



NOAA Technical Memorandum NMFS-AFSC-121

Data Report: 1999 Gulf of Alaska Bottom Trawl Survey

by
L. L. Britt and M. H. Martin

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

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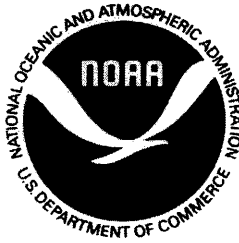
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Alaska Fisheries Science Center
7600 Sand Point Way N.E.
Seattle, WA 98115-0070

U.S. DEPARTMENT OF COMMERCE

Donald L. Evans, Secretary

National Oceanic and Atmospheric Administration

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National Marine Fisheries Service

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PREFACE

This data report is one of three types of standard reports presenting data from the 1999 Gulf of Alaska groundfish survey conducted by the National Marine Fisheries Service (NMFS).

The three standard reports are:

- 1) **Cruise Report** outlines the survey objectives, documents itinerary, personnel, and vessels employed and summarizes major accomplishments.

- 2) **Report to Industry** is 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 diagrams.

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

ABSTRACT

The sixth triennial (or first biennial) groundfish assessment survey of the Gulf of Alaska was conducted during the summer of 1999 by the Alaska Fisheries Science Center's Resource Assessment and Conservation Engineering (RACE) Division. The survey area covered the continental shelf and upper continental slope to 1000 m in the Gulf of Alaska from Islands of Four Mountains (170°W long.) to Dixon Entrance (132°40'W long.). The survey was conducted aboard three chartered trawlers, the F/V *Dominator*, F/V *Morning Star*, and F/V *Vesteraalen*. A total of 764 survey stations was successfully sampled using standard RACE Division Nor'eastern high-opening bottom trawl nets with rubber bobbin roller gear.

The primary survey objectives were to define the distribution and estimate the relative abundance of the principal groundfish within the survey area and to collect data on biological parameters useful to groundfish researchers and managers including age, growth, length-weight relationships, feeding habits, and size, sex, and age composition. The survey also collected ancillary data requested by other research groups.

At least 181 fish species and 271 invertebrate species were captured in survey tows (Appendix C). In terms of total biomass, arrowtooth flounder (*Atheresthes stomias*), Pacific ocean perch (*Sebastes alutus*), walleye pollock (*Theragra chalcogramma*), Pacific halibut (*Hippoglossus stenolepis*) and giant grenadier (*Albatrossia pectoralis*) were the most abundant species within the survey area. Pacific cod (*Gadus macrocephalus*), northern rockfish (*Sebastes*

polyspinus) and flathead sole (*Hippoglossoides elassodon*) were locally abundant in some areas.

Survey results are presented including estimates of catch per unit effort and biomass, species distribution, length frequency distribution, and length-weight relationships for commercially important species encountered during the survey.

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INTRODUCTION

The sixth triennial (or first biennial) groundfish survey of the Gulf of Alaska was conducted during the summer of 1999 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 Resource Assessment and Conservation Engineering (RACE) Division in Seattle, Washington.

This report presents the 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 1999 Gulf of Alaska groundfish survey, and to supplement the status of stocks resource assessment and allocation process. This report presents the 1999 survey results only and makes no comparisons with previous Gulf of Alaska surveys.

The survey objectives were to:

- 1) Delineate the distributions of major groundfish and commercially important invertebrate species inhabiting the continental shelf and upper continental slope of the Gulf of Alaska in water depths to 1,000 m.
- 2) Collect data to estimate the abundance of the major groundfish species.

- 3) Collect data on specific biological parameters of general interest to researchers and resource managers including :
- size, sex and age composition
 - growth, length-weight relationships
 - food habits.
- 4) Collect accurate net mensuration data for all survey nets and vessels.
- 5) Collect data for special research projects including:
- a rex sole life history study
 - a skate parasite study
 - a fish parasite study (genus *Argulus*)
 - snailfish and lumpsucker taxonomy studies
 - bigmouth sculpin life history and development study
 - rockfish and lingcod tissue sampling for molecular phylogenetic studies
 - Pacific ocean perch, northern rockfish and roughey rockfish genetic studies
- 6) Investigate the use of a tire gear footrope in areas untrawlable with the standard survey footrope.

METHODS

Survey Area

The Gulf of Alaska forms the northeastern border of the Pacific Ocean and consists of complex bathymetric features ranging from jagged, mountainous pinnacles to flat, muddy areas. These features provide a variety of habitats resulting in a complex ecosystem mosaic (Fig. 1). Prevailing rough bottom conditions in many areas require the standard use of rubber bobbin roller gear for all bottom trawling operations. The 1999 Gulf of Alaska survey included the entire continental shelf and upper portion of the continental slope to the 1,000 m depth contour.

The total survey area was approximately 319,884 km² (93,263 square nautical miles (nmi²), Table 1). The shelf, comprising about 71% of the total Gulf of Alaska (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. The shelf is bisected by gullies in many areas extending from the upper slope to the inner shore. These gully areas make up about 16% of the total survey area. The outer shelf is bordered by the continental slope, a region approximately 20 km in width, which descends steeply into the abyssal Aleutian Trench in the western and central Gulf of Alaska and the Alaska Plain in the eastern gulf. The survey assessed only that portion of the slope shallower than 1,000 m, an area of approximately 42,257 km² (12,320 nmi²). Several areas were removed from the survey area prior to the 1996 survey including several unnavigable bays and coastal areas and the generally untrawlable areas in the Sandman Reef and Pavlov Islands areas in the Shumagin INPFC area (Appendix B).

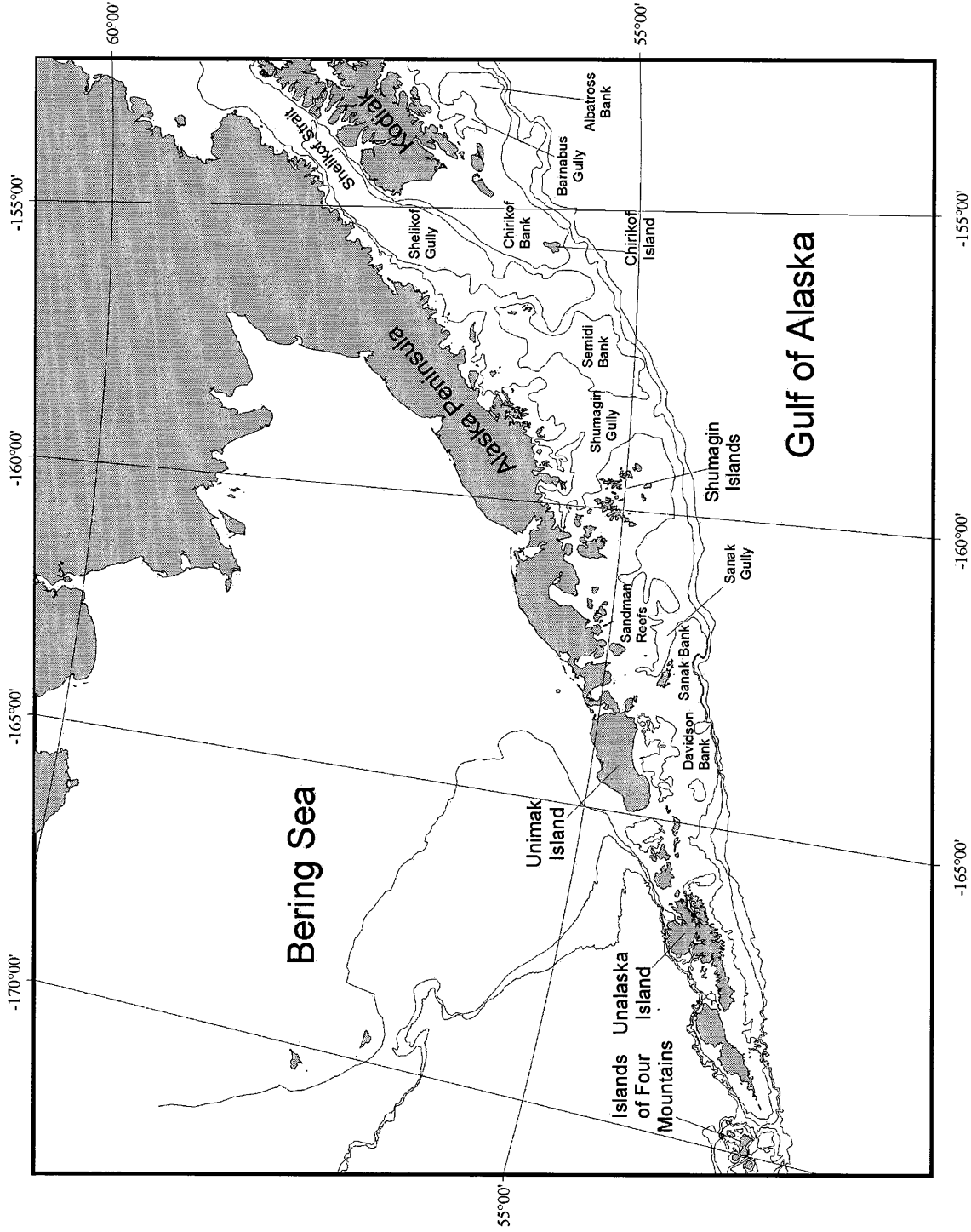


Figure 1.--Bathymetric and geographic features of the survey area for the 1999 Gulf of Alaska triennial groundfish survey.

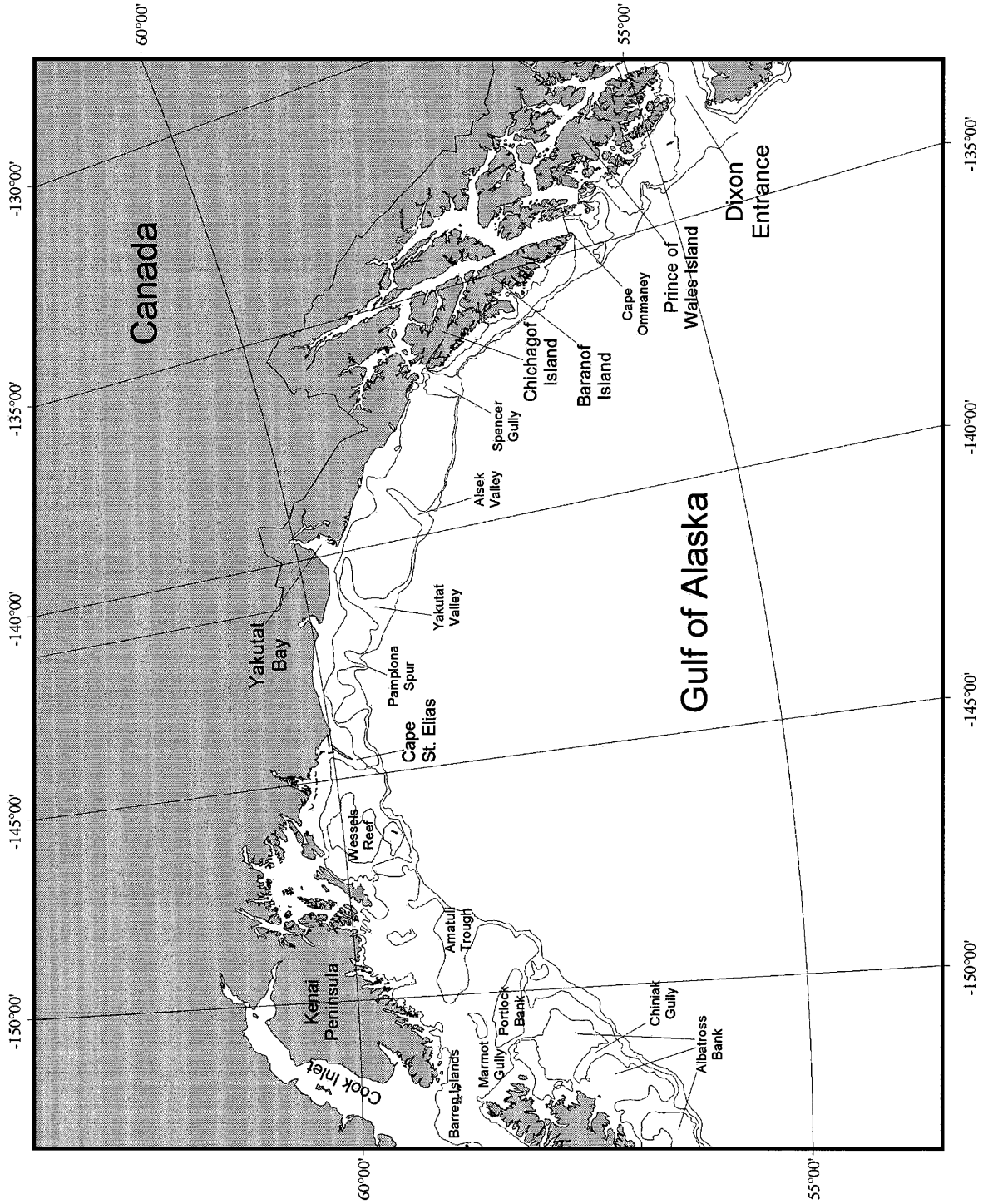


Figure 1.--Continued.

About 32% (101,494 km²) of the total survey area is within the Kodiak INPFC area (Table 1). The portion survey area contained within the Chirikof INPFC area and the Shumagin INPFC area are approximately equal at about 21% (68,057 km²) and 20% (65,091 km²), respectively, while the Yakutat INPFC survey area makes up about 18% (57,201 km²). The Southeastern INPFC survey area comprised the smallest portion with about 9% of the total survey area (28,041 km²).

Vessels

All three charter vessels used during 1999 were house-forward stern trawlers with stern ramps, two net storage reels, telescoping deck cranes, propeller nozzles, and paired, controlled-tension hydraulic trawl winches with 1,280 m to 1,460 m of 2.54 cm diameter steel cable. The F/V *Vesteraalen*, captained throughout the survey by Tim Cosgrove, is 38 m in overall length (LOA) and is powered by a single, 1,700 continuous horsepower (HP) main engine. The F/V *Dominator* is also 38 m LOA with a 1,700 HP main engine. The F/V *Dominator* was operated by Bill Klop during the first two legs, by Gary Hansen on leg three and Craig Jensen on leg four. The F/V *Morning Star* is 44 m LOA and is propelled by a 1,700 HP main engine. Jon Edson was the skipper aboard the F/V *Morning Star* during the first two legs, while Scott Clark captained legs three and four. Electronic equipment on all vessels included global positioning systems (GPS) receivers with video position plotters, at least two radars, single sideband and VHF transmitter-receivers, color video fish-finders, paper recorder depth sounders, and auto-pilots.

Fishing Gear

All vessels used standard RACE Division poly-Nor'eastern high-opening bottom trawls rigged with rubber bobbin roller gear for standard survey tows (Appendix A). Gear specifications included: a 27.2 m headrope with twenty-one 30 cm diameter floats, and a 24.3 m chain "fishing line" attached to a 24.9 m, 0.95 cm diameter galvanized wire footrope. The roller gear was 24.2 m long and constructed of 1.91 cm diameter galvanized wire rope, 36 cm rubber bobbins separated by 10 cm rubber disks. In addition, 5.9 m wire rope extensions with 10 cm and 20 cm rubber disks were used to span each lower flying wing section.

Trawls were constructed of 12.7 cm stretched-mesh polyethylene web with a 3.2 cm mesh nylon liner in the codend. Net rigging consisted of triple 54.84 m, 1.59 cm diameter galvanized wire rope dandyines. The dandyines were rigged with 22.9 cm, 45.7 cm, and 60.7 cm chain extensions to the headrope, side, and bottom wing attachments, respectively. Steel V-doors (1.83 m × 2.74 m) weighing approximately 800 kg each were used. The fishing dimensions of the trawls were measured aboard each vessel using Scanmar acoustic net mensuration equipment.

In the course of conducting previous trawl surveys in the GOA, many areas have been identified that are untrawlable with the standard survey gear, primarily due to rough, hard bottom or steep slopes. In an attempt to increase the spatial coverage of the survey, two experimental nets with tire gear were deployed during the 1999 survey to gauge their ability to increase coverage and work within the confines of the existing survey. The data collected using these

trawls were not included in the estimates of mean catch per unit effort (CPUE) and biomass. The reinforced poly-Nor'eastern net was built to the same plan as the standard Nor'eastern net but used heavier material and a tire gear footrope. The net and codend were made of 5 mm web double bar twine. Net riblines consist of 6 mm Ultra Blue Line. The top and bottom wings and side panel front used 5 mm double bar twine. Floats were metallic with a depth rating of 1,600 m. Wing extensions consisted of 1.59 cm diameter alloy chain, 5.18 m long, strung through 53-61 cm diameter rock hopper disks placed 61 cm apart and separated with 20.3 cm diameter rubber disks. The roller gear had a 9.7 m center section consisting of three 1.59 cm diameter chains strung through the sidewalls of loosely packed automobile tires 53.3 to 61 cm in diameter. The chains were connected to wing ends made with 1.59 cm diameter long link alloy chain strung through 61 cm diameter rock hopper disks placed 61 cm apart and separated with 20.3 cm diameter rubber disks. The overall length of the two wing ends joined to the tire gear center section was 24.2 m.

Survey Design

The 1999 triennial survey used a stratified random sampling pattern consistent with previous triennial surveys (Martin 1997, Martin and Clausen 1995, Stark and Clausen 1995, Munro and Hoff 1995). The Gulf of Alaska was divided into 59 strata categorized by water depth, type of geographical area (e.g., banks, gullies, and slopes) and INPFC statistical area boundaries (Appendix B).

As in past years, a stratified random survey design was employed in the 1999 triennial survey. A modified Neyman optimal allocation strategy (Cochran 1977) based on data from the 1990, 1993 and 1996 triennial surveys was used to allocate effort between strata. Neyman optimum allocation calculations were made for each of the principal groundfish species in each year, based on that year's survey data and using the estimated time to perform a tow in a given stratum as the cost variable (deeper tows cost more). Each stratum was required to have at least three samples and the maximum sample density was limited to a maximum of 2.5 times the mean sample density to constrain the potential influence of a single species on the overall results. A mean of the resulting proportions was then calculated, resulting in an estimate of optimal allocation for each of the principal groundfish species. A weighted mean of these values was then calculated using each species' mean biomass as the weighting variable. Within each major depth interval (1-100 m, 101-200 m, etc.), the number of stations was then summed resulting in an optimal allocation between depth intervals. This number of tows was then reallocated between the strata proportional to the area of each stratum so that the sampling density was approximately constant in each depth interval throughout the survey area. The number of stations allocated above were randomly selected without replacement from a grid composed of cells of 25 km² in area (based on lines of latitude and longitude) which covered the entire survey area.

The selected gridpoints were considered to define the center of 5 by 5 km areas, defined as grid-areas. Within each selected grid-area, the bottom was searched using echosounder returns to find sufficient trawlable bottom to obtain a successful 15 minute tow, not necessarily

trawling at the actual gridpoint. If trawlable bottom could not be found in the immediate area of the selected gridpoint, a search for a suitable location within the grid-area was commenced. If, in the judgment of the field party chief, no trawlable grounds could be found within the grid-area within a 2 hour time limit, a nearby alternate station was selected from successful tows completed during previous triennial groundfish surveys. If sufficient trawlable bottom was encountered while transiting to the alternate site, this location was selected for the sample.

Data Collection Techniques

The goal of each sample (tow) was to maintain a constant vessel speed of 3 knots while maintaining the net in fishing configuration for 15 minutes. Occasionally, tows of shorter duration were necessary to prevent net damage or when echosounder and Scanmar information suggested the potential for an exceptionally large catch that would affect the efficiency of the net. The time and location (estimated by GPS) of the vessel were recorded every 2 seconds during each tow. Pressure at depth, water temperature, and time were recorded every 6 seconds during most tows using a MicroBT data logger (Richard Brancker Research Ltd.) placed on the headrope of the net. The vertical and horizontal net openings were monitored with Scanmar net sonde units. Scanmar net spread data were generally not collected for tows over rough bottom as these units are very susceptible to damage or loss under these circumstances. The surface water temperature was estimated at most stations with a bucket thermometer and from the MicroBT data stream. To reduce potential fishing power differences between the survey vessels, standardized trawling and gear handling methods were practiced including the use of scope ratio tables (trawl warp relative to bottom depth) and maintaining a 3 nmi/hour trawling speed.

A trawl sample was considered successful if horizontal and vertical net openings remained within a range considered normal for that depth, the roller gear maintained consistent contact with the bottom, the net suffered no or little damage during the tow, and there were no conflicts with derelict fishing gear. Trawl samples were considered unsuccessful when the field party chief deemed that the sample result was affected by trawl damage or an unstable trawl configuration or if the duration of the tow was less than 7.5 minutes.

Collection and Processing of Samples

Catches weighing less than approximately 1,100 kg were emptied directly onto a sorting table, sorted to species, and weighed to the nearest 0.1 kg using a platform scale. Species groups weighing less than about 2 kg were generally weighed to the nearest 2 g on a Marel digital read-out scale. Larger catches were weighed with a dynamometer or the weight was estimated volumetrically. A representative subsample that approximated the sampling table capacity was then obtained following the procedures described by Hughes (1976) to reduce subsampling bias caused by species and size stratification within the codend. The entire catch was sampled for major groundfish species that occurred in limited numbers and were easily differentiated to species. Pacific halibut were immediately measured and released. Halibut weights were estimated from the length data. Numbers and weights of all species were estimated for each haul.

Additional data collection was concentrated on fish species of high commercial value or abundance in the survey area. A random subsample of 100 to 300 individuals (target subsample size was species-dependent) of each of these species identified in the catch was sorted by sex and individual fork lengths (FL) were measured using Polycorder (Omnidata) data loggers with barcode reading capabilities and barcoded length strips. Fish that could not be readily sexed were classified as unsexed and measured. Age structures were also collected from the target species. Fork length was estimated to the nearest 1 cm interval, and weight was estimated to the nearest 2-10 g (scale accuracy depended on the weight of the specimen) with a Marel digital read-out scale. To ensure that adequate samples for all commonly observed year classes were collected, the age specimen collections were stratified by sex and 1 cm FL intervals. Every attempt was made to distribute the age specimen collections over the entire survey area.

Stomach samples for selected species were collected throughout the western and central portions of the survey by biologists from the Trophic Interactions Program of the AFSC's Resource Ecology and Fisheries Management Division aboard the F/V *Dominator*. Ancillary data and specimens were collected for several other research projects including a rex sole life history study, a skate parasite study, a fish parasite study (genus *Argulus*), snailfish and lumpsucker taxonomy studies, a bigmouth sculpin life history and development study, rockfish and lingcod tissue sampling for molecular phylogenetic studies and Pacific ocean perch, northern rockfish and rougheye rockfish genetic studies.

Data Analysis

Biomass estimates were calculated using the area-swept method (Alverson and Pereyra 1969). The area swept was estimated by multiplying the estimated distance towed by the estimated mean net spread for each tow. The distance towed was estimated by computing the distance traveled over ground by the vessel between the estimated time when the footrope came into contact with the bottom (on-bottom) and the estimated time when the center of the footrope left the bottom (off-bottom). The distance traveled by the vessel was estimated by smoothing the GPS location data and estimating the distance along this line. The mean net spread was estimated by a distance-weighted averaging of the smoothed net spread readings from the Scanmar units between on-bottom and off-bottom. Net spreads for tows for which there were no Scanmar data were estimated using a stepwise generalized additive model using net number, net height (when available), mean speed over ground (when available), depth, total catch and the actual scope/expected scope ratio as variables. For each species, a CPUE was calculated for each tow by dividing catch weight (in kilograms) by the area swept by the trawl (in square kilometers). A mean CPUE for each stratum was calculated as the mean of the individual tow CPUEs (including zero catches) within that stratum. Mean CPUEs of combined strata were calculated as the component strata CPUE means weighted by strata area. Biomass estimates were calculated by multiplying each stratum mean CPUE by the stratum area and summing the results to obtain estimates by INPFC statistical areas and depth intervals. The 95% confidence interval was calculated for each species biomass estimate. A detailed description of the analytical procedures is presented in Wakabayashi et al. (1985).

Population length compositions were estimated by expanding the length-frequency data to the total catch for each species by length and sex category at each station (Wakabayashi et al. 1985). 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.

Length-weight data collected from individual fish were used to estimate length-weight relationships based on a nonlinear least squares regression algorithm. The length-weight relationship was expressed as :

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

where W = weight (grams), L = length (mm), a = coefficient, and b = exponent.

Data Limitations

Due to the multi-species nature of this survey, there are some limitations in its ability to estimate fish abundance. Obviously, populations whose entire depth range is not covered by the survey are not fully sampled (e.g., sablefish, shortspine thornyhead). The size of populations that extend into areas untrawlable with the survey gear may be underestimated (e.g., many rockfish species). Populations of species that exhibit a highly contagious distribution pattern (e.g., Atka mackerel and Pacific ocean perch) or are highly restricted in the amount of available habitat in the Gulf of Alaska (e.g., yellowfin sole and starry flounder) would be better sampled with a different survey design. For these reasons, survey estimates of abundance are considered more reliable for species that are widely and more uniformly distributed.

Estimates of population size within the survey area are routinely represented as absolute biomass estimates. These estimates make the assumption that 100% of the fish within the path of the trawl are captured. In fact, the situation is much more complex. As with any fishing gear, the survey trawl exhibits some size selectivity. Fish small enough to pass through the net mesh are not sampled well. Some larger fish may be able to outswim the trawl, at least for a short time. Fish are herded into the path of the trawl by the doors and the bridles in front of the trawl. Some fish escape under the footrope of the net. The rate of herding and escapement depend upon several factors including the species of fish and the speed of the vessel and this is an active area of research at the AFSC (Somerton and Munro, in press; Somerton and Weinberg, 2000; Munro and Somerton, in press). Given these limitations, survey abundance estimates should always be considered relative measures of abundance.

RESULTS

Tows were attempted at a total of 833 survey stations, and 764 of these (92%) were considered successful tows and included in the biomass and size composition analyses (Table 1). Scanmar net spread data were successfully collected for 772 tows (93%). Headrope depth and temperature data were successfully collected for a total of 808 tows (97%). Bottom temperatures ranged from 2° to 12.5°C. Sea surface temperatures were collected at a total of 830 stations (99+%) and ranged from 2.8° to 14.8°C.

Table 1.--Number of allocated, attempted, and successfully completed stations and sampling density for the 1999 Gulf of Alaska triennial groundfish survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of Stations				Area (km ²)	Sampling Density (stations/1000 km ²)
		Allocated	Attempted	Successful	Tire Gear		
Shumagin	1 - 100	99	94	90	7	41,151	2.19
	101 - 200	31	33	31	---	14,678	2.11
	201 - 300	10	9	8	1	2,788	2.87
	301 - 500	12	13	12	---	2,531	4.74
	501 - 700	6	5	5	---	2,006	2.49
	701 - 1000	5	1	0	---	1,937	0.
	All depths	163	155	147	8	65,091	2.26
Chirikof	1 - 100	63	70	59	6	26,036	2.27
	101 - 200	56	54	52	4	23,851	2.18
	201 - 300	37	37	35	2	11,547	3.03
	301 - 500	9	8	8	1	1,604	4.99
	501 - 700	6	6	6	---	1,953	3.07
	701 - 1000	8	8	8	---	3,066	2.61
	All depths	179	183	168	13	68,057	2.47
Kodiak	1 - 100	91	99	86	4	38,518	2.23
	101 - 200	94	102	95	---	43,334	2.19
	201 - 300	35	38	36	---	11,491	3.13
	301 - 500	14	17	14	---	2,912	4.81
	501 - 700	6	7	5	---	1,745	2.87
	701 - 1000	10	12	10	---	3,494	2.86
	All depths	250	275	246	4	101,494	2.42
Yakutat	1 - 100	39	41	38	1	16,663	2.28
	101 - 200	65	69	63	2	29,383	2.14
	201 - 300	15	15	14	---	5,170	2.71
	301 - 500	12	13	12	---	2,628	4.57
	501 - 700	5	5	5	---	1,469	3.4
	701 - 1000	5	3	3	---	1,888	1.59
	All depths	141	146	135	3	57,201	2.36
Southeastern	1 - 100	15	10	10	---	6,547	1.53
	101 - 200	27	26	24	1	11,085	2.17
	201 - 300	16	16	16	1	5,053	3.17
	301 - 500	15	18	14	---	3,117	4.49
	501 - 700	3	2	2	---	1,034	1.94
	701 - 1000	3	2	2	---	1,206	1.66
	All depths	79	74	68	2	28,041	2.43
All areas	1 - 100	307	314	283	18	128,915	2.2
	101 - 200	273	284	265	7	122,331	2.17
	201 - 300	113	115	109	4	36,049	3.02
	301 - 500	62	69	60	1	12,792	4.69
	501 - 700	26	25	23	---	8,207	2.8
	701 - 1000	31	26	24	---	11,591	2.07
	All depths	812	833	764	30	319,884	2.39

Catch Results by Area

At least 181 fish species from 40 families were captured during the 1999 survey. Appendix C presents lists of fish (Appendix C-1) and invertebrate (Appendix C-2) species encountered during the survey. Relative abundance estimates, reported as CPUE, are presented in Table 2 for the 20 most abundant groundfish species in each of the five INPFC areas.

Over the entire survey area, arrowtooth flounder was the most abundant groundfish encountered during the survey (Table 2). Arrowtooth flounder had the highest CPUE of any species in three of the five INPFC areas covered by the survey. It was second in terms of CPUE in the other two areas. Pacific ocean perch, walleye pollock, Pacific halibut, giant grenadier and Pacific cod were also very important components of the gulf-wide species composition.

In the Shumagin INPFC area, walleye pollock had by far the highest CPUE of any species, mostly due to one extremely large tow. Arrowtooth flounder, Pacific halibut, Pacific cod and giant grenadier were also relatively abundant in this area. In the Chirikof INPFC area, Pacific ocean perch and arrowtooth flounder were the dominant species in survey catches. Pacific halibut, Pacific cod and giant grenadiers were also important components of the species composition. In the Kodiak INPFC area, arrowtooth flounder was by far the most dominant component of the groundfish CPUE. Pacific halibut, Pacific ocean perch, northern rockfish, giant grenadier and walleye pollock were also relatively abundant in this area. In the Yakutat INPFC area, arrowtooth flounder was the dominant species with a mean CPUE over three times higher than the next most abundant species, sablefish. In the Southeastern INPFC area,

arrowtooth flounder again predominated with a mean CPUE almost three and a half times that of the next most abundant groundfish, Pacific ocean perch. Walleye pollock, Pacific halibut and giant grenadier were also important catch components.

Table 2.-- Mean CPUE (kg/km²) for the 20 most abundant groundfish in each International North Pacific Fisheries Commission area during the 1999 triennial Gulf of Alaska bottom trawl survey.

Shumagin Area		Chirikof Area		Kodiak Area	
Species	CPUE	Species	CPUE	Species	CPUE
walleye pollock	6,636	Pacific ocean perch	5,911	arrowtooth flounder	5,463
arrowtooth flounder	2,201	arrowtooth flounder	4,273	Pacific halibut	2,768
Pacific halibut	1,737	Pacific halibut	1,983	Pacific ocean perch	2,066
Pacific cod	1,718	Pacific cod	1,350	northern rockfish	1,642
giant grenadier	1,667	giant grenadier	1,325	giant grenadier	1,481
flathead sole	763	walleye pollock	755	walleye pollock	1,080
northern rockfish	698	flathead sole	577	flathead sole	986
northern rock sole	693	skate unident.	565	Pacific cod	796
southern rock sole	689	northern rockfish	440	sablefish	735
Pacific ocean perch	587	sablefish	386	skate unident.	391
yellowfin sole	559	southern rock sole	312	light dusky rockfish	332
sculpin unident.	280	rex sole	257	southern rock sole	330
skate unident.	241	starry flounder	222	rex sole	249
shortspine thornyhead	217	shortspine thornyhead	203	Dover sole	241
sablefish	202	Dover sole	144	shortspine thornyhead	185
rex sole	196	light dusky rockfish	135	rougheye rockfish	171
starry flounder	163	shark unident.	126	shark unident.	169
shark unident.	127	smelt unident.	88	starry flounder	135
rougheye rockfish	95	northern rock sole	86	northern rock sole	103
Alaska plaice	87	sculpin unident.	63	yellowfin sole	99
Number of hauls	147	Number of hauls	168	Number of hauls	246

Yakutat Area		Southeastern Area		All Areas	
Species	CPUE	Species	CPUE	Species	CPUE
arrowtooth flounder	2,106	arrowtooth flounder	5,458	arrowtooth flounder	3,945
sablefish	687	Pacific ocean perch	1,582	Pacific ocean perch	2,274
giant grenadier	602	walleye pollock	1,035	walleye pollock	1,981
Pacific halibut	596	silvergray rockfish	872	Pacific halibut	1,829
Pacific ocean perch	572	spotted ratfish	843	giant grenadier	1,208
Pacific herring	533	Pacific halibut	782	Pacific cod	957
Dover sole	443	sablefish	523	northern rockfish	757
shortspine thornyhead	294	shortspine thornyhead	493	flathead sole	649
sharpchin rockfish	264	Dover sole	473	sablefish	526
flathead sole	264	yellowtail rockfish	446	skate unident.	353
shark unident.	253	Pacific cod	365	southern rock sole	331
skate unident.	247	rex sole	334	shortspine thornyhead	242
lingcod	216	redbanded rockfish	324	rex sole	234
walleye pollock	204	redstripe rockfish	287	Dover sole	232
Pacific cod	201	yellowmouth rockfish	198	northern rock sole	192
rex sole	177	skate unident.	176	shark unident.	161
shortraker rockfish	171	english sole	150	light dusky rockfish	155
rougheye rockfish	150	rougheye rockfish	147	yellowfin sole	151
starry flounder	125	southern rock sole	138	starry flounder	146
english sole	116	shortraker rockfish	137	rougheye rockfish	124
Number of hauls	135	Number of hauls	68	Number of hauls	764

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Catch Results by Species

For each species of great commercial interest or abundance, the following items are presented:

1. A brief synopsis of the data analysis for that species.
2. A table presenting the number of hauls, the number of hauls with catch, CPUE, estimated biomass, and mean length and weight of that species by INPFC area and depth.
3. A figure representing the distribution and relative CPUE of that species at each successfully sampled station.
4. A figure showing the estimated size composition of the population for that species.
5. A figure showing the length-weight relationship from the individual length and weight data collected.
6. CPUE and biomass estimates by stratum for that species.

For other species that were locally abundant (other flatfish and other rockfish), only items 1, 2, and 6 above are presented.

The scientific names used generally follow the fifth edition of the *Common and Scientific Names of Fishes from the United States and Canada* (Robins et al. 1991). The only exceptions to this are in the Order Pleuronectiformes (flatfish) scientific names. The names used throughout this report reflect a more recent reexamination of the phylogeny of this family (Cooper and Chapleau 1998, Ivankov 1996, Orr and Matarese 2000, Rass 1996).

Arrowtooth flounder (*Atheresthes stomias*)

Arrowtooth flounder had the highest mean CPUE of any species caught in the 1999 survey (Table 2), including the highest CPUE in three of the five INPFC areas. Arrowtooth flounder were found throughout the survey area at depths less than 700 m, occurring in 91% of the tows at these depths, including 99% of the tows between 101 and 300 m. The highest CPUEs were observed on the broad continental shelf in the Kodiak INPFC area, especially in Albatross Gullies, and on the continental shelf west of Prince of Wales Island in the Southeast INPFC area (Fig. 2 and Table 4). Mean CPUEs were generally low on the continental slope at depths greater than 700 m with the notable exception of the Shumagin slope where the mean CPUE was extremely high. Length data were collected from over 53,000 arrowtooth flounder. Mean length and mean weight generally increased with depth (Table 3), as fish less than about 30 cm FL were relatively rare in water greater than 300 m deep (Fig. 3). A distinct length mode around 20 cm FL was detected in water less than 200 m in the western and central GOA. In addition, a female length mode at around 55 cm FL was detected in most depths and areas. The survey data indicate the arrowtooth flounder population is predominantly female within the survey area, comprising about 69% of the total estimated population. The length-weight relationship for arrowtooth flounder specimens collected during the survey is depicted in Figure 4.

Table 3.--Number of survey hauls, number of hauls with arrowtooth flounder, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of trawl hauls	Hauls with catch	CPUE (kg/km²)	Biomass (t)	Mean weight (kg)	Mean length (cm)
Shumagin	1 - 100	90	85	1,512	62,240	0.49	33.5
	101 - 200	32	30	2,924	42,913	0.53	36.4
	201 - 300	8	8	3,871	10,792	1.51	52.7
	301 - 500	12	12	2,875	7,277	1.49	53.0
	501 - 700	5	5	8,581	17,211	2.33	58.6
	701 - 1000	0	0	---	---	---	---
	All depths	148	140	2,157	140,433	0.61	36.4
Chirikof	1 - 100	59	52	3,124	81,350	0.67	38.7
	101 - 200	52	52	5,845	139,417	0.59	37.9
	201 - 300	35	35	5,667	65,433	0.95	45.1
	301 - 500	8	8	2,825	4,531	2.01	57.3
	501 - 700	6	2	41	80	2.00	59.0
	701 - 1000	8	0	---	---	---	---
	All depths	168	149	4,273	290,810	0.68	39.4
Kodiak	1 - 100	86	67	4,272	164,553	0.84	41.6
	101 - 200	94	94	7,863	340,750	0.75	41.4
	201 - 300	36	36	4,188	48,125	1.11	46.2
	301 - 500	14	12	1,512	4,404	1.93	56.6
	501 - 700	5	1	125	217	1.31	38.8
	701 - 1000	10	0	---	---	---	---
	All depths	245	210	5,498	558,049	0.80	41.8
Yakutat	1 - 100	38	29	946	15,765	0.73	39.4
	101 - 200	63	63	2,598	76,350	0.65	38.5
	201 - 300	14	14	4,461	23,067	1.66	53.5
	301 - 500	12	12	1,835	4,821	1.69	54.6
	501 - 700	5	2	302	443	1.60	54.0
	701 - 1000	3	0	---	---	---	---
	All depths	135	120	2,106	120,446	0.77	40.3
Southeastern	1 - 100	10	7	2,960	19,381	0.99	44.8
	101 - 200	24	22	10,694	118,546	0.89	43.8
	201 - 300	16	16	2,383	12,042	0.99	45.6
	301 - 500	14	12	991	3,090	1.39	52.1
	501 - 700	2	0	---	---	---	---
	701 - 1000	2	0	---	---	---	---
	All depths	68	57	5,458	153,059	0.92	44.1
All areas	1 - 100	283	240	2,663	343,288	0.70	38.8
	101 - 200	265	261	5,869	717,976	0.70	40.2
	201 - 300	109	109	4,423	159,458	1.10	46.7
	301 - 500	60	56	1,886	24,123	1.66	54.4
	501 - 700	23	10	2,187	17,951	2.28	58.0
	701 - 1000	24	0	---	---	---	---
	All depths	764	676	3,948	1,262,797	0.75	40.5

All areas biomass, 95% confidence interval: 1,063,419 - 1,460,662 metric tons (t).

