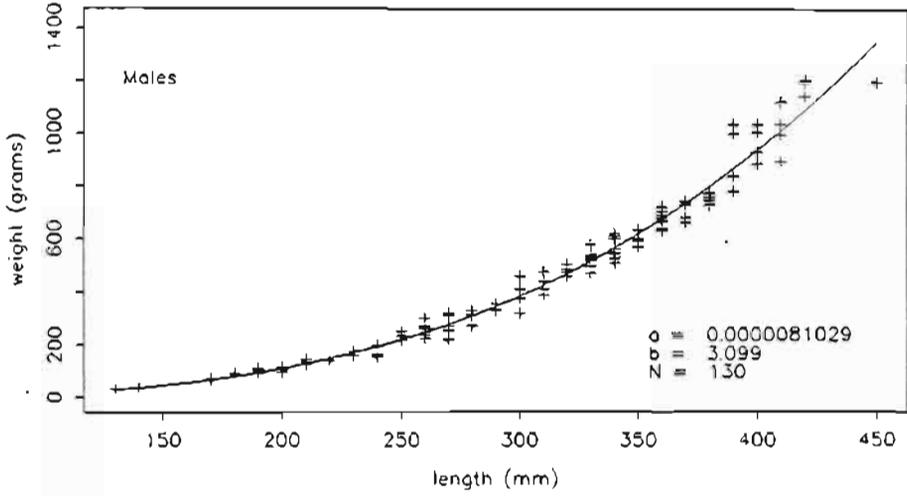


PACIFIC COD

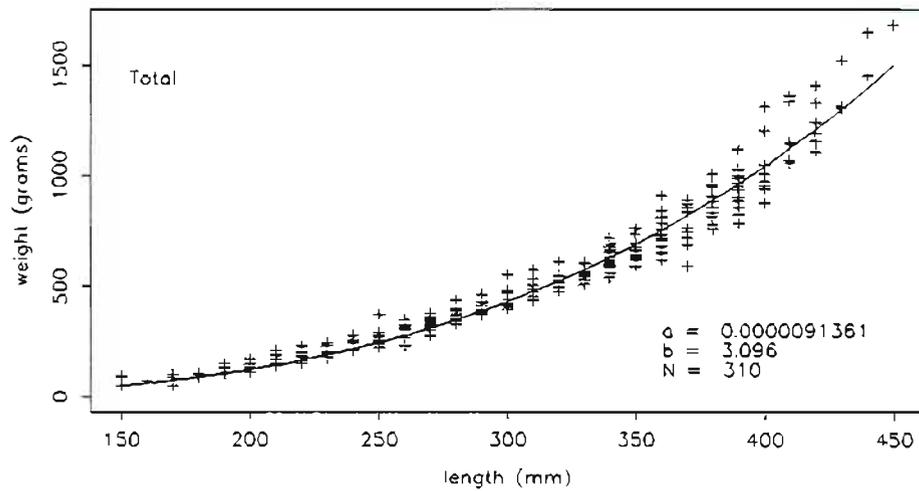
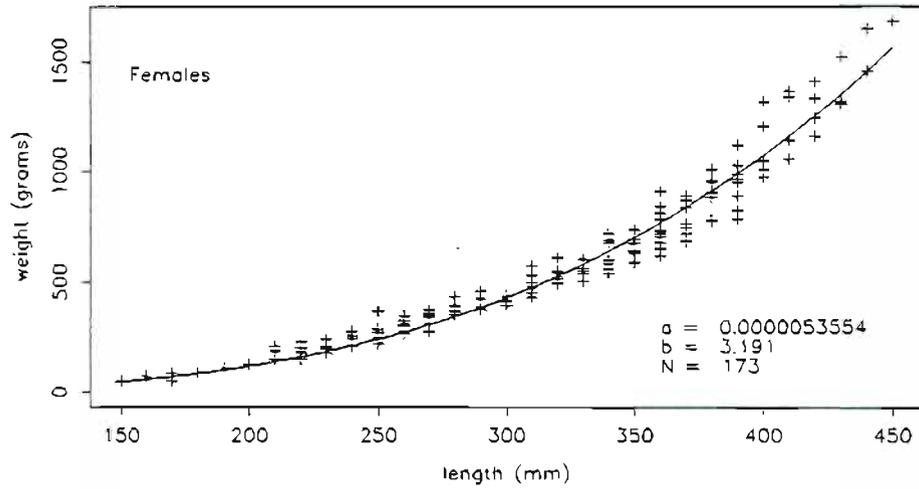
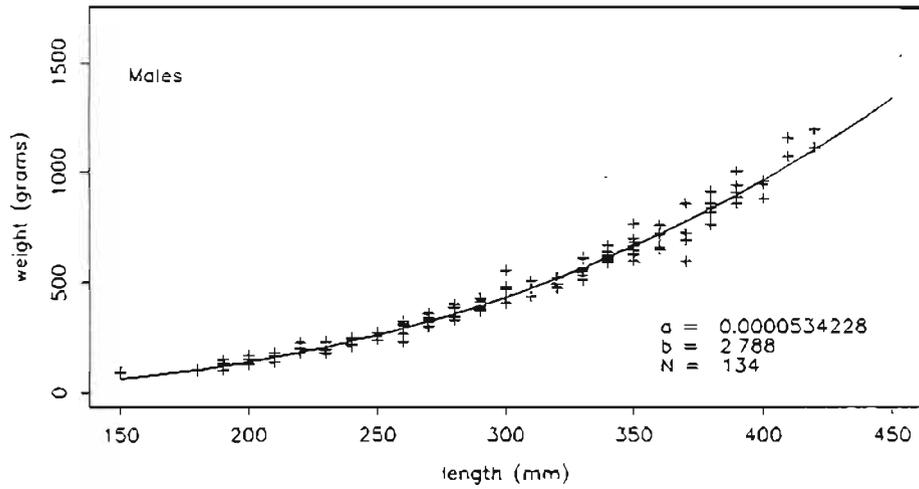
length vs weight regression ($\text{weight}_{(\text{grams})} = a \cdot \text{length}_{(\text{mm})}^b$)

PACIFIC OCEAN PERCH

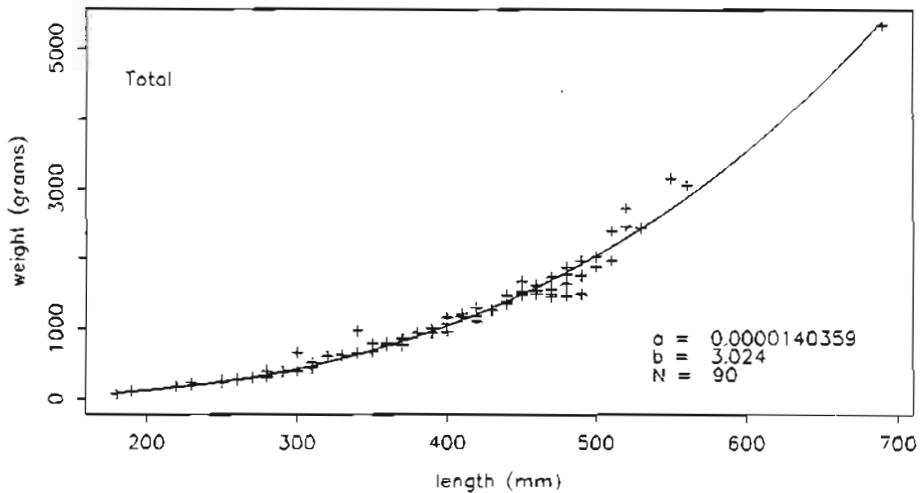
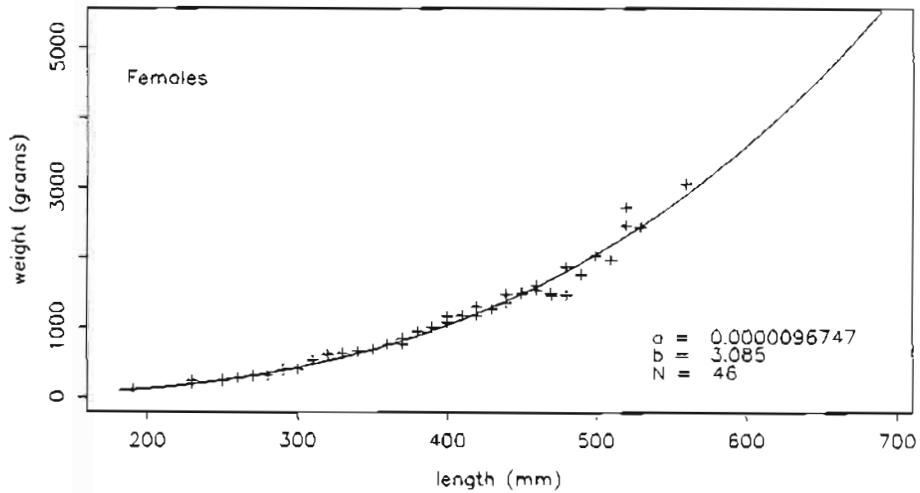
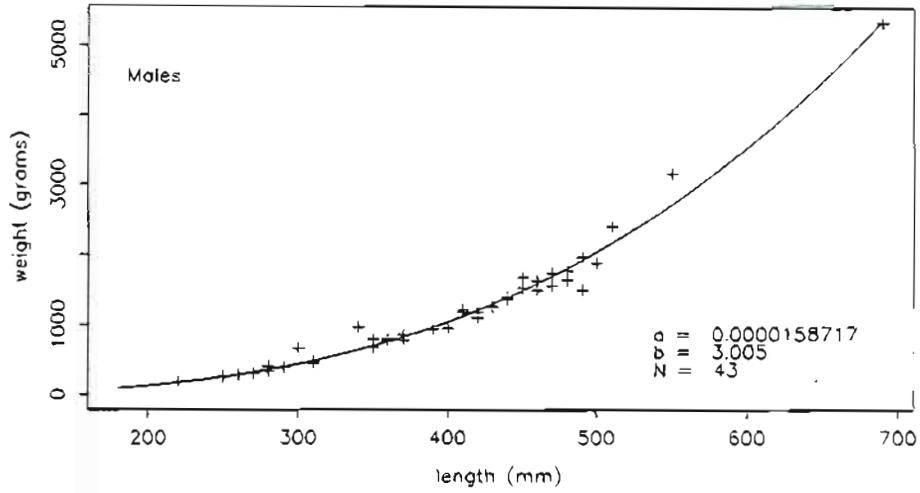
length vs weight regression (weight_(grams) = a · length_(mm)^b)



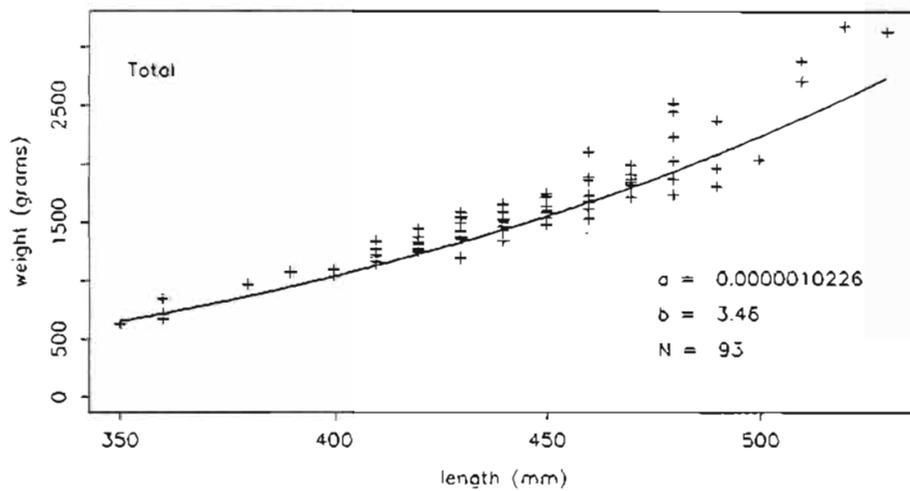
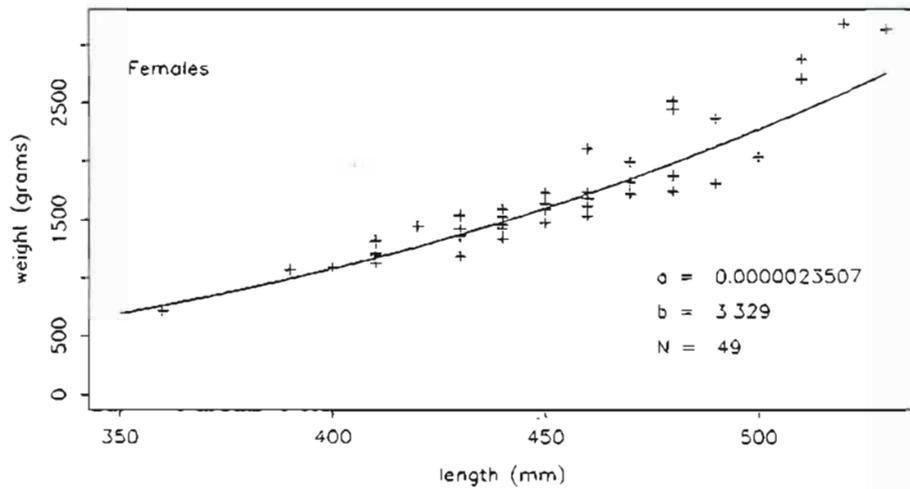
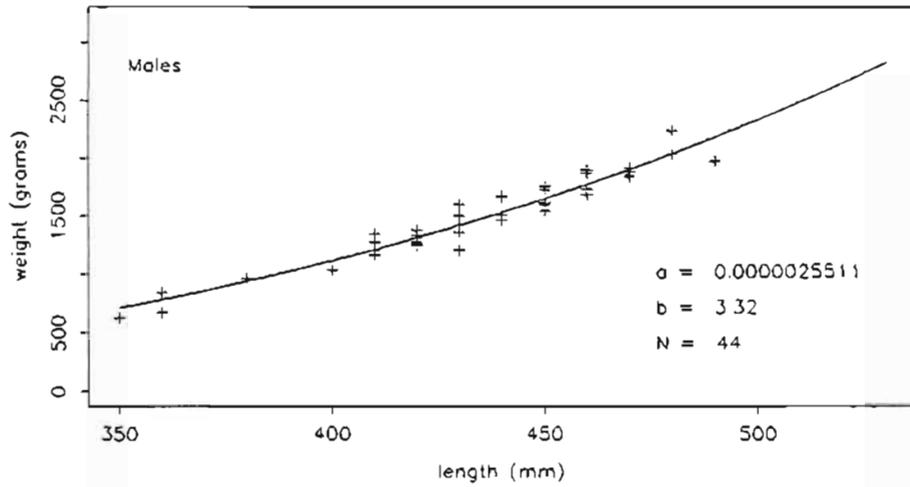
NORTHERN ROCKFISH

length vs weight regression (weight_(grams) = a * length_(mm)^b)

ROUGHEYE ROCKFISH

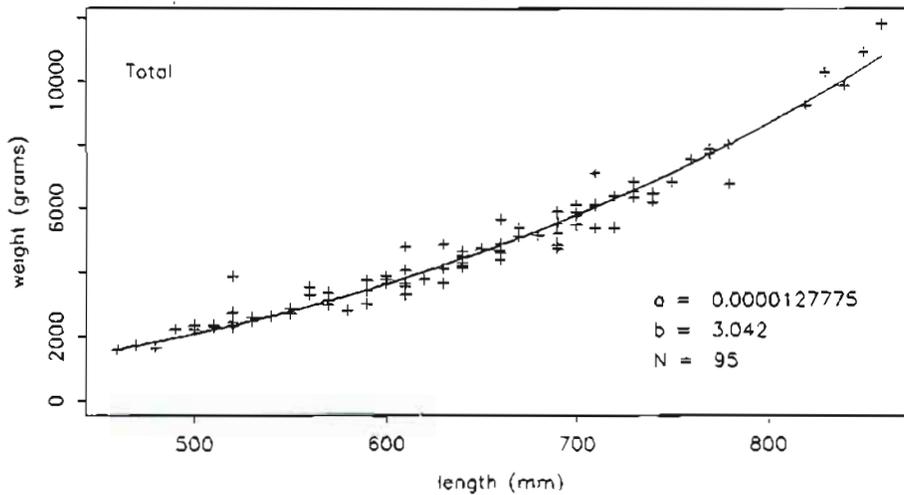
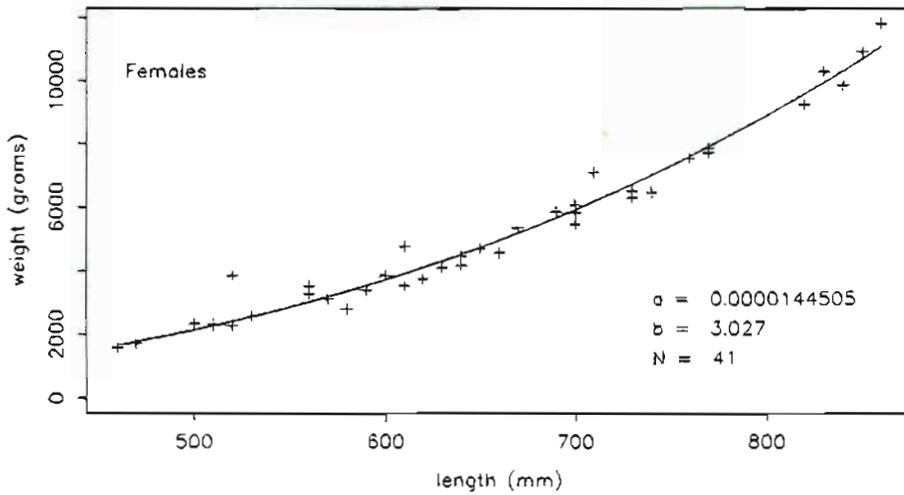
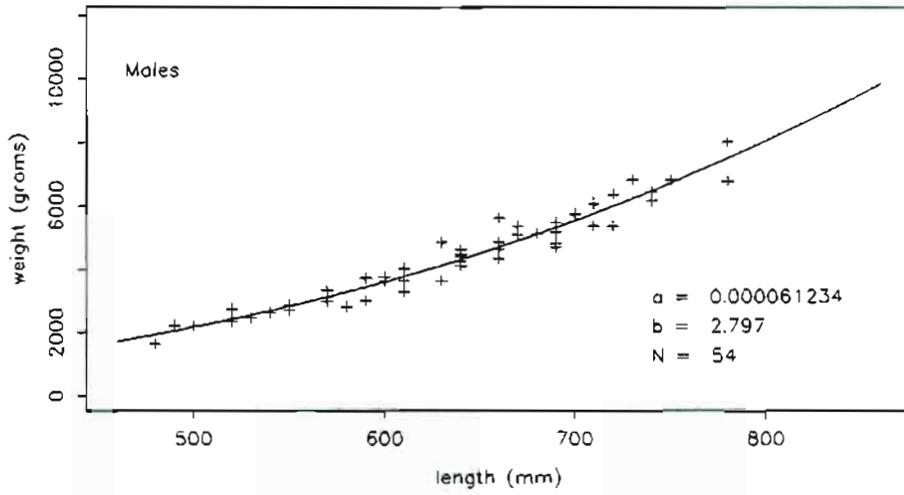
length vs weight regression (weight_(grams) = a * length_(mm)^b)

DUSKY ROCKFISH

length vs weight regression ($\text{weight}_{(\text{grams})} = a \cdot \text{length}_{(\text{mm})}^b$)

SHORTRAKER ROCKFISH

length vs weight regression (weight_(grams) = a • length_(mm)^b)



APPENDIX E

Catch Per Unit Effort and Biomass Estimates
by Strata for Principal Species

Appendix E presents estimates of catch-per-unit-effort (CPUE) and biomass for the most dominant species. Estimates of variance and confidence intervals do not incorporate variation associated with measurements of effort. CPUE is measured in kilograms per square kilometer (kg/km^2) area. Estimates are given for each strata in which catch occurred. Catches are ranked in descending order. The strata are defined in Appendix B.