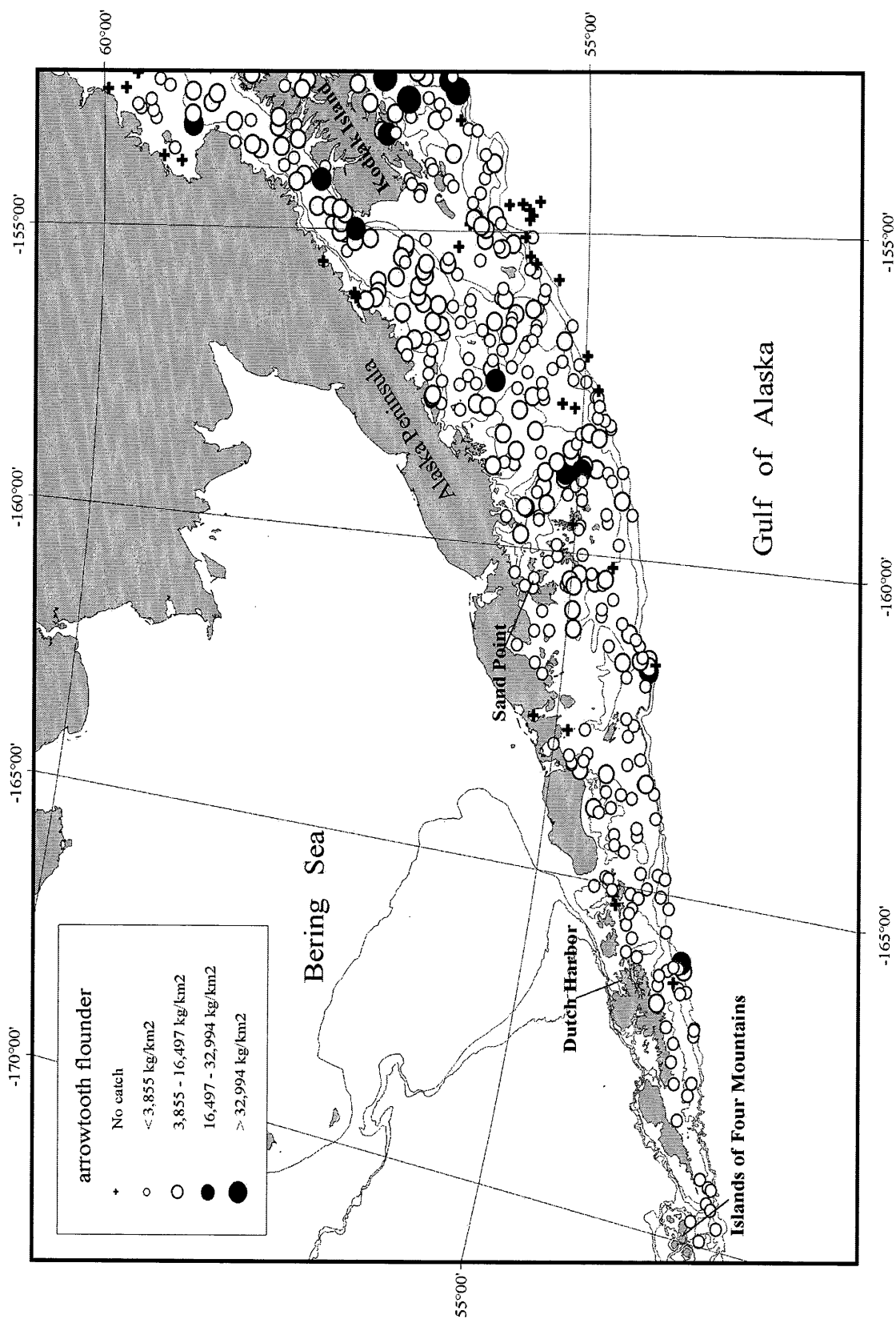


Figure 2.--Distribution and relative abundance of arrowtooth flounder from the 1999 Gulf of Alaska bottom trawl survey. Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations above mean CPUE, and greater than four standard deviations above mean CPUE. Each symbol is proportional to the sample CPUE.

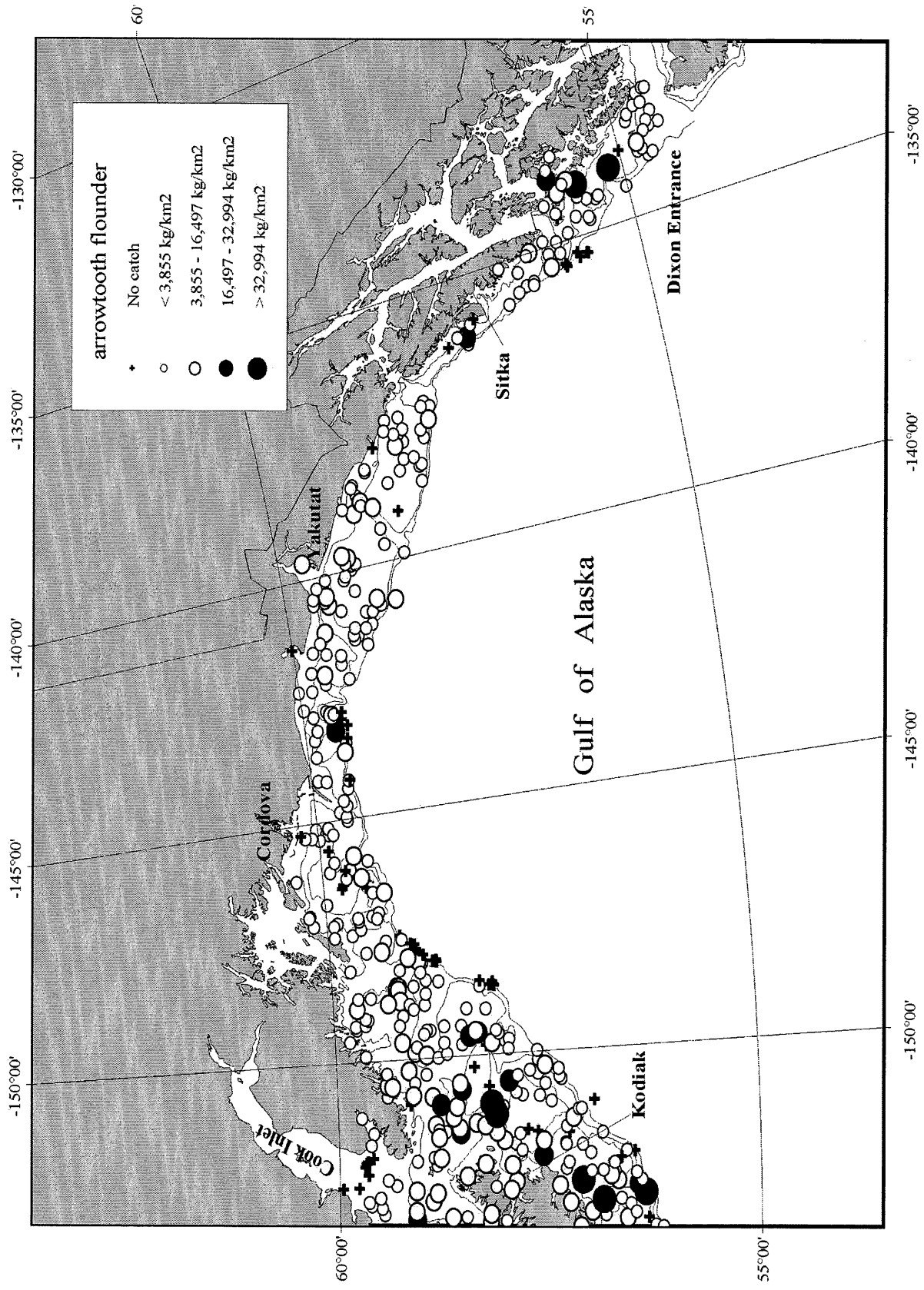


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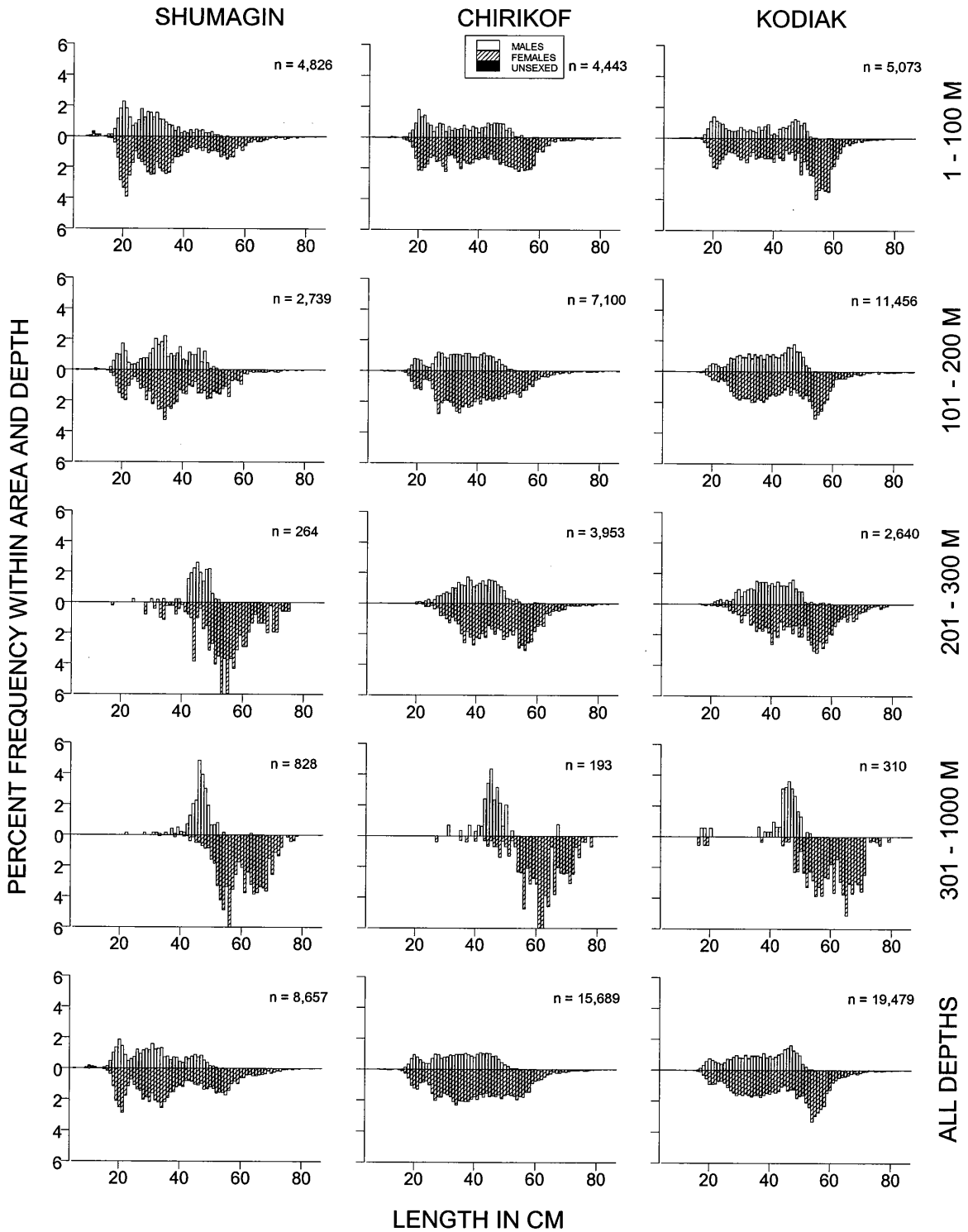


Figure 3.--Size composition of the estimated arrowtooth flounder population from the 1999 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

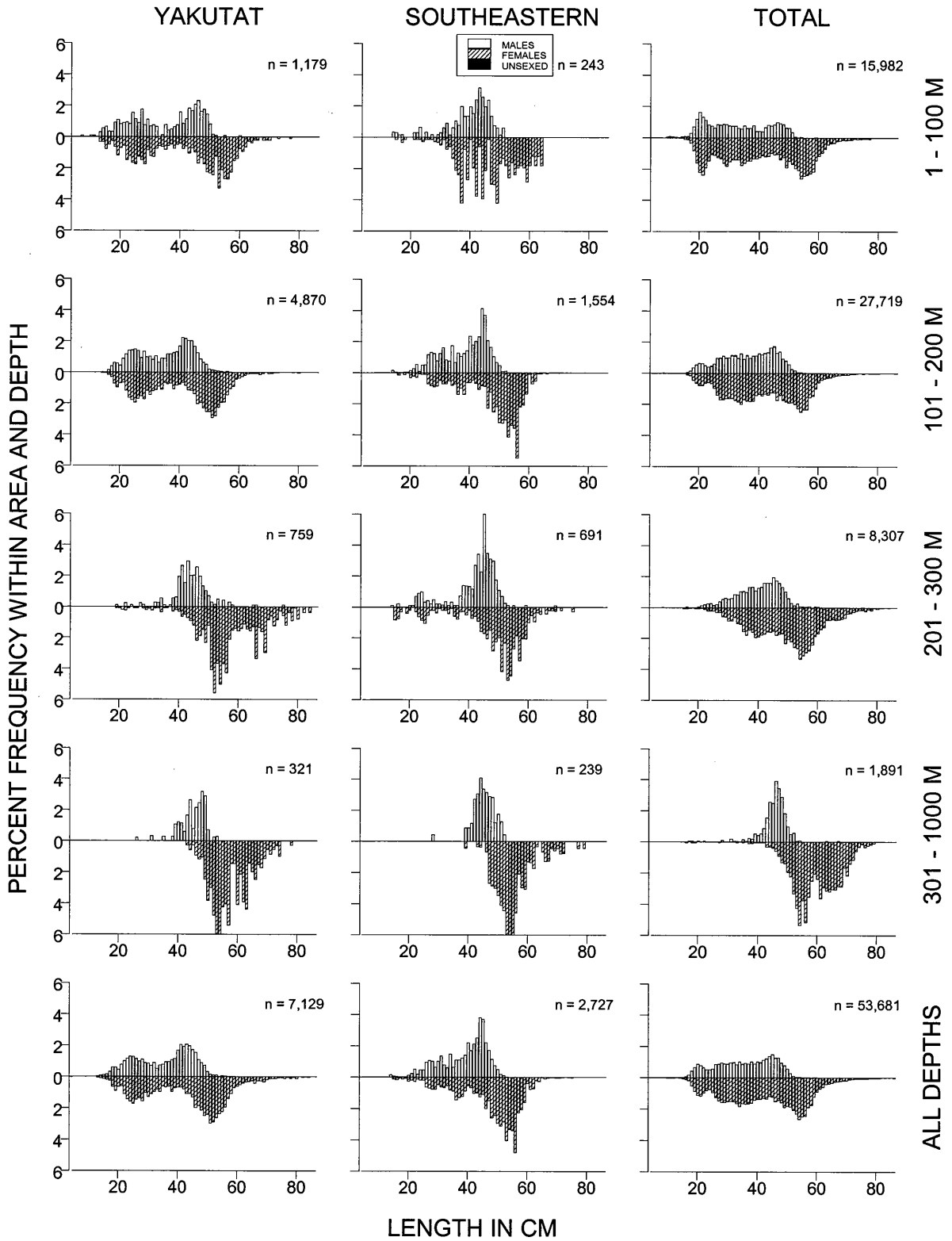


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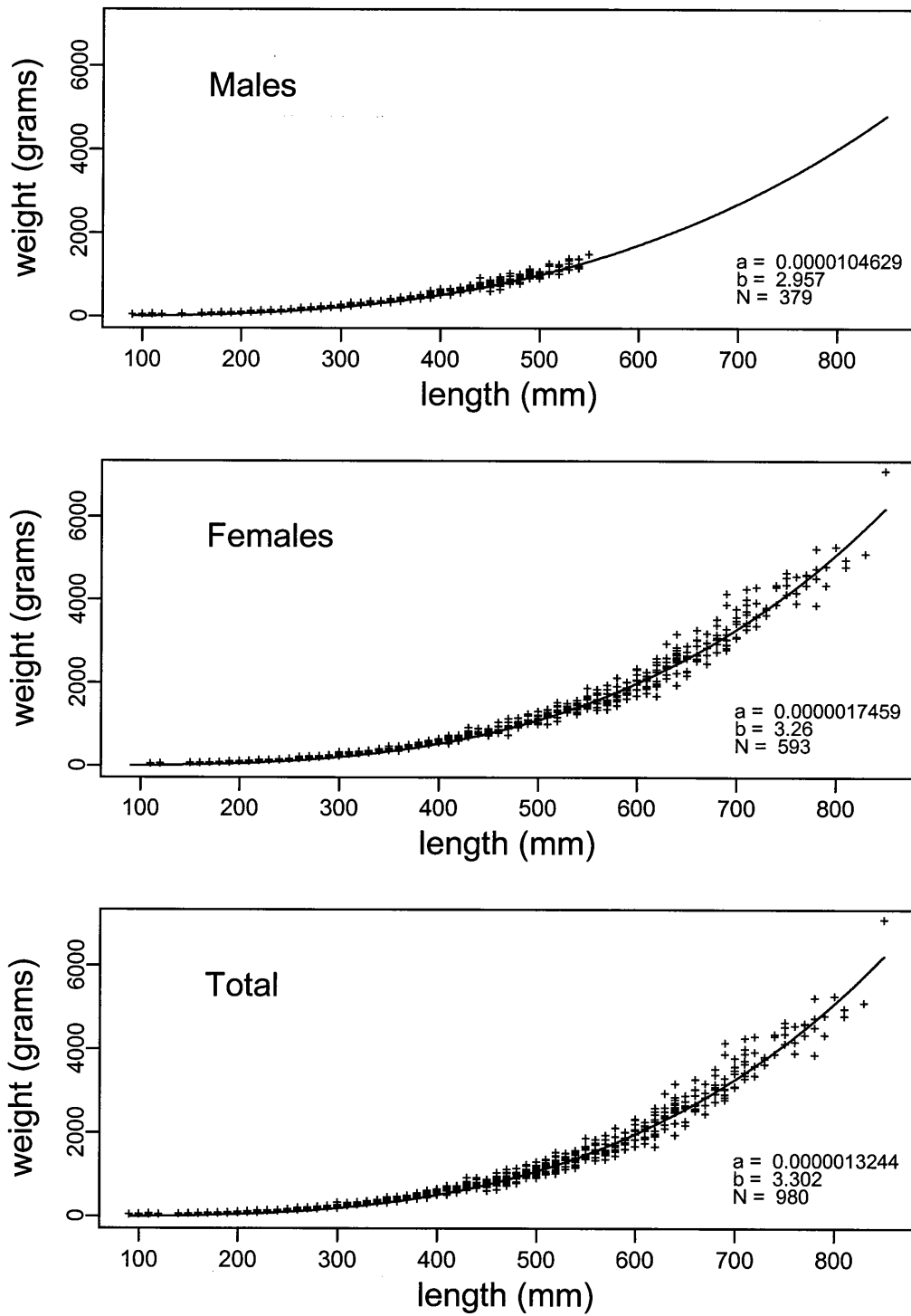


Figure 4.--Length-weight relationship for arrowtooth flounder specimens collected during the 1999 Gulf of Alaska bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a \times Length_{(mm)}^b$.

Table 4.--Catch per unit effort by stratum for arrowtooth flounder sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Hauls		CPUE (kg/km ²)	Biomass (t)	Lower	Upper
			Number of hauls	with catch			C.I. Biomass	C.I. Biomass
Kodiak	101-200	Albatross Gullies	18	18	15,423	122,033	43,984	200,082
Southeastern	101-200	Prince of Wales Shelf	14	13	14,043	96,728	0	216,751
Shumagin	501-700	Shumagin Slope	5	5	8,581	17,211	0	41,930
Kodiak	101-200	Portlock Flats	16	16	8,231	60,395	20,705	100,085
Kodiak	201-300	Kodiak Slope	5	5	7,882	12,790	0	34,404
Kodiak	101-200	Barren Islands	24	24	7,742	85,020	58,630	111,411
Kodiak	1-100	Albatross Shallows	13	13	7,544	43,502	20,528	66,476
Chirikof	101-200	East Shumagin Gully	24	24	7,434	82,554	52,787	112,322
Kodiak	201-300	Upper Shelikof Gully	10	10	7,402	23,748	14,371	33,124
Chirikof	201-300	Lower Shelikof Gully	30	30	6,101	61,124	46,012	76,236
Kodiak	101-200	Kodiak Outer Shelf	11	11	6,082	30,564	0	67,265
Yakutat	201-300	Yakutat Slope	5	5	5,992	12,747	0	35,107
Kodiak	1-100	Northern Kodiak Shallows	5	5	5,534	12,173	0	31,258
Southeastern	101-200	Baranof-Chichagof Shelf	10	9	5,199	21,818	0	48,612
Chirikof	101-200	Shelikof Edge	17	17	5,189	40,135	21,986	58,285
Shumagin	101-200	Sanak Gully	9	9	5,051	21,454	5,689	37,219
Kodiak	1-100	Albatross Banks	34	25	4,985	76,793	0	183,292
Shumagin	201-300	Shumagin Slope	8	8	3,871	10,792	0	29,868
Yakutat	101-200	Yakutat Flats	19	19	3,658	33,042	14,697	51,387
Chirikof	1-100	Upper Alaska Peninsula	18	15	3,509	27,866	10,766	44,967
Yakutat	201-300	Yakutat Gullies	9	9	3,391	10,319	4,384	16,255
Shumagin	101-200	West Shumagin Gully	5	5	3,361	7,657	2,510	12,803
Chirikof	101-200	Chirikof Outer Shelf	11	11	3,338	16,728	2,799	30,656
Kodiak	101-200	Kenai Flats	26	26	3,238	39,103	27,505	50,701
Chirikof	1-100	Chirikof Bank	24	22	3,193	34,461	20,675	48,247
Southeastern	1-100	Southeastern Shallows	10	7	2,960	19,381	0	58,899
Southeastern	201-300	Baranof-Chichagof Slope	3	3	2,960	3,331	806	5,856
Shumagin	301-500	Shumagin Slope	12	12	2,875	7,277	913	13,642
Chirikof	301-500	Chirikof Slope	8	8	2,825	4,531	0	11,162
Kodiak	1-100	Kenai Peninsula	12	11	2,820	14,834	3,888	25,780
Chirikof	201-300	Chirikof Slope	5	5	2,820	4,310	1,134	7,485
Chirikof	1-100	Semidi Bank	17	15	2,605	19,022	777	37,268
Yakutat	101-200	Fairweather Shelf	17	17	2,540	19,631	13,448	25,814
Yakutat	301-500	Yakutat Slope	7	7	2,534	3,853	1,406	6,301
Southeastern	201-300	Prince of Wales Slope/Gullies	13	13	2,218	8,711	0	18,203
Shumagin	101-200	Shumagin Outer Shelf	17	17	2,038	16,618	6,562	26,674
Yakutat	101-200	Yakataga Shelf	11	11	2,021	10,664	4,127	17,200
Shumagin	1-100	Lower Alaska Peninsula	16	14	1,795	12,342	3,811	20,872
Yakutat	101-200	Middleton Shelf	16	16	1,772	13,014	9,072	16,955
Kodiak	1-100	Lower Cook Inlet	22	13	1,745	17,252	0	37,997
Kodiak	201-300	Kenai Gullies	21	21	1,740	11,587	7,871	15,304
Shumagin	1-100	Shumagin Bank	26	25	1,626	20,161	11,021	29,302
Shumagin	1-100	Davidson Bank	29	29	1,582	21,644	12,401	30,887
Kodiak	301-500	Kodiak Slope	14	12	1,512	4,404	2,071	6,737
Southeastern	301-500	Southeastern Deep Gullies	10	10	1,053	2,469	436	4,501
Shumagin	1-100	Fox Islands	19	17	988	8,093	3,617	12,568
Yakutat	1-100	Yakutat Shallows	23	20	972	9,672	2,645	16,698
Yakutat	1-100	Middleton Shallows	15	9	908	6,093	0	12,812
Yakutat	301-500	Yakutat Gullies	5	5	875	968	0	2,130
Southeastern	301-500	Southeastern Slope	4	2	804	621	0	2,331
Yakutat	501-700	Yakutat Slope	5	2	302	443	0	1,472
Kodiak	501-700	Kodiak Slope	5	1	125	217	0	821
Chirikof	501-700	Chirikof Slope	6	2	41	80	0	226

Pacific halibut (*Hippoglossus stenolepis*)

Pacific halibut were most common in water less than 100 m deep and were caught in approximately 94% of tows in this depth range, including 100% of the tows in the Shumagin and Chirikof INPFC areas. The frequency of occurrence of Pacific halibut in tows decreased from west to east, ranging from about 92% of the tows in the Shumagin INPFC area to 40% of the tows in the Southeastern INPFC area. Approximately 71% of the survey area biomass was estimated to reside in water less than 100 m deep, about 40% of the survey area. The highest CPUEs were noted in this depth range in every area except the Southeastern where the highest CPUEs were found between 101 and 200 m. The highest CPUEs of the survey were recorded to the southeast and southwest of Kodiak Island on Albatross Banks and Chirikof Bank and in lower Cook Inlet (Fig. 5 and Table 6). Albatross Banks accounted for about 24% of the total survey area estimate, while comprising less than 5% of the survey area. The mean length and weight of Pacific halibut generally increased with depth and from east to west (Table 5). A strong length mode between 40 and 45 cm FL was noted in the Shumagin area, while the mode in the Kodiak area was between 75 and 80 cm FL. Fish greater than 135 cm FL (~ 0.5% of the estimated total population) were excluded from Figure 6 to improve its readability.

Table 5.--Number of survey hauls, number of hauls with Pacific halibut, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	90	2,182	90,081	2.80	53.6
	101 - 200	31	26	1,068	15,674	4.16	64.9
	201 - 300	8	4	464	1,294	6.69	78.1
	301 - 500	12	11	778	1,968	5.86	76.3
	501 - 700	5	4	2,141	4,294	13.72	101.7
	701 - 1000	1	0	---	---	---	---
	All depths		147	135	1,737	113,311	3.08
Chirikof	1 - 100	59	59	3,765	98,013	3.25	58.0
	101 - 200	52	39	929	22,154	7.44	77.3
	201 - 300	35	25	1,058	12,218	9.70	89.3
	301 - 500	8	5	1,610	2,582	9.66	91.5
	501 - 700	6	0	---	---	---	---
	701 - 1000	8	0	---	---	---	---
	All depths		168	128	1,983	134,967	3.89
Kodiak	1 - 100	86	81	5,423	208,880	3.39	59.3
	101 - 200	95	76	1,564	67,785	8.39	83.6
	201 - 300	36	18	336	3,860	11.05	92.8
	301 - 500	14	3	128	372	10.76	90.1
	501 - 700	5	0	---	---	---	---
	701 - 1000	10	0	---	---	---	---
	All depths		246	178	2,768	280,897	4.01
Yakutat	1 - 100	38	28	893	14,883	3.22	61.0
	101 - 200	63	35	564	16,557	5.41	73.7
	201 - 300	14	8	494	2,555	12.95	96.5
	301 - 500	12	2	27	71	4.46	72.5
	501 - 700	5	1	32	47	4.10	71.0
	701 - 1000	3	0	---	---	---	---
	All depths		135	74	596	34,112	4.32
Southeastern	1 - 100	10	8	788	5,158	2.26	57.4
	101 - 200	24	14	1,432	15,871	5.24	75.4
	201 - 300	16	5	180	910	9.22	84.0
	301 - 500	14	0	---	---	---	---
	501 - 700	2	0	---	---	---	---
	701 - 1000	2	0	---	---	---	---
	All depths		68	27	782	21,939	4.05
All areas	1 - 100	283	266	3,231	417,015	3.19	57.6
	101 - 200	265	190	1,128	138,041	6.60	76.7
	201 - 300	109	60	578	20,836	9.93	89.3
	301 - 500	60	21	390	4,993	7.64	83.2
	501 - 700	23	5	529	4,340	13.39	100.7
	701 - 1000	24	0	---	---	---	---
	All depths		764	542	1,829	585,225	3.78

All areas biomass, 95% confidence interval: 453,779 - 716,672 metric tons (t).

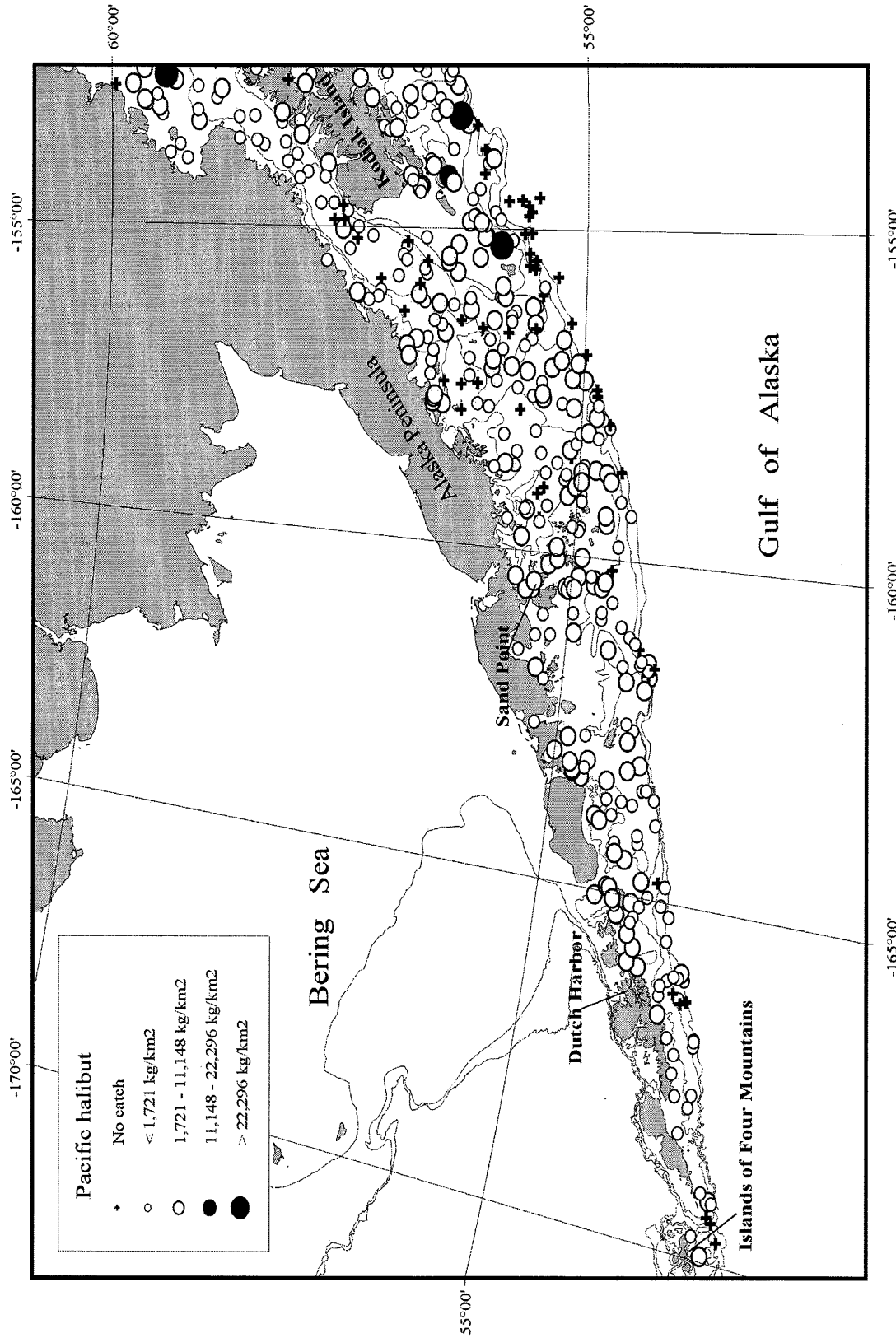


Figure 5. Distribution and relative abundance of Pacific halibut from the 1999 Gulf of Alaska bottom trawl survey. Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations above mean CPUE, and greater than four standard deviations above mean CPUE. Each symbol is proportional to the sample CPUE.