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Table E-1.- Total number of survey hauls, hauls containing arrowtooth flounder, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C. I.	Upper C. I.
22	Chirikof Bank	13	8	26,377	2.02E+08	289,954	0	630,763
220	Lower Shelikof Gully	12	12	22,859	2.48E+08	227,838	0	573,415
131	Portlock Flats	28	27	21,238	2.73E+07	155,452	76,910	233,993
130	Albatross Gullies	36	36	16,706	8,348,979	130,928	84,923	176,932
121	Shelikof Edge	20	20	15,463	2.08E+07	118,647	45,494	191,800
120	East Shumagin Gully	68	67	12,605	2,597,083	139,692	104,015	175,368
110	Sanak Gully	12	12	11,191	6,151,015	47,364	24,260	70,468
112	West Shumagin Gully	10	10	9,327	880,259	21,145	16,333	25,956
150	Baranof-Chichagof Shelf	10	10	8,684	5,890,180	35,623	13,103	58,143
132	Barren Islands	23	23	7,427	820,777	81,311	60,739	101,882
133	Kenai Flats	29	28	7,347	2,588,340	88,174	48,631	127,717
122	Chirikof Outer Shelf	18	18	7,304	5,030,443	36,477	12,844	60,111
230	Kenai Gullies	18	16	7,282	1.71E+07	49,001	0	107,662
140	Middleton Shelf	19	19	6,836	5,565,931	53,316	14,656	91,977
111	Shumagin Outer Shelf	24	24	6,521	9,840,487	52,402	244	104,560
232	Upper Shelikof Gully	5	5	5,969	2,625,217	19,039	4,692	33,386
30	Albatross Shallows	14	13	5,565	1,814,689	34,050	16,245	51,854
35	N Kodiak Shallows	1	1	4,957	0	11,902	0	0
134	Kodiak Outer Shelf	13	10	4,658	3,542,178	23,644	2,826	44,462
31	Albatross Banks	23	19	4,324	3,980,599	66,328	2,858	129,798
10	Fox Islands	24	19	3,361	2,219,616	28,962	2,404	55,521
143	Fairweather Shelf	13	13	3,102	1,036,428	23,549	6,711	40,387
231	Kodiak Slope	6	6	2,664	1,945,860	4,331	0	10,161
13	Shumagin Bank	13	12	2,652	1,525,689	38,784	0	78,147
40	Yakutat Shallows	8	8	2,124	898,389	17,760	0	36,504
11	Davidson Bank	29	24	1,880	166,166	25,712	14,293	37,131
141	Yakataga Shelf	10	10	1,733	125,641	9,309	5,003	13,616
142	Yakutat Flats	14	14	1,631	136,595	13,652	6,968	20,336
20	Upper Alaska Pen	10	6	1,574	466,111	13,041	249	25,833
41	Middleton Shallows	9	7	1,563	1,317,551	13,244	0	35,678
33	Kenai Peninsula	6	6	1,495	284,487	8,242	684	15,801
12	Lower Alaska Pen	9	7	1,467	651,690	10,918	0	24,773
221	Chirikof Slope	4	4	1,425	241,736	2,185	0	4,584
240	Yakutat Gullies	27	27	1,385	77,653	4,982	2,920	7,043
151	Prince of Wales Shelf	13	13	1,381	214,996	7,967	2,138	13,795
21	Semidi Bank	5	4	1,066	638,615	7,781	0	23,973
341	Yakutat Slope	13	11	838	217,816	1,027	0	2,272
251	Prince of Wales Slope	18	18	593	28,010	2,370	958	3,782
350	SE Deep Gullies	16	15	562	148,605	1,167	0	2,872
250	Baranof-Chichagof Slope	9	8	492	13,020	510	238	783
210	Shumagin Slope	9	8	440	11,764	1,204	519	1,889
351	Southeastern Slope	2	2	397	36,465	321	0	2,285
330	Kodiak Slope	6	3	367	100,043	1,088	0	3,495
320	Chirikof Slope	4	3	309	13,366	505	0	1,105
241	Yakutat Slope	9	8	262	3,044	334	171	496
340	Yakutat Deep Gullies	12	12	221	2,294	385	202	668
310	Shumagin Slope	7	3	45	1,119	114	0	321
32	Lower Cook Inlet	7	5	37	259	390	0	802

Table E-2.- - Total number of survey hauls, hauls containing Pacific halibut, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

Strata code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C. I.	Upper C. I.
21	Semidi Bank	5	5	4,464	5,315,807	32,582	0	79,297
31	Albatross Banks	23	22	3,159	662,086	48,461	22,576	74,346
12	Lower Alaska Pen	9	8	2,763	1,027,971	20,563	3,161	37,965
131	Portlock Flats	28	26	2,291	154,991	16,769	10,856	22,682
35	N Kodiak Shallows	1	1	2,009	0	4,824	0	0
112	West Shumagin Gully	10	9	1,899	292,140	4,305	1,533	7,077
22	Chirikof Bank	13	12	1,824	205,569	20,049	9,189	30,910
134	Kodiak Outer Shelf	13	12	1,682	234,345	8,538	3,184	13,893
110	Sanak Gully	12	11	1,429	198,404	6,050	1,901	10,200
130	Albatross Gullies	36	32	1,335	57,097	10,460	6,655	14,264
13	Shumagin Bank	13	12	1,314	79,977	19,218	10,206	28,231
10	Fox Islands	24	24	1,248	42,807	10,749	7,061	14,437
120	East Shumagin Gully	68	62	1,234	58,105	13,675	8,339	19,012
11	Davidson Bank	29	29	1,109	21,902	15,169	11,024	19,315
121	Shelikof Edge	20	18	1,078	51,442	8,273	4,631	11,915
230	Kenai Gullies	18	6	1,059	551,371	7,126	0	17,669
30	Albatross Shallows	14	11	1,028	79,282	6,291	2,570	10,013
122	Chirikof Outer Shelf	18	16	942	47,393	4,702	2,408	6,996
41	Middleton Shallows	9	8	935	85,270	7,923	2,216	13,630
20	Upper Alaska Pen	10	8	905	71,536	7,492	2,481	12,504
111	Shumagin Outer Shelf	24	20	897	23,752	7,207	4,645	9,770
150	Baranof-Chichagof Shelf	10	6	733	54,216	3,006	845	5,167
140	Middleton Shelf	19	17	639	50,705	4,986	1,296	8,676
133	Kenai Flats	29	14	635	34,351	7,625	3,070	12,181
220	Lower Shelikof Gully	12	7	635	151,141	6,328	0	14,857
221	Chirikof Slope	4	2	599	246,700	919	0	3,342
241	Yakutat Slope	9	4	561	77,082	716	0	1,533
33	Kenai Peninsula	6	4	513	58,166	2,826	0	6,243
40	Yakutat Shallows	8	6	496	35,021	4,145	444	7,846
132	Barran Islands	23	15	388	10,488	4,250	1,925	6,575
141	Yakataga Shelf	10	5	368	38,419	1,976	0	4,357
143	Fairweather Shelf	13	7	347	44,429	2,633	0	6,119
231	Kodiak Slope	6	2	278	54,426	452	0	1,427
32	Lower Cook Inlet	7	5	278	14,640	2,909	0	6,010
351	Southeastern Slope	2	1	254	64,357	205	0	2,815
232	Upper Shelikof Gully	5	4	248	6,026	790	103	1,477
251	Prince of Wales Slope	18	4	236	27,059	943	0	2,331
142	Yakutat Flats	14	6	186	7,870	1,555	0	3,159
151	Prince of Wales Shelf	13	2	123	7,577	710	0	1,804
210	Shumagin Slope	9	2	74	2,520	202	0	519
341	Yakutat Slope	13	1	68	4,614	83	0	264
350	SE Deep Gullies	16	2	64	1,963	132	0	328
340	Yakutat Deep Gullies	12	2	49	1,516	85	0	234
250	Baranof-Chichagof Slope	9	1	44	1,909	45	0	150
240	Yakutat Gullies	27	4	21	122	75	0	156

Table E-3. - Total number of survey hauls, hauls containing flathead sole, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

Strata code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C. I.	Upper C. I.
30	Albatross Shallows	14	11	8,927	1.71E+07	54,624	0	109,278
35	N Kodiak Shallows	1	1	4,359	0	10,466	0	0
12	Lower Alaska Pen	9	6	4,095	1,749,332	30,479	7,778	53,180
112	West Shumagin Gully	10	10	2,534	594,061	5,745	1,793	9,698
22	Chirikof Bank	13	8	2,029	329,809	22,306	8,550	36,062
130	Albatross Gullies	36	36	1,745	102,191	13,678	8,588	18,768
110	Sanak Gully	12	11	1,343	126,957	5,684	2,364	9,003
41	Middleton Shallows	9	6	1,313	965,770	11,131	0	30,338
120	East Shumagin Gully	68	61	1,115	40,674	12,353	7,889	16,818
131	Portlock Flats	28	22	988	48,658	7,235	3,922	10,548
140	Middleton Shelf	19	18	969	49,524	7,559	3,913	11,206
20	Upper Alaska Pen	10	7	779	126,396	6,453	0	13,114
121	Shelikof Edge	20	18	745	54,651	5,716	1,962	9,470
11	Davldson Bank	29	20	731	68,174	10,004	2,690	17,319
132	Barren Islands	23	18	651	21,687	7,127	3,784	10,471
232	Upper Shelikof Gully	5	5	623	39,366	1,988	231	3,745
13	Shumagin Bank	13	5	614	170,455	8,980	0	22,137
133	Kenai Flats	29	25	569	32,092	6,830	2,427	11,233
220	Lower Shelikof Gully	12	10	499	12,321	4,972	2,536	7,407
141	Yakataga Shelf	10	7	488	91,065	2,620	0	6,286
31	Albatross Banks	23	6	468	61,201	7,173	0	16,043
33	Kenai Peninsula	6	5	391	50,798	2,167	0	5,351
21	Semidi Bank	5	2	347	50,320	2,530	0	7,075
40	Yakutat Shallows	8	8	315	13,146	2,632	365	4,900
240	Yakutat Gullies	27	20	312	12,366	1,123	300	1,946
230	Kenai Gullies	18	11	209	8,380	1,404	104	2,704
111	Shumagin Outer Shelf	24	11	72	917	577	74	1,081
231	Kodiak Slope	6	4	71	2,843	115	0	338
122	Chirikof Outer Shelf	18	9	60	803	298	0	597
143	Fairweather Shelf	13	7	56	513	429	54	803
21	Semidi Bank	9	5	42	233	114	18	211
32	Lower Cook Inlet	7	3	41	945	431	0	1,218
10	Fox Islands	24	8	41	456	354	0	735
142	Yakutat Flats	14	6	28	179	233	0	475
221	Chirikof Slope	4	2	22	432	34	0	135
340	Yakutat Deep Gullies	12	2	17	158	29	0	78
134	Kodiak Outer Shelf	13	3	17	92	84	0	190
251	Prince of Wales Slope	18	3	8	27	33	0	77
241	Yakutat Slope	9	3	3	3	3	0	9
330	Kodiak Slope	6	1	2	2	5	0	16
150	Baranof-Chichagof Shelf	10	1	1	2	6	0	20
151	Prince of Wales Shelf	13	1	0	0	1	0	3

Table E-4.- - Total number of survey hauls, hauls containing rock sole, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

Strata code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C. I.	Upper C. I.
31	Albatross Banks	23	23	2,270	314,772	34,819	16,971	52,667
10	Fox Islands	24	22	2,152	105,444	18,539	12,750	24,328
11	Davidson Bank	29	28	1,936	164,360	26,476	15,119	37,833
30	Albatross Shallows	14	14	1,692	423,357	10,351	1,752	18,951
12	Lower Alaska Pen	9	9	1,486	343,272	11,060	1,004	21,116
22	Chirikof Bank	13	7	1,218	1,251,094	13,390	0	40,182
13	Shumagin Bank	13	11	1,143	470,541	16,712	0	38,572
111	Shumagin Outer Shelf	24	18	1,051	47,977	8,444	4,803	12,086
20	Upper Alaska Pen	10	8	421	63,084	3,485	0	8,191
21	Semidi Bank	5	5	363	45,213	2,651	0	6,959
134	Kodiak Outer Shelf	13	8	360	32,098	1,829	0	3,811
41	Middleton Shallows	9	3	272	28,650	2,309	0	5,617
131	Portlock Flats	28	11	258	17,057	1,889	0	3,850
32	Lower Cook Inlet	7	7	257	5,947	2,687	711	4,664
33	Kenai Peninsula	6	2	242	55,736	1,336	0	4,681
121	Shelikof Edge	20	6	133	9,432	1,024	0	2,583
120	East Shumagin Gully	68	23	117	1,169	1,292	535	2,049
110	Sanak Gully	12	10	112	3,892	472	0	1,054
130	Albatross Gullies	36	9	109	3,720	855	0	1,826
112	West Shumagin Gully	10	6	92	1,497	208	10	407
122	Chirikof Outer Shelf	18	4	55	1,056	276	0	618
143	Fairweather Shelf	13	1	38	1,422	286	0	910
150	Baranof-Chichagof Shelf	10	2	32	833	129	0	397
220	Lower Shelikof Gully	12	1	8	63	79	0	253
210	Shumagin Slope	9	2	5	17	14	0	40
132	Barren Islands	23	4	2	1	23	0	47
140	Middleton Shelf	19	2	2	2	16	0	39
133	Kenai Flats	29	1	2	4	23	0	71
40	Yakutat Shallows	8	1	2	2	13	0	43

Table E-5.- - Total number of survey hauls, hauls containing rex sole, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C. I.	Upper C. I.
130	Albatross Gullies	36	30	1,903	176,417	14,917	8,229	21,604
131	Portlock Flats	28	23	1,451	124,732	10,617	5,312	15,921
220	Lower Shelikof Gully	12	11	1,144	533,436	11,400	0	27,423
231	Kodiak Slope	6	5	901	568,984	1,464	0	4,617
221	Chirikof Slope	4	3	780	192,042	1,195	0	3,333
140	Middleton Shelf	19	19	721	48,812	5,624	2,004	9,245
122	Chirikof Outer Shelf	18	13	694	39,901	3,467	1,362	5,572
121	Shelikof Edge	20	16	654	62,622	5,022	1,003	9,040
210	Shumagin Slope	9	7	551	77,870	1,508	0	3,269
120	East Shumagin Gully	68	60	541	11,085	5,993	3,663	8,324
230	Kenai Gullies	18	16	494	29,834	3,324	871	5,776
22	Chirikof Bank	13	5	425	58,330	4,675	0	10,460
40	Yakutat Shallows	8	7	393	84,046	3,288	0	9,022
133	Kenai Flats	29	28	381	6,458	4,571	2,596	6,546
111	Shumagin Outer Shelf	24	13	338	15,316	2,713	655	4,770
150	Baranof-Chichagof Shelf	10	9	330	22,572	1,354	0	2,748
134	Kodiak Outer Shelf	13	6	306	22,449	1,555	0	3,212
33	Kenai Peninsula	6	4	287	31,348	1,579	0	4,088
30	Albatross Shallows	14	7	274	34,744	1,676	0	4,140
251	Prince of Wales Slope	18	17	267	5,996	1,066	413	1,720
250	Baranof-Chichagof Slope	9	8	249	17,006	258	0	569
350	SE Deep Gullies	16	12	206	6,223	428	79	777
240	Yakutat Gullies	27	24	205	2,514	737	366	1,108
132	Barron Islands	23	21	174	4,231	1,909	432	3,385
41	Middleton Shallows	9	5	166	14,818	1,406	0	3,785
110	Sanak Gully	12	11	162	5,869	684	0	1,398
112	West Shumagin Gully	10	9	113	2,647	257	0	521
320	Chirikof Slope	4	2	93	7,625	152	0	606
340	Yakutat Deep Gullies	12	9	83	651	145	47	243
330	Kodiak Slope	6	5	81	1,165	240	0	499
241	Yakutat Slope	9	8	73	2,458	94	0	240
11	Davidson Bank	29	14	73	1,258	996	2	1,990
351	Southeastern Slope	2	2	72	1,643	58	0	475
143	Fairweather Shelf	13	9	65	383	495	172	819
232	Upper Shelikof Gully	5	5	61	1,252	194	0	508
31	Albatross Banks	23	3	55	2,094	836	0	2,292
35	N Kodiak Shallows	1	1	53	0	128	0	0
141	Yakataga Shelf	10	7	52	798	280	0	624
151	Prince of Wales Shelf	13	11	48	725	279	0	617
341	Yakutat Slope	13	9	44	281	54	9	99
142	Yakutat Flats	14	12	22	37	181	71	291
310	Shumagin Slope	7	2	21	361	52	0	170
12	Lower Alaska Pen	9	5	17	132	129	0	326
20	Upper Alaska Pen	10	5	16	52	132	0	267
10	Fox Islands	24	4	8	27	71	0	164
13	Shumagin Bank	13	2	7	48	107	0	327
21	Semidi Bank	5	1	1	1	7	0	26
32	Lower Cook Inlet	7	0	0	0	0	0	0

Table E-6.- Total number of survey hauls, hauls containing Dover sole, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C. I.	Upper C. I.
131	Portlock Flats	28	22	2,020	211,646	14,785	7,876	21,695
140	Middleton Shelf	19	19	1,176	48,635	9,167	5,553	12,781
130	Albatross Gullies	36	33	1,121	72,950	8,788	4,487	13,088
220	Lower Shelikof Gully	12	11	1,028	542,731	10,242	0	26,404
340	Yakutat Deep Gullies	12	10	863	64,475	1,502	630	2,473
22	Chirikof Bank	13	5	846	498,526	9,304	0	26,217
350	SE Deep Gullies	16	16	811	57,173	1,683	626	2,741
134	Kodiak Outer Shelf	13	4	662	117,948	3,360	0	7,159
240	Yakutat Gullies	27	26	659	27,800	2,371	1,138	3,805
230	Kenai Gullies	18	16	578	14,503	3,890	2,180	5,600
141	Yakataga Shelf	10	8	515	83,187	2,766	0	6,270
133	Kenai Flats	29	28	512	14,354	6,142	3,197	9,087
330	Kodiak Slope	6	6	481	46,490	1,425	0	3,065
341	Yakutat Slope	13	13	481	26,308	589	157	1,022
251	Prince of Wales Slope	18	18	429	24,692	1,715	389	3,041
231	Kodiak Slope	6	6	422	19,044	687	110	1,264
320	Chirikof Slope	4	4	375	15,389	612	0	1,267
121	Shelikof Edge	20	17	373	6,376	2,860	1,578	4,142
132	Barran Islands	23	18	349	9,769	3,823	1,579	6,068
260	Baranof-Chichagof Slope	9	8	330	20,068	342	4	681
310	Shumagin Slope	7	5	281	15,498	711	0	1,481
351	Southeastern Slope	2	2	251	2,039	203	0	667
221	Chirikof Slope	4	3	225	10,695	346	0	850
150	Baranof-Chichagof Shelf	10	10	219	7,635	898	88	1,709
122	Chirikof Outer Shelf	18	12	188	3,137	937	346	1,527
143	Fairweather Shelf	13	11	181	7,128	1,377	0	2,773
120	East Shumagin Gully	68	43	130	722	1,445	850	2,040
142	Yakutat Flats	14	8	125	5,281	1,043	0	2,358
30	Albatross Shallows	14	5	105	6,926	642	0	1,742
35	N Kodiak Shallows	1	1	80	0	191	0	0
31	Albatross Banks	23	3	59	2,712	903	0	2,560
111	Shumagin Outer Shelf	24	6	58	958	467	0	982
241	Yakutat Slope	9	6	56	644	71	0	145
40	Yakutat Shallows	8	5	54	1,095	456	0	1,110
41	Middleton Shallows	9	6	46	1,188	388	0	1,062
33	Kenai Peninsula	6	4	46	1,117	252	0	726
110	Sanak Gully	12	5	41	851	174	0	445
112	West Shumagin Gully	10	4	25	372	57	0	156
210	Shumagin Slope	9	4	18	96	50	0	112
20	Upper Alaska Pen	10	3	15	98	128	0	313
151	Prince of Wales Shelf	13	7	13	60	77	0	175
13	Shumagin Bank	13	1	11	112	155	0	492
12	Lower Alaska Pen	9	2	4	9	33	0	84
21	Semidi Bank	5	1	2	6	17	0	65
232	Upper Shelikof Gully	5	1	2	4	6	0	24

Table E-7.- - Total number of survey hauls, hauls containing yellowfin sole, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C .I.	Upper C .I.
12	Lower Alaska Pen	9	7	6,131	1.23E+07	45,636	0	105,724
32	Lower Cook Inlet	7	2	508	134,382	5,323	0	14,716
112	West Shumagin Gully	10	3	337	30,332	764	0	1,657
20	Upper Alaska Pen	10	4	207	38,620	1,712	0	5,394
11	Davidson Bank	29	3	189	33,269	2,579	0	7,689
22	Chirikof Bank	13	4	155	7,851	1,700	0	3,822
13	Shumagin Bank	13	2	151	22,650	2,211	0	6,997
30	Albatross Shallows	14	4	112	6,230	683	0	1,727
31	Albatross Banks	23	2	68	4,093	1,039	0	3,074
120	East Shumagin Gully	68	3	11	65	124	0	302