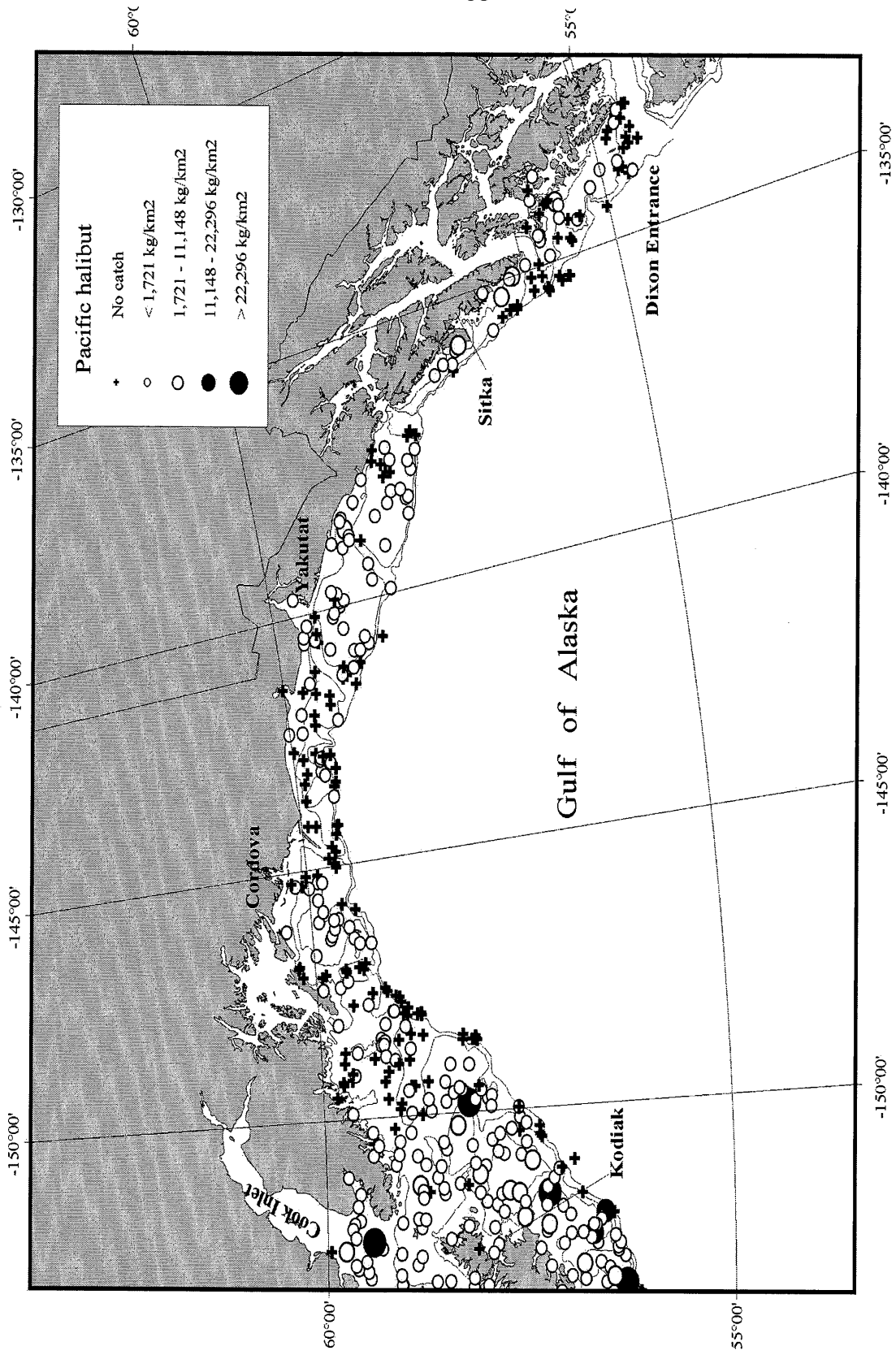


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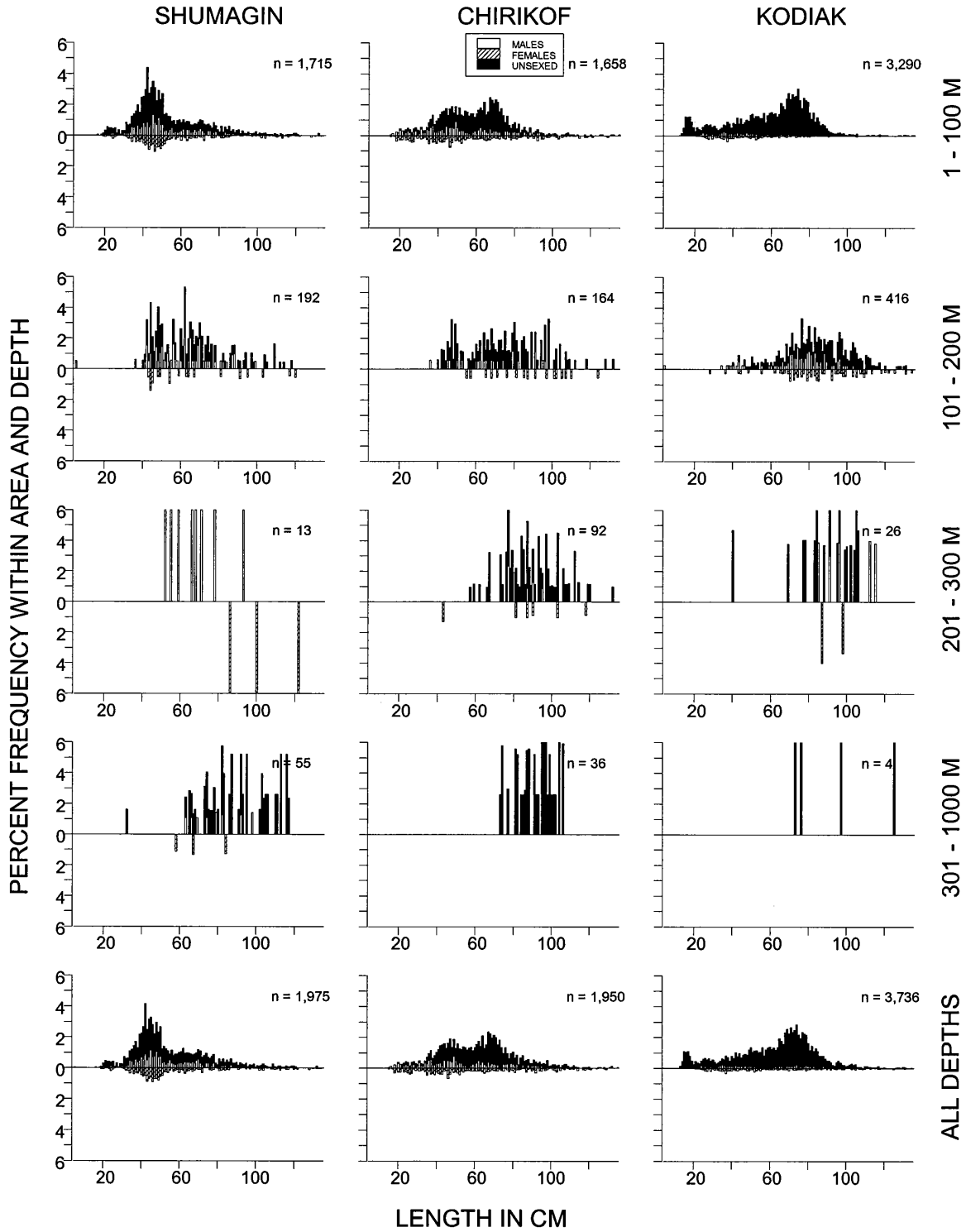


Figure 6.--Size composition of the estimated Pacific halibut population from the 1999 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

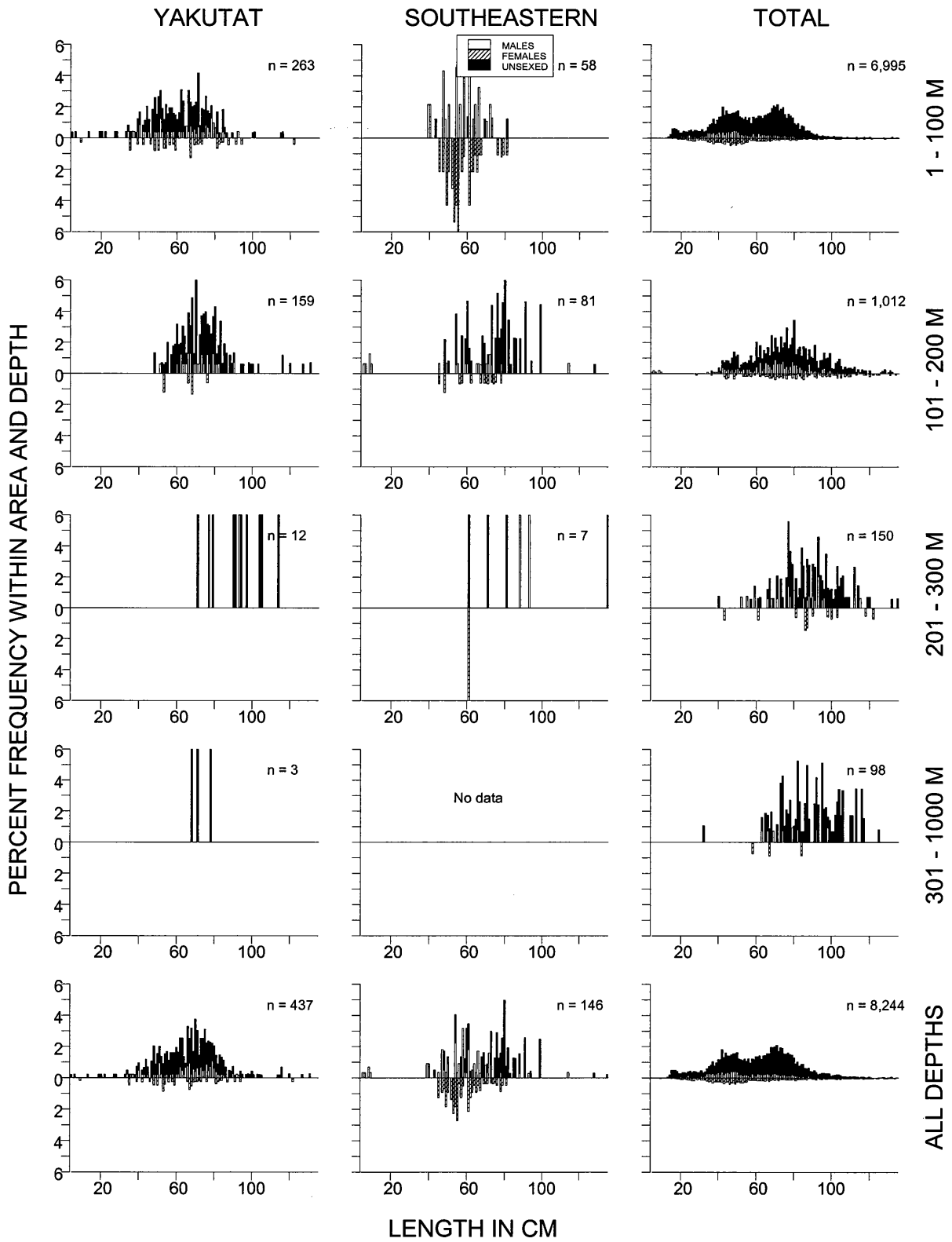


Figure 6.--Continued.

Table 6.--Catch per unit effort by stratum for Pacific halibut sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Hauls		CPUE (kg/km ²)	Biomass (t)	Lower	Upper
			Number of hauls	with catch			C.I. Biomass	C.I. Biomass
Kodiak	1-100	Albatross Banks	34	34	9,051	139,409	38,825	239,993
Chirikof	1-100	Chirikof Bank	24	24	5,943	64,132	34,725	93,538
Kodiak	1-100	Lower Cook Inlet	22	21	5,290	52,300	0	125,659
Kodiak	101-200	Kodiak Outer Shelf	11	11	3,289	16,528	0	33,463
Kodiak	1-100	Northern Kodiak Shallows	5	5	2,839	6,246	1,393	11,098
Shumagin	1-100	Shumagin Bank	26	26	2,543	31,525	20,361	42,689
Kodiak	101-200	Albatross Gullies	18	16	2,527	19,993	0	43,735
Shumagin	1-100	Lower Alaska Peninsula	16	16	2,338	16,077	9,062	23,093
Chirikof	1-100	Semidi Bank	17	17	2,224	16,236	9,518	22,954
Chirikof	1-100	Upper Alaska Peninsula	18	18	2,222	17,645	10,835	24,455
Shumagin	501-700	Shumagin Slope	5	4	2,141	4,294	0	11,918
Shumagin	1-100	Fox Islands	19	19	2,039	16,990	9,348	24,633
Kodiak	101-200	Barren Islands	24	23	1,873	20,562	9,381	31,742
Shumagin	1-100	Davidson Bank	29	29	1,863	25,489	18,445	32,532
Kodiak	1-100	Albatross Shallows	13	12	1,612	9,293	4,208	14,378
Chirikof	301-500	Chirikof Slope	8	5	1,610	2,582	0	6,245
Shumagin	101-200	Sanak Gully	9	9	1,608	6,824	1,437	12,212
Shumagin	101-200	West Shumagin Gully	5	3	1,499	3,415	0	11,415
Southeastern	101-200	Prince of Wales Shelf	14	7	1,453	10,008	0	24,539
Chirikof	101-200	Chirikof Outer Shelf	11	9	1,436	7,194	1,451	12,938
Southeastern	101-200	Baranof-Chichagof Shelf	10	7	1,397	5,864	827	10,900
Chirikof	201-300	Lower Shelikof Gully	30	22	1,076	10,775	5,771	15,778
Yakutat	101-200	Fairweather Shelf	17	12	980	7,572	3,417	11,727
Yakutat	201-300	Yakutat Slope	5	5	947	2,015	0	4,265
Kodiak	101-200	Portlock Flats	16	14	946	6,941	3,323	10,559
Chirikof	201-300	Chirikof Slope	5	3	944	1,443	0	3,912
Chirikof	101-200	Shelikof Edge	17	13	935	7,234	2,098	12,369
Yakutat	1-100	Middleton Shallows	15	13	919	6,168	2,377	9,959
Yakutat	1-100	Yakutat Shallows	23	15	876	8,716	1,674	15,758
Yakutat	101-200	Yakutat Flats	19	17	793	7,157	3,945	10,370
Southeastern	1-100	Southeastern Shallows	10	8	788	5,158	0	11,960
Shumagin	301-500	Shumagin Slope	12	11	778	1,968	224	3,712
Kodiak	201-300	Kodiak Slope	5	4	746	1,210	29	2,392
Chirikof	101-200	East Shumagin Gully	24	17	696	7,726	2,854	12,599
Shumagin	101-200	Shumagin Outer Shelf	17	14	667	5,435	2,626	8,245
Shumagin	201-300	Shumagin Slope	8	4	464	1,294	0	3,206
Kodiak	201-300	Upper Shelikof Gully	10	7	417	1,337	0	2,789
Kodiak	101-200	Kenai Flats	26	12	311	3,761	894	6,628
Kodiak	1-100	Kenai Peninsula	12	9	310	1,633	288	2,977
Southeastern	201-300	Baranof-Chichagof Slope	3	2	299	337	0	1,101
Yakutat	101-200	Yakataga Shelf	11	2	224	1,180	0	2,954
Kodiak	201-300	Kenai Gullies	21	7	197	1,313	279	2,346
Yakutat	201-300	Yakutat Gullies	9	3	178	540	0	1,229
Southeastern	201-300	Prince of Wales Slope & Gullies	13	3	146	573	0	1,640
Kodiak	301-500	Kodiak Slope	14	3	128	372	0	858
Yakutat	101-200	Middleton Shelf	16	4	88	647	0	1,483
Yakutat	501-700	Yakutat Slope	5	1	32	47	0	176
Yakutat	301-500	Yakutat Gullies	5	1	28	31	0	118
Yakutat	301-500	Yakutat Slope	7	1	26	39	0	136

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Flathead sole (*Hippoglossoides elassodon*)

The flathead sole population was concentrated in the nearshore areas around Kodiak Island and along the Alaska Peninsula, as these areas accounted for about 50% of the total survey area biomass estimate (Fig. 7 and Table 8). The Albatross Shallows stratum, comprised of the nearshore area southeast of Kodiak Island (less than 2% of the survey area), accounted for over 28% of the total estimated biomass of flathead sole. Very few flathead sole were captured in depths over 300 m (Table 7). The male length frequency data indicated a mode between 30 and 35 cm FL, while the female length mode was between 35 and 40 cm FL (Fig. 8). The length-weight relationship for flathead sole specimens collecting during the survey is depicted in Figure 9.

Table 7.--Number of survey hauls, number of hauls with flathead sole, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	67	1,080	44,578	0.36	32.2
	101 - 200	31	21	342	5,018	0.27	30.3
	201 - 300	8	3	12	33	0.17	27.1
	301 - 500	12	0	---	---	---	---
	501 - 700	5	1	4	8	0.45	34.0
	701 - 1000	1	0	---	---	---	---
	All depths		147	92	761	49,636	0.35
Chirikof	1 - 100	59	29	921	23,976	0.28	30.1
	101 - 200	52	44	556	13,263	0.22	28.6
	201 - 300	35	27	177	2,042	0.34	34.2
	301 - 500	8	0	---	---	---	---
	501 - 700	6	0	---	---	---	---
	701 - 1000	8	0	---	---	---	---
	All depths		168	100	577	39,280	0.26
Kodiak	1 - 100	86	39	1,860	71,649	0.34	31.7
	101 - 200	95	58	625	27,089	0.34	32.3
	201 - 300	36	27	115	1,324	0.27	30.5
	301 - 500	14	1	5	14	0.42	36.3
	501 - 700	5	0	---	---	---	---
	701 - 1000	10	0	---	---	---	---
	All depths		246	125	986	100,076	0.34
Yakutat	1 - 100	38	20	106	1,769	0.29	29.7
	101 - 200	63	37	449	13,197	0.39	32.5
	201 - 300	14	10	29	149	0.19	27.9
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	3	0	---	---	---	---
	All depths		135	67	264	15,115	0.37
Southeastern	1 - 100	10	4	516	3,376	0.16	25.9
	101 - 200	24	3	7	74	0.21	28.1
	201 - 300	16	2	7	33	0.33	33.2
	301 - 500	14	0	---	---	---	---
	501 - 700	2	0	---	---	---	---
	701 - 1000	2	0	---	---	---	---
	All depths		68	9	124	3,482	0.17
All areas	1 - 100	283	159	1,126	145,347	0.32	31.2
	101 - 200	265	163	479	58,641	0.31	31.0
	201 - 300	109	69	99	3,581	0.30	32.2
	301 - 500	60	1	1	14	0.42	36.3
	501 - 700	23	1	1	8	0.45	34.0
	701 - 1000	24	0	---	---	---	---
	All depths		764	393	649	207,590	0.32

All areas biomass, 95% confidence interval: 158,269 - 256,911 metric tons (t).

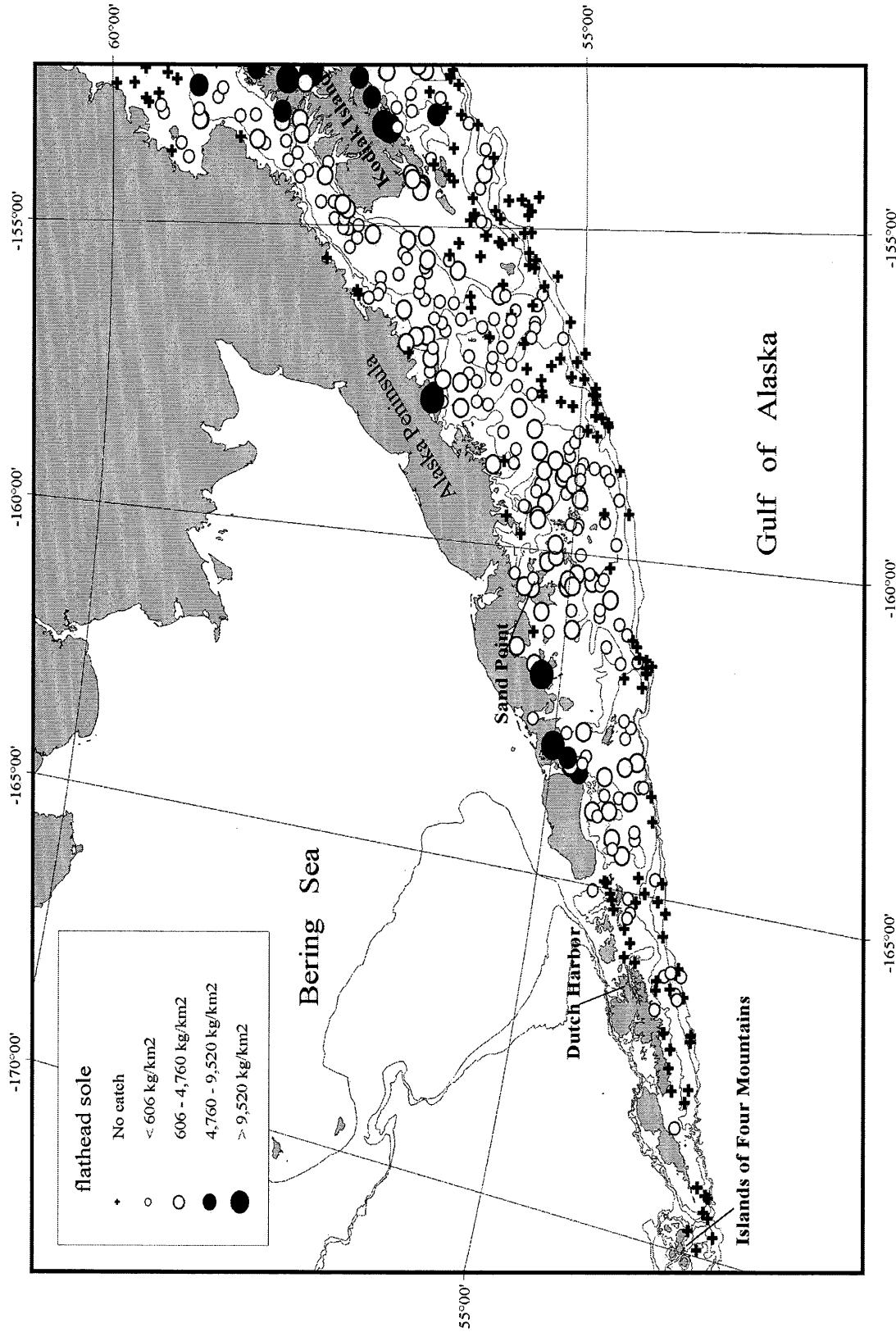


Figure 7.--Distribution and relative abundance of flathead sole from the 1999 Gulf of Alaska bottom trawl survey. Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations above mean CPUE, and greater than four standard deviations above mean CPUE. Each symbol is proportional to the sample CPUE.

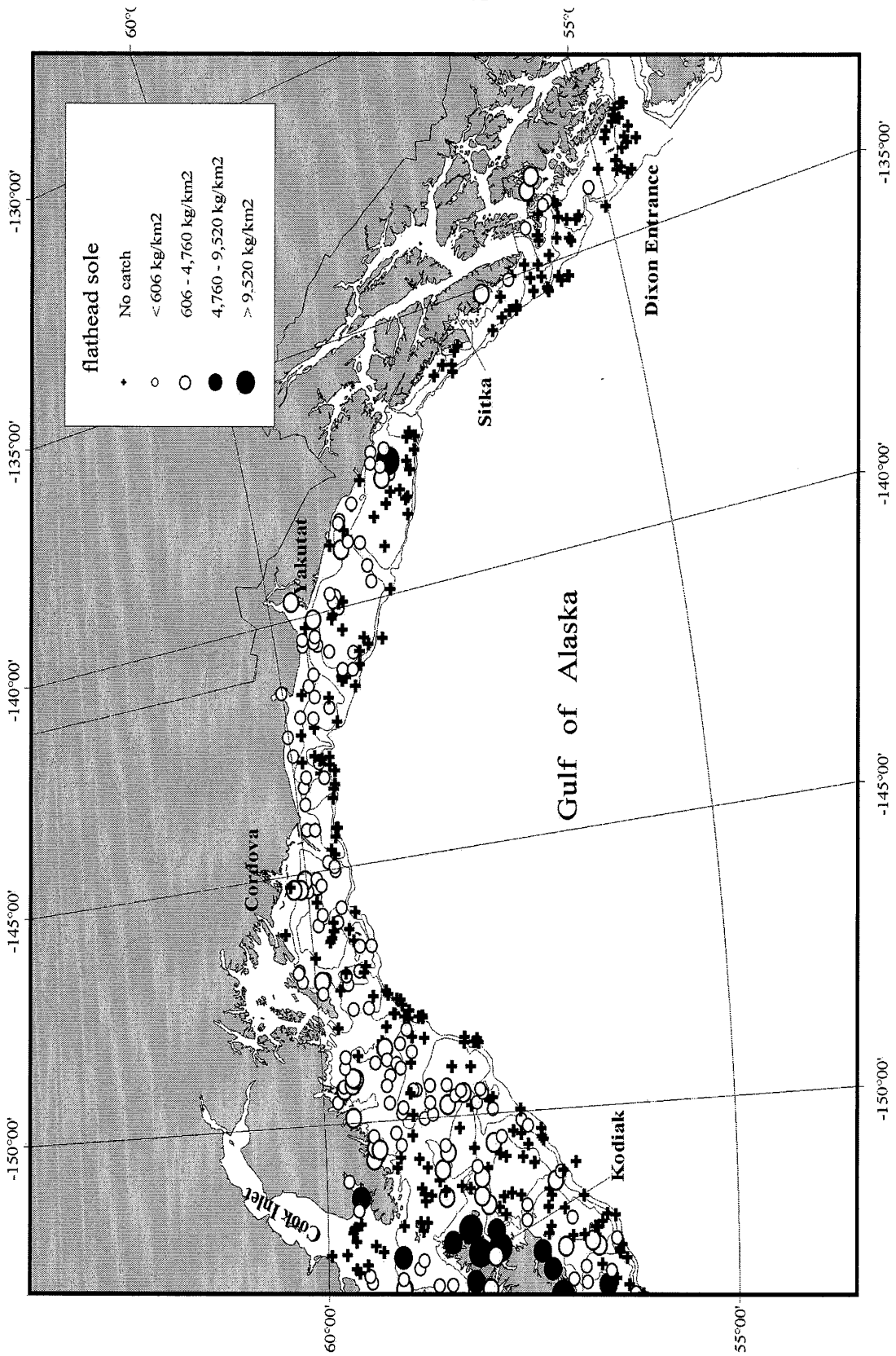


Figure 7.--Continued.

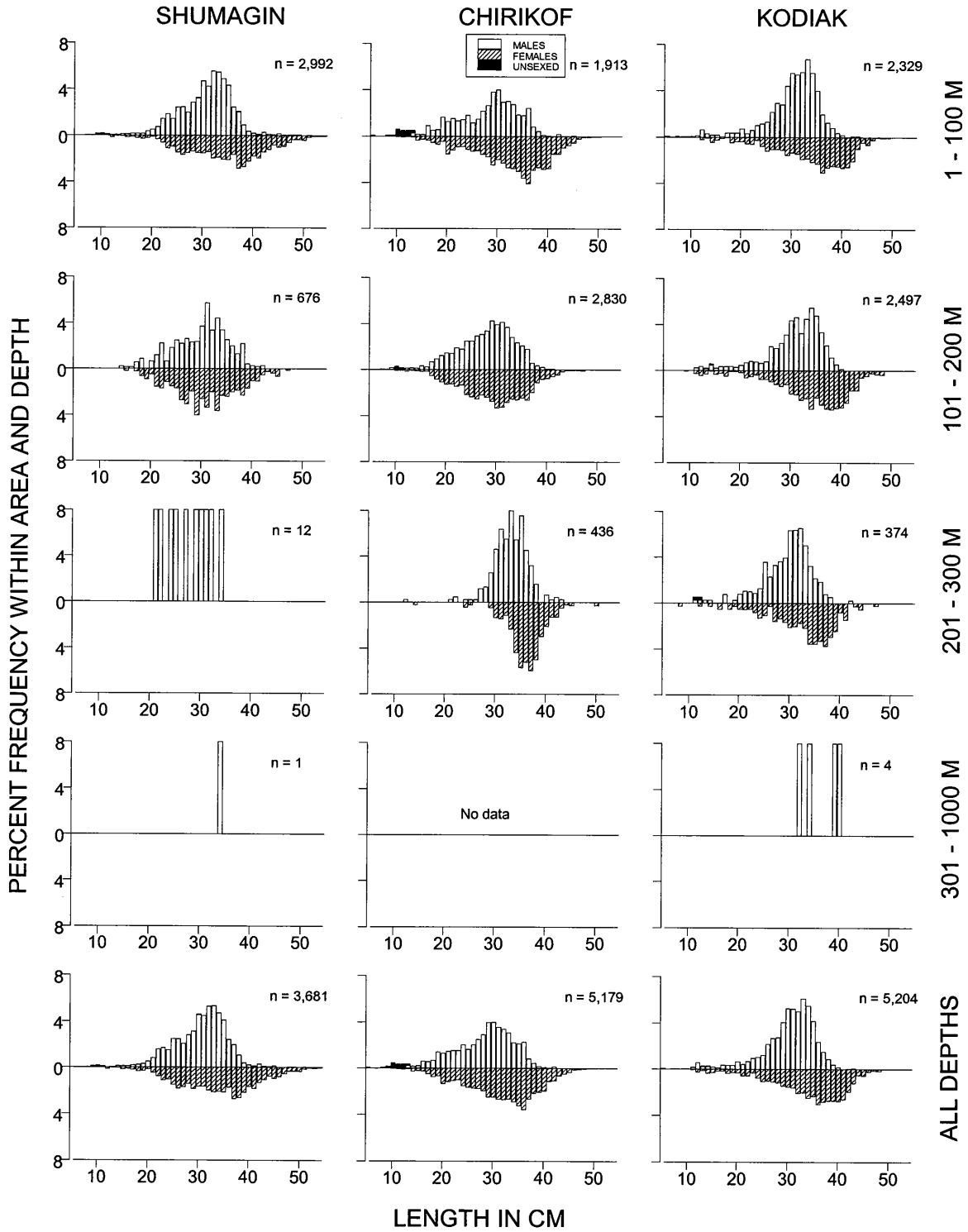


Figure 8.--Size composition of the estimated flathead sole population from the 1999 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

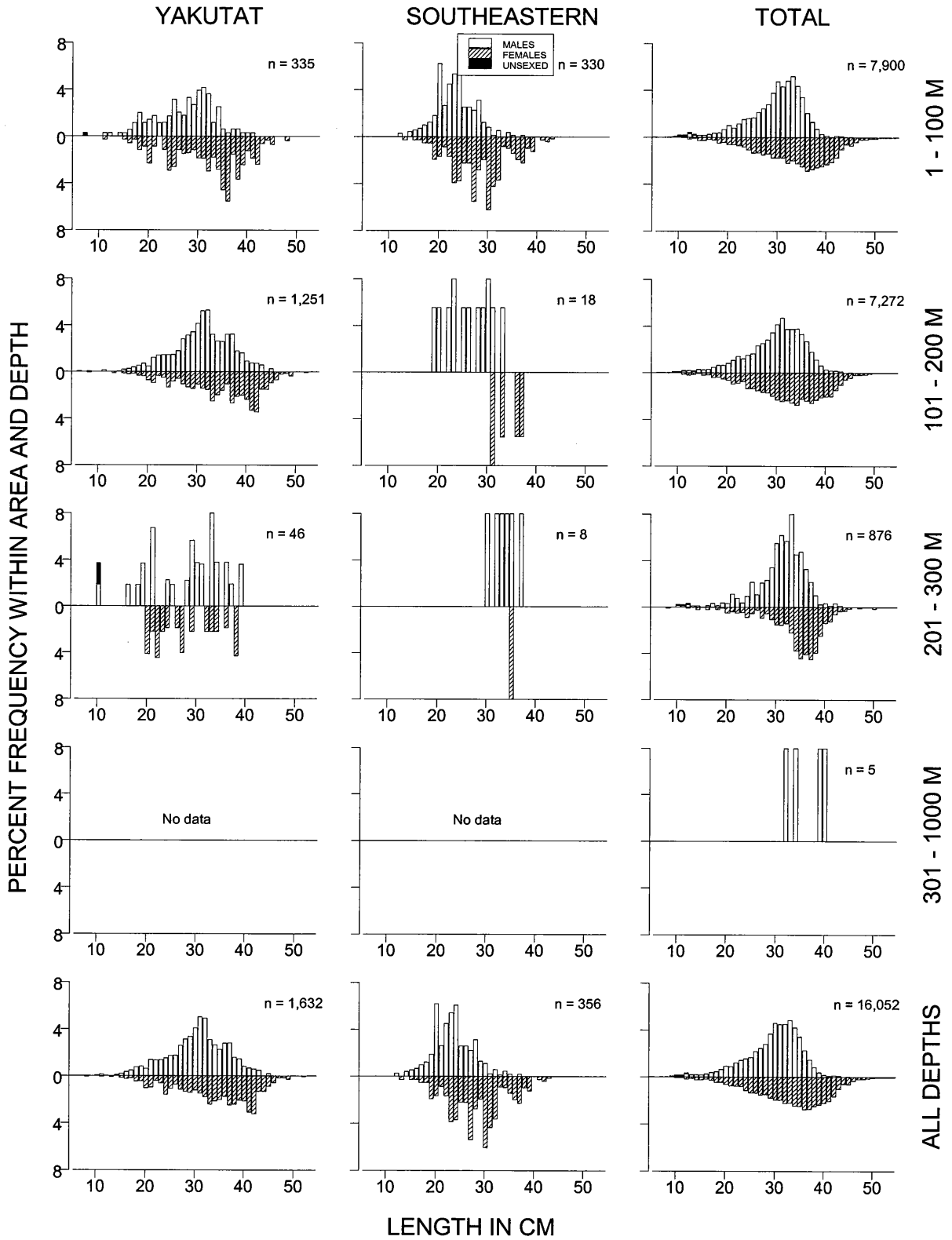


Figure 8.--Continued.

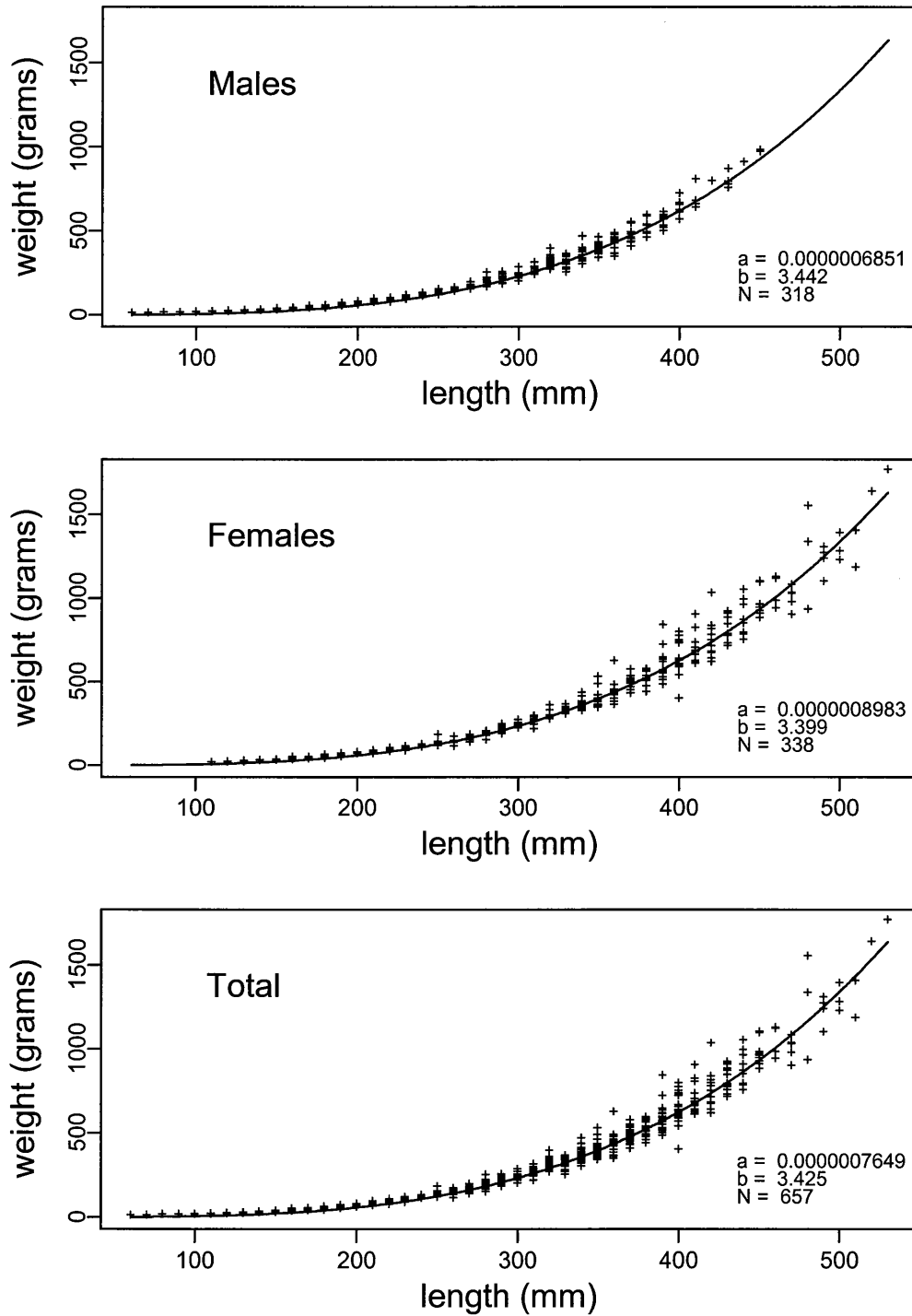


Figure 9.--Length-weight relationship for flathead sole specimens collected during the 1999 Gulf of Alaska bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a \times Length_{(mm)}^b$.

Table 8.--Catch per unit effort by stratum for flathead sole sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Lower	Upper
							C.I. Biomass	C.I. Biomass
Kodiak	1-100	Albatross Shallows	13	12	10,209	58,867	21,570	96,164
Shumagin	1-100	Lower Alaska Peninsula	16	13	3,370	23,173	3,497	42,849
Kodiak	1-100	Northern Kodiak Shallows	5	5	2,426	5,337	0	15,272
Chirikof	1-100	Upper Alaska Peninsula	18	12	1,963	15,590	223	30,957
Kodiak	101-200	Albatross Gullies	18	13	1,439	11,389	2,868	19,909
Yakutat	101-200	Fairweather Shelf	17	7	1,103	8,523	0	25,449
Shumagin	101-200	West Shumagin Gully	5	5	874	1,991	0	4,168
Shumagin	1-100	Davidson Bank	29	23	822	11,249	3,516	18,982
Shumagin	1-100	Shumagin Bank	26	25	800	9,917	4,669	15,164
Chirikof	1-100	Chirikof Bank	24	10	743	8,015	1,862	14,168
Chirikof	101-200	East Shumagin Gully	24	24	709	7,871	4,872	10,871
Shumagin	101-200	Sanak Gully	9	9	656	2,786	0	5,971
Chirikof	101-200	Shelikof Edge	17	15	652	5,046	1,735	8,358
Kodiak	101-200	Barren Islands	24	12	548	6,013	0	12,208
Kodiak	1-100	Kenai Peninsula	12	8	543	2,856	641	5,071
Southeastern	1-100	Southeastern Shallows	10	4	516	3,376	0	7,638
Kodiak	101-200	Kenai Flats	26	19	462	5,577	470	10,685
Kodiak	101-200	Portlock Flats	16	11	458	3,357	89	6,624
Kodiak	1-100	Lower Cook Inlet	22	9	421	4,161	0	10,847
Yakutat	101-200	Middleton Shelf	16	14	377	2,768	1,199	4,338
Kodiak	201-300	Upper Shelikof Gully	10	10	210	675	352	997
Chirikof	201-300	Lower Shelikof Gully	30	26	204	2,042	1,054	3,030
Kodiak	201-300	Kodiak Slope	5	4	162	262	0	554
Kodiak	101-200	Kodiak Outer Shelf	11	3	150	754	0	2,285
Yakutat	101-200	Yakutat Flats	19	10	148	1,338	0	2,877
Yakutat	1-100	Yakutat Shallows	23	15	114	1,137	327	1,948
Yakutat	101-200	Yakataga Shelf	11	6	108	568	41	1,096
Yakutat	1-100	Middleton Shallows	15	5	94	632	0	1,396
Chirikof	101-200	Chirikof Outer Shelf	11	5	69	345	0	1,047
Kodiak	201-300	Kenai Gullies	21	13	58	387	94	680
Chirikof	1-100	Semidi Bank	17	7	51	371	0	749
Yakutat	201-300	Yakutat Gullies	9	7	35	105	0	245
Shumagin	101-200	Shumagin Outer Shelf	17	7	30	241	0	500
Shumagin	1-100	Fox Islands	19	6	29	240	0	667
Kodiak	1-100	Albatross Banks	34	5	28	427	0	864
Yakutat	201-300	Yakutat Slope	5	3	21	44	0	107
Shumagin	201-300	Shumagin Slope	8	3	12	33	0	82
Southeastern	101-200	Prince of Wales Shelf	14	2	10	66	0	204
Southeastern	201-300	Prince of Wales Slope/Gullies	13	2	8	33	0	95
Kodiak	301-500	Kodiak Slope	14	1	5	14	0	43
Shumagin	501-700	Shumagin Slope	5	1	4	8	0	29
Southeastern	101-200	Baranof-Chichagof Shelf	10	1	2	8	0	25
Chirikof	201-300	Chirikof Slope	5	1	<1	<1	0	1

Southern rock sole (*Lepidopsetta bilineata*)

The southern rock sole population was concentrated in water less than 100 m deep in the Kodiak, Chirikof and Shumagin INPFC areas (Table 10; Fig. 10). These areas comprise only about 33% of the total survey area, yet accounted for 90% of the estimated biomass of southern rock sole (Table 9). About 41% of the total biomass was estimated to be in the Shumagin INPFC area in water less than 100 m, about 13% of the total area. The survey data indicate that the population within the survey area is predominantly female as they were estimated to make up over 70% of the total population (Fig. 11). Female length data indicated a mode just over 40 cm FL, while the male data show a mode between 30 and 35 cm FL. The length-weight relationship for southern rock sole is depicted in Figure 12.

Table 9.--Number of survey hauls, number of hauls with southern rock sole, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	73	1,054	43,525	0.64	35.6
	101 - 200	31	12	98	1,445	0.62	36.8
	201 - 300	8	0	---	---	---	---
	301 - 500	12	1	1	3	0.26	28.0
	501 - 700	5	0	---	---	---	---
	701 - 1000	1	0	---	---	---	---
	All depths		147	86	689	44,973	0.64
Chirikof	1 - 100	59	47	797	20,762	1.02	40.1
	101 - 200	52	10	19	451	0.77	35.7
	201 - 300	35	1	2	27	0.82	38.5
	301 - 500	8	0	---	---	---	---
	501 - 700	6	0	---	---	---	---
	701 - 1000	8	0	---	---	---	---
	All depths		168	58	312	21,240	1.01
Kodiak	1 - 100	86	60	802	30,878	0.63	33.9
	101 - 200	95	25	61	2,664	0.76	37.6
	201 - 300	36	0	---	---	---	---
	301 - 500	14	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	10	0	---	---	---	---
	All depths		246	85	330	33,542	0.64
Yakutat	1 - 100	38	17	145	2,418	0.53	32.3
	101 - 200	63	2	2	46	0.63	35.6
	201 - 300	14	1	5	24	0.64	36.5
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	3	0	---	---	---	---
	All depths		135	20	43	2,488	0.53
Southeastern	1 - 100	10	7	349	2,285	0.71	35.7
	101 - 200	24	6	143	1,582	0.61	34.2
	201 - 300	16	0	---	---	---	---
	301 - 500	14	0	---	---	---	---
	501 - 700	2	0	---	---	---	---
	701 - 1000	2	0	---	---	---	---
	All depths		68	13	138	3,867	0.66
All areas	1 - 100	283	204	774	99,868	0.69	35.6
	101 - 200	265	55	51	6,188	0.68	36.3
	201 - 300	109	2	1	51	0.73	37.4
	301 - 500	60	1	<1	3	0.26	28.0
	501 - 700	23	0	---	---	---	---
	701 - 1000	24	0	---	---	---	---
	All depths		764	262	332	106,109	0.69

All areas biomass, 95% confidence interval: 85,161 - 127,058 metric tons (t).

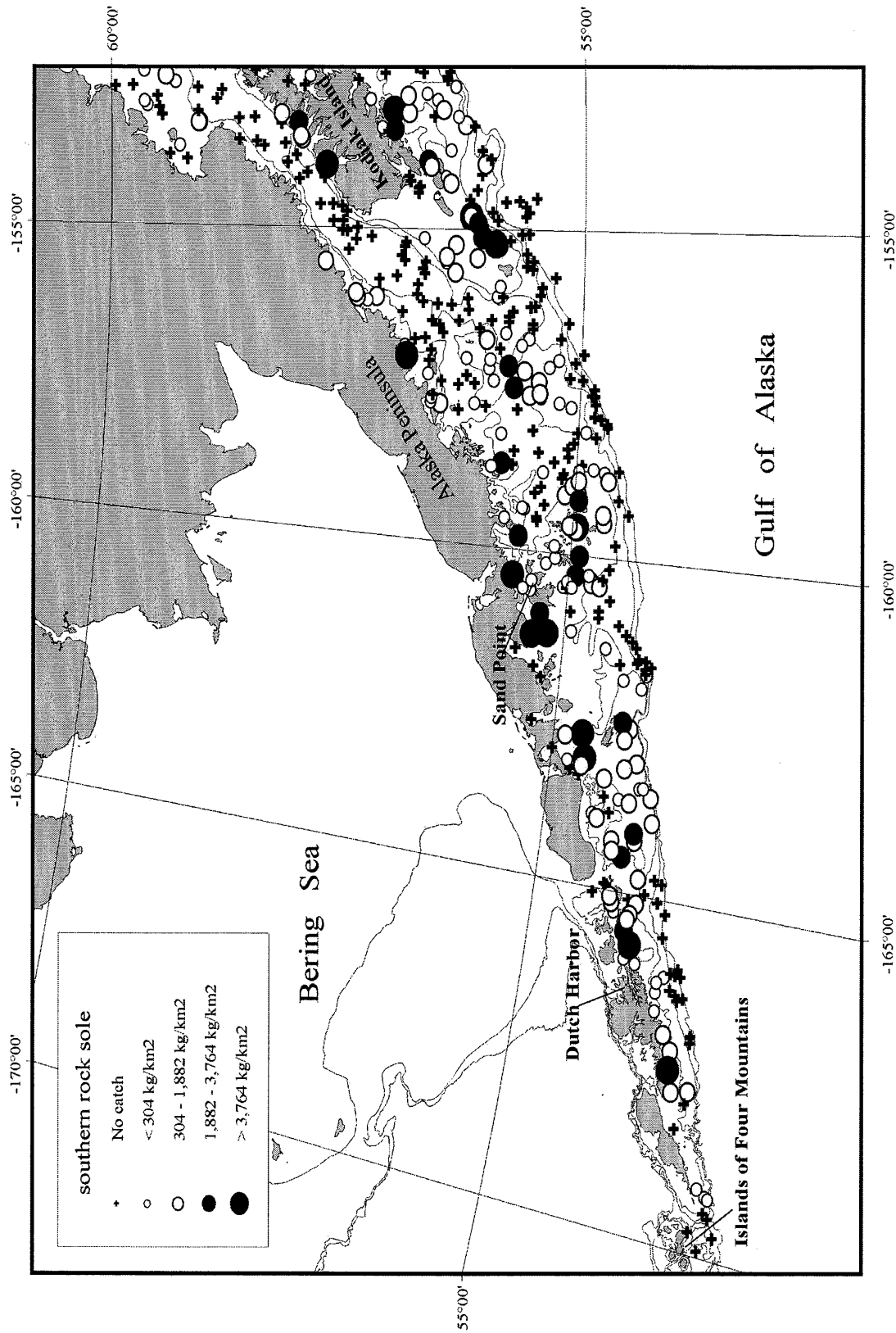


Figure 10.--Distribution and relative abundance of southern rock sole from the 1999 Gulf of Alaska bottom trawl survey. Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations above mean CPUE, and greater than four standard deviations above mean CPUE. Each symbol is proportional to the sample CPUE.

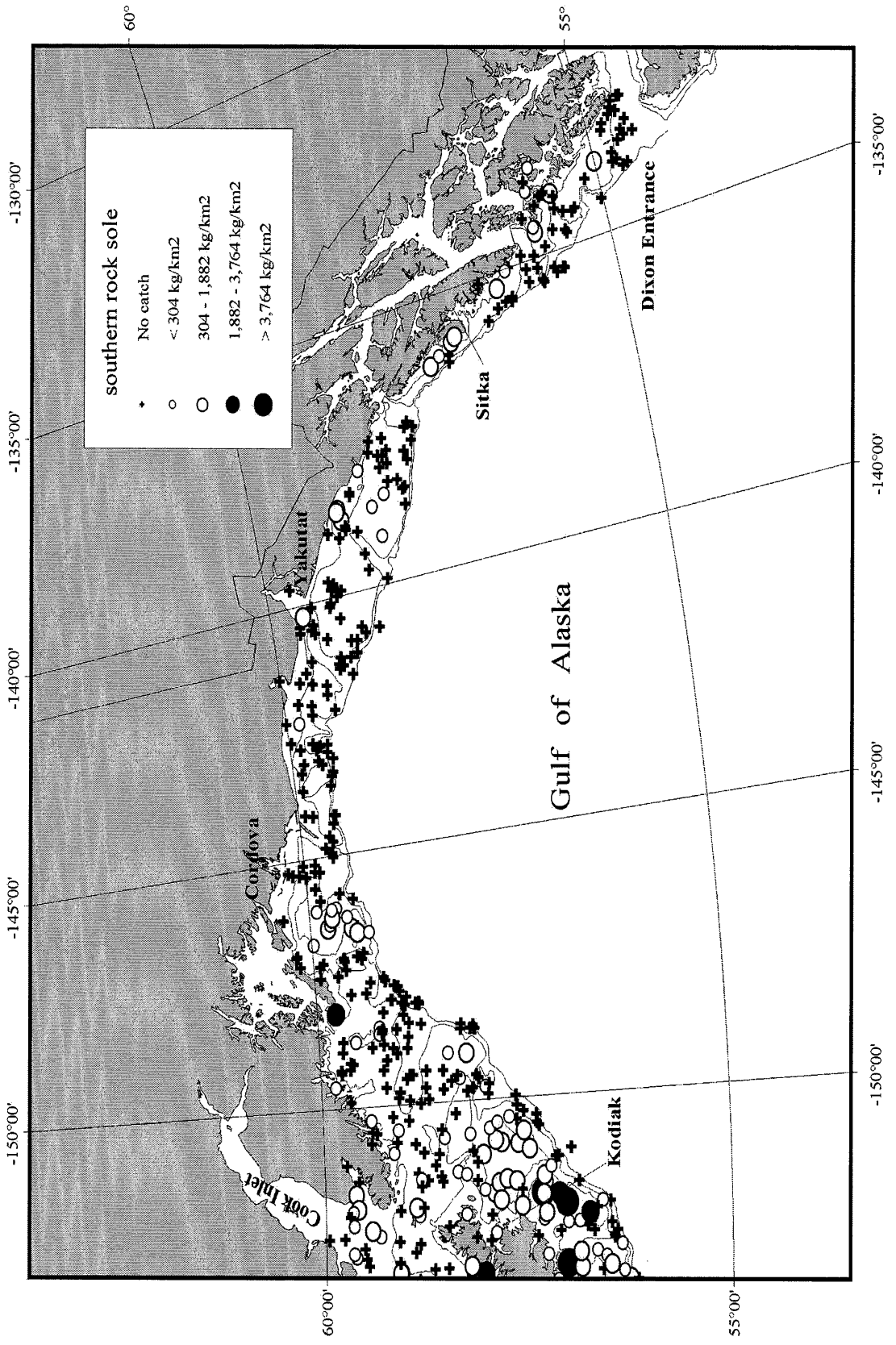


Figure 10.--Continued.

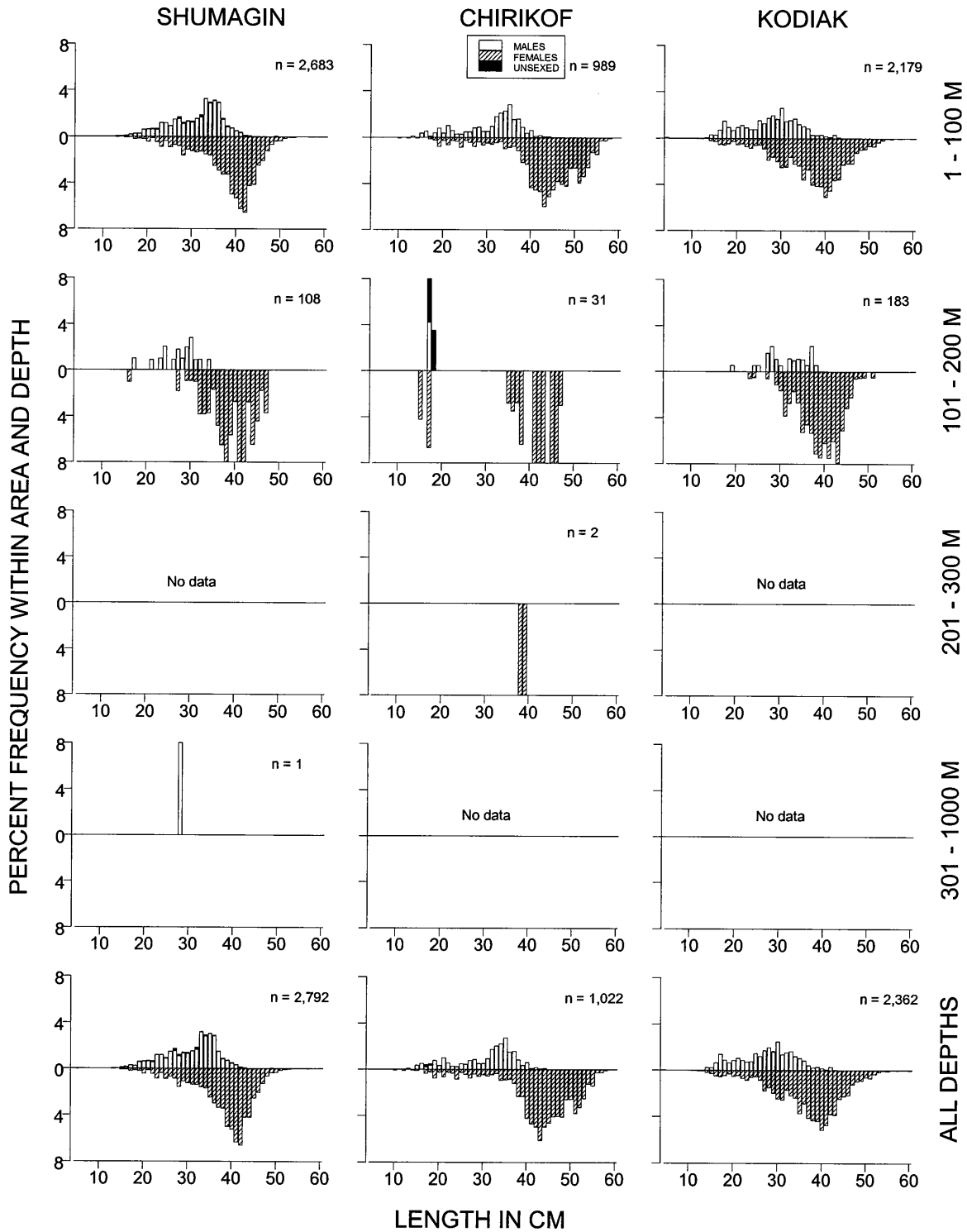


Figure 11.--Size composition of the estimated southern rock sole population from the 1999 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

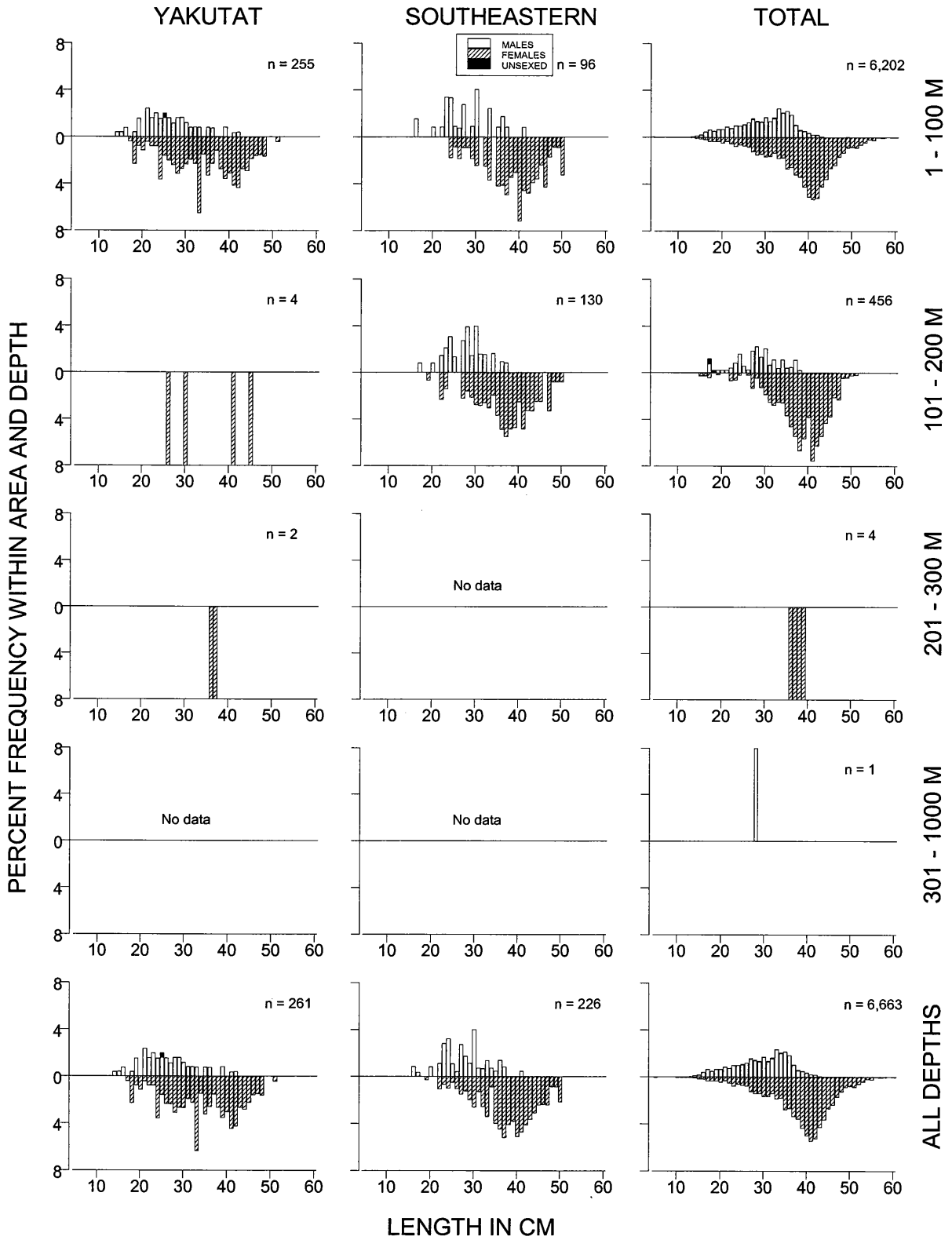


Figure 11.--Continued.

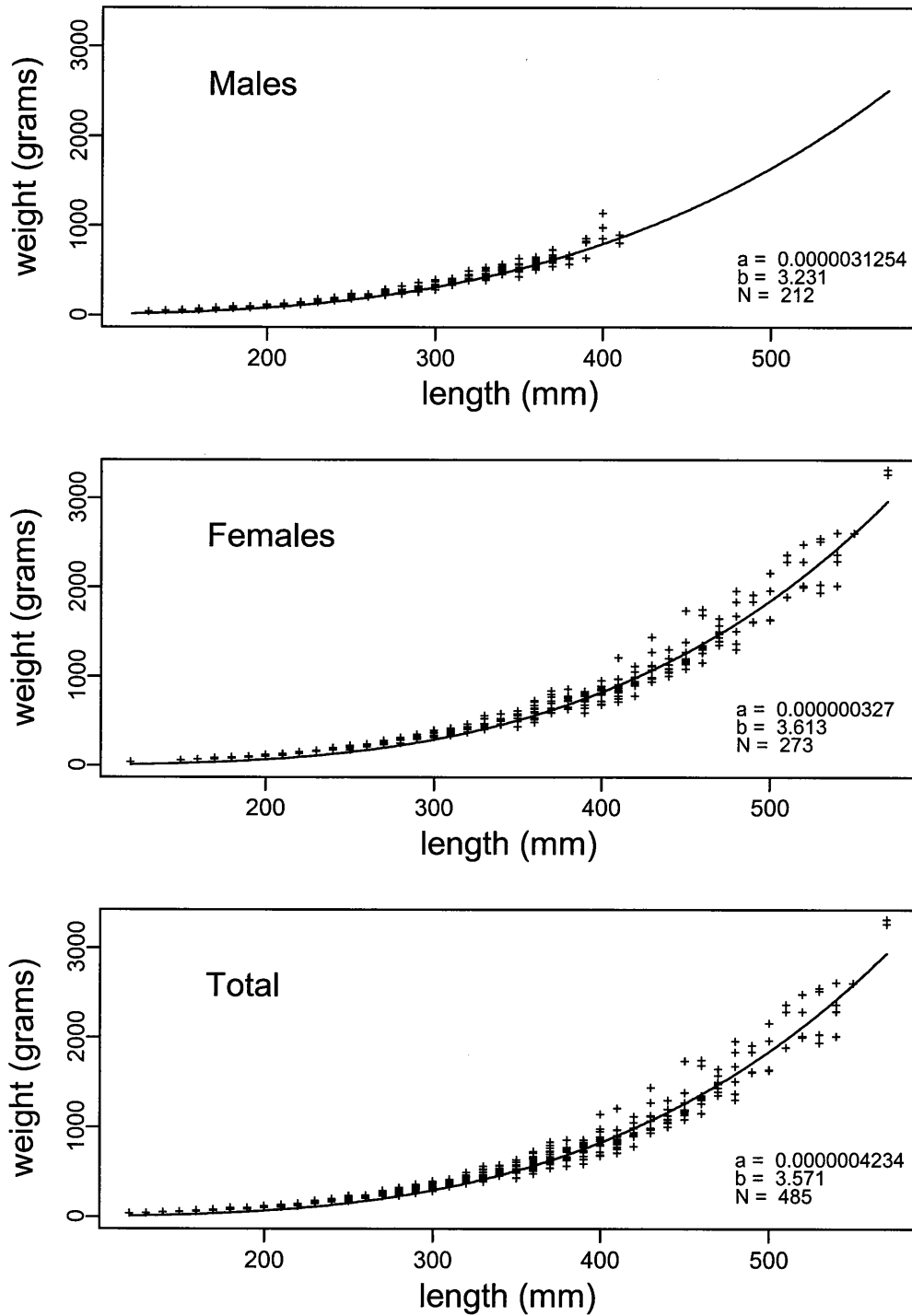


Figure 12.-- Length-weight relationship for southern rock sole specimens collected during the 1999 Gulf of Alaska bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a \times Length_{(mm)}^b$.

Table 10.--Catch per unit effort by stratum for southern rock sole sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Hauls		CPUE (kg/km ²)	Biomass (t)	Lower	Upper
			Number of hauls	with catch			C.I. Biomass	C.I. Biomass
Kodiak	1-100	Northern Kodiak Shallows	5	5	2,471	5,435	0	12,387
Chirikof	1-100	Chirikof Bank	24	17	1,170	12,622	3,049	22,196
Kodiak	1-100	Albatross Shallows	13	8	1,157	6,670	0	14,681
Shumagin	1-100	Shumagin Bank	26	24	1,086	13,461	6,531	20,390
Shumagin	1-100	Davidson Bank	29	24	1,085	14,841	6,461	23,221
Kodiak	1-100	Albatross Banks	34	31	1,016	15,644	8,402	22,886
Shumagin	1-100	Fox Islands	19	16	1,006	8,380	2,210	14,549
Shumagin	1-100	Lower Alaska Peninsula	16	9	995	6,843	0	13,804
Chirikof	1-100	Upper Alaska Peninsula	18	13	557	4,421	175	8,667
Chirikof	1-100	Semidi Bank	17	17	509	3,719	1,001	6,437
Southeastern	1-100	Southeastern Shallows	10	7	349	2,285	47	4,523
Kodiak	1-100	Kenai Peninsula	12	5	216	1,137	0	3,148
Yakutat	1-100	Middleton Shallows	15	10	206	1,382	231	2,534
Kodiak	1-100	Lower Cook Inlet	22	11	202	1,992	318	3,665
Kodiak	101-200	Kodiak Outer Shelf	11	6	177	889	0	2,061
Southeastern	101-200	Prince of Wales Shelf	14	2	164	1,127	0	3,018
Shumagin	101-200	Sanak Gully	9	3	158	671	0	1,796
Southeastern	101-200	Baranof-Chichagof Shelf	10	4	109	455	0	1,049
Yakutat	1-100	Yakutat Shallows	23	7	104	1,036	113	1,959
Kodiak	101-200	Albatross Gullies	18	6	97	771	0	2,079
Shumagin	101-200	Shumagin Outer Shelf	17	8	92	753	0	1,561
Kodiak	101-200	Barren Islands	24	5	66	720	0	1,634
Chirikof	101-200	Chirikof Outer Shelf	11	2	50	250	0	773
Kodiak	101-200	Portlock Flats	16	4	29	214	0	545
Chirikof	101-200	East Shumagin Gully	24	5	18	197	0	432
Yakutat	201-300	Yakutat Slope	5	1	11	24	0	91
Shumagin	101-200	West Shumagin Gully	5	1	9	21	0	79
Yakutat	101-200	Fairweather Shelf	17	2	6	46	0	113
Kodiak	101-200	Kenai Flats	26	4	6	70	0	141
Chirikof	201-300	Lower Shelikof Gully	30	1	3	27	0	81
Shumagin	301-500	Shumagin Slope	12	1	1	3	0	9
Chirikof	101-200	Shelikof Edge	17	3	1	5	0	12

Northern rock sole (*Lepidopsetta polyxystra*)

The northern rock sole population was concentrated primarily in the Shumagin INPFC area in water less than 100 m deep where 68% of the population was estimated to reside (Table 11). Approximately 92% of the tows in this area and depth contained northern rock sole. The stratum consisting of the nearshore area off the lower Alaska Peninsula (about 2% of the survey area) had the highest mean CPUE observed in the survey and accounted for about 34% of the overall estimated survey biomass (Table 12). A single tow in this stratum accounted for about 22% of the estimated total survey biomass. Northern rock sole were extremely rare east of 150°W (Fig. 13). In the Shumagin INPFC area, a distinct male length mode between 25 and 30 cm FL was observed in addition to a distinct female mode between 30 and 35 cm FL (Fig. 14). In the other areas, no length modes were clearly discernible, but large fish (> 40 cm FL) made up a much larger fraction of the population than in the Shumagin INPFC area. The length-weight relationship for northern rock sole is depicted in Figure 15.

Table 11.-- Number of survey hauls, number of hauls with northern rock sole, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	83	1,015	41,912	0.37	30.5
	101 - 200	31	17	219	3,209	0.48	34.7
	201 - 300	8	2	20	56	0.97	44.9
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	1	0	---	---	---	---
	All depths	147	102	693	45,178	0.37	30.7
Chirikof	1 - 100	59	28	224	5,819	0.54	31.9
	101 - 200	52	2	2	37	0.53	34.9
	201 - 300	35	0	---	---	---	---
	301 - 500	8	0	---	---	---	---
	501 - 700	6	0	---	---	---	---
	701 - 1000	8	0	---	---	---	---
	All depths	168	30	86	5,855	0.54	31.9
Kodiak	1 - 100	86	47	270	10,414	0.54	30.4
	101 - 200	95	3	1	65	0.50	33.2
	201 - 300	36	0	---	---	---	---
	301 - 500	14	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	10	0	---	---	---	---
	All depths	246	50	103	10,479	0.54	30.4
Yakutat	1 - 100	38	1	2	31	1.66	46.0
	101 - 200	63	0	---	---	---	---
	201 - 300	14	0	---	---	---	---
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	3	0	---	---	---	---
	All depths	135	1	1	31	1.66	46.0
Southeastern	1 - 100	10	0	---	---	---	---
	101 - 200	24	0	---	---	---	---
	201 - 300	16	0	---	---	---	---
	301 - 500	14	0	---	---	---	---
	501 - 700	2	0	---	---	---	---
	701 - 1000	2	0	---	---	---	---
	All depths	68	0	---	---	---	---
All areas	1 - 100	283	159	451	58,176	0.40	30.6
	101 - 200	265	22	27	3,311	0.48	34.7
	201 - 300	109	2	2	56	0.97	44.9
	301 - 500	60	0	---	---	---	---
	501 - 700	23	0	---	---	---	---
	701 - 1000	24	0	---	---	---	---
	All depths	764	183	192	61,543	0.41	30.8

All areas biomass, 95% confidence interval: 30,640 - 92,447 metric tons (t).

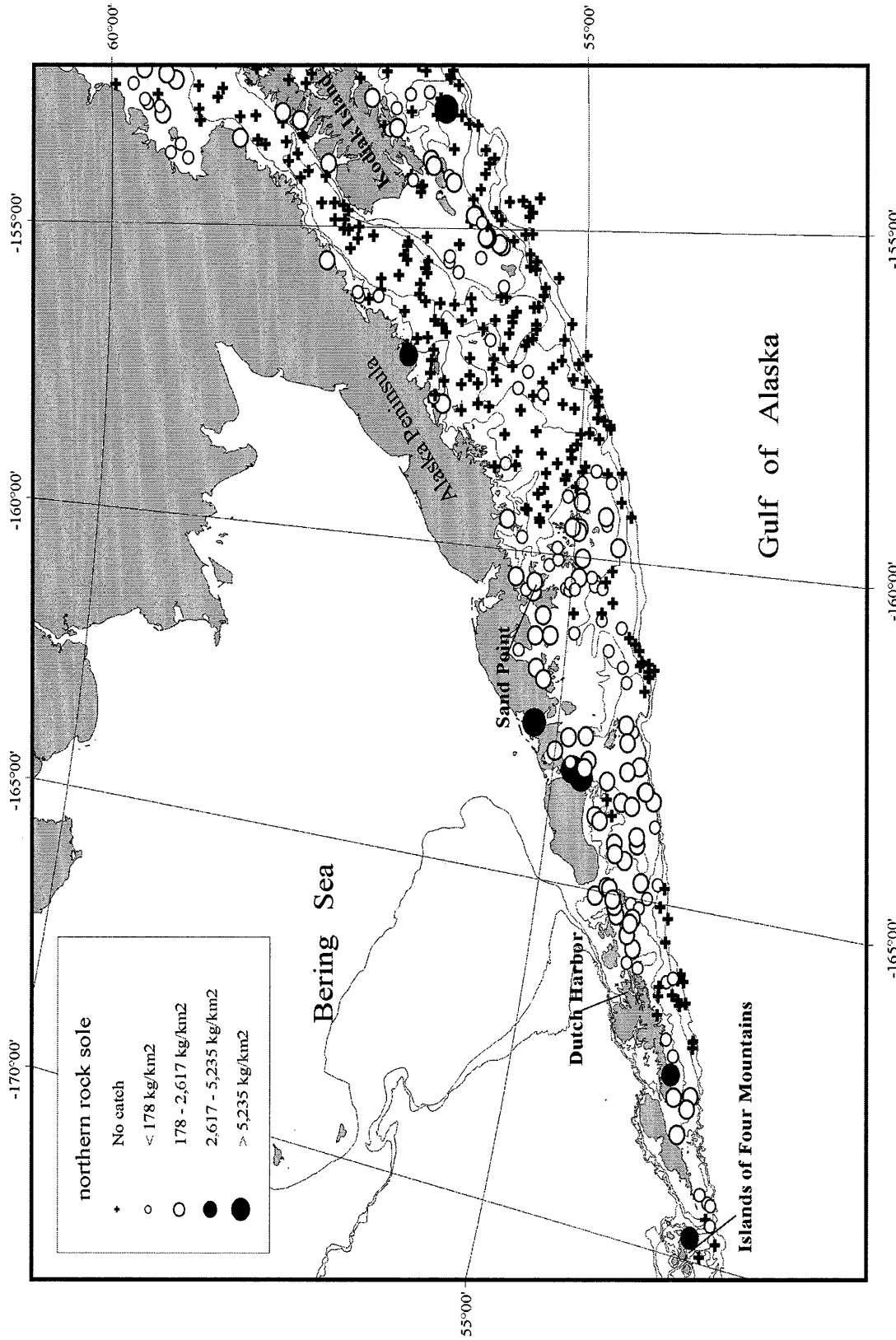


Figure 13.--Distribution and relative abundance of northern rock sole from the 1999 Gulf of Alaska bottom trawl survey. Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations above mean CPUE, and greater than four standard deviations above mean CPUE. Each symbol is proportional to the sample CPUE.

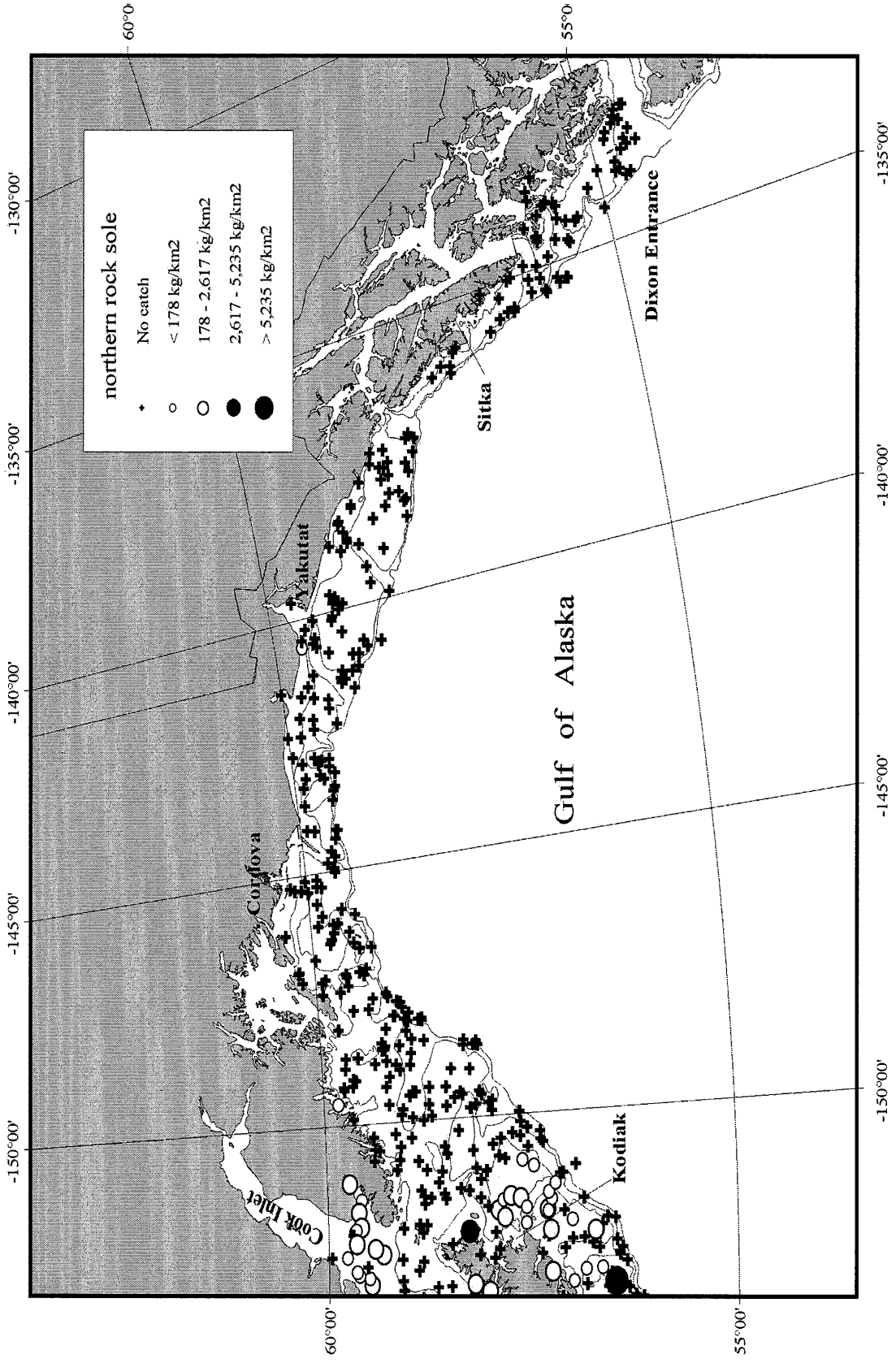


Figure 13.--Continued.