Table E-8.- - Total number of survey hauls, hauls containing walleye pollock, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C. I.	Upper C. I.
130	Albatross Gullies	36	33	23,230	1.39E+07	182,064	122,713	241,415
230	Kenai Gullies	18	18	9,170	5.60E+07	61,710	0	167,987
112	West Shumagin Gully	10	8	7,923	1.66E+07	17,963	0	38,856
12	Lower Alaska Pen	9	7	7,899	1.26E+07	58,792	0	119,740
30	Albatross Shallows	14	13	6,405	3,383,120	39,191	14,881	63,501
22	Chirikof Bank	13	8	5,661	6,126,041	62,233	2,946	121,520
20	Upper Alaska Pen	10	9	5,518	7,453,051	45,710	0	96,861
110	Sanak Gully	12	12	4,648	1.30E+07	19,674	0	53,212
11	Davidson Bank	29	20	4,277	1.00E+07	58,506	0	147,294
231	Kodiak Slope	6	5	4,228	4,778,285	6,873	0	16,010
121	Shellkof Edge	20	19	3,457	1,463,288	26,524	7,098	45,950
232	Upper Shelikof Gully	5	5	3,360	398,347	10,718	5,129	16,306
132	Barren Islands	23	23	3,338	233,954	36,547	25,564	47,530
131	Portlock Flats	28	20	2,744	851,042	20,086	6,230	33,942
31	Albatross Banks	23	12	2,520	4,456,274	38,657	0	105,812
120	East Shumagin Gully	68	46	2,484	1,074,121	27,528	4,584	50,472
220	Lower Shelikof Gully	12	11	2,224	302,371	22,168	10,104	34,231
133	Kenai Flats	29	27	2,019	588,625	24,236	5,379	43,093
35	N Kodiak Shallows	1	1	1,887	0	4,531	0	0
250	Baranof-Chichagof Slope	9	8	1,854	1,595,282	1,920	0	4,937
33	Kenai Peninsula	6	5	1,739	618,275	9,585	0	20,727
140	Middleton Shelf	19	19	1,612	210,651	12,573	5,052	20,094
210	Shumagin Slope	9	8	1,485	344,438	4,063	359	7,767
150	Baranof-Chichagof Shelf	10	9	1,467	557,513	6,018	0	12,946
122	Chirikof Outer Shelf	18	13	1,448	1,243,748	7,231	0	18,983
240	Yakutat Gullies	27	26	1,267	198,400	4,560	1,265	7,855
241	Yakutat Slope	9	8	1,231	383,801	1,571	0	3,394
251	Prince of Wales Slope	18	15	1,088	194,576	4,349	627	8,072
41	Middleton Shallows	9	7	1,008	360,706	8,547	0	20,285
141	Yakataga Shelf	10	9	849	38,188	4,559	2,185	6,933
143	Fairweather Shelf	13	12	768	116,804	5,833	180	11,485
134	Kodiak Outer Shelf	13	6	657	129,431	3,334	0	7,313
40	Yakutat Shallows	8	8	650	56,859	5,436	720	10,152
221	Chirikof Slope	4	3	523	184,386	801	0	2,896
341	Yakutat Slope	13	8	370	72,254	453	0	1,170
340	Yakutat Deep Gullies	12	9	350	21,761	609	45	1,174
13	Shumagin Bank	13	11	295	41,360	4,315	0	10,796
142	Yakutat Flats	14	14	276	4,471	2,307	1,098	3,516
330	Kodiak Slope	6	3	219	42,536	647	0	2,217
111	Shumagin Outer Shelf	24	14	195	8,723	1,564	11	3,117
151	Prince of Wales Shelf	13	7	154	9,205	891	0	2,097
10	Fox Islands	24	11	123	13,531	1,060	0	3,134
32	Lower Cook Inlet	7	6	89	1,420	934	0	1,899
351	Southeastern Slope	2	1	63	3,928	51	0	695
320	Chirikof Slope	4	1	29	847	48	0	199
310	Shumagin Slope	7	4	19	82	48	0	103
350	SE Deep Gullies	16	3	13	51	27	0	59
21	Semidi Bank	5	4	5	7	39	0	94

Table E-9.- - Total number of survey hauls, hauls containing Pacific cod, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

Strata code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C. I.	Upper C. I.
21	Semidi Bank	5	4	6,616	3.84E+07	48,289	0	173,800
12	Lower Alaska Pen	9	7	5,026	4,489,319	37,406	1,040	73,771
121	Shelikof Edge	20	18	3,468	1,115,553	26,609	9,648	43,571
11	Davidson Bank	29	26	2,934	587,356	40,129	18,660	61,598
30	Albatross Shallows	14	12	2,637	1,754,097	16,138	0	33,642
120	East Shumagin Gully	68	59	2,621	240,837	29,048	18,184	39,913
111	Shumagin Outer Shelf	24	21	2,552	259,772	20,511	12,037	28,986
22	Chirikof Bank	13	12	2,458	1,344,987	27,021	0	54,801
10	Fox Islands	24	21	2,385	458,349	20,550	8,481	32,619
122	Chirikof Outer Shelf	18	16	1,721	469,800	8,592	1,370	15,815
130	Albatross Gullies	36	34	1,588	72,538	12,446	8,168	16,734
134	Kodiak Outer Shelf	13	9	1,537	818,156	7,801	0	17,806
31	Albatross Banks	23	17	1,442	150,405	22,119	9,781	34,456
132	Barren Islands	23	23	1,414	80,328	15,485	9,049	21,920
221	Chirikof Slope	4	3	1,353	624,865	2,074	0	5,931
110	Sanak Gully	12	12	1,217	167,755	5,153	1,337	8,968
220	Lower Shelikof Gully	12	10	1,140	229,057	11,366	866	21,865
112	West Shumagin Gully	10	9	1,054	151,246	2,390	396	4,385
133	Kenai Flats	29	19	963	122,520	11,561	2,958	20,164
131	Portlock Flats	28	26	857	19,224	6,272	4,190	8,355
151	Prince of Wales Shelf	13	10	821	82,113	4,735	1,133	8,337
251	Prince of Wales Slope	18	12	770	77,930	3,080	724	5,436
232	Upper Shelikof Gully	5	5	604	17,678	1,927	749	3,104
41	Middleton Shallows	9	8	604	88,423	5,118	0	10,930
150	Baranof-Chichagof Shelf	10	9	533	30,592	2,187	564	3,810
13	Shumagin Bank	13	9	453	74,993	6,624	0	15,351
40	Yakutat Shallows	8	8	375	20,100	3,133	329	5,937
230	Kenai Gullies	18	9	357	32,919	2,402	0	4,979
210	Shumagin Slope	9	5	342	25,324	937	0	1,941
140	Middleton Shelf	19	14	332	7,195	2,586	1,196	3,976
20	Upper Alaska Pen	10	8	296	6,096	2,452	989	3,915
231	Kodiak Slope	6	4	283	20,362	460	0	1,056
250	Baranof-Chichagof Slope	9	8	263	3,758	272	126	419
32	Lower Cook Inlet	7	7	241	2,722	2,521	1,184	3,858
143	Fairweather Shelf	13	7	217	9,573	1,649	31	3,268
33	Kenai Peninsula	6	4	165	8,618	910	0	2,226
241	Yakutat Slope	9	4	159	8,955	202	0	481
142	Yakutat Flats	14	7	135	2,241	1,131	275	1,987
141	Yakataga Shelf	10	5	117	2,385	627	33	1,220
35	N Kodiak Shallows	1	1	33	0	80	0	0
350	SE Deep Gullies	16	3	14	71	29	0	66
240	Yakutat Gullies	27	2	10	46	35	0	85
310	Shumagin Slope	7	1	6	38	16	0	54

Table E-10.- - Total number of survey hauls, hauls containing sablefish, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

Strata code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C .I.	Upper C. I.
230	Kenai Gullies	18	16	7,992	1.03E+07	53,779	8,237	99,321
131	Portlock Flats	28	21	5,621	5,250,273	41,142	6,727	75,557
220	Lower Shelikof Gully	12	11	3,608	4,594,869	35,959	0	82,985
340	Yakutat Deep Gullies	12	12	2,326	607,300	4,044	1,061	7,027
350	SE Deep Gullies	16	15	1,960	290,887	4,068	1,683	6,453
221	Chirikof Slope	4	3	1,096	614,332	1,680	0	5,503
133	Kenai Flats	29	25	1,083	220,109	13,003	1,472	24,534
140	Middleton Shelf	19	19	949	59,132	7,403	3,418	11,388
320	Chirikof Slope	4	2	824	324,894	1,345	0	4,306
122	Chirikof Outer Shelf	18	8	800	273,008	3,994	0	9,500
341	Yakutat Slope	13	8	793	87,560	971	181	1,760
132	Barron Islands	23	18	780	158,203	8,540	0	17,572
111	Shumagin Outer Shelf	24	3	740	444,115	5,945	0	17,026
150	Baranof-Chichagof Shelf	10	10	675	49,409	2,768	706	4,831
33	Kenai Peninsula	6	4	665	246,610	3,667	0	10,705
240	Yakutat Gullies	27	25	596	32,597	2,143	808	3,479
130	Albatross Gullies	36	21	553	18,071	4,331	2,191	6,471
232	Upper Shelikof Gully	5	4	422	52,560	1,347	0	3,377
134	Kodiak Outer Shelf	13	5	407	41,944	2,064	0	4,330
120	East Shumagin Gully	68	27	374	15,805	4,144	1,361	6,927
330	Kodiak Slope	6	2	369	78,202	1,092	0	3,220
121	Shelikof Edge	20	10	310	14,985	2,378	412	4,344
250	Baranof-Chichagof Slope	9	6	274	15,180	284	0	578
241	Yakutat Slope	9	5	263	33,915	336	0	878
310	Shumagin Slope	7	3	253	16,483	640	0	1,434
231	Kodiak Slope	6	3	222	16,015	362	0	891
251	Prince of Wales Slope	18	13	211	8,067	845	87	1,602
210	Shumagin Slope	9	6	202	5,524	553	84	1,022
30	Albatross Shallows	14	3	112	7,256	683	0	1,809
351	Southeastern Slope	2	1	91	8,243	73	0	1,007
143	Fairweather Shelf	13	8	72	593	546	144	949
141	Yakataga Shelf	10	5	59	768	316	0	653
41	Middleton Shallows	9	3	38	618	320	0	805
20	Upper Alaska Pen	10	4	29	308	239	0	568
40	Yakutat Shallows	8	3	13	49	106	0	244
142	Yakutat Flats	14	4	11	47	96	0	220
151	Prince of Wales Shelf	13	4	8	26	46	0	110
110	Sanak Gully	12	2	3	3	11	0	26
31	Albatross Banks	23	1	2	4	31	0	94
112	West Shumagin Gully	10	1	2	3	4	0	13
11	Davidson Bank	29	1	0	0	1	0	3