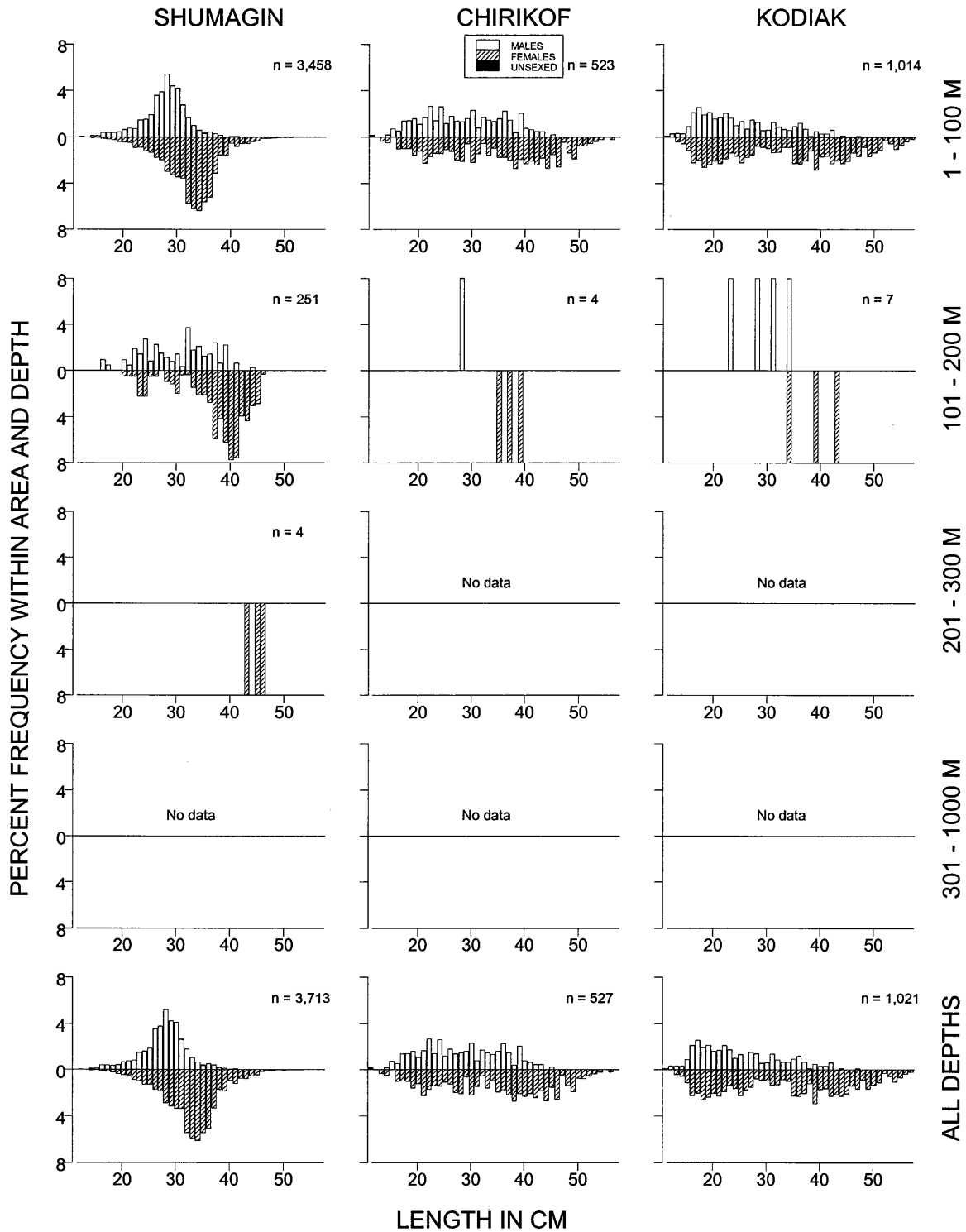


Figure 14.--Size composition of the estimated northern rock sole population from the 1999 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

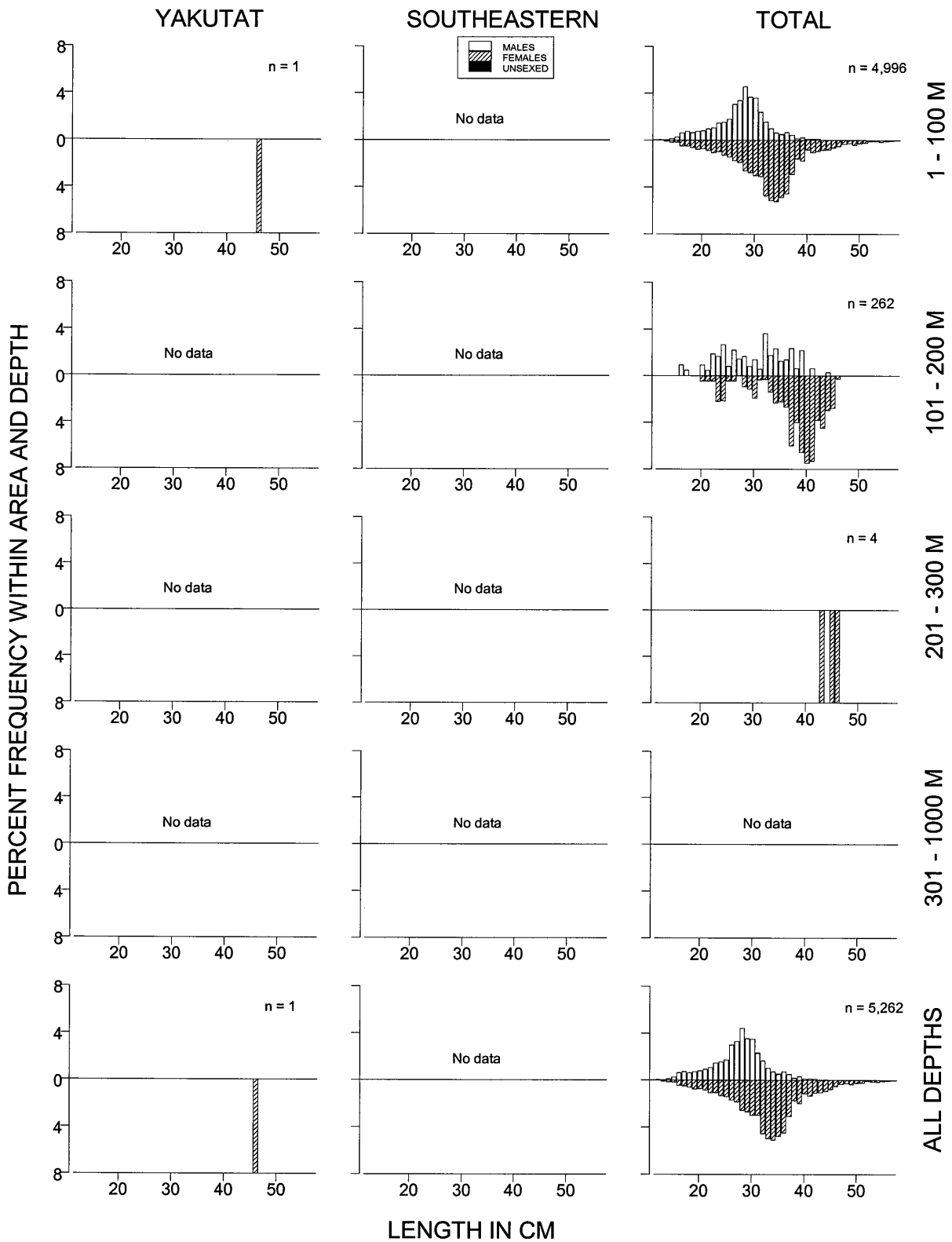


Figure 14.--Continued.

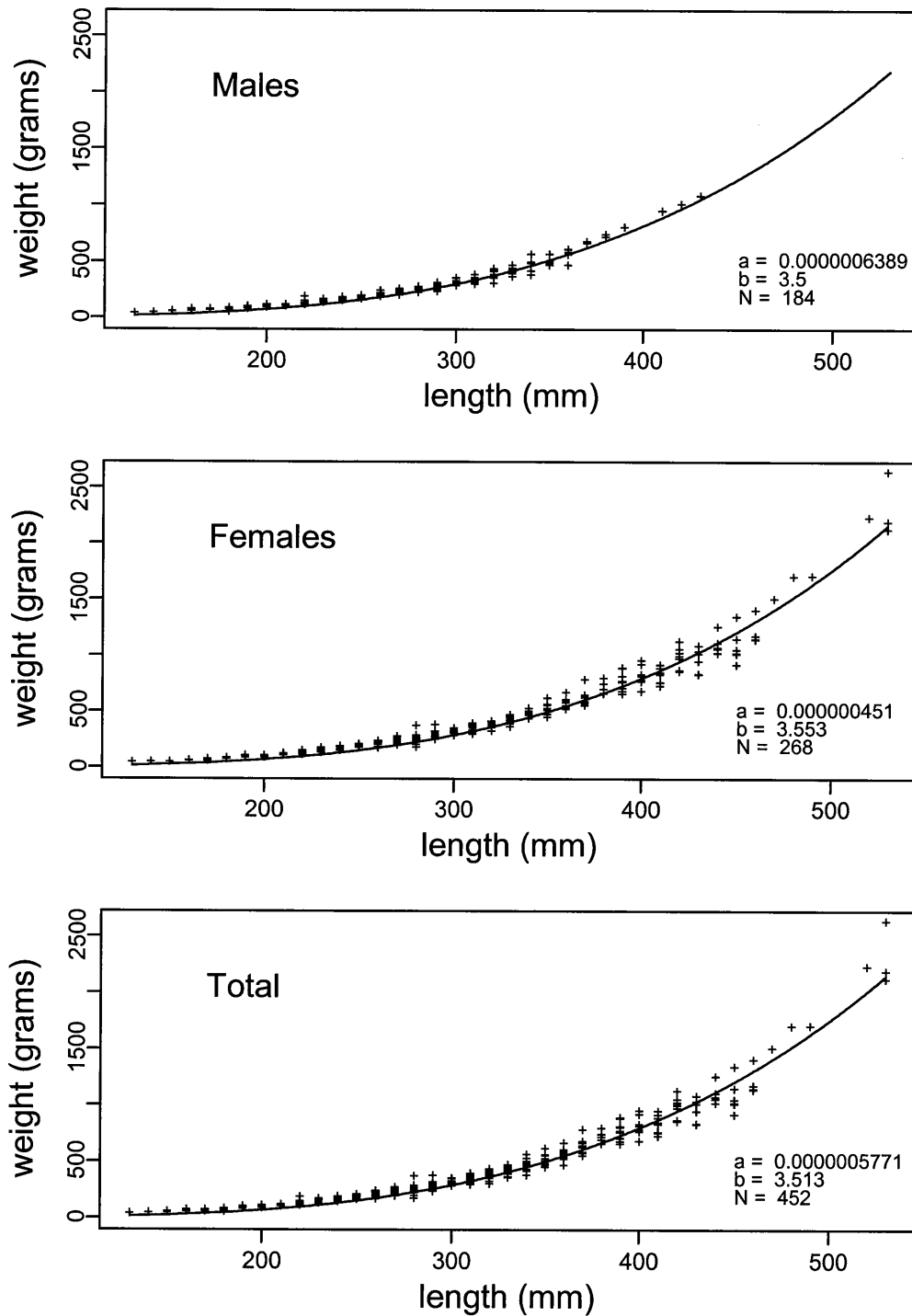


Figure 15.-- Length-weight relationship for northern rock sole specimens collected during the 1999 Gulf of Alaska bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a \times Length_{(mm)}^b$.

Table 12.—Catch per unit effort by stratum for northern rock sole sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Hauls		CPUE (kg/km ²)	Biomass (t)	Lower	Upper
			Number of hauls	with catch			C.I. Biomass	C.I. Biomass
Shumagin	1-100	Lower Alaska Peninsula	16	15	3,024	20,796	0	49,775
Shumagin	1-100	Davidson Bank	29	26	874	11,955	3,935	19,974
Shumagin	1-100	Fox Islands	19	18	533	4,444	80	8,808
Kodiak	1-100	Albatross Shallows	13	7	464	2,676	0	5,476
Shumagin	1-100	Shumagin Bank	26	24	381	4,718	2,135	7,301
Shumagin	101-200	Shumagin Outer Shelf	17	11	374	3,051	0	6,678
Kodiak	1-100	Albatross Banks	34	19	347	5,349	0	12,823
Chirikof	1-100	Chirikof Bank	24	15	329	3,552	199	6,905
Chirikof	1-100	Upper Alaska Peninsula	18	9	278	2,209	0	5,054
Kodiak	1-100	Lower Cook Inlet	22	17	208	2,057	670	3,443
Kodiak	1-100	Northern Kodiak Shallows	5	3	140	307	0	659
Shumagin	101-200	Sanak Gully	9	6	37	158	40	276
Shumagin	201-300	Shumagin Slope	8	2	20	56	0	157
Chirikof	1-100	Semidi Bank	17	4	8	57	0	120
Kodiak	1-100	Kenai Peninsula	12	1	5	26	0	82
Chirikof	101-200	Chirikof Outer Shelf	11	1	5	25	0	79
Kodiak	101-200	Albatross Gullies	18	1	5	39	0	121
Yakutat	1-100	Yakutat Shallows	23	1	3	31	0	97
Kodiak	101-200	Kodiak Outer Shelf	11	1	2	10	0	31
Kodiak	101-200	Barren Islands	24	1	2	16	0	50
Chirikof	101-200	East Shumagin Gully	24	1	1	12	0	38
Kodiak	101-200	Barren Islands	24	5	66	720	0	1,634
Chirikof	101-200	Chirikof Outer Shelf	11	2	50	250	0	773
Kodiak	101-200	Portlock Flats	16	4	29	214	0	545
Chirikof	101-200	East Shumagin Gully	24	5	18	197	0	432
Yakutat	201-300	Yakutat Slope	5	1	11	24	0	91
Shumagin	101-200	West Shumagin Gully	5	1	9	21	0	79
Yakutat	101-200	Fairweather Shelf	17	2	6	46	0	113
Kodiak	101-200	Kenai Flats	26	4	6	70	0	141
Chirikof	201-300	Lower Shelikof Gully	30	1	3	27	0	81
Shumagin	301-500	Shumagin Slope	12	1	1	3	0	9
Chirikof	101-200	Shelikof Edge	17	3	1	5	0	12

Rex sole (*Glyptocephalus zachirus*)

Rex sole were widely distributed throughout the survey area, occurring in all 54 strata less than 700 m in depth (Fig. 16). No catches were recorded in the deepest strata (701 - 1000 m). Although large catches were rare, rex sole were present in about 80% of the tows between 101 and 500 m (Table 13). Mean length and weight generally decreased from west to east (Table 13). The largest CPUEs encountered were in the shallower depth ranges (0 to 300 m) of the Kodiak and Chirikof INPFC areas (Table 14). Large females greater than 50 cm FL comprised a much higher fraction of the total population in the Shumagin and Chirikof INPFC areas than in other areas (Fig. 17). Fish larger than 40 cm FL were rare in the Southeast INPFC area. The length-weight relationship for rex sole specimens collected during the survey is depicted in Figure 18.

Table 13.-- Number of survey hauls, number of hauls with rex sole, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	33	185	7,640	0.59	39.5
	101 - 200	31	16	163	2,399	0.42	35.8
	201 - 300	8	5	500	1,393	0.49	39.1
	301 - 500	12	12	520	1,317	0.51	40.7
	501 - 700	5	2	3	6	0.17	30.5
	701 - 1000	1	0	---	---	---	---
	All depths		147	68	196	12,755	0.53
Chirikof	1 - 100	59	26	40	1,042	0.28	31.8
	101 - 200	52	41	488	11,641	0.50	39.8
	201 - 300	35	30	365	4,211	0.50	39.8
	301 - 500	8	8	239	383	0.37	37.6
	501 - 700	6	3	114	223	0.36	36.9
	701 - 1000	8	0	---	---	---	---
	All depths		168	108	257	17,499	0.47
Kodiak	1 - 100	86	28	42	1,636	0.19	27.9
	101 - 200	95	70	437	18,929	0.40	36.9
	201 - 300	36	29	350	4,020	0.32	35.2
	301 - 500	14	12	212	618	0.31	35.2
	501 - 700	5	3	27	48	0.25	33.9
	701 - 1000	10	0	---	---	---	---
	All depths		246	142	249	25,251	0.36
Yakutat	1 - 100	38	27	148	2,463	0.18	28.8
	101 - 200	63	50	141	4,147	0.23	31.1
	201 - 300	14	14	629	3,254	0.22	31.4
	301 - 500	12	9	66	174	0.24	32.9
	501 - 700	5	2	55	80	0.27	34.8
	701 - 1000	3	0	---	---	---	---
	All depths		135	102	177	10,118	0.21
Southeastern	1 - 100	10	6	291	1,902	0.14	26.3
	101 - 200	24	22	282	3,124	0.19	30.2
	201 - 300	16	15	572	2,888	0.22	32.1
	301 - 500	14	14	433	1,349	0.26	33.9
	501 - 700	2	1	92	95	0.26	34.6
	701 - 1000	2	0	---	---	---	---
	All depths		68	58	334	9,358	0.19
All areas	1 - 100	283	120	114	14,682	0.28	30.8
	101 - 200	265	199	329	40,239	0.37	35.5
	201 - 300	109	93	437	15,766	0.30	34.3
	301 - 500	60	55	300	3,841	0.33	35.9
	501 - 700	23	11	55	451	0.30	35.4
	701 - 1000	24	0	---	---	---	---
	All depths		764	478	234	74,980	0.33

All areas biomass, 95% confidence interval: 57,487 - 92,473 metric tons (t).

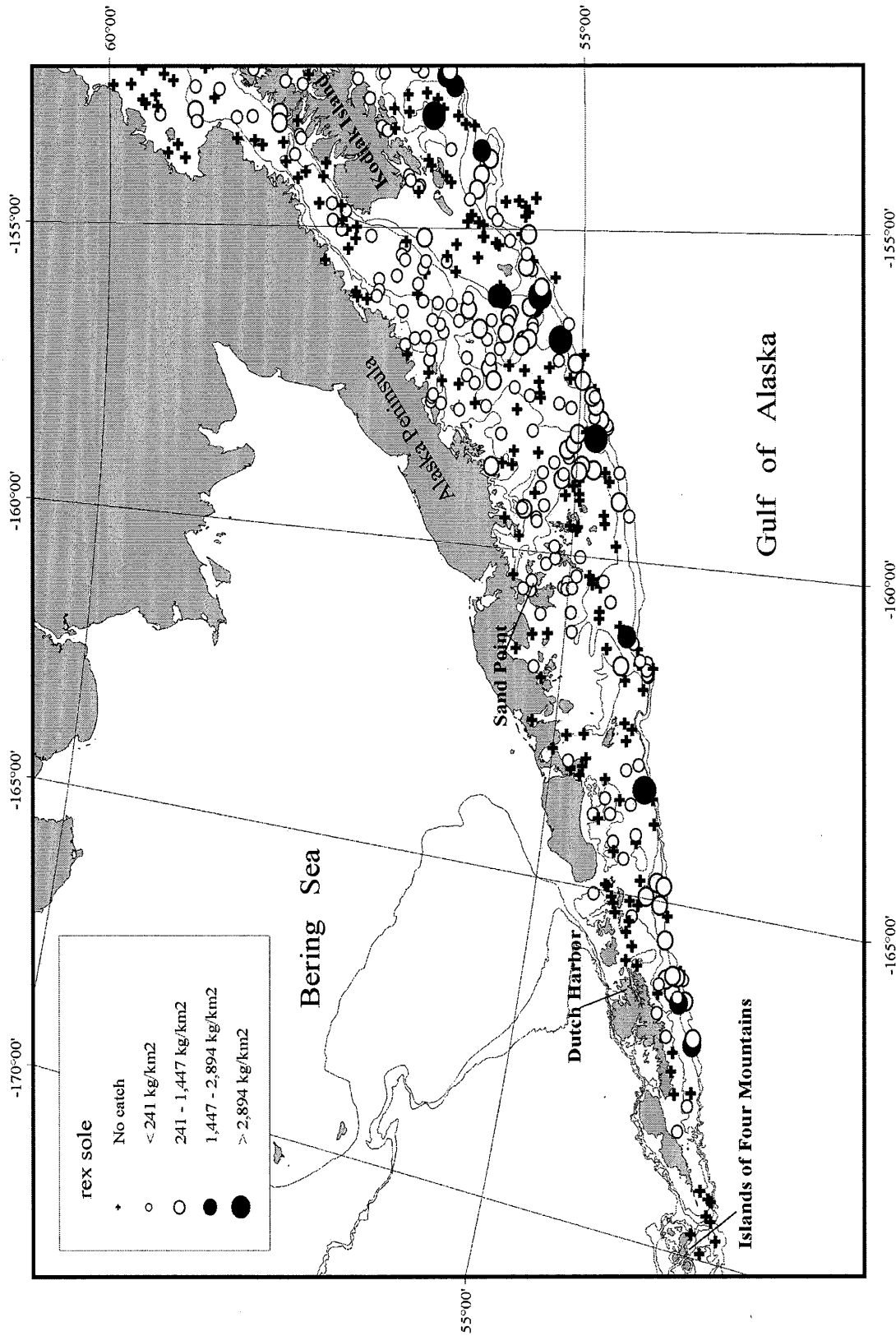


Figure 16. --Distribution and relative abundance of rex sole from the 1999 Gulf of Alaska bottom trawl survey. Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations above mean CPUE, and greater than four standard deviations above mean CPUE. Each symbol is proportional to the sample CPUE.

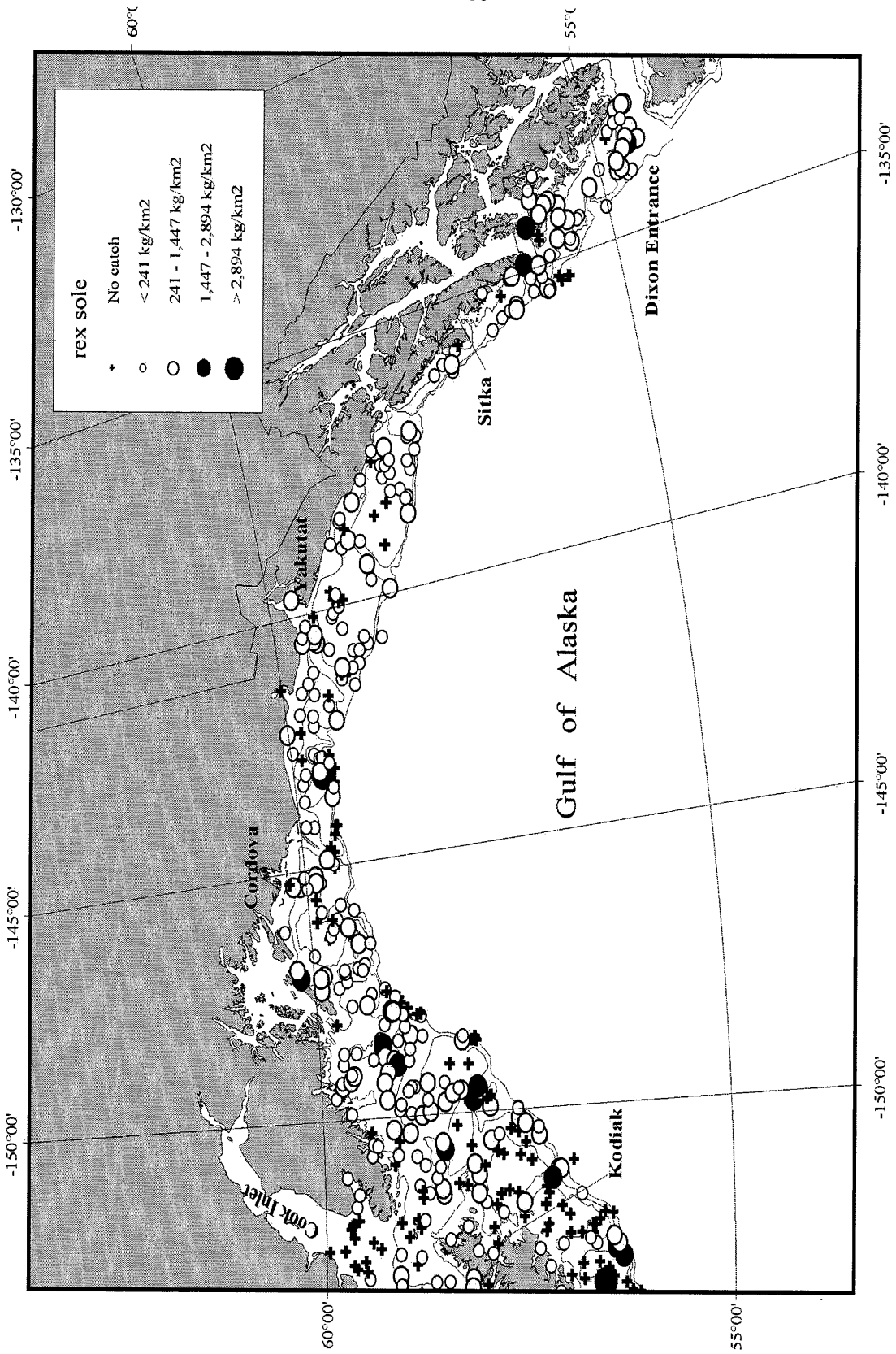


Figure 16.--Continued.

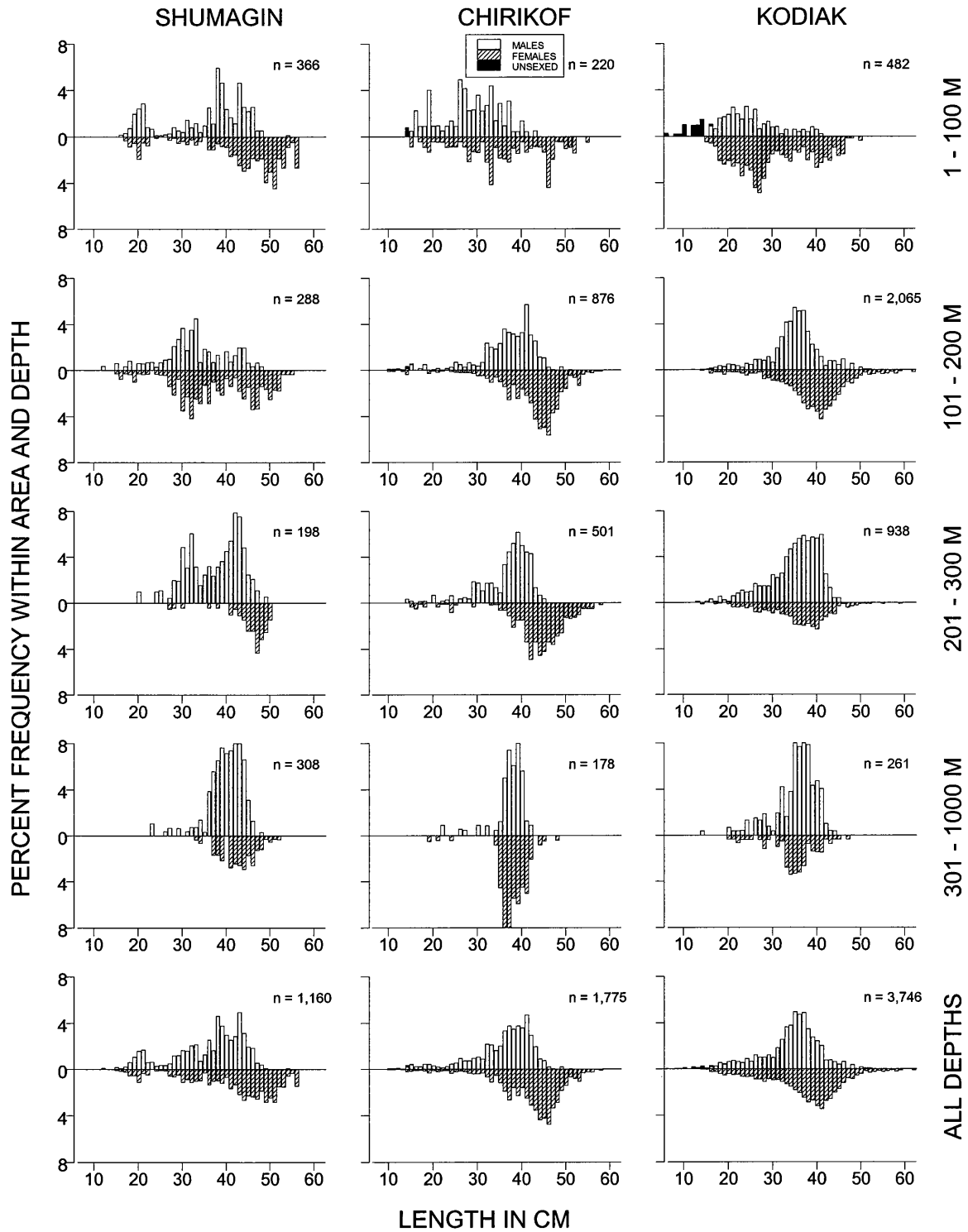


Figure 17.-- Size composition of the estimated rex sole population from the 1999 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

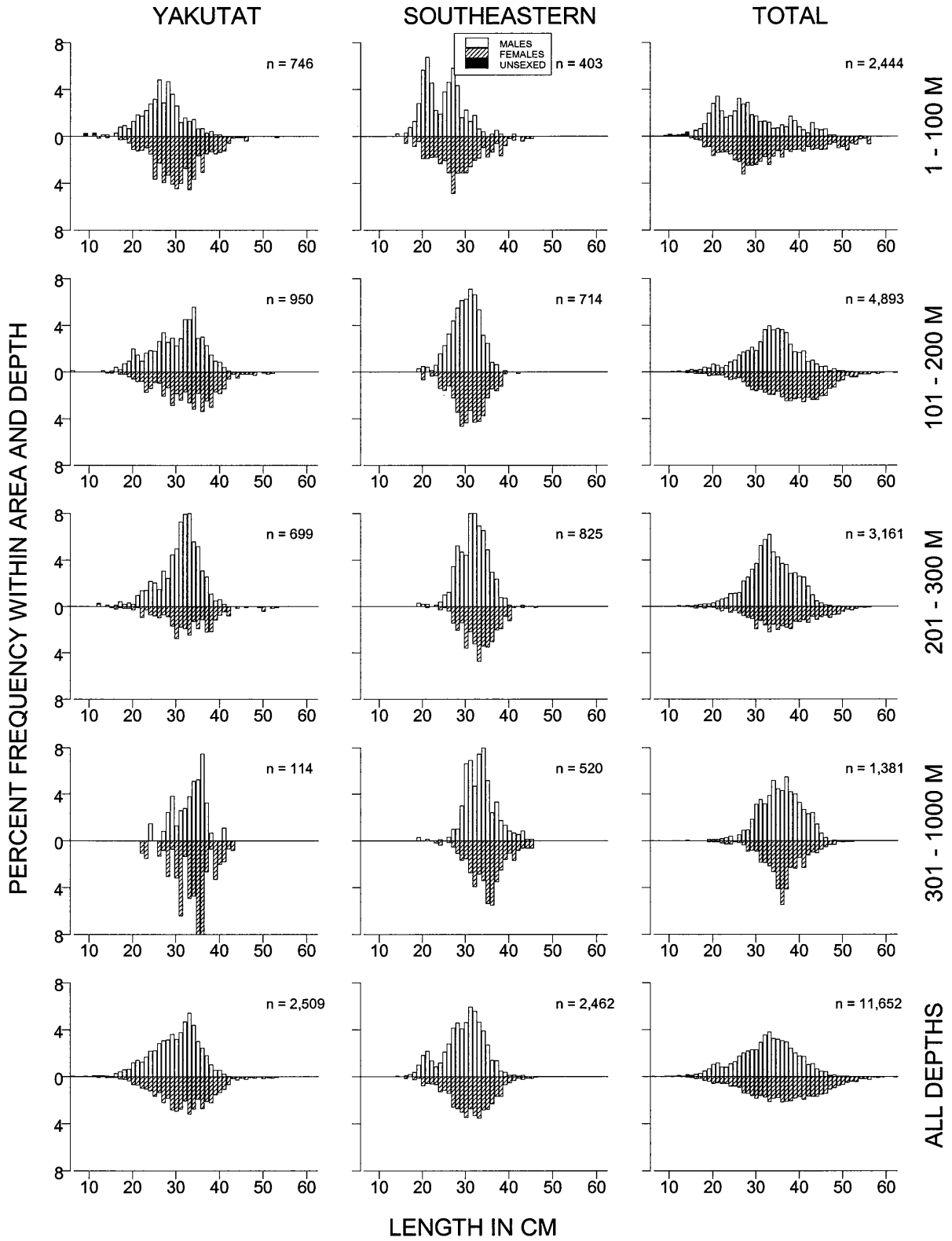


Figure 17.--Continued.

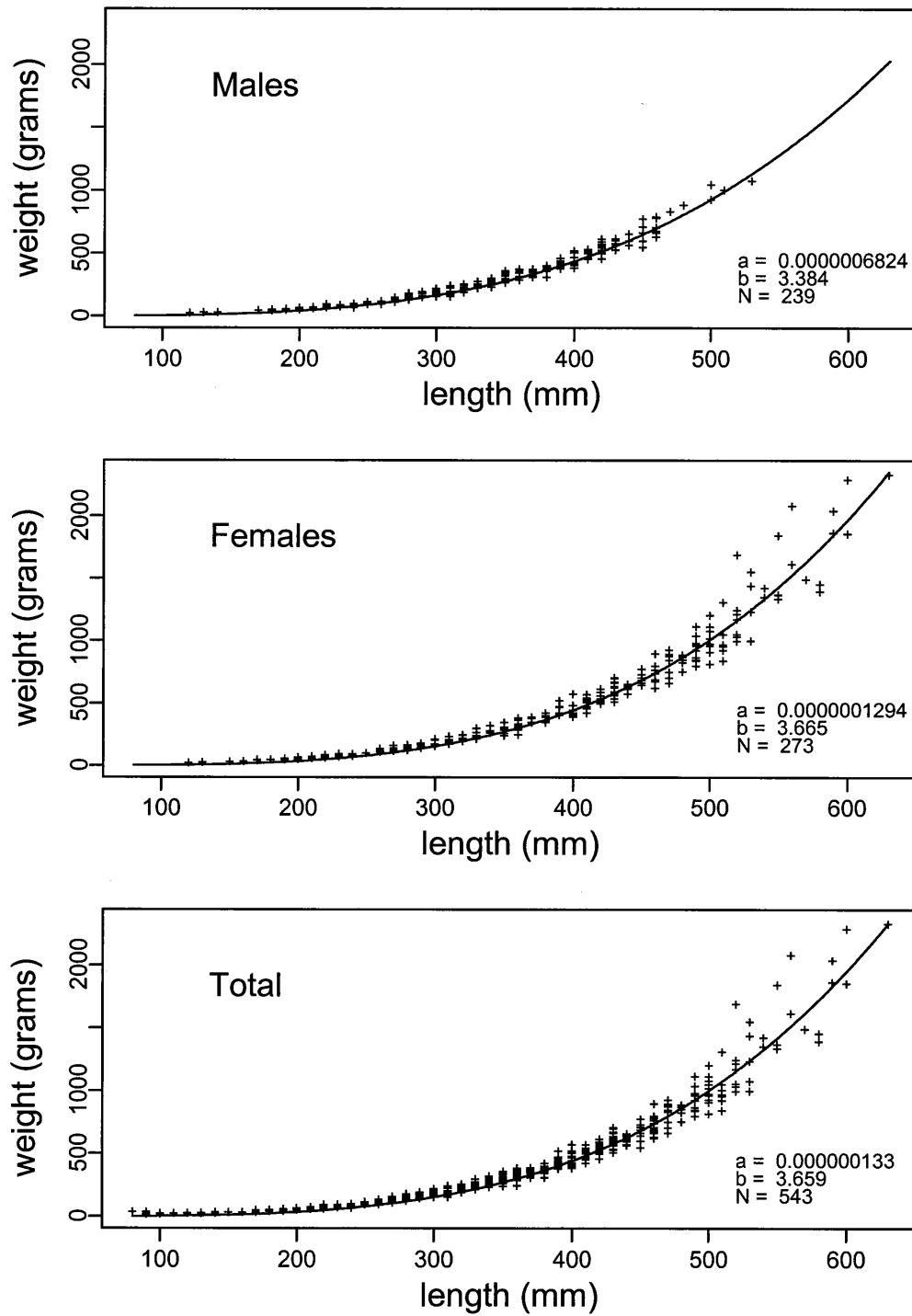


Figure 18.-- Length-weight relationship for rex sole specimens collected during the 1999 Gulf of Alaska bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a \times Length_{(mm)}^b$.

Table 14.-- Catch per unit effort by stratum for rex sole sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Hauls		CPUE (kg/km ²)	Biomass (t)	Lower	Upper
			Number of hauls	with catch			C.I. Biomass	C.I. Biomass
Kodiak	201-300	Kodiak Slope	5	5	1,337	2,169	1,257	3,081
Chirikof	101-200	Chirikof Outer Shelf	11	8	1,310	6,563	0	13,425
Chirikof	201-300	Chirikof Slope	5	5	1,169	1,786	0	4,316
Yakutat	201-300	Yakutat Slope	5	5	861	1,831	0	5,439
Southeastern	201-300	Baranof-Chichagof Slope	3	3	775	872	0	3,761
Kodiak	101-200	Albatross Gullies	18	12	660	5,219	318	10,121
Kodiak	101-200	Kodiak Outer Shelf	11	6	637	3,203	0	6,495
Shumagin	1-100	Davidson Bank	29	11	529	7,234	0	20,683
Shumagin	301-500	Shumagin Slope	12	12	520	1,317	635	1,999
Kodiak	101-200	Portlock Flats	16	14	515	3,779	1,858	5,700
Southeastern	201-300	Prince of Wales Slope/Gullies	13	12	513	2,016	1,019	3,013
Southeastern	301-500	Southeastern Deep Gullies	10	10	511	1,198	421	1,974
Shumagin	201-300	Shumagin Slope	8	5	500	1,393	0	3,054
Kodiak	101-200	Kenai Flats	26	25	473	5,710	2,796	8,624
Yakutat	201-300	Yakutat Gullies	9	9	468	1,423	335	2,511
Chirikof	101-200	Shelikof Edge	17	15	356	2,755	672	4,838
Southeastern	101-200	Prince of Wales Shelf	14	13	327	2,255	750	3,759
Southeastern	1-100	Southeastern Shallows	10	6	291	1,902	0	4,302
Kodiak	201-300	Kenai Gullies	21	21	278	1,850	366	3,334
Yakutat	101-200	Middleton Shelf	16	13	273	2,003	569	3,437
Shumagin	101-200	Shumagin Outer Shelf	17	8	248	2,024	127	3,921
Chirikof	201-300	Lower Shelikof Gully	30	25	242	2,425	446	4,405
Chirikof	301-500	Chirikof Slope	8	8	239	383	0	772
Kodiak	1-100	Kenai Peninsula	12	9	213	1,120	0	2,589
Kodiak	301-500	Kodiak Slope	14	12	212	618	200	1,036
Chirikof	101-200	East Shumagin Gully	24	18	209	2,323	623	4,023
Southeastern	101-200	Baranof-Chichagof Shelf	10	9	207	869	87	1,651
Southeastern	301-500	Southeastern Slope	4	4	196	152	19	284
Yakutat	1-100	Yakutat Shallows	23	18	154	1,533	563	2,504
Yakutat	1-100	Middleton Shallows	15	9	138	929	39	1,819
Chirikof	501-700	Chirikof Slope	6	3	114	223	0	627
Yakutat	101-200	Yakataga Shelf	11	9	112	589	0	1,269
Yakutat	101-200	Fairweather Shelf	17	15	99	761	394	1,128
Kodiak	101-200	Barren Islands	24	13	93	1,018	0	2,126
Southeastern	501-700	Southeastern Slope	2	1	92	95	0	1,299
Yakutat	101-200	Yakutat Flats	19	13	88	795	219	1,370
Kodiak	1-100	Northern Kodiak Shallows	5	3	79	173	0	596
Yakutat	301-500	Yakutat Gullies	5	3	79	87	0	286
Shumagin	101-200	West Shumagin Gully	5	4	75	170	0	502
Chirikof	1-100	Semidi Bank	17	10	62	453	18	888
Yakutat	301-500	Yakutat Slope	7	6	57	86	8	165
Yakutat	501-700	Yakutat Slope	5	2	55	80	0	265
Shumagin	101-200	Sanak Gully	9	4	48	205	0	473
Kodiak	1-100	Albatross Shallows	13	8	43	249	33	465
Chirikof	1-100	Chirikof Bank	24	7	36	387	0	911
Kodiak	501-700	Kodiak Slope	5	3	27	48	0	113
Chirikof	1-100	Upper Alaska Peninsula	18	9	25	202	0	448
Shumagin	1-100	Shumagin Bank	26	12	21	265	77	452
Shumagin	1-100	Lower Alaska Peninsula	16	5	13	91	0	233
Kodiak	1-100	Lower Cook Inlet	22	6	7	67	7	127
Shumagin	1-100	Fox Islands	19	5	6	51	0	110
Shumagin	501-700	Shumagin Slope	5	2	3	6	0	17
Kodiak	1-100	Albatross Banks	34	2	2	27	0	69
Kodiak	201-300	Upper Shelikof Gully	10	3	<1	1	0	2

Dover sole (*Microstomus pacificus*)

Dover sole were found in moderate numbers throughout the survey area and were caught in 54 of the 59 strata sampled (Fig. 19; Table 16). Mean CPUEs were generally highest in the 301 - 500 m depth range and decreased in both shallower and deeper water (Table 16). Mean CPUEs generally increased from west to east and Dover sole were very rare in the waters less than 100 m in the Shumagin and Chirikof INPFC areas (Table 15). Dover sole were captured in about 90% of the tows between 301 and 700 m, including all tows between 501 and 700 m. Males and females appeared to be distributed differently as about 61% of the females were estimated to reside in water less than 200 m deep, while 63% of the males were estimated to be in water deeper than 200 m (Fig. 20). The length-weight relationship for Dover sole specimens collected during the survey is depicted in Figure 21.

Table 15.-- Number of survey hauls, number of hauls with Dover sole, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	2	<1	7	0.20	28.5
	101 - 200	31	5	4	56	0.57	37.5
	201 - 300	8	3	16	43	0.61	36.6
	301 - 500	12	5	257	651	1.17	46.6
	501 - 700	5	5	341	685	1.05	45.5
	701 - 1000	1	0	---	---	---	---
	All depths		147	20	22	1,442	1.02
Chirikof	1 - 100	59	5	7	182	0.83	40.0
	101 - 200	52	25	129	3,076	0.90	42.2
	201 - 300	35	22	217	2,501	0.95	44.2
	301 - 500	8	8	1,197	1,919	0.79	42.2
	501 - 700	6	6	986	1,926	0.68	39.8
	701 - 1000	8	3	65	199	0.90	43.7
	All depths		168	69	144	9,804	0.83
Kodiak	1 - 100	86	12	89	3,437	0.84	41.6
	101 - 200	95	64	256	11,079	1.01	45.3
	201 - 300	36	25	486	5,584	0.87	43.2
	301 - 500	14	14	982	2,859	0.73	41.2
	501 - 700	5	5	552	964	0.68	40.0
	701 - 1000	10	7	148	517	0.97	43.5
	All depths		246	127	241	24,439	0.89
Yakutat	1 - 100	38	19	73	1,219	0.32	30.4
	101 - 200	63	50	430	12,647	0.88	43.2
	201 - 300	14	14	1,493	7,719	0.78	41.8
	301 - 500	12	11	849	2,230	0.83	42.7
	501 - 700	5	5	995	1,462	0.72	40.8
	701 - 1000	3	1	36	68	0.77	42.7
	All depths		135	100	443	25,344	0.77
Southeastern	1 - 100	10	5	242	1,587	0.34	32.2
	101 - 200	24	14	160	1,779	0.42	34.6
	201 - 300	16	14	738	3,729	0.53	37.2
	301 - 500	14	14	1,494	4,658	0.64	39.5
	501 - 700	2	2	946	978	0.77	42.2
	701 - 1000	2	2	446	538	0.73	41.2
	All depths		68	51	473	13,268	0.52
All areas	1 - 100	283	43	50	6,431	0.50	34.8
	101 - 200	265	158	234	28,636	0.86	42.7
	201 - 300	109	78	543	19,576	0.75	41.1
	301 - 500	60	52	963	12,317	0.73	41.0
	501 - 700	23	23	733	6,013	0.73	40.9
	701 - 1000	24	13	114	1,323	0.84	42.4
	All depths		764	367	232	74,297	0.75

All areas biomass, 95% confidence interval: 63,867 - 84,726 metric tons (t).

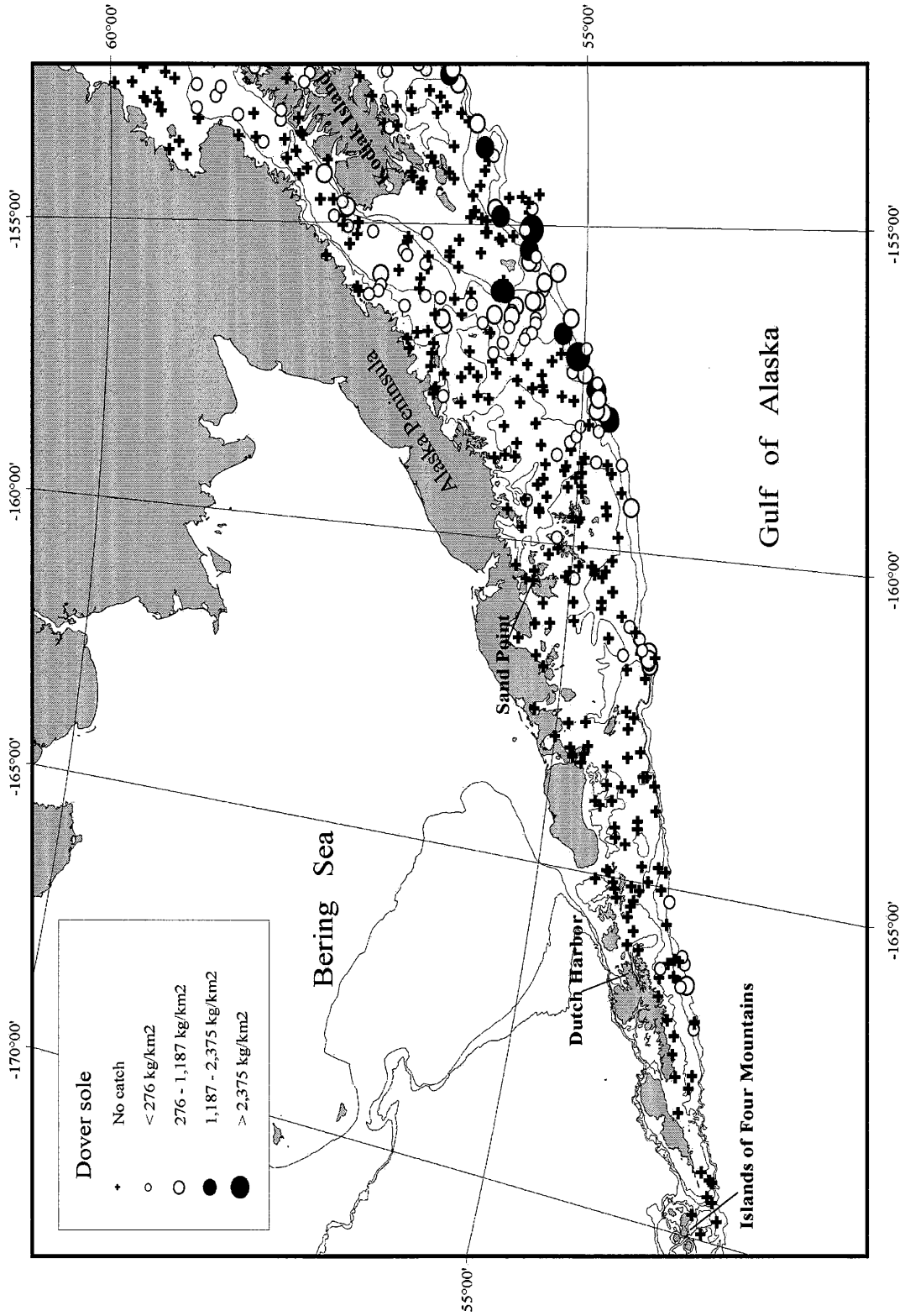


Figure 19.--Distribution and relative abundance of Dover sole from the 1999 Gulf of Alaska bottom trawl survey. Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations above mean CPUE, and greater than four standard deviations above mean CPUE. Each symbol is proportional to the sample CPUE.

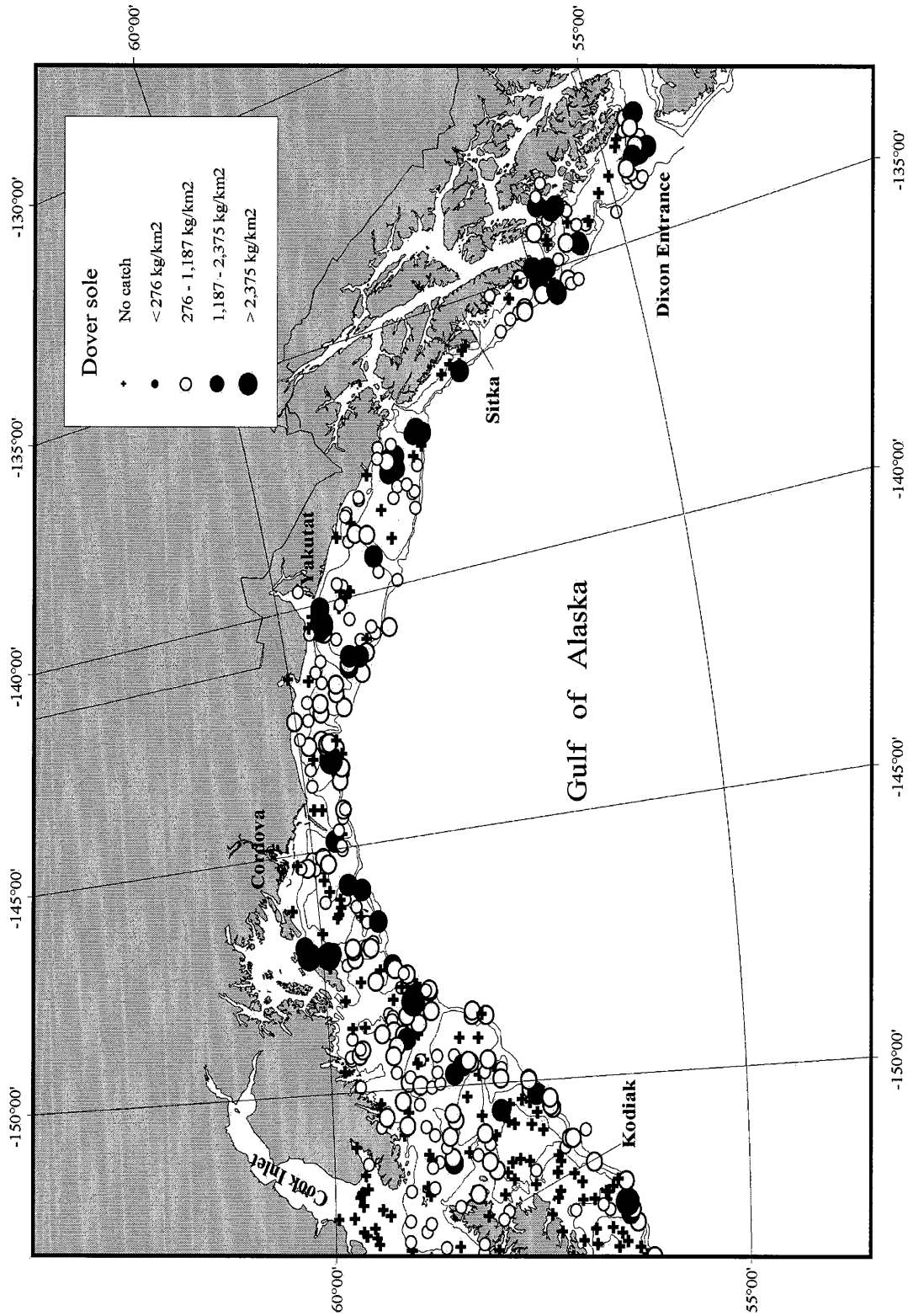


Figure 19.--Continued.

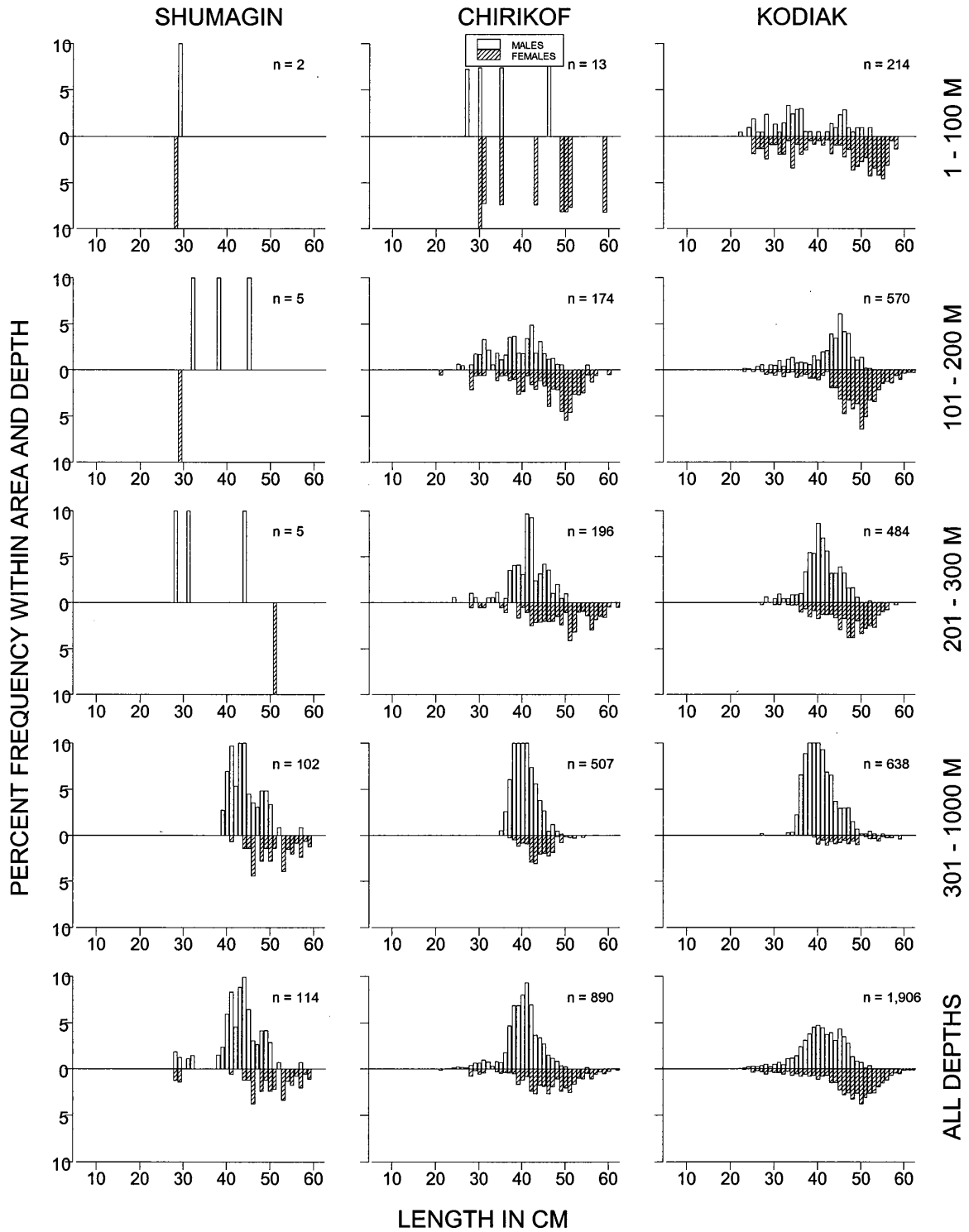


Figure 20.-- Size composition of the estimated Dover sole population from the 1999 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

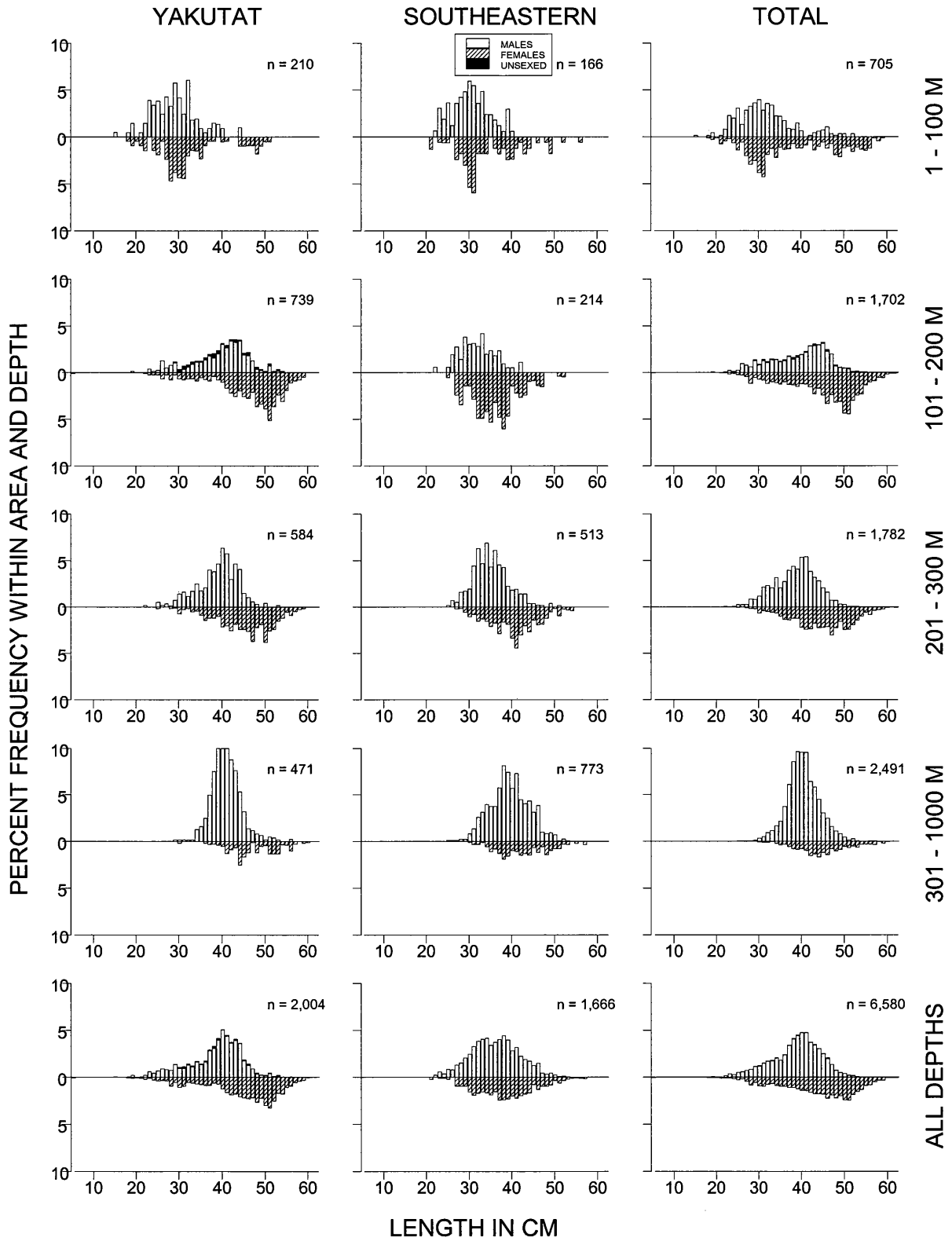


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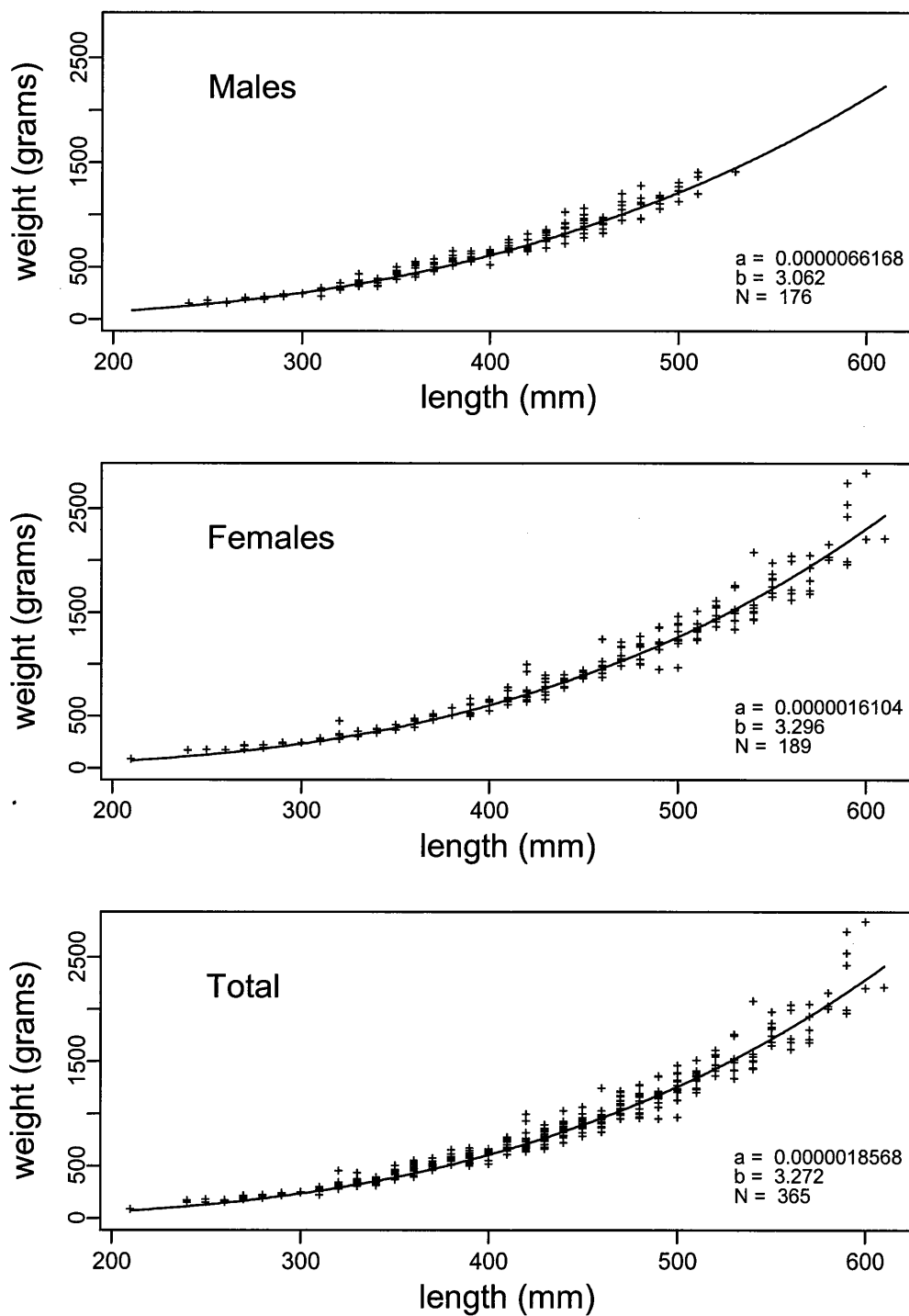


Figure 21.-- Length-weight relationship for Dover sole specimens collected during the 1999 Gulf of Alaska bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a \times Length_{(mm)}^b$.

Table 16.-- Catch per unit effort by stratum for Dover sole sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Hauls		CPUE (kg/km ²)	Biomass (t)	Lower	Upper
			Number of hauls	with catch			C.I. Biomass	C.I. Biomass
Southeastern	301-500	Southeastern Deep Gullies	10	10	1,712	4,012	2,472	5,552
Yakutat	201-300	Yakutat Slope	5	5	1,497	3,184	0	6,816
Yakutat	201-300	Yakutat Gullies	9	9	1,491	4,535	2,520	6,550
Kodiak	201-300	Kodiak Slope	5	5	1,369	2,221	1,088	3,354
Chirikof	301-500	Chirikof Slope	8	8	1,197	1,919	779	3,060
Yakutat	301-500	Yakutat Gullies	5	4	1,077	1,192	135	2,249
Yakutat	501-700	Yakutat Slope	5	5	995	1,462	136	2,788
Chirikof	501-700	Chirikof Slope	6	6	986	1,926	0	4,481
Kodiak	301-500	Kodiak Slope	14	14	982	2,859	1,784	3,935
Southeastern	501-700	Southeastern Slope	2	2	946	978	0	10,856
Southeastern	201-300	Baranof-Chichagof Slope	3	3	935	1,053	0	3,887
Southeastern	301-500	Southeastern Slope	4	4	835	645	0	1,437
Yakutat	101-200	Middleton Shelf	16	14	700	5,142	1,269	9,015
Yakutat	301-500	Yakutat Slope	7	7	683	1,038	138	1,938
Southeastern	201-300	Prince of Wales Slope/Gullies	13	11	682	2,677	895	4,458
Chirikof	201-300	Chirikof Slope	5	5	672	1,027	231	1,823
Yakutat	101-200	Fairweather Shelf	17	14	556	4,300	897	7,702
Kodiak	501-700	Kodiak Slope	5	5	552	964	225	1,702
Kodiak	1-100	Kenai Peninsula	12	5	536	2,822	0	7,780
Kodiak	201-300	Kenai Gullies	21	18	502	3,343	1,132	5,554
Kodiak	101-200	Portlock Flats	16	14	466	3,415	654	6,176
Southeastern	701-1000	Southeastern Slope	2	2	446	538	0	5,982
Yakutat	101-200	Yakataga Shelf	11	10	350	1,848	653	3,043
Shumagin	501-700	Shumagin Slope	5	5	341	685	0	1,764
Chirikof	101-200	Shelikof Edge	17	14	284	2,194	223	4,165
Kodiak	101-200	Kenai Flats	26	19	260	3,143	1,310	4,976
Shumagin	301-500	Shumagin Slope	12	5	257	651	10	1,293
Kodiak	101-200	Albatross Gullies	18	11	256	2,027	333	3,722
Southeastern	1-100	Southeastern Shallows	10	5	242	1,587	0	3,895
Southeastern	101-200	Prince of Wales Shelf	14	9	191	1,316	0	2,948
Kodiak	101-200	Barren Islands	24	15	164	1,796	17	3,575
Yakutat	101-200	Yakutat Flats	19	12	150	1,357	0	2,844
Kodiak	701-1000	Kodiak Slope	10	7	148	517	169	865
Chirikof	201-300	Lower Shelikof Gully	30	17	147	1,474	706	2,242
Kodiak	101-200	Kodiak Outer Shelf	11	5	139	698	0	1,865
Chirikof	101-200	Chirikof Outer Shelf	11	6	139	695	126	1,265
Yakutat	1-100	Middleton Shallows	15	6	119	797	0	1,949
Southeastern	101-200	Baranof-Chichagof Shelf	10	5	110	463	0	1,030
Kodiak	1-100	Albatross Shallows	13	5	89	512	0	1,486
Chirikof	701-1000	Chirikof Slope	8	3	65	199	0	505
Yakutat	1-100	Yakutat Shallows	23	13	42	422	97	746
Yakutat	701-1000	Yakutat Slope	3	1	36	68	0	361
Kodiak	1-100	Northern Kodiak Shallows	5	1	25	55	0	209
Chirikof	101-200	East Shumagin Gully	24	5	17	187	5	369
Shumagin	201-300	Shumagin Slope	8	3	16	43	0	103
Chirikof	1-100	Upper Alaska Peninsula	18	3	14	111	0	268
Shumagin	101-200	West Shumagin Gully	5	1	7	17	0	62
Kodiak	201-300	Upper Shelikof Gully	10	2	6	19	0	59
Kodiak	1-100	Lower Cook Inlet	22	1	5	47	0	145
Chirikof	1-100	Chirikof Bank	24	1	4	46	0	142
Shumagin	101-200	Shumagin Outer Shelf	17	3	4	33	0	77
Chirikof	1-100	Semidi Bank	17	1	3	24	0	75
Shumagin	101-200	Sanak Gully	9	1	2	6	0	21
Shumagin	1-100	Shumagin Bank	26	2	1	7	0	17

Yellowfin sole (*Limanda asper*)

Yellowfin sole were not widely distributed, but were locally abundant in some areas (Table 17). Yellowfin sole were captured exclusively in nearshore areas, especially along the Alaska Peninsula, around Kodiak Island and the Shumagin Islands, and in lower Cook Inlet (Fig. 22). The highest mean CPUEs in the survey were noted along the lower Alaska Peninsula where about 81% of the catches contained yellowfin sole (Table 18). This stratum accounted for about 61% of the survey area's biomass estimate despite making up only about 2% of the survey area. Males dominated the population estimates in the Shumagin and Chirikof INPFC areas, while females predominated in the Kodiak INPFC area (Fig. 23). Females tended to be slightly larger on average with a length mode around 33 cm FL, while the male mode appeared around 30 cm FL.

Table 17.-- Number of survey hauls, number of hauls with yellowfin sole, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	23	879	36,294	0.36	---
	101 - 200	31	2	5	80	0.27	---
	201 - 300	8	0	---	---	---	---
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	1	0	---	---	---	---
	All depths		147	25	558	36,374	0.36
Chirikof	1 - 100	59	7	71	1,846	0.39	---
	101 - 200	52	0	---	---	---	---
	201 - 300	35	0	---	---	---	---
	301 - 500	8	0	---	---	---	---
	501 - 700	6	0	---	---	---	---
	701 - 1000	8	0	---	---	---	---
	All depths		168	7	27	1,846	0.39
Kodiak	1 - 100	86	16	259	9,983	0.53	---
	101 - 200	95	1	1	24	0.23	---
	201 - 300	36	0	---	---	---	---
	301 - 500	14	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	10	0	---	---	---	---
	All depths		246	17	99	10,008	0.53
Yakutat	1 - 100	38	0	---	---	---	---
	101 - 200	63	0	---	---	---	---
	201 - 300	14	0	---	---	---	---
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	3	0	---	---	---	---
	All depths		135	0	---	---	---
Southeastern	1 - 100	10	1	13	85	0.30	---
	101 - 200	24	0	---	---	---	---
	201 - 300	16	0	---	---	---	---
	301 - 500	14	0	---	---	---	---
	501 - 700	2	0	---	---	---	---
	701 - 1000	2	0	---	---	---	---
	All depths		68	1	3	85	0.30
All areas	1 - 100	283	47	374	48,208	0.39	---
	101 - 200	265	3	1	104	0.26	---
	201 - 300	109	0	---	---	---	---
	301 - 500	60	0	---	---	---	---
	501 - 700	23	0	---	---	---	---
	701 - 1000	24	0	---	---	---	---
	All depths		764	50	151	48,313	0.39

All areas biomass, 95% confidence interval: 18,189 - 78,436 metric tons (t).

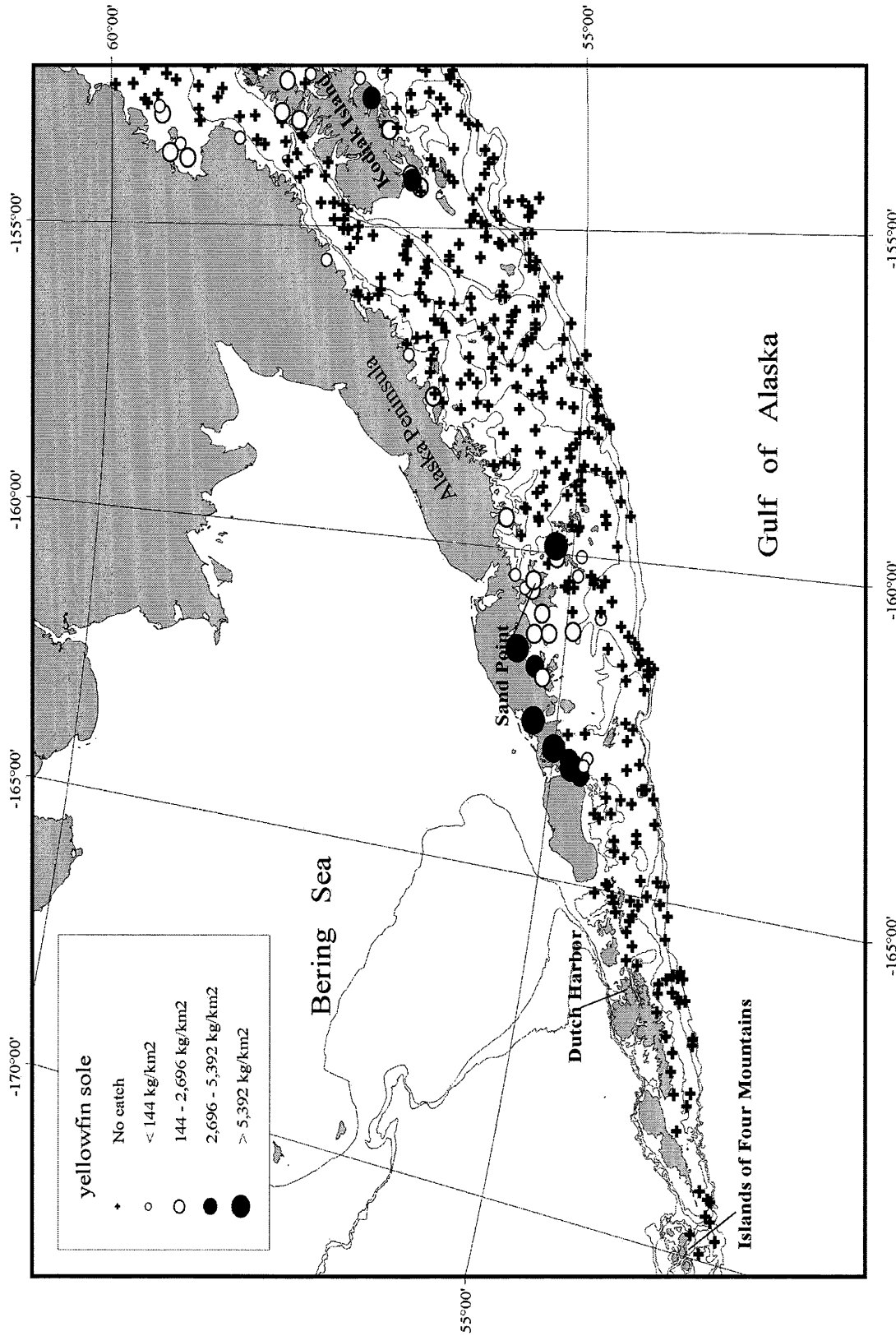


Figure 22.—Distribution and relative abundance of yellowfin sole from the 1999 Gulf of Alaska bottom trawl survey. Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations above mean CPUE, and greater than four standard deviations above mean CPUE. Each symbol is proportional to the sample CPUE.

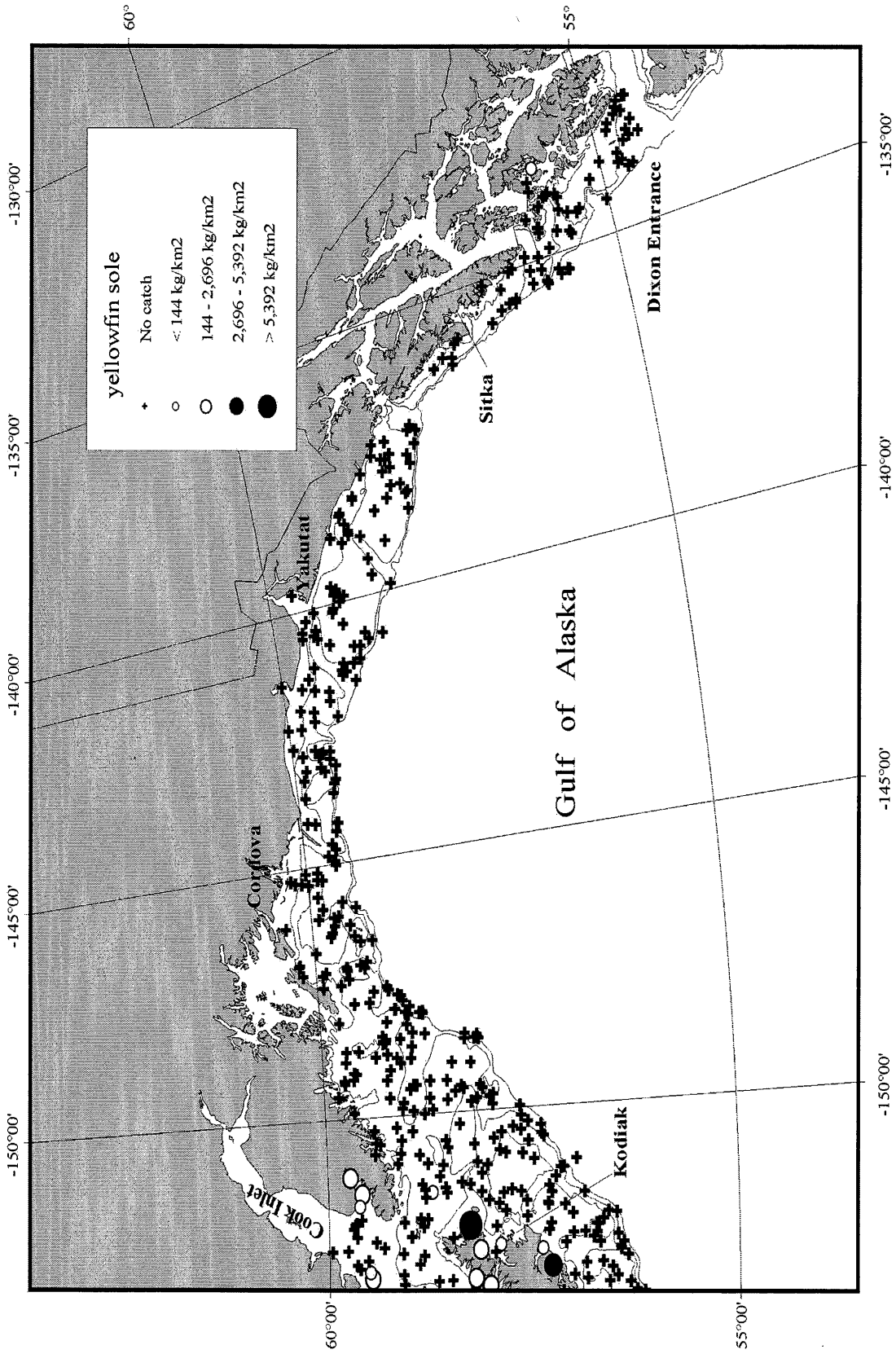


Figure 22.---Continued.