Table E-11.- - Total number of survey hauls, hauls containing Pacific ocean perch, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

Strata code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C. I.	Upper C. I.
241	Yakutat Slope	9	8	21,926	4.08E+08	27,976	0	87,376
250	Baranof-Chichagof Slope	9	9	6,193	2,005,300	6,415	3,032	9,797
251	Prince of Wales Slope	18	18	4,980	3,463,312	19,917	4,213	35,621
350	SE Deep Gullies	16	10	3,340	8,706,063	6,930	0	19,978
221	Chirikof Slope	4	4	2,548	2,915,246	3,906	0	12,236
111	Shumagin Outer Shelf	24	10	2,248	2,721,267	18,066	0	45,495
351	Southeastern Slope	2	2	2,223	2,769,164	1,799	0	18,914
150	Baranof-Chichagof Shelf	10	10	2,222	832,391	9,114	649	17,680
341	Yakutat Slope	13	9	1,657	1,550,052	2,028	0	6,350
210	Shumagin Slope	9	7	1,397	386,753	3,823	0	7,748
131	Portlock Flats	28	18	1,127	459,106	8,253	0	18,429
122	Chirikof Outer Shelf	18	13	792	201,114	3,955	0	8,680
240	Yakutat Gullies	27	23	648	95,790	2,331	42	4,621
231	Kodiak Slope	6	5	622	115,375	1,011	0	2,431
230	Kenai Gullies	18	11	464	75,498	3,124	0	7,026
151	Prince of Wales Shelf	13	10	452	110,103	2,605	0	6,777
120	East Shumagin Gully	68	36	364	25,298	4,037	516	7,559
220	Lower Shelikof Gully	12	1	279	77,893	2,782	0	8,905
134	Kodiak Outer Shelf	13	5	259	27,669	1,314	0	3,154
141	Yakataga Shelf	10	3	245	48,882	1,319	0	4,005
340	Yakutat Deep Gullies	12	4	186	21,470	323	0	884
330	Kodiak Slope	6	3	145	16,942	429	0	1,419
121	Shelikof Edge	20	9	144	5,663	1,102	0	2,310
143	Fairweather Shelf	13	8	140	7,018	1,063	0	2,449
13	Shumagin Bank	13	4	140	12,595	2,043	0	5,619
112	West Shumagin Gully	10	4	63	2,746	142	0	411
133	Kenai Flats	29	15	62	475	739	203	1,275
142	Yakutat Flats	14	11	42	273	350	52	649
140	Middleton Shelf	19	4	31	767	244	0	698
21	Semidi Bank	5	2	24	230	176	0	483
130	Albatross Gullies	36	5	20	257	159	0	414
12	Lower Alaska Pen	9	2	16	110	115	0	295
10	Fox Islands	24	5	16	81	129	0	289
320	Chirikof Slope	4	2	11	52	17	0	55
132	Barren Islands	23	5	9	19	98	0	197
310	Shumagin Slope	7	1	5	29	14	0	47
33	Kenai Peninsula	6	2	5	11	26	0	72
31	Albatross Banks	23	3	5	14	70	0	189
110	Sanak Gully	12	2	4	8	15	0	42
11	Davidson Bank	29	4	2	3	27	0	75
20	Upper Alaska Pen	10	2	2	2	15	0	38

Table E-12.- Total number of survey hauls, hauls containing northern rockfish, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

Strata code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C. I.	Upper C. I.
134	Kodiak Outer Shelf	13	7	10,586	6.55E+07	53,737	0	143,242
131	Portlock Flats	28	11	1,964	1,111,402	14,373	0	30,206
111	Shumagin Outer Shelf	24	9	1,672	2,008,121	13,439	0	37,001
13	Shumagin Bank	13	6	1,612	962,282	23,570	0	54,668
120	East Shumagin Gully	68	23	328	76,741	3,635	0	9,768
221	Chirikof Slope	4	4	281	19,366	430	0	1,109
122	Chirikof Outer Shelf	18	11	252	10,637	1,260	174	2,347
210	Shumagin Slope	9	5	49	357	135	16	254
133	Kenai Flats	29	6	44	1,266	526	0	1,401
140	Middleton Shelf	19	5	42	768	326	0	780
21	Semidi Bank	5	2	40	1,170	290	0	983
121	Shelikof Edge	20	7	32	562	247	0	627
112	West Shumagin Gully	10	2	31	909	70	0	224
11	Davidson Bank	29	3	19	234	258	0	687
12	Lower Alaska Pen	9	2	17	273	124	0	408
10	Fox Islands	24	6	15	55	131	0	263
31	Albatross Banks	23	1	15	215	225	0	692
110	Sanak Gully	12	3	14	66	58	0	133
231	Kodiak Slope	6	2	8	28	14	0	36
130	Albatross Gullies	36	3	5	11	39	0	92
141	Yakataga Shelf	10	2	4	7	21	0	52
230	Kenai Gullies	18	2	2	2	13	0	34
232	Upper Shelikof Gully	5	1	2	3	6	0	21
241	Yakutat Slope	9	1	2	2	2	0	7
240	Yakutat Gullies	27	2	2	1	6	0	14
320	Chirikof Slope	4	1	1	1	1	0	6
41	Middleton Shallows	9	1	1	0	5	0	18
132	Barren Islands	23	1	1	0	6	0	18
20	Upper Alaska Pen	10	1	0	0	1	0	4

Table E-13.- - Total number of survey hauls, hauls containing rougheye rockfish, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C. I.	Upper C. I.
330	Kodiak Slope	6	6	3,691	4,455,805	10,630	0	26,694
320	Chirikof Slope	4	3	3,567	8,761,903	5,824	0	21,201
341	Yakutat Slope	13	13	1,715	368,409	2,100	481	3,720
351	Southeastern Slope	2	2	1,332	1,395,889	1,078	0	13,230
33	Kenai Peninsula	6	4	866	225,667	4,775	0	11,506
133	Kenai Flats	29	18	481	94,221	5,773	0	13,318
20	Upper Alaska Pen	10	2	298	86,365	2,472	0	7,978
240	Yakutat Gullies	27	20	295	9,643	1,062	335	1,788
350	SE Deep Gullies	16	13	263	7,620	545	159	931
210	Shumagin Slope	9	5	222	20,952	609	0	1,522
232	Upper Shelikof Gully	5	4	219	4,707	697	90	1,305
130	Albatross Gullies	36	11	187	5,169	1,465	321	2,610
310	Shumagin Slope	7	2	176	21,127	444	0	1,343
140	Middleton Shelf	19	15	171	6,592	1,335	4	2,665
220	Lower Shelikof Gully	12	9	165	5,841	1,643	0	3,320
241	Yakutat Slope	9	4	158	10,989	201	0	510
340	Yakutat Deep Gullies	12	8	150	6,032	262	0	559
230	Kenai Gullies	18	12	137	1,414	924	390	1,458
121	Shelikof Edge	20	9	93	1,196	713	168	1,268
131	Portlock Flats	28	18	68	588	501	137	865
231	Kodiak Slope	6	4	62	651	101	0	207
132	Barren Islands	23	11	56	475	612	118	1,107
30	Albatross Shallows	14	6	48	402	295	30	560
143	Fairweather Shelf	13	3	47	1,640	355	0	1,025
120	East Shumagin Gully	68	27	46	132	509	255	763
221	Chirikof Slope	4	2	42	1,388	65	0	247
141	Yakataga Shelf	10	5	38	357	205	0	434
13	Shumagin Bank	13	1	27	723	393	0	1,250
112	West Shumagin Gully	10	4	20	124	46	0	103
250	Baranof-Chichagof Slope	9	1	15	239	16	0	53
110	Sanak Gully	12	3	15	109	64	0	161
251	Prince of Wales Slope	18	4	14	77	54	0	128
151	Prince of Wales Shelf	13	1	13	165	74	0	235
142	Yakutat Flats	14	6	12	29	98	1	196
122	Chirikof Outer Shelf	18	4	8	22	39	0	88
134	Kodiak Outer Shelf	13	2	8	28	39	0	98
40	Yakutat Shallows	8	1	6	40	53	0	178
150	Baranof-Chichagof Shelf	10	1	4	17	17	0	55
41	Middleton Shallows	9	2	4	6	31	0	81
11	Davidson Bank	29	1	2	2	21	0	63
111	Shumagin Outer Shelf	24	2	0	0	2	0	5

Table E-14.- - Total number of survey hauls, hauls containing dusky rockfish, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C. I.	Upper C. I.
134	Kodiak Outer Shelf	13	4	1,799	1,983,853	9,134	0	24,714
131	Portlock Flats	28	13	873	158,681	6,387	404	12,370
140	Middleton Shelf	19	5	452	190,956	3,527	0	10,688
150	Baranof-Chichagof Shelf	10	3	230	48,987	945	0	2,999
111	Shumagin Outer Shelf	24	5	216	22,924	1,735	0	4,252
142	Yakutat Flats	14	3	162	11,428	1,355	0	3,288
12	Lower Alaska Pen	9	2	112	12,245	830	0	2,729
130	Albatross Gullies	36	9	85	1,580	666	33	1,299
120	East Shumagin Gully	68	15	79	1,942	870	0	1,846
143	Fairweather Shelf	13	1	71	5,071	541	0	1,718
231	Kodiak Slope	6	2	47	1,636	76	0	245
141	Yakataga Shelf	10	3	28	252	149	0	341
230	Kenai Gullies	18	3	27	515	179	0	501
121	Shelikof Edge	20	2	26	391	203	0	520
41	Middleton Shallows	9	2	23	332	192	0	549
13	Shumagin Bank	13	5	22	207	318	0	776
221	Chirikof Slope	4	3	21	59	32	0	70
241	Yakutat Slope	9	2	13	90	16	0	44
133	Kenai Flats	29	5	11	26	127	1	253
122	Chirikof Outer Shelf	18	3	10	35	50	0	113
210	Shumagin Slope	9	2	10	44	28	0	70
132	Barren Islands	23	3	8	25	89	0	204
240	Yakutat Gullies	27	4	8	19	29	0	60
250	Baranof-Chichagof Slope	9	2	7	23	7	0	19
31	Albatross Banks	23	1	5	25	77	0	238
22	Chirikof Bank	13	1	5	22	52	0	165
232	Upper Shelikof Gully	5	1	5	21	15	0	56
10	Fox Islands	24	2	4	12	38	0	99
32	Lower Cook Inlet	7	1	3	7	28	0	96
220	Lower Shelikof Gully	12	1	3	7	26	0	82
112	West Shumagin Gully	10	1	2	4	4	0	15
11	Davidson Bank	29	1	1	0	10	0	29