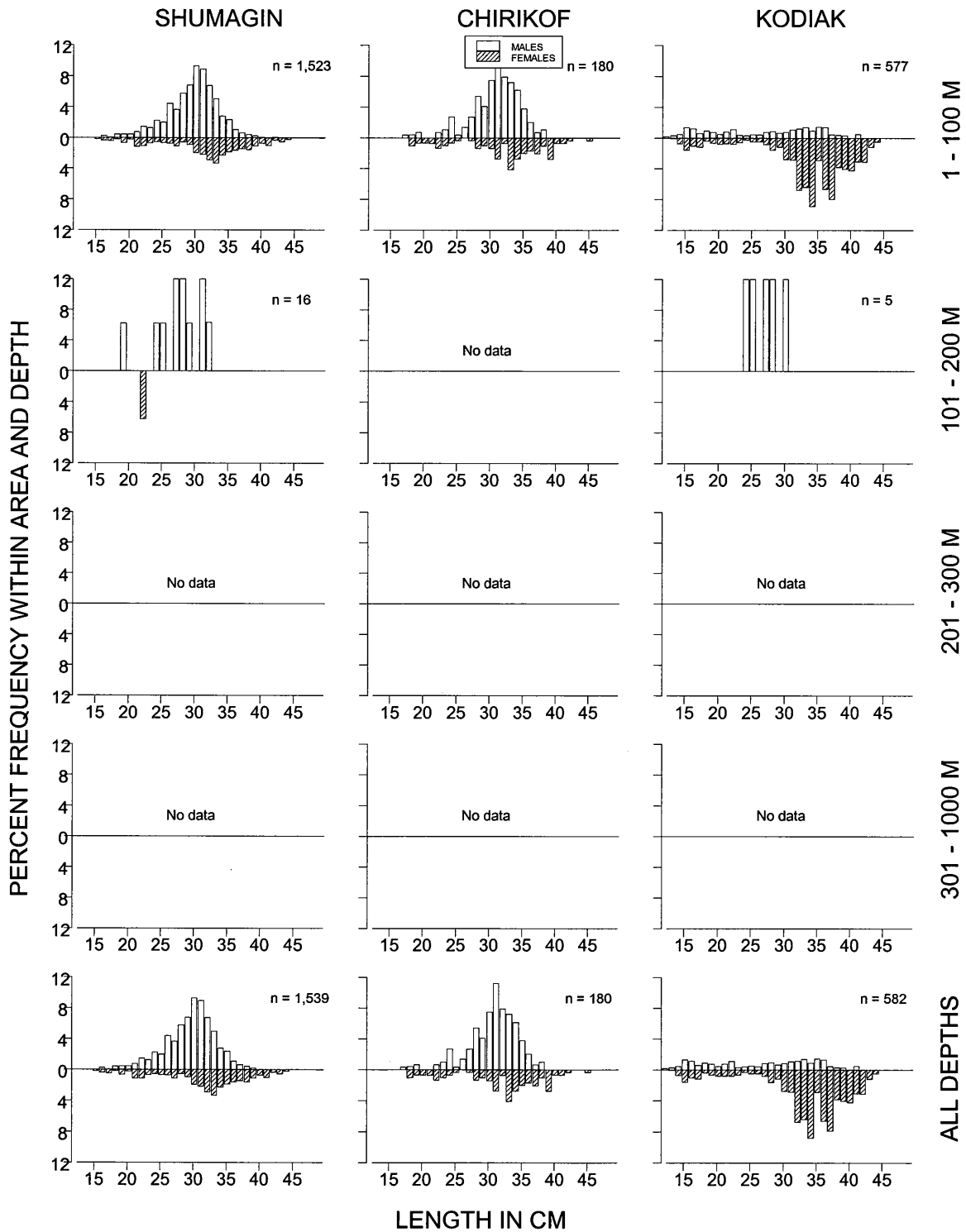


Figure 23.-- Size composition of the estimated yellowfin sole population from the 1999 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

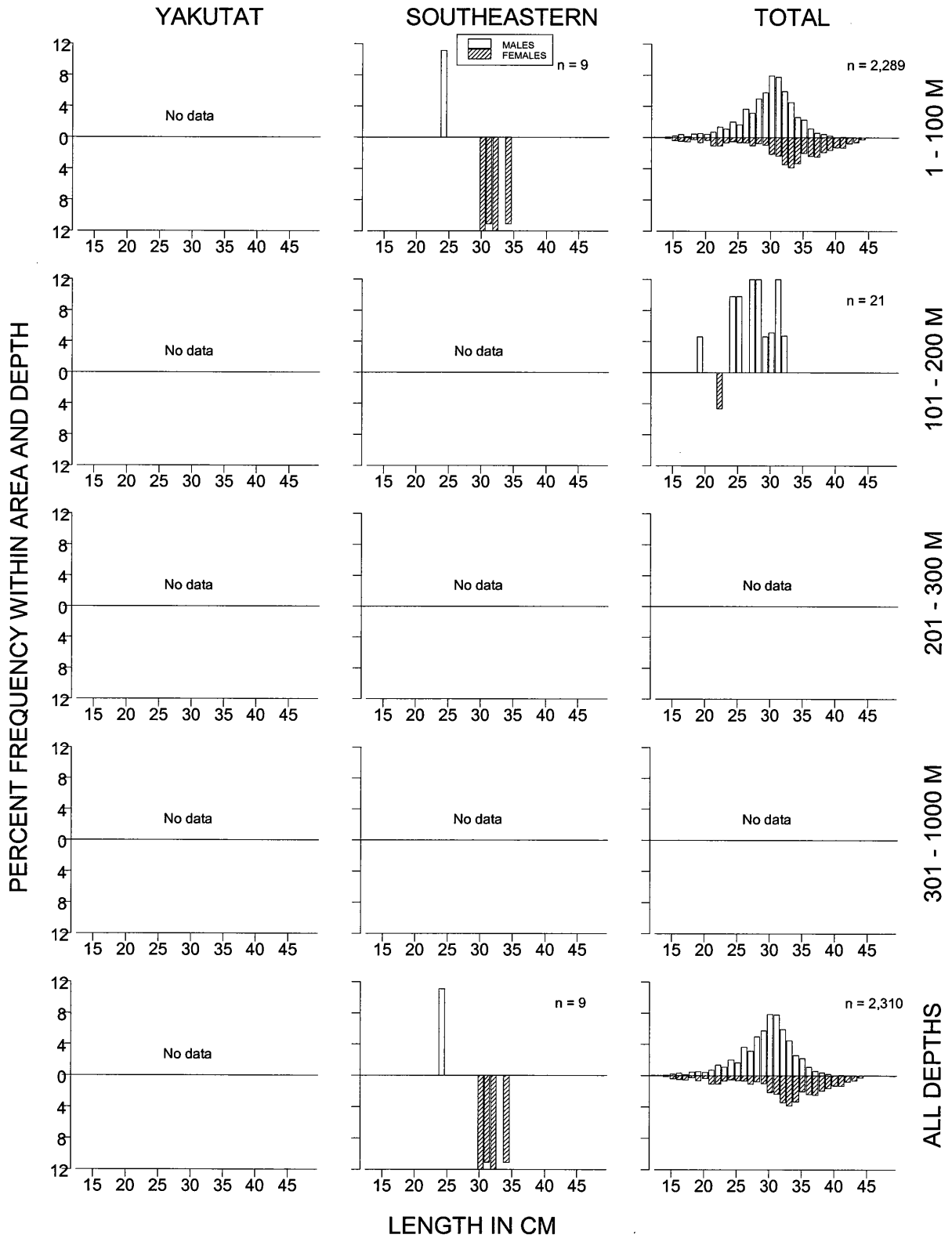


Figure 23.--Continued.

Table 18.-- Catch per unit effort by stratum for yellowfin sole sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls	CPUE (kg/km ²)	Biomass (t)	Lower	Upper
				with catch			C.I. Biomass	C.I. Biomass
Shumagin	1-100	Lower Alaska Peninsula	16	13	4,299	29,559	2,436	56,682
Kodiak	1-100	Albatross Shallows	13	6	1,382	7,968	0	21,488
Kodiak	1-100	Northern Kodiak Shallows	5	2	440	967	0	3,053
Shumagin	1-100	Shumagin Bank	26	7	379	4,697	0	11,310
Chirikof	1-100	Chirikof Bank	24	3	158	1,706	0	4,527
Shumagin	1-100	Davidson Bank	29	3	149	2,038	0	6,185
Kodiak	1-100	Lower Cook Inlet	22	8	106	1,049	0	2,135
Shumagin	101-200	Sanak Gully	9	2	19	80	0	242
Chirikof	1-100	Upper Alaska Peninsula	18	4	18	140	0	335
Southeastern	1-100	Southeastern Shallows	10	1	13	85	0	277
Kodiak	101-200	Barren Islands	24	1	2	24	0	75

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Other Flatfish**Alaska plaice (*Pleuronectes quadrituberculatus*)**

Approximately 56% of the estimated total Alaska plaice biomass in the survey area came from the lower Alaska Peninsula stratum in the Shumagin INPFC area (just over 2% of the total survey area) (Table 20). Modest numbers of Alaska plaice were also captured in the nearshore areas surrounding Kodiak and the Shumagin Islands and in lower Cook inlet. No Alaska plaice were recorded east of Cook Inlet (Table 19).

Starry flounder (*Platichthys stellatus*)

Starry flounder were found almost exclusively in water depths less than 100 m (Table 21), especially in nearshore areas. The highest mean CPUEs occurred in the nearshore areas along the Alaska Peninsula, around Kodiak Island and in lower Cook Inlet and the nearshore areas in the Yakutat INPFC area (Table 22).

English sole (*Parophrys vetulus*)

Although CPUEs for English sole were low throughout the survey area, modest catches were recorded primarily in water less than 100 m in depth (Tables 23 and 24). About 69% of the total survey biomass estimate of English sole came from the nearshore areas in the

Yakutat and Southeastern INPFC areas, and about 22% of the total came from one tow in the Middleton Shallows stratum. Catch rates were also relatively high in the nearshore areas around Kodiak Island. Mean length and mean weight generally increased with depth (Table 23).

Butter sole (*Isopsetta isolepis*)

Except for a single, small catch in the Albatross Gullies stratum, all of the butter sole catches occurred in water less than 100 m deep (Tables 25 and 26). About 91% of the total biomass estimate came from water less than 100 m in the Shumagin, Chirikof and Kodiak INPFC areas (Table 26). The areas with the highest mean CPUEs included the nearshore areas around Kodiak and the Shumagin Islands and lower Cook Inlet (Table 26).

Table 19.-- Number of survey hauls, number of hauls with Alaska plaice, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	19	137	5,646	1.35	45.0
	101 - 200	31	0	---	---	---	---
	201 - 300	8	0	---	---	---	---
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	1	0	---	---	---	---
	All depths		147	19	87	5,646	1.35
Chirikof	1 - 100	59	5	18	470	1.19	44.1
	101 - 200	52	0	---	---	---	---
	201 - 300	35	0	---	---	---	---
	301 - 500	8	0	---	---	---	---
	501 - 700	6	0	---	---	---	---
	701 - 1000	8	0	---	---	---	---
	All depths		168	5	7	470	1.19
Kodiak	1 - 100	86	16	67	2,563	1.12	41.1
	101 - 200	95	0	---	---	---	---
	201 - 300	36	0	---	---	---	---
	301 - 500	14	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	10	0	---	---	---	---
	All depths		246	16	25	2,563	1.12
Yakutat	1 - 100	38	0	---	---	---	---
	101 - 200	63	0	---	---	---	---
	201 - 300	14	0	---	---	---	---
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	3	0	---	---	---	---
	All depths		135	0	---	---	---
Southeastern	1 - 100	10	0	---	---	---	---
	101 - 200	24	0	---	---	---	---
	201 - 300	16	0	---	---	---	---
	301 - 500	14	0	---	---	---	---
	501 - 700	2	0	---	---	---	---
	701 - 1000	2	0	---	---	---	---
	All depths		68	0	---	---	---
All areas	1 - 100	283	40	67	8,680	1.27	43.7
	101 - 200	265	0	---	---	---	---
	201 - 300	109	0	---	---	---	---
	301 - 500	60	0	---	---	---	---
	501 - 700	23	0	---	---	---	---
	701 - 1000	24	0	---	---	---	---
	All depths		764	40	27	8,680	1.27

All areas biomass, 95% confidence interval: 2,730 - 14,629 metric tons (t).

Table 20.-- Catch per unit effort by stratum for Alaska plaice sole sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Lower	Upper
							C.I. Biomass	C.I. Biomass
Shumagin	1-100	Lower Alaska Peninsula	16	9	709	4,877	0	10,709
Kodiak	1-100	Northern Kodiak Shallows	5	2	156	344	0	953
Kodiak	1-100	Lower Cook Inlet	22	7	151	1,492	92	2,893
Kodiak	1-100	Albatross Shallows	13	7	126	727	277	1,178
Shumagin	1-100	Shumagin Bank	26	7	48	596	77	1,116
Chirikof	1-100	Chirikof Bank	24	3	40	432	0	1,136
Shumagin	1-100	Davidson Bank	29	3	13	173	0	421
Chirikof	1-100	Upper Alaska Peninsula	18	2	5	39	0	94

Table 21.-- Number of survey hauls, number of hauls with starry flounder, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	16	252	10,414	1.53	46.6
	101 - 200	31	3	15	220	1.59	48.0
	201 - 300	8	0	---	---	---	---
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	1	0	---	---	---	---
	All depths		147	19	163	10,634	1.53
Chirikof	1 - 100	59	11	580	15,097	2.12	52.2
	101 - 200	52	0	---	---	---	---
	201 - 300	35	0	---	---	---	---
	301 - 500	8	0	---	---	---	---
	501 - 700	6	0	---	---	---	---
	701 - 1000	8	0	---	---	---	---
	All depths		168	11	222	15,097	2.12
Kodiak	1 - 100	86	26	354	13,640	1.74	48.5
	101 - 200	95	1	1	24	1.17	47.0
	201 - 300	36	0	---	---	---	---
	301 - 500	14	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	10	0	---	---	---	---
	All depths		246	27	135	13,664	1.74
Yakutat	1 - 100	38	6	430	7,158	1.87	48.3
	101 - 200	63	0	---	---	---	---
	201 - 300	14	0	---	---	---	---
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	3	0	---	---	---	---
	All depths		135	6	125	7,158	1.87
Southeastern	1 - 100	10	1	16	104	3.30	64.0
	101 - 200	24	0	---	---	---	---
	201 - 300	16	0	---	---	---	---
	301 - 500	14	0	---	---	---	---
	501 - 700	2	0	---	---	---	---
	701 - 1000	2	0	---	---	---	---
	All depths		68	1	4	104	3.30
All areas	1 - 100	283	60	360	46,412	1.81	49.0
	101 - 200	265	4	2	244	1.53	47.8
	201 - 300	109	0	---	---	---	---
	301 - 500	60	0	---	---	---	---
	501 - 700	23	0	---	---	---	---
	701 - 1000	24	0	---	---	---	---
	All depths		764	64	146	46,656	1.81

All areas biomass, 95% confidence interval: 23,775 - 69,538 metric tons (t).

Table 22.-- Catch per unit effort by stratum for starry flounder sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Hauls		CPUE (kg/km ²)	Biomass (t)	Lower	Upper
			Number of hauls	with catch			C.I. Biomass	C.I. Biomass
Shumagin	1-100	Lower Alaska Peninsula	16	12	1,075	7,391	334	14,447
Chirikof	1-100	Upper Alaska Peninsula	18	4	1,052	8,356	0	22,586
Kodiak	1-100	Albatross Shallows	13	5	914	5,269	0	14,036
Kodiak	1-100	Lower Cook Inlet	22	16	804	7,950	1,531	14,368
Chirikof	1-100	Chirikof Bank	24	7	625	6,741	0	18,740
Yakutat	1-100	Middleton Shallows	15	2	443	2,976	0	8,286
Yakutat	1-100	Yakutat Shallows	23	4	420	4,182	0	8,508
Shumagin	1-100	Davidson Bank	29	3	217	2,973	0	7,324
Kodiak	1-100	Northern Kodiak Shallows	5	3	66	145	0	343
Shumagin	101-200	West Shumagin Gully	5	1	65	148	0	560
Kodiak	1-100	Albatross Banks	34	2	18	277	0	779
Shumagin	101-200	Sanak Gully	9	2	17	72	0	192
Southeastern	1-100	Southeastern Shallows	10	1	16	104	0	339
Shumagin	1-100	Shumagin Bank	26	1	4	50	0	152
Kodiak	101-200	Barren Islands	24	1	2	24	0	75

Table 23.-- Number of survey hauls, number of hauls with English sole, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	7	14	563	0.43	34.2
	101 - 200	31	0	---	---	---	---
	201 - 300	8	0	---	---	---	---
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	1	0	---	---	---	---
	All depths		147	7	9	563	0.43
Chirikof	1 - 100	59	2	6	158	1.25	50.0
	101 - 200	52	0	---	---	---	---
	201 - 300	35	0	---	---	---	---
	301 - 500	8	0	---	---	---	---
	501 - 700	6	0	---	---	---	---
	701 - 1000	8	0	---	---	---	---
	All depths		168	2	2	158	1.25
Kodiak	1 - 100	86	14	75	2,908	0.45	34.4
	101 - 200	95	0	---	---	---	---
	201 - 300	36	0	---	---	---	---
	301 - 500	14	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	10	0	---	---	---	---
	All depths		246	14	29	2,908	0.45
Yakutat	1 - 100	38	17	395	6,574	0.47	35.5
	101 - 200	63	1	1	35	0.93	45.5
	201 - 300	14	0	---	---	---	---
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	3	0	---	---	---	---
	All depths		135	18	116	6,609	0.47
Southeastern	1 - 100	10	6	519	3,401	0.26	30.4
	101 - 200	24	5	69	768	0.66	40.5
	201 - 300	16	1	5	26	0.86	45.5
	301 - 500	14	0	---	---	---	---
	501 - 700	2	0	---	---	---	---
	701 - 1000	2	0	---	---	---	---
	All depths		68	12	150	4,194	0.29
All areas	1 - 100	283	46	105	13,604	0.39	33.4
	101 - 200	265	6	7	803	0.66	40.7
	201 - 300	109	1	1	26	0.86	45.5
	301 - 500	60	0	---	---	---	---
	501 - 700	23	0	---	---	---	---
	701 - 1000	24	0	---	---	---	---
	All depths		764	53	45	14,433	0.40

All areas biomass, 95% confidence interval: 5,818 - 23,047 metric tons (t).

Table 24.-- Catch per unit effort by stratum for English sole sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Hauls		CPUE (kg/km ²)	Biomass (t)	Lower	Upper
			Number of hauls	with catch			C.I. Biomass	C.I. Biomass
Yakutat	1-100	Middleton Shallows	15	5	764	5,131	0	12,085
Southeastern	1-100	Southeastern Shallows	10	6	519	3,401	0	8,310
Kodiak	1-100	Northern Kodiak Shallows	5	3	446	981	0	2,534
Kodiak	1-100	Kenai Peninsula	12	3	217	1,143	0	3,426
Yakutat	1-100	Yakutat Shallows	23	12	145	1,442	185	2,700
Kodiak	1-100	Albatross Shallows	13	3	114	655	0	2,037
Southeastern	101-200	Prince of Wales Shelf	14	4	109	753	0	1,765
Shumagin	1-100	Shumagin Bank	26	4	35	430	0	1,246
Chirikof	1-100	Chirikof Bank	24	2	15	158	0	469
Shumagin	1-100	Lower Alaska Peninsula	16	1	14	97	0	304
Kodiak	1-100	Lower Cook Inlet	22	3	11	104	0	305
Southeastern	201-300	Prince of Wales Slope/Gullies	13	1	7	26	0	81
Yakutat	101-200	Middleton Shelf	16	1	5	35	0	110
Southeastern	101-200	Baranof-Chichagof Shelf	10	1	4	15	0	50
Shumagin	1-100	Fox Islands	19	1	4	30	0	94
Kodiak	1-100	Albatross Banks	34	2	2	25	0	63
Shumagin	1-100	Davidson Bank	29	1	1	7	0	20

Table 25.-- Number of survey hauls, number of hauls with butter sole, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	20	121	4,985	0.43	33.9
	101 - 200	31	0	---	---	---	---
	201 - 300	8	0	---	---	---	---
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	1	0	---	---	---	---
	All depths		147	20	76	4,985	0.43
Chirikof	1 - 100	59	16	127	3,314	0.47	34.2
	101 - 200	52	0	---	---	---	---
	201 - 300	35	0	---	---	---	---
	301 - 500	8	0	---	---	---	---
	501 - 700	6	0	---	---	---	---
	701 - 1000	8	0	---	---	---	---
	All depths		168	16	49	3,314	0.47
Kodiak	1 - 100	86	26	118	4,561	0.33	30.9
	101 - 200	95	1	1	54	0.38	32.5
	201 - 300	36	0	---	---	---	---
	301 - 500	14	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	10	0	---	---	---	---
	All depths		246	27	45	4,615	0.33
Yakutat	1 - 100	38	9	76	1,274	0.27	28.7
	101 - 200	63	0	---	---	---	---
	201 - 300	14	0	---	---	---	---
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	3	0	---	---	---	---
	All depths		135	9	22	1,274	0.27
Southeastern	1 - 100	10	0	---	---	---	---
	101 - 200	24	0	---	---	---	---
	201 - 300	16	0	---	---	---	---
	301 - 500	14	0	---	---	---	---
	501 - 700	2	0	---	---	---	---
	701 - 1000	2	0	---	---	---	---
	All depths		68	0	---	---	---
All areas	1 - 100	283	71	110	14,134	0.38	32.2
	101 - 200	265	1	<1	54	0.38	32.5
	201 - 300	109	0	---	---	---	---
	301 - 500	60	0	---	---	---	---
	501 - 700	23	0	---	---	---	---
	701 - 1000	24	0	---	---	---	---
	All depths	764	72	44	14,188	0.38	32.2

All areas biomass, 95% confidence interval: 8,661 - 19,714 metric tons (t).

Table 26.-- Catch per unit effort by stratum for butter sole sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Lower	Upper
							C.I. Biomass	C.I. Biomass
Chirikof	1-100	Chirikof Bank	24	12	300	3,232	425	6,039
Kodiak	1-100	Albatross Shallows	13	7	286	1,646	0	3,636
Kodiak	1-100	Lower Cook Inlet	22	13	285	2,819	575	5,063
Shumagin	1-100	Shumagin Bank	26	8	272	3,368	347	6,389
Shumagin	1-100	Davidson Bank	29	5	88	1,202	0	3,389
Yakutat	1-100	Middleton Shallows	15	2	81	541	0	1,650
Yakutat	1-100	Yakutat Shallows	23	7	74	733	0	1,550
Shumagin	1-100	Lower Alaska Peninsula	16	6	51	350	0	924
Chirikof	1-100	Upper Alaska Peninsula	18	4	10	82	0	167
Shumagin	1-100	Fox Islands	19	1	8	65	0	203
Kodiak	101-200	Albatross Gullies	18	1	7	54	0	168
Kodiak	1-100	Albatross Banks	34	6	6	96	0	200

Walleye pollock (*Theragra chalcogramma*)

Walleye pollock were estimated to be the third most abundant fish species in the survey area (Table 2). Pollock were captured at all depths, but were most abundant in water less than 100 m, especially in the Shumagin INPFC area (Table 27). The Davidson Bank stratum was estimated to contain approximately 48% of the total walleye pollock biomass in the survey area , as the two largest catches of the survey were recorded in this stratum and included a single tow which accounted for about 36% of the overall survey biomass estimate (Table 28 and Fig. 24). Pollock were captured in about 74% of the survey tows, including over 95% of the tows in the 201 - 300 m depth range. Distinct modes of age 1 (9 - 21 cm FL) and age 2 (22 - 31 cm FL) fish were apparent in many areas at depths less than 300 m (Fig. 25). In the central and western GOA, larger, older fish were found at shallower and deeper depths, while younger, smaller fish were found at intermediate depths. In the eastern GOA, mean fish size generally increased with depth. The length-weight relationship for walleye pollock specimens collected during the survey is depicted in Figure 26.

Table 27.-- Number of survey hauls, number of hauls with walleye pollock, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	84	10,126	418,093	1.03	51.4
	101 - 200	31	26	700	10,271	0.44	32.1
	201 - 300	8	8	1,128	3,145	0.74	45.8
	301 - 500	12	10	202	512	0.82	47.1
	501 - 700	5	5	81	162	0.73	46.3
	701 - 1000	1	0	---	---	---	---
	All depths		147	133	6,626	432,182	0.99
Chirikof	1 - 100	59	40	1,474	38,384	0.81	44.7
	101 - 200	52	48	426	10,159	0.65	41.6
	201 - 300	35	35	239	2,754	0.34	30.1
	301 - 500	8	5	51	82	0.67	44.6
	501 - 700	6	0	---	---	---	---
	701 - 1000	8	1	6	17	1.09	56.0
	All depths		168	129	755	51,395	0.72
Kodiak	1 - 100	86	55	1,732	66,729	0.55	36.6
	101 - 200	95	66	867	37,566	0.49	34.4
	201 - 300	36	32	433	4,975	0.22	25.1
	301 - 500	14	7	66	192	0.70	44.0
	501 - 700	5	1	7	13	0.78	45.0
	701 - 1000	10	4	35	122	0.82	48.1
	All depths		246	165	1,080	109,596	0.50
Yakutat	1 - 100	38	26	301	5,010	0.11	20.4
	101 - 200	63	54	159	4,661	0.16	23.3
	201 - 300	14	14	370	1,913	0.42	37.3
	301 - 500	12	5	40	105	0.85	48.0
	501 - 700	5	0	---	---	---	---
	701 - 1000	3	0	---	---	---	---
	All depths		135	99	204	11,689	0.15
Southeastern	1 - 100	10	5	2,194	14,362	0.23	29.1
	101 - 200	24	18	487	5,396	0.52	39.1
	201 - 300	16	15	1,816	9,176	0.72	44.7
	301 - 500	14	3	24	76	0.93	49.3
	501 - 700	2	0	---	---	---	---
	701 - 1000	2	0	---	---	---	---
	All depths		68	41	1,035	29,011	0.34
All areas	1 - 100	283	210	4,204	542,578	0.79	44.2
	101 - 200	265	212	556	68,053	0.44	33.1
	201 - 300	109	104	609	21,964	0.42	33.4
	301 - 500	60	30	76	966	0.79	46.4
	501 - 700	23	6	21	174	0.73	46.2
	701 - 1000	24	5	12	139	0.85	48.9
	All depths		764	567	1,981	633,874	0.71

All areas biomass, 95% confidence interval: 159,397 - 1,108,351 metric tons (t).

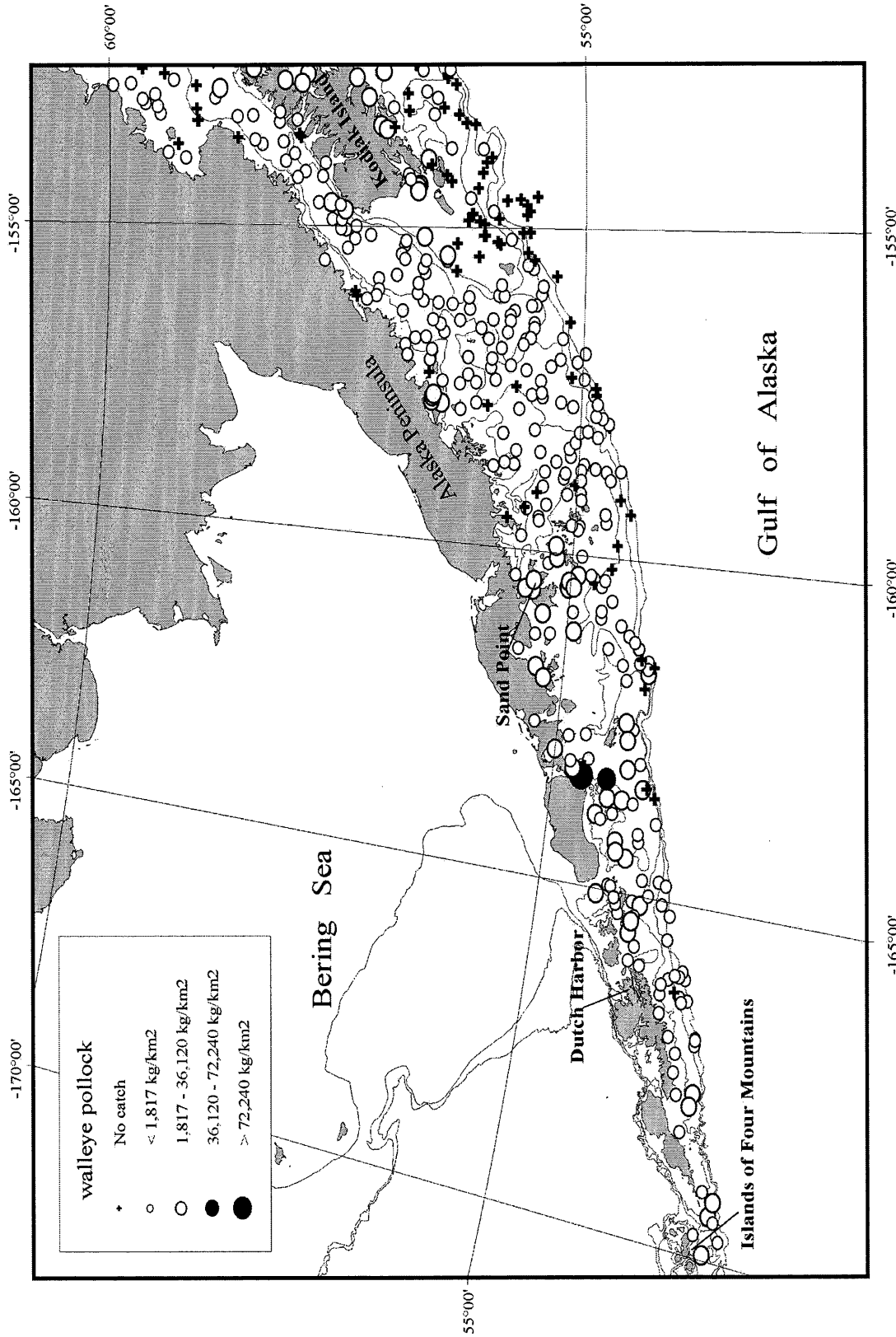


Figure 24.—Distribution and relative abundance of walleye pollock from the 1999 Gulf of Alaska bottom trawl survey. Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations above mean CPUE, and greater than four standard deviations above mean CPUE. Each symbol is proportional to the sample CPUE.

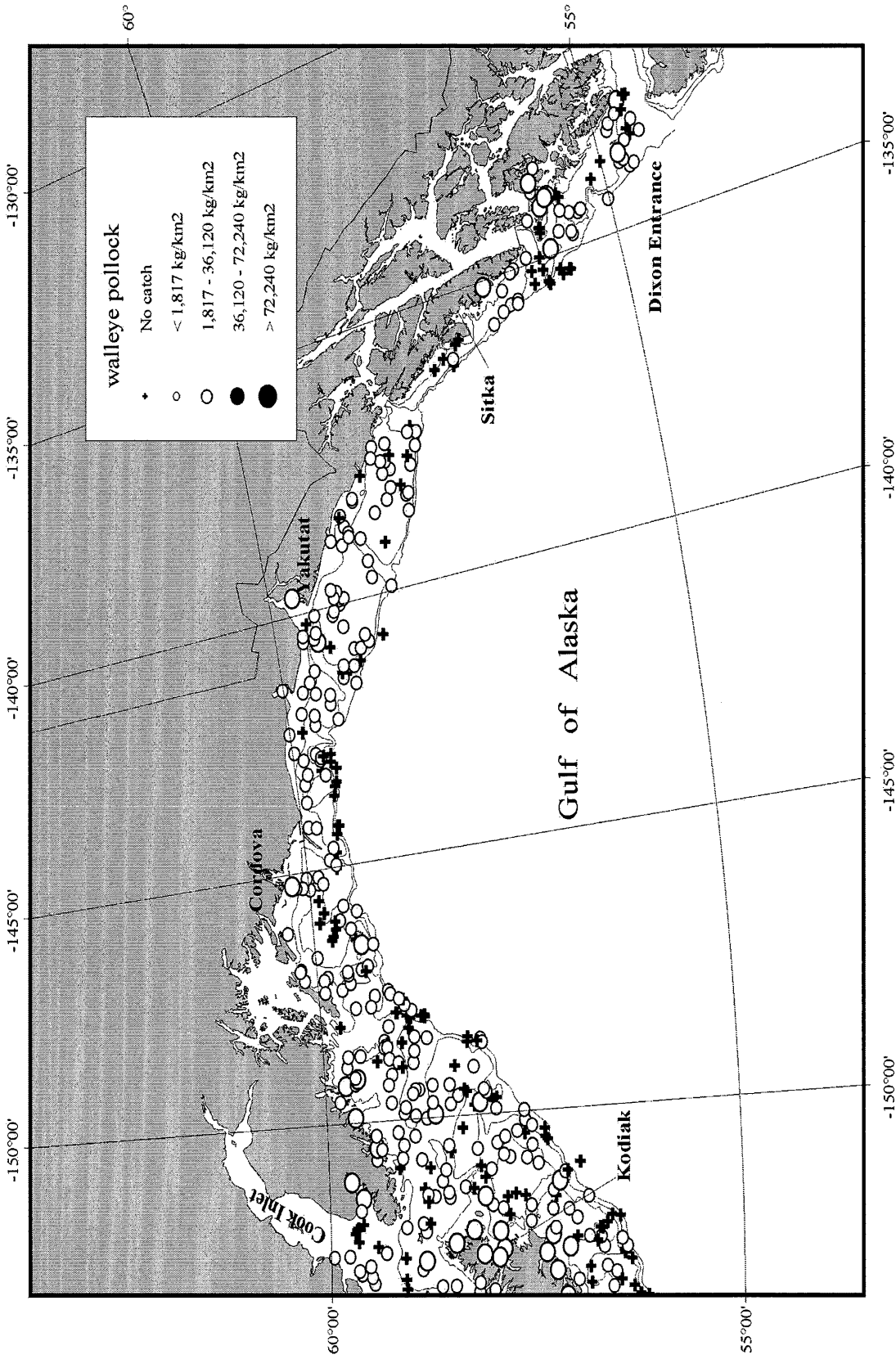


Figure 24.--Continued.