Table E-15.- - Total number of survey hauls, hauls containing sharpchin rockfish, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C. I.	Upper C. I.
251	Prince of Wales Slope	18	10	5,407	1.12E+07	21,625	0	49,914
250	Baranof-Chichagof Slope	9	9	1,288	168,254	1,335	355	2,314
151	Prince of Wales Shelf	13	9	1,198	398,523	6,910	0	14,846
241	Yakutat Slope	9	6	919	258,522	1,173	0	2,669
134	Kodiak Outer Shelf	13	3	541	280,139	2,748	0	8,602
150	Baranof-Chichagof Shelf	10	8	356	19,188	1,459	174	2,745
143	Fairweather Shelf	13	2	120	13,888	908	0	2,857
141	Yakataga Shelf	10	4	56	1,375	299	0	750
131	Portlock Flats	28	10	38	172	282	84	479
140	Middleton Shelf	19	1	15	216	115	0	355
351	Southeastern Slope	2	1	13	157	10	0	139
133	Kenai Flats	29	9	9	20	103	0	214
240	Yakutat Gullies	27	6	8	19	28	0	60
231	Kodiak Slope	6	2	7	31	11	0	34
330	Kodiak Slope	6	2	3	5	10	0	26
320	Chirikof Slope	4	1	2	3	3	0	12
130	Albatross Gullies	36	1	2	3	13	0	40
340	Yakutat Deep Gullies	12	3	2	1	3	0	7
341	Yakutat Slope	13	1	1	1	1	0	3
142	Yakutat Flats	14	2	1	0	6	0	14
350	SE Deep Gullies	16	2	1	0	1	0	3
210	Shumagin Slope	9	1	1	0	2	0	5
230	Kenai Gullies	18	1	0	0	3	0	10
132	Barren Islands	23	1	0	0	3	0	10

Table E-16.- - Total number of survey hauls, hauls containing shorttraker rockfish, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C. I.	Upper C. I.
341	Yakutat Slope	13	13	3,108	1,165,646	3,806	925	6,687
351	Southeastern Slope	2	2	1,217	724,145	985	0	9,737
320	Chirikof Slope	4	3	898	269,066	1,467	0	4,162
330	Kodiak Slope	6	3	756	463,815	2,237	0	7,420
340	Yakutat Deep Gullies	12	6	289	21,146	503	0	1,060
350	SE Deep Gullies	16	8	271	13,585	562	47	1,077
310	Shumagin Slope	7	3	113	4,673	285	0	708
143	Fairweather Shelf	13	3	65	1,495	421	0	1,060
240	Yakutat Gullies	27	4	53	936	190	0	416
210	Shumagin Slope	9	1	28	803	78	0	256
220	Lower Shelikof Gully	12	1	17	277	166	0	531
231	Kodiak Slope	6	1	11	131	19	0	66
151	Prince of Wales Shelf	13	1	6	37	35	0	112
132	Barren Islands	23	1	5	26	66	0	171

Table E-17.- - Total number of survey hauls, hauls containing shortspine thornyhead, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C. I.	Upper C. I.
351	Southeastern Slope	2	2	1,653	154,159	1,338	0	5,376
250	Baranof-Chichagof Slope	9	9	1,248	129,154	1,292	434	2,151
350	SE Deep Gullies	16	16	983	60,052	2,041	957	3,124
320	Chirikof Slope	4	4	908	323,133	1,483	0	4,436
341	Yakutat Slope	13	13	653	15,582	800	467	1,133
330	Kodiak Slope	6	5	530	57,743	1,669	0	3,398
310	Shumagin Slope	7	5	394	36,536	996	0	2,179
340	Yakutat Deep Gullies	12	12	371	7,808	644	306	983
240	Yakutat Gullies	27	26	366	6,662	1,318	714	1,922
221	Chirikof Slope	4	1	359	129,179	551	0	2,304
251	Prince of Wales Slope	18	16	358	7,653	1,432	694	2,171
150	Baranof-Chichagof Shelf	10	7	322	23,315	1,319	0	2,736
210	Shumagin Slope	9	7	269	23,657	737	0	1,708
230	Kenai Gullies	18	12	259	11,793	1,743	201	3,285
231	Kodiak Slope	6	6	235	19,608	383	0	968
143	Fairweather Shelf	13	2	68	4,550	514	0	1,630
241	Yakutat Slope	9	7	63	824	81	0	165
140	Middleton Shelf	19	5	55	585	426	29	822
142	Yakutat Flats	14	3	42	1,142	348	0	959
151	Prince of Wales Shelf	13	6	21	168	124	0	287
141	Yakataga Shelf	10	2	16	213	83	0	261
131	Portlock Flats	28	1	8	72	62	0	189
133	Kenai Flats	29	2	4	11	45	0	128
134	Kodiak Outer Shelf	13	1	1	1	4	0	13
111	Shumagin Outer Shelf	24	1	1	0	5	0	16

Table E-18.- - Total number of survey hauls, hauls containing redstripe rockfish, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C. I.	Upper C. I.
151	Prince of Wales Shelf	13	8	2,353	3,436,892	13,575	0	36,880
150	Baranof-Chichagof Shelf	10	5	1,165	1,283,502	4,780	0	15,292
251	Prince of Wales Slope	18	8	727	152,456	2,909	0	6,204
140	Middleton Shelf	19	1	368	135,789	2,874	0	8,913
41	Middleton Shallows	9	1	45	2,051	384	0	1,269
143	Fairweather Shelf	13	1	17	288	129	0	410
250	Baranof-Chichagof Slope	9	3	14	78	15	0	36
133	Kenai Flats	29	2	1	1	15	0	37

Table E-19.- - Total number of survey hauls, hauls containing harlequin rockfish, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C .I.	Upper C. I.
134	Kodiak Outer Shelf	13	5	1,539	2,312,281	7,811	0	24,630
131	Portlock Flats	28	9	515	165,985	3,771	0	9,891
221	Chirikof Slope	4	1	344	118,321	527	0	2,205
151	Prince of Wales Shelf	13	8	241	26,990	1,389	0	3,454
251	Prince of Wales Slope	18	5	227	27,355	909	0	2,305
133	Kenai Flats	29	8	86	2,162	1,031	0	2,174
150	Baranof-Chichagof Shelf	10	8	66	906	272	0	652
41	Middleton Shallows	9	1	58	3,390	493	0	1,631
143	Fairweather Shelf	13	2	50	2,433	376	0	1,192
140	Middleton Shelf	19	1	39	1,521	304	0	943
241	Yakutat Slope	9	2	23	236	29	0	74
231	Kodiak Slope	6	2	21	196	35	0	93
111	Shumagin Outer Shelf	24	2	15	153	121	0	326
141	Yakataga Shelf	10	2	6	24	35	0	94
240	Yakutat Gullies	27	7	6	12	21	0	46
132	Barren Islands	23	2	2	2	20	0	55
250	Baranof-Chichagof Slope	9	4	2	1	2	0	4
350	SE Deep Gullies	16	2	2	2	3	0	9
341	Yakutat Slope	13	2	2	1	2	0	5
20	Upper Alaska Pen	10	1	1	2	11	0	34
130	Albatross Gullies	36	1	1	1	8	0	24
33	Kenai Peninsula	6	1	1	0	4	0	13
122	Chirikof Outer Shelf	18	1	1	0	3	0	10
340	Yakutat Deep Gullies	12	1	0	0	1	0	2
142	Yakutat Flats	14	1	0	0	3	0	10
13	Shumagin Bank	13	1	0	0	5	0	17
230	Kenai Gullies	18	1	0	0	2	0	7
121	Shelikof Edge	20	1	0	0	2	0	6
120	East Shumagin Gully	68	1	0	0	2	0	5

Table E-20.- - Total number of survey hauls, hauls containing silverygray rockfish, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C .I.	Upper C. I.
251	Prince of Wales Slope	18	11	922	261,504	3,687	0	8,003
151	Prince of Wales Shelf	13	9	720	161,255	4,156	0	9,204
140	Middleton Shelf	19	4	666	439,301	5,193	0	16,054
241	Yakutat Slope	9	4	54	694	69	0	147
150	Baranof-Chichagof Shelf	10	4	45	568	186	0	407
133	Kenai Flats	29	5	23	162	279	0	592
250	Baranof-Chichagof Slope	9	2	15	166	16	0	45
143	Fairweather Shelf	13	1	14	207	109	0	347
141	Yakataga Shelf	10	3	9	23	47	0	105
340	Yakutat Deep Gullies	12	1	4	17	7	0	23
131	Portlock Flats	28	1	1	1	7	0	22
130	Albatross Gullies	36	1	1	1	7	0	20
41	Middleton Shallows	9	1	1	1	7	0	22
121	Shellkof Edge	20	1	1	0	4	0	12

Table E-21.- - Total number of survey hauls, hauls containing redbanded rockfish, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

Strata code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C. I.	Upper C. I.
143	Fairweather Shelf	13	2	160	20,312	1,218	0	3,575
251	Prince of Wales Slope	18	16	99	466	397	215	579
151	Prince of Wales Shelf	13	8	99	4,194	572	0	1,386
250	Baranof-Chichagof Slope	9	9	85	385	88	41	135
350	SE Deep Gullies	16	7	84	1,396	175	10	340
241	Yakutat Slope	9	6	83	5,103	105	0	316
150	Baranof-Chichagof Shelf	10	5	65	832	265	0	533
231	Kodiak Slope	6	2	50	2,071	82	0	272
351	Southeastern Slope	2	2	29	127	24	0	140
240	Yakutat Gullies	27	12	25	89	89	20	159
230	Kenai Gullies	18	3	7	23	45	0	112
131	Portlock Flats	28	5	6	8	42	0	84
122	Chirikof Outer Shelf	18	1	6	30	27	0	85
341	Yakutat Slope	13	3	3	4	4	0	9
133	Kenai Flats	29	2	2	1	20	0	49
141	Yakataga Shelf	10	1	2	3	9	0	28
340	Yakutat Deep Gullies	12	2	1	1	2	0	5
142	Yakutat Flats	14	1	1	1	7	0	22
121	Shelikof Edge	20	1	0	0	2	0	7
120	East Shumagin Gully	68	1	0	0	1	0	2

Table E-22.- - Total number of survey hauls, hauls containing yellowmouth rockfish, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

Strata code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C. I.	Upper C. I.
251	Prince of Wales Slope	18	1	459	210,278	1,834	0	5,703
151	Prince of Wales Shelf	13	1	11	110	61	0	193
111	Shumagin Outer Shelf	24	1	1	0	5	0	17

Table E-23.- - Total number of survey hauls, hauls containing yelloweye rockfish, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

Strata code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C. I.	Upper C. I.
150	Baranof-Chichagof Shelf	10	2	58	1,519	239	0	601
151	Prince of Wales Shelf	13	4	26	138	150	2	297
140	Middleton Shelf	19	1	20	414	169	0	492
133	Kenai Flats	29	5	18	94	217	0	455
40	Yakutat Shallows	8	1	16	269	137	0	461
131	Portlock Flats	28	2	7	28	52	0	131
141	Yakataga Shelf	10	1	4	14	20	0	66
230	Kenai Gullies	18	1	4	12	24	0	74
112	West Shumagin Gully	10	1	2	6	6	0	18
120	East Shumagin Gully	68	4	2	2	24	0	58

Table E-24.- - Total number of survey hauls, hauls containing rosethorn rockfish, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

Strata code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C. I.	Upper C. I.
251	Prince of Wales Slope	18	11	97	1,546	388	66	720
151	Prince of Wales Shelf	13	6	44	313	252	29	474
250	Baranof-Chichagof Slope	9	6	19	62	20	1	38
351	Southeastern Slope	2	1	13	157	10	0	139
241	Yakutat Slope	9	2	4	6	5	0	12
150	Baranof-Chichagof Shelf	10	3	4	3	15	0	32
350	SE Deep Gullies	16	1	2	2	3	0	10

Table E-25.- - Total number of survey hauls, hauls containing Alaska plaice, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

Strata code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C. I.	Upper C. I.
12	Lower Alaska Pen	9	5	372	57,829	2,769	0	6,897
20	Upper Alaska Pen	10	3	223	17,082	1,844	0	4,292
112	West Shumagin Gully	10	2	50	1,564	114	0	317
32	Lower Cook Inlet	7	1	49	2,406	514	0	1,770
22	Chirikof Bank	13	3	36	565	398	0	967
31	Albatross Banks	23	1	16	250	243	0	746
13	Shumagin Bank	13	1	12	142	174	0	554
220	Lower Shelikof Gully	12	1	2	5	23	0	74
120	East Shumagin Gully	68	1	2	3	18	0	64
11	Davidson Bank	29	1	1	0	9	0	26

Table E-26.- - Total number of survey hauls, hauls containing English sole, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

Strata code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C. I.	Upper C. I.
40	Yakutat Shallows	8	6	389	82,540	3,250	0	8,932
140	Middleton Shelf	19	8	169	15,703	1,319	0	3,373
41	Middleton Shallows	9	4	80	1,071	682	42	1,322
13	Shumagin Bank	13	1	58	3,341	845	0	2,687
22	Chirikof Bank	13	1	15	237	169	0	538
150	Baranof-Chichagof Shelf	10	3	14	161	57	0	174
32	Lower Cook Inlet	7	1	10	98	104	0	358
130	Albatross Gullies	36	3	8	29	62	0	147
11	Davidson Bank	29	2	4	15	58	0	166
133	Kenai Flats	29	3	3	4	38	0	84
151	Prince of Wales Shelf	13	1	3	9	17	0	64
132	Barren Islands	23	1	3	7	29	0	90
111	Shumagin Outer Shelf	24	2	3	4	21	0	52
231	Kodiak Slope	6	1	2	6	4	0	14
134	Kodiak Outer Shelf	13	1	2	6	12	0	39
110	Sanak Gully	12	1	2	6	10	0	32
31	Albatross Banks	23	2	2	3	35	0	86
143	Fairweather Shelf	13	1	2	3	14	0	44
120	East Shumagin Gully	68	1	1	2	15	0	46
251	Prince of Wales Slope	18	1	1	1	5	0	15
142	Yakutat Flats	14	1	1	1	8	0	25

Table E-27.- - Total number of survey hauls, hauls containing butter sole, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C .I.	Upper C. I.
31	Albatross Banks	23	5	626	178,382	9,596	0	23,032
30	Albatross Shallows	14	7	246	29,288	1,497	0	3,769
32	Lower Cook Inlet	7	6	207	7,510	2,168	0	4,389
40	Yakutat Shallows	8	2	133	10,239	1,114	0	3,115
22	Chirikof Bank	13	6	96	7,040	1,055	0	3,065
12	Lower Alaska Pen	9	3	92	7,212	687	0	2,145
41	Middleton Shallows	9	1	87	7,483	733	0	2,424
11	Davidson Bank	29	3	25	355	345	0	873
13	Shumagin Bank	13	3	15	201	214	0	666
130	Albatross Gullies	36	1	4	13	28	0	85
20	Upper Alaska Pen	10	1	1	2	11	0	35

Table E-28.- - Total number of survey hauls, hauls containing starry flounder, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C .I.	Upper C. I.
41	Middleton Shallows	9	1	443	195,824	3,750	0	12,399
32	Lower Cook Inlet	7	4	342	59,908	3,680	0	9,851
12	Lower Alaska Pen	9	2	169	20,928	1,259	0	3,742
31	Albatross Banks	23	5	126	7,727	1,936	0	4,732
11	Davidson Bank	29	2	30	625	414	0	1,115
22	Chirikof Bank	13	1	15	230	167	0	530
30	Albatross Shallows	14	1	5	23	29	0	93
40	Yakutat Shallows	8	1	3	10	27	0	90
20	Upper Alaska Pen	10	1	2	4	16	0	52

Table E-29.- - Total number of survey hauls, hauls containing Pacific herring, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C .I.	Upper C. I.
20	Upper Alaska Pen	10	3	696	482,603	5,767	0	18,783
40	Yakutat Shallows	8	7	667	343,169	5,577	0	17,162
22	Chirikof Bank	13	5	265	58,698	2,917	0	8,720
140	Middleton Shelf	19	6	44	912	341	0	836
121	Shelikof Edge	20	2	43	1,822	329	0	1,014
41	Middleton Shallows	9	5	29	266	242	0	561
32	Lower Cook Inlet	7	4	6	6	59	0	122
133	Kensai Flats	29	10	2	1	24	0	48
240	Yakutat Gullies	27	7	2	1	6	1	12
30	Albatross Shallows	14	1	2	3	10	0	31
141	Yakataga Shelf	10	3	1	1	7	0	17
132	Barron Islands	23	4	1	1	14	0	30
143	Fairweather Shelf	13	2	1	1	8	0	21
131	Portlock Flats	28	3	1	0	7	0	17
151	Prince of Wales Shelf	13	2	1	0	4	0	11
232	Upper Shelikof Gully	5	1	1	0	2	0	7
134	Kodiak Outer Shelf	13	1	0	0	1	0	4
130	Albatross Gullies	36	1	0	0	1	0	2

Table E-30.- - Total number of survey hauls, hauls containing Atka mackerel, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

Strata code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C. I.	Upper C. I.
10	Fox Islands	24	3	3,533	1.21E+07	30,438	0	92,453
111	Shumagin Outer Shelf	24	2	2	2	13	0	34
121	Shelikof Edge	20	1	1	2	11	0	34
11	Davidson Bank	29	2	1	0	12	0	29

Table E-31.- - Total number of survey hauls, hauls containing red squid, CPUE, variance of CPUE, biomass and biomass confidence intervals, based on the NMFS 1990 Gulf of Alaska groundfish survey, by strata.

Strata code	Strata name	Number of hauls	Hauls with catch	CPUE kg/km	Variance of CPUE	Biomass (t)	Lower C. I.	Upper C. I.
33	Kenai Peninsula	6	3	143	4,703	790	0	1,762
232	Upper Shelikof Gully	5	5	130	9,493	414	0	1,277
350	SE Deep Gullies	16	15	108	517	223	123	324
341	Yakutat Slope	13	11	99	1,073	122	34	209
340	Yakutat Deep Gullies	12	12	86	638	149	53	246
330	Kodiak Slope	6	3	65	1,416	193	0	479
310	Shumagin Slope	7	2	49	1,555	124	0	368
133	Kenai Flats	29	5	45	1,211	542	0	1,397
351	Southeastern Slope	2	2	45	229	36	0	192
250	Baranof-Chichagof Slope	9	7	40	151	41	12	70
240	Yakutat Slope	27	14	39	472	142	0	302
132	Barren Islands	23	5	38	330	412	0	824
320	Chirikof Slope	4	2	35	1,006	57	0	222
140	Middleton Shelf	19	2	24	449	190	0	537
251	Prince of Wales Slope	18	5	20	181	80	0	194
220	Lower Shelikof Gully	12	7	18	61	177	5	348
20	Upper Alaska Pen	10	2	15	107	127	0	321
121	Shelikof Edge	20	4	14	61	106	0	231
230	Kenai Gullies	18	6	10	30	70	0	148
141	Yakataga Shelf	10	2	9	74	50	0	154
221	Chirikof Slope	4	1	9	73	13	0	55
231	Kodiak Slope	6	1	6	33	9	0	33
142	Yakutat Flats	14	2	6	30	47	0	145
210	Shumagin Slope	9	2	5	25	15	0	46
35	N Kodiak Shallows	1	1	4	0	10	0	0
241	Yakutat Slope	9	1	2	4	3	0	8
111	Shumagin Outer Shelf	24	2	1	1	9	0	22
150	Baranof-Chichagof Shelf	10	1	1	1	4	0	13
151	Prince of Wales Shelf	13	1	1	0	4	0	12

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