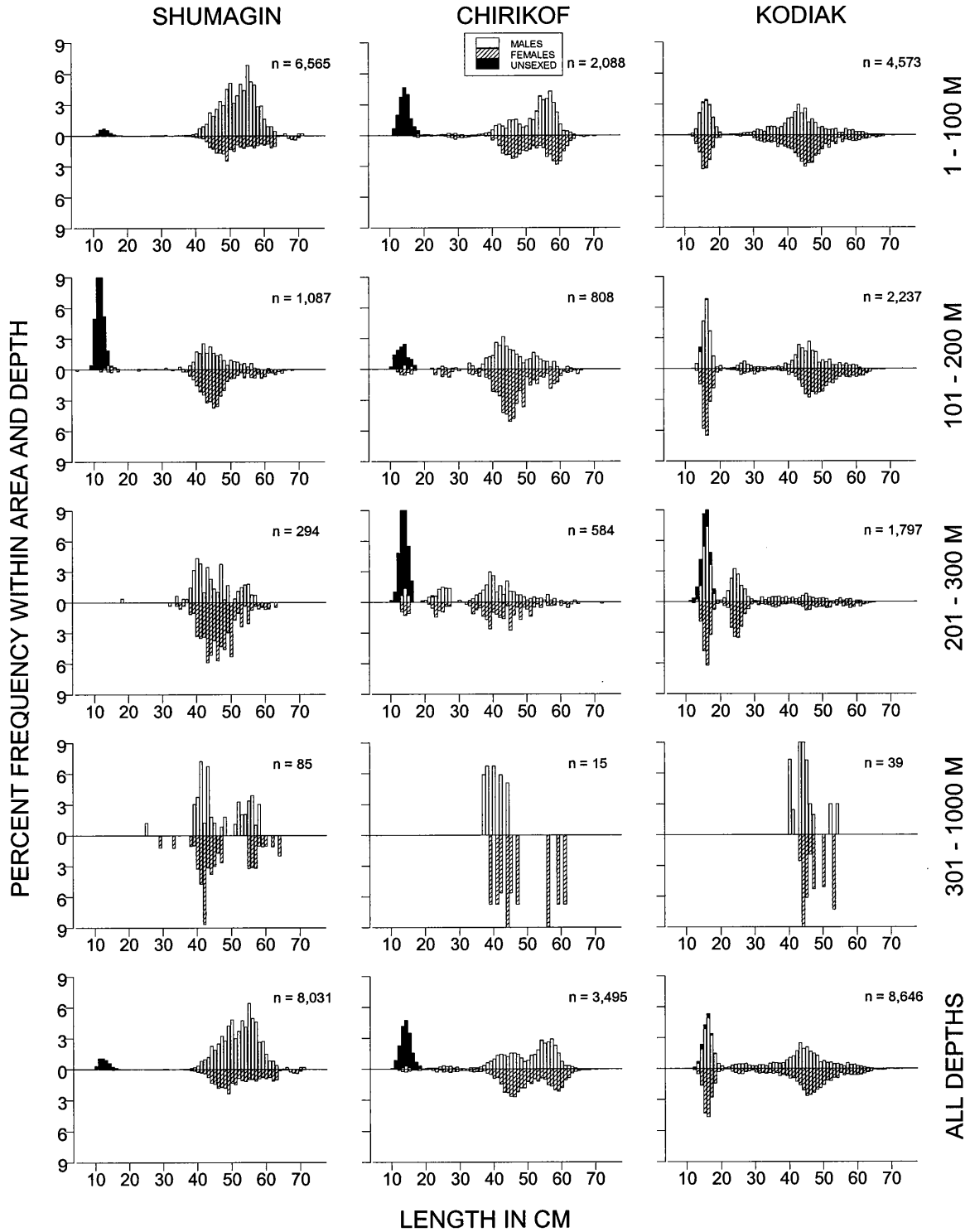


Figure 25.-- Size composition of the estimated walleye pollock population from the 1999 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

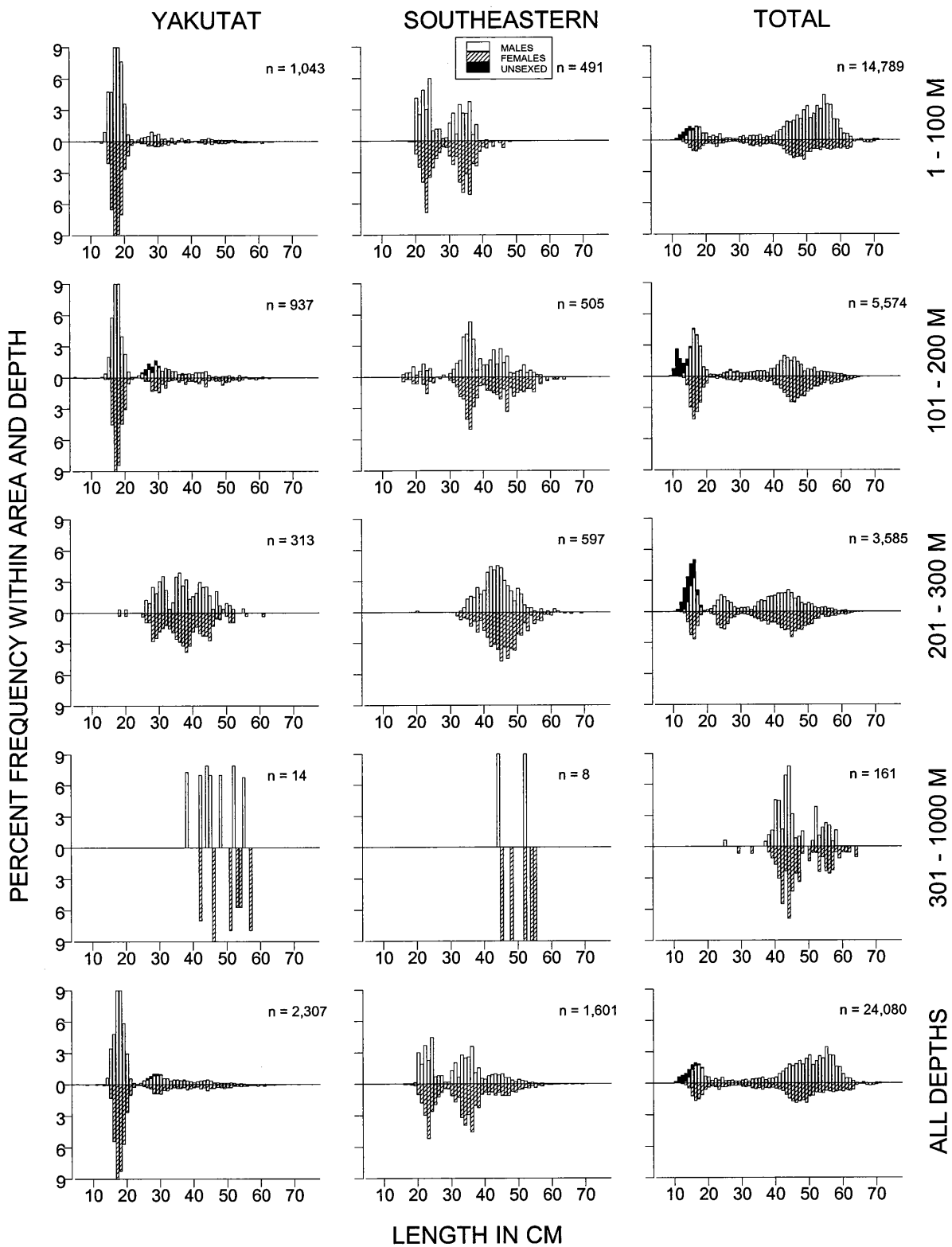


Figure 25.--Continued.

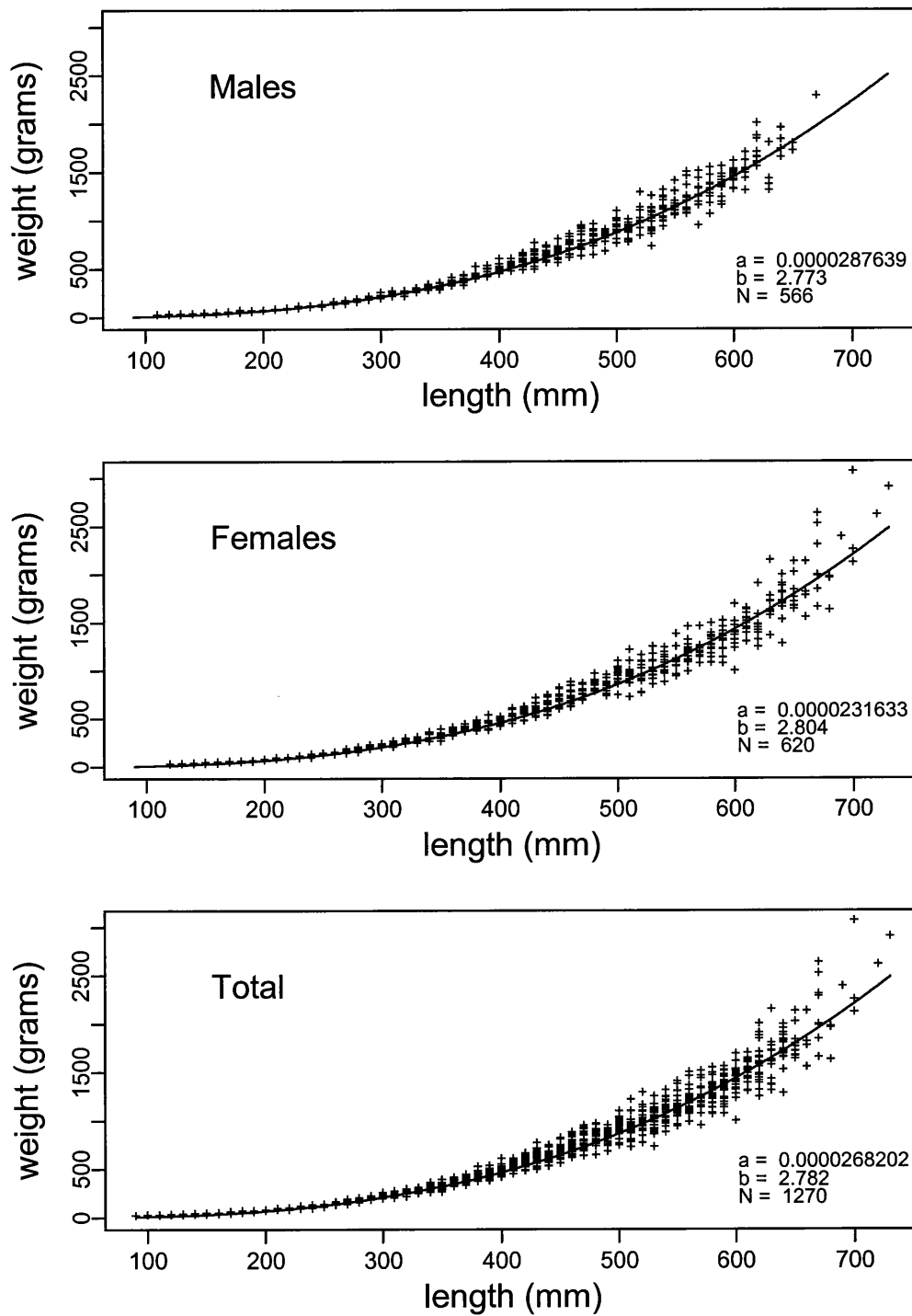


Figure 26.-- Length-weight relationship for walleye pollock specimens collected during the 1999 Gulf of Alaska bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a \times Length_{(mm)}^b$.

Table 28.-- Catch per unit effort by stratum for walleye pollock sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Hauls		CPUE (kg/km ²)	Biomass (t)	Lower	Upper
			Number of hauls	with catch			C.I. Biomass	C.I. Biomass
Shumagin	1-100	Davidson Bank	29	26	22,139	302,882	0	771,635
Kodiak	1-100	Albatross Shallows	13	11	8,015	46,213	16,667	75,758
Shumagin	1-100	Lower Alaska Peninsula	16	14	7,024	48,298	9,586	87,010
Shumagin	1-100	Shumagin Bank	26	25	3,929	48,709	13,939	83,480
Kodiak	101-200	Kodiak Outer Shelf	11	1	2,963	14,891	0	48,069
Southeastern	201-300	Prince of Wales Slope/Gullies	13	12	2,196	8,623	0	19,061
Southeastern	1-100	Southeastern Shallows	10	5	2,194	14,362	0	40,370
Shumagin	1-100	Fox Islands	19	19	2,185	18,204	1,131	35,276
Chirikof	1-100	Chirikof Bank	24	10	2,111	22,783	0	45,783
Chirikof	1-100	Upper Alaska Peninsula	18	14	1,896	15,054	399	29,709
Kodiak	101-200	Albatross Gullies	18	13	1,495	11,827	0	24,155
Kodiak	1-100	Kenai Peninsula	12	10	1,228	6,458	0	13,749
Shumagin	201-300	Shumagin Slope	8	8	1,128	3,145	197	6,094
Shumagin	101-200	Shumagin Outer Shelf	17	14	977	7,966	3,334	12,599
Kodiak	1-100	Albatross Banks	34	18	708	10,910	0	32,438
Kodiak	201-300	Upper Shelikof Gully	10	10	667	2,139	954	3,325
Chirikof	101-200	Shelikof Edge	17	17	625	4,831	822	8,840
Yakutat	201-300	Yakutat Gullies	9	9	539	1,640	0	3,679
Southeastern	101-200	Prince of Wales Shelf	14	10	513	3,530	0	7,288
Southeastern	201-300	Baranof-Chichagof Slope	3	3	492	554	0	2,130
Shumagin	101-200	West Shumagin Gully	5	4	467	1,064	0	2,785
Southeastern	101-200	Baranof-Chichagof Shelf	10	8	445	1,866	0	4,697
Yakutat	1-100	Middleton Shallows	15	8	419	2,810	0	6,189
Kodiak	101-200	Kenai Flats	26	23	395	4,775	1,852	7,697
Kodiak	101-200	Barren Islands	24	18	379	4,157	1,313	7,000
Chirikof	101-200	East Shumagin Gully	24	23	358	3,974	1,615	6,332
Kodiak	201-300	Kodiak Slope	5	4	346	561	0	1,319
Kodiak	201-300	Kenai Gullies	21	18	342	2,275	1,119	3,430
Shumagin	101-200	Sanak Gully	9	8	292	1,241	0	3,551
Kodiak	1-100	Lower Cook Inlet	22	13	276	2,729	0	6,415
Chirikof	101-200	Chirikof Outer Shelf	11	8	270	1,354	0	2,783
Kodiak	101-200	Portlock Flats	16	11	261	1,917	0	4,790
Chirikof	201-300	Lower Shelikof Gully	30	30	252	2,528	1,652	3,403
Yakutat	1-100	Yakutat Shallows	23	18	221	2,201	0	4,651
Shumagin	301-500	Shumagin Slope	12	10	202	512	291	733
Yakutat	101-200	Middleton Shelf	16	13	200	1,468	41	2,896
Kodiak	1-100	Northern Kodiak Shallows	5	3	190	419	0	1,332
Yakutat	101-200	Fairweather Shelf	17	14	163	1,262	0	2,656
Yakutat	101-200	Yakutat Flats	19	18	154	1,387	479	2,294
Chirikof	201-300	Chirikof Slope	5	5	148	226	0	488
Yakutat	201-300	Yakutat Slope	5	5	128	272	26	519
Yakutat	101-200	Yakataga Shelf	11	9	103	544	61	1,028
Shumagin	501-700	Shumagin Slope	5	5	81	162	18	305
Chirikof	1-100	Semidi Bank	17	16	75	546	99	994
Kodiak	301-500	Kodiak Slope	14	7	66	192	20	364
Chirikof	301-500	Chirikof Slope	8	5	51	82	0	206
Yakutat	301-500	Yakutat Gullies	5	2	45	50	0	176
Southeastern	301-500	Southeastern Slope	4	1	45	35	0	145
Yakutat	301-500	Yakutat Slope	7	3	36	55	0	131
Kodiak	701-1000	Kodiak Slope	10	4	35	122	0	272
Southeastern	301-500	Southeastern Deep Gullies	10	2	18	42	0	109
Kodiak	501-700	Kodiak Slope	5	1	7	13	0	48
Chirikof	701-1000	Chirikof Slope	8	1	6	17	0	58

Pacific cod (*Gadus macrocephalus*)

Pacific cod were found throughout the GOA at depths less than 300 m, although CPUEs were generally low at depths greater than 200 m (Table 29). About 73% of the survey-wide biomass was estimated to be in water less than 100 m deep (Fig. 27). Over 77% of the catches in this depth range contained Pacific cod. A single cod was captured below 300 m over the entire survey (303 m). About 93% of the total Pacific cod biomass was estimated to be in the central and western GOA (Table 30). Cod were caught consistently in the eastern GOA, but the CPUEs were generally low. Mean fish length and weight generally increased with depth and fish less than 35 cm FL were rare in depths greater than 100 m (Fig. 28). The length-weight relationship for Pacific cod specimens collected during the survey is depicted in Figure 29.

Table 29.-- Number of survey hauls, number of hauls with Pacific cod, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	85	2,288	94,459	1.49	49.0
	101 - 200	31	27	1,093	16,041	2.27	55.9
	201 - 300	8	5	565	1,575	3.06	64.5
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	1	0	---	---	---	---
	All depths		147	117	1,718	112,076	1.58
Chirikof	1 - 100	59	51	2,663	69,327	2.64	59.4
	101 - 200	52	40	890	21,237	2.20	57.4
	201 - 300	35	18	112	1,297	2.92	63.8
	301 - 500	8	0	---	---	---	---
	501 - 700	6	0	---	---	---	---
	701 - 1000	8	0	---	---	---	---
	All depths		168	109	1,350	91,861	2.53
Kodiak	1 - 100	86	62	1,366	52,627	1.63	47.5
	101 - 200	95	58	619	26,832	1.62	52.0
	201 - 300	36	13	113	1,300	2.36	59.3
	301 - 500	14	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	10	0	---	---	---	---
	All depths		246	133	796	80,759	1.64
Yakutat	1 - 100	38	15	236	3,929	2.74	61.3
	101 - 200	63	18	256	7,517	2.60	60.8
	201 - 300	14	1	9	48	3.00	62.0
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	3	0	---	---	---	---
	All depths		135	34	201	11,493	2.65
Southeastern	1 - 100	10	6	333	2,181	1.54	48.1
	101 - 200	24	16	653	7,239	1.86	54.4
	201 - 300	16	9	155	785	2.22	58.7
	301 - 500	14	1	7	20	2.15	61.0
	501 - 700	2	0	---	---	---	---
	701 - 1000	2	0	---	---	---	---
	All depths		68	32	365	10,225	1.81
All areas	1 - 100	283	219	1,724	222,523	1.78	50.9
	101 - 200	265	159	645	78,865	1.97	54.9
	201 - 300	109	46	139	5,005	2.66	61.7
	301 - 500	60	1	2	20	2.15	61.0
	501 - 700	23	0	---	---	---	---
	701 - 1000	24	0	---	---	---	---
	All depths		764	425	958	306,413	1.84

All areas biomass, 95% confidence interval: 229,015 - 383,811 metric tons (t).

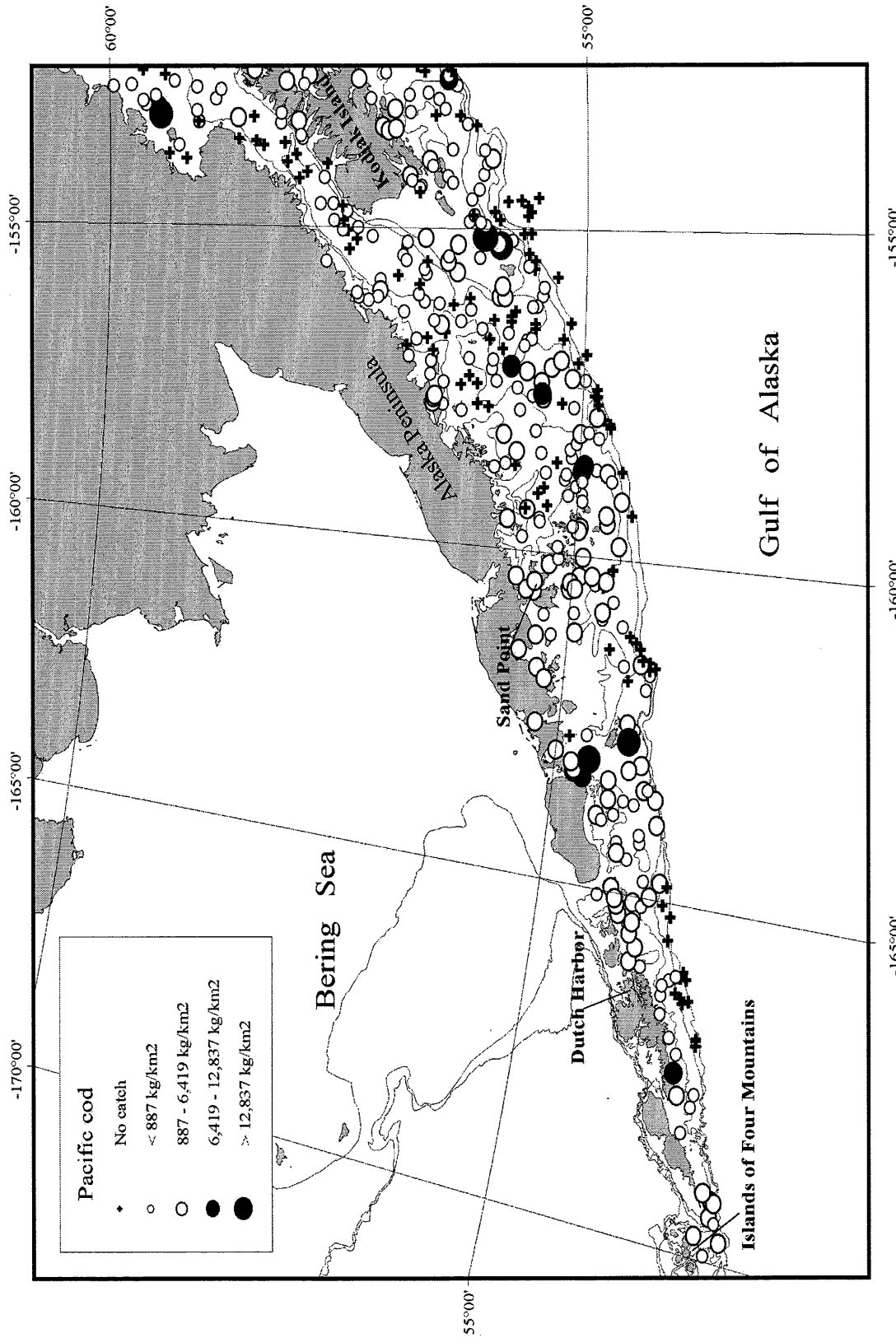


Figure 27.—Distribution and relative abundance of Pacific cod from the 1999 Gulf of Alaska bottom trawl survey. Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations above mean CPUE, and greater than four standard deviations above mean CPUE. Each symbol is proportional to the sample CPUE.

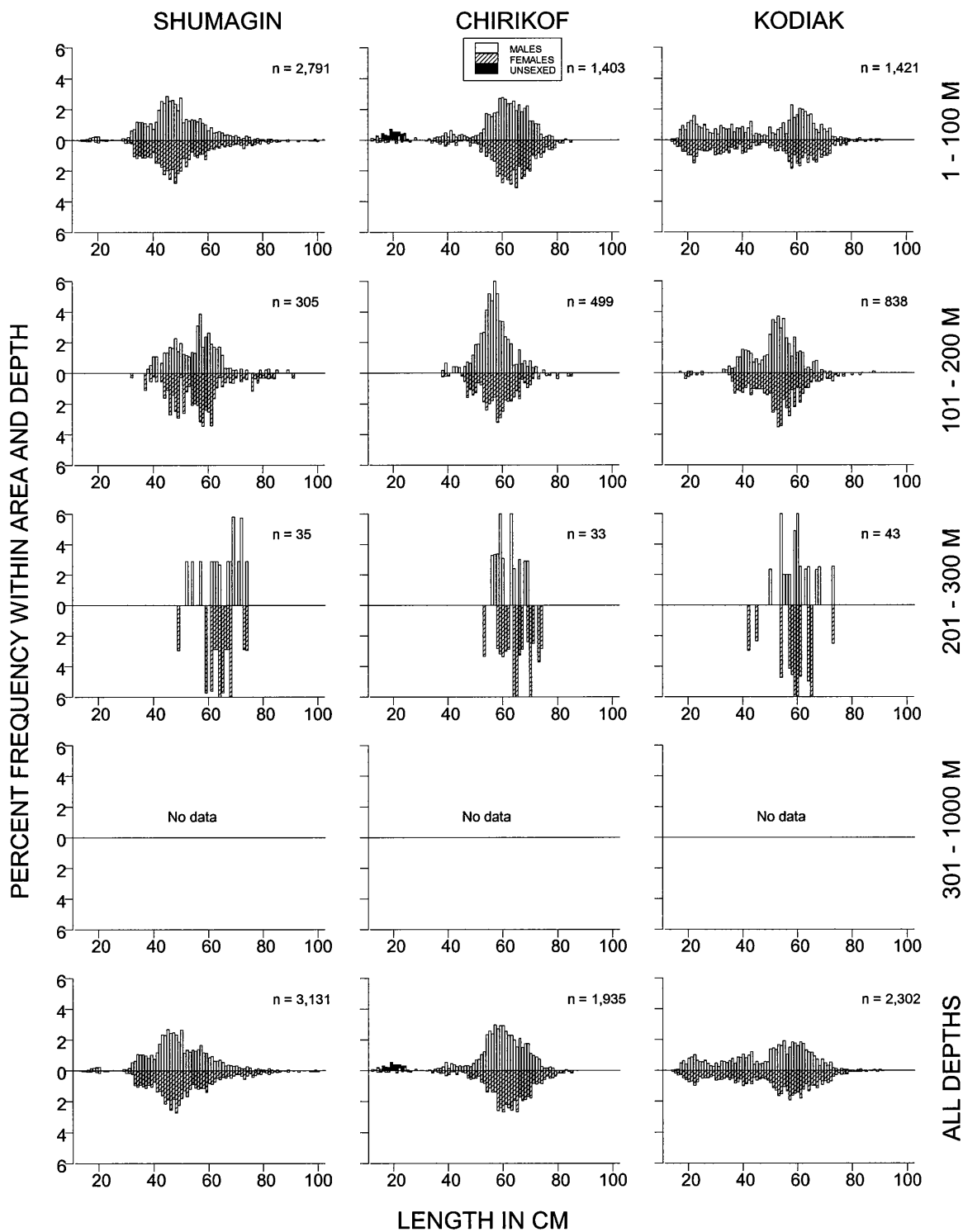


Figure 28.-- Size composition of the estimated walleye pollock population from the 1999 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

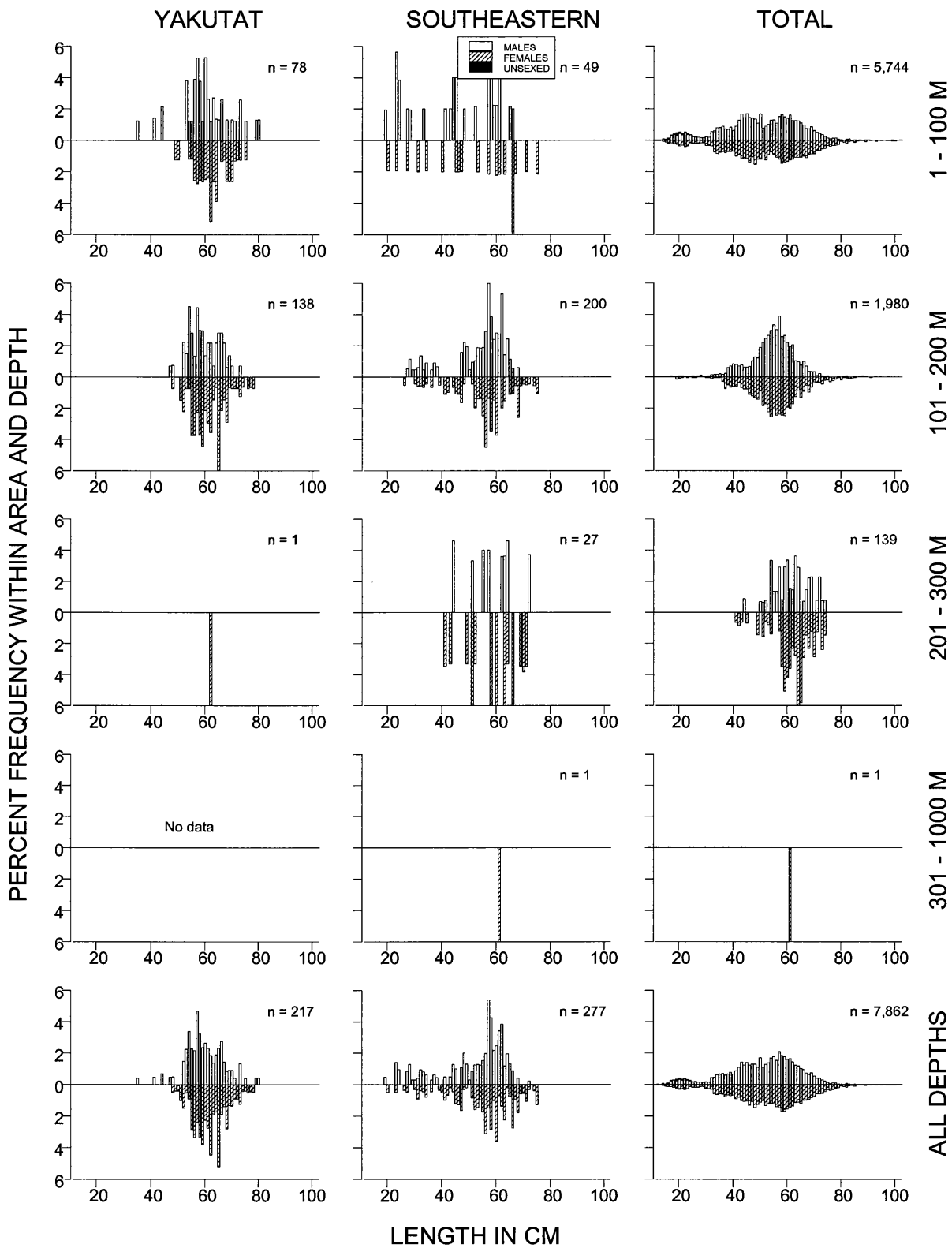


Figure 28.--Continued.

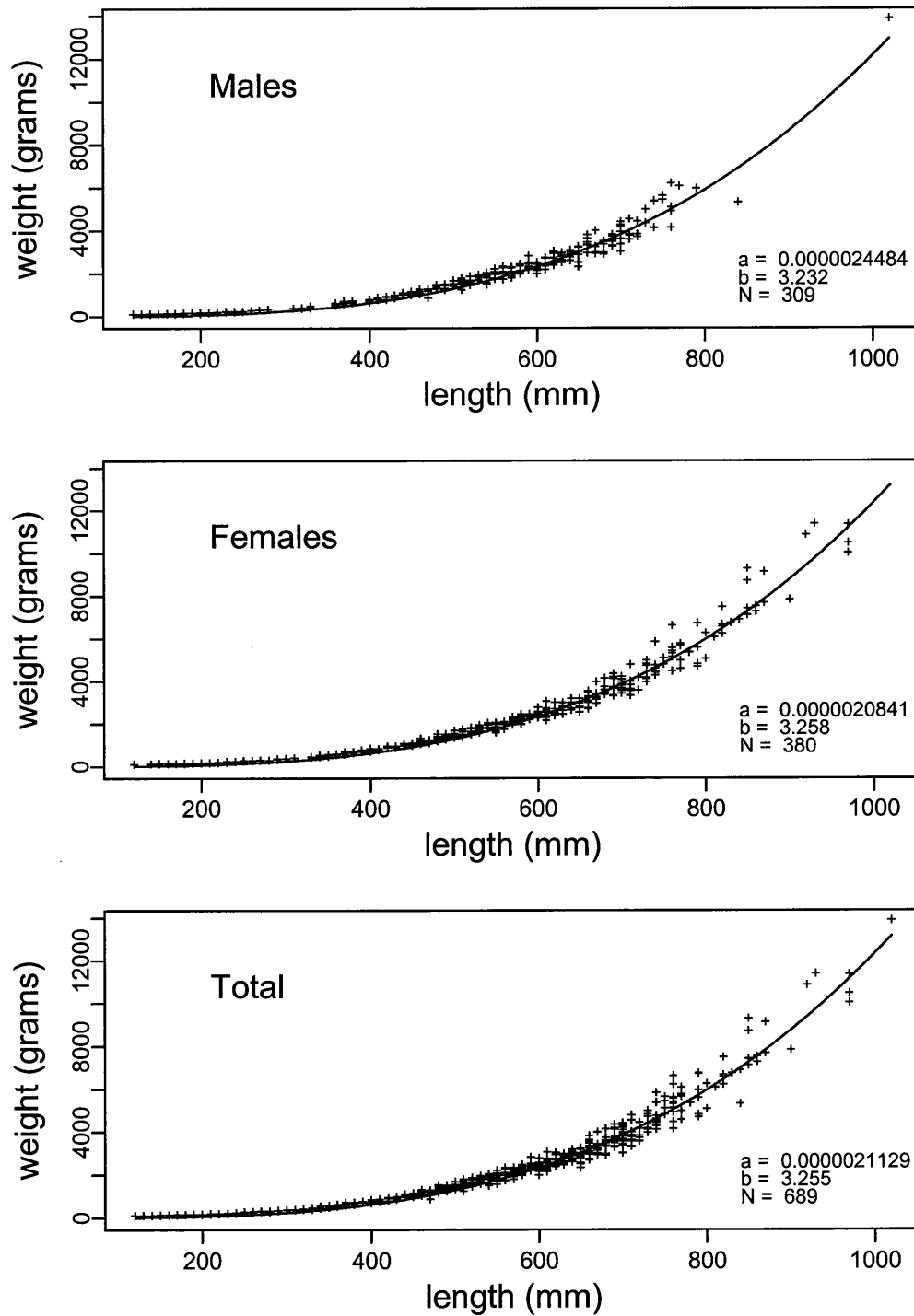


Figure 29.-- Length-weight relationship for walleye pollock specimens collected during the 1999 Gulf of Alaska bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a \times Length_{(mm)}^b$.

Table 30.-- Catch per unit effort by stratum for Pacific cod sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Lower	Upper
							C.I. Biomass	C.I. Biomass
Chirikof	1-100	Chirikof Bank	24	22	4,777	51,550	2,041	101,059
Shumagin	1-100	Davidson Bank	29	27	3,338	45,664	8,425	82,903
Shumagin	1-100	Lower Alaska Peninsula	16	14	2,409	16,562	9,521	23,603
Kodiak	101-200	Kodiak Outer Shelf	11	9	2,260	11,359	0	23,427
Shumagin	1-100	Fox Islands	19	19	2,044	17,031	8,384	25,677
Chirikof	1-100	Semidi Bank	17	15	1,990	14,529	4,055	25,003
Kodiak	1-100	Albatross Shallows	13	13	1,829	10,546	6,408	14,685
Kodiak	1-100	Lower Cook Inlet	22	13	1,661	16,425	0	33,755
Kodiak	1-100	Albatross Banks	34	24	1,523	23,460	0	61,594
Shumagin	101-200	Shumagin Outer Shelf	17	16	1,248	10,177	5,123	15,230
Shumagin	1-100	Shumagin Bank	26	25	1,226	15,203	9,915	20,491
Chirikof	101-200	East Shumagin Gully	24	17	1,088	12,079	391	23,768
Shumagin	101-200	Sanak Gully	9	8	1,049	4,455	252	8,658
Chirikof	101-200	Chirikof Outer Shelf	11	11	910	4,561	970	8,152
Southeastern	101-200	Baranof-Chichagof Shelf	10	7	909	3,816	0	9,128
Kodiak	101-200	Portlock Flats	16	10	644	4,726	0	9,833
Shumagin	101-200	West Shumagin Gully	5	3	619	1,409	0	3,983
Kodiak	101-200	Albatross Gullies	18	12	614	4,860	1,465	8,256
Chirikof	101-200	Shelikof Edge	17	12	594	4,596	1,745	7,448
Shumagin	201-300	Shumagin Slope	8	5	565	1,575	0	4,203
Yakutat	101-200	Fairweather Shelf	17	6	542	4,188	0	11,316
Southeastern	101-200	Prince of Wales Shelf	14	9	497	3,423	416	6,429
Yakutat	101-200	Yakataga Shelf	11	2	488	2,574	0	6,829
Kodiak	101-200	Barren Islands	24	18	442	4,848	2,784	6,913
Chirikof	1-100	Upper Alaska Peninsula	18	14	409	3,248	1,014	5,482
Kodiak	1-100	Northern Kodiak Shallows	5	4	346	760	0	2,118
Southeastern	1-100	Southeastern Shallows	10	6	333	2,181	0	4,911
Yakutat	1-100	Yakutat Shallows	23	9	282	2,800	742	4,858
Kodiak	1-100	Kenai Peninsula	12	8	273	1,437	0	2,896
Kodiak	201-300	Upper Shelikof Gully	10	4	185	592	0	1,256
Southeastern	201-300	Prince of Wales Slope/Gullies	13	8	168	661	226	1,097
Yakutat	1-100	Middleton Shallows	15	6	168	1,128	0	2,359
Kodiak	201-300	Kodiak Slope	5	4	124	201	0	446
Chirikof	201-300	Lower Shelikof Gully	30	17	122	1,224	622	1,825
Southeastern	201-300	Baranof-Chichagof Slope	3	1	110	124	0	657
Kodiak	101-200	Kenai Flats	26	9	86	1,038	0	2,123
Kodiak	201-300	Kenai Gullies	21	5	76	507	0	1,128
Yakutat	101-200	Yakutat Flats	19	6	62	564	0	1,159
Chirikof	201-300	Chirikof Slope	5	1	48	73	0	277
Yakutat	101-200	Middleton Shelf	16	4	26	190	0	387
Yakutat	201-300	Yakutat Slope	5	1	22	48	0	180
Southeastern	301-500	Southeastern Deep Gullies	10	1	9	20	0	67

Atka mackerel (*Pleurogrammus monopterygius*)

Approximately 87% of the Atka mackerel biomass was estimated to be in the Shumagin INPFC area, especially in the Davidson Bank stratum which accounted for over 54% of the survey's total biomass estimate (Tables 31 and 32). About 37% of the total biomass estimate came from a single tow in this stratum. Only one Atka mackerel was captured east of Chirikof Island (Fig. 30). Most of the fish captured were greater than 40 cm FL, although a few fish less than 35 cm FL were captured in the Shumagin INPFC area (Fig. 31). The length-weight relationship for Atka mackerel specimens collected during the survey is depicted in Figure 32.

Table 31.-- Number of survey hauls, number of hauls with Atka mackerel, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	23	86	3,559	1.20	46.0
	101 - 200	31	6	42	619	1.13	44.9
	201 - 300	8	0	---	---	---	---
	301 - 500	12	1	6	14	1.34	46.0
	501 - 700	5	0	---	---	---	---
	701 - 1000	1	0	---	---	---	---
	All depths		147	30	64	4,192	1.19
Chirikof	1 - 100	59	2	2	58	1.49	50.9
	101 - 200	52	7	22	532	1.38	49.3
	201 - 300	35	1	1	15	1.41	48.0
	301 - 500	8	0	---	---	---	---
	501 - 700	6	0	---	---	---	---
	701 - 1000	8	0	---	---	---	---
	All depths		168	10	9	604	1.39
Kodiak	1 - 100	86	1	<1	3	0.17	---
	101 - 200	95	0	---	---	---	---
	201 - 300	36	0	---	---	---	---
	301 - 500	14	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	10	0	---	---	---	---
	All depths		246	1	<1	3	0.17
Yakutat	1 - 100	38	0	---	---	---	---
	101 - 200	63	0	---	---	---	---
	201 - 300	14	0	---	---	---	---
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	3	0	---	---	---	---
	All depths		135	0	---	---	---
Southeastern	1 - 100	10	0	---	---	---	---
	101 - 200	24	0	---	---	---	---
	201 - 300	16	0	---	---	---	---
	301 - 500	14	0	---	---	---	---
	501 - 700	2	0	---	---	---	---
	701 - 1000	2	0	---	---	---	---
	All depths		68	0	---	---	---
All areas	1 - 100	283	26	28	3,620	1.20	46.0
	101 - 200	265	13	9	1,151	1.24	46.7
	201 - 300	109	1	<1	15	1.41	48.0
	301 - 500	60	1	1	14	1.34	46.0
	501 - 700	23	0	---	---	---	---
	701 - 1000	24	0	---	---	---	---
	All depths		764	41	15	4,799	1.21

All areas biomass, 95% confidence interval: 889 - 8,710 metric tons (t).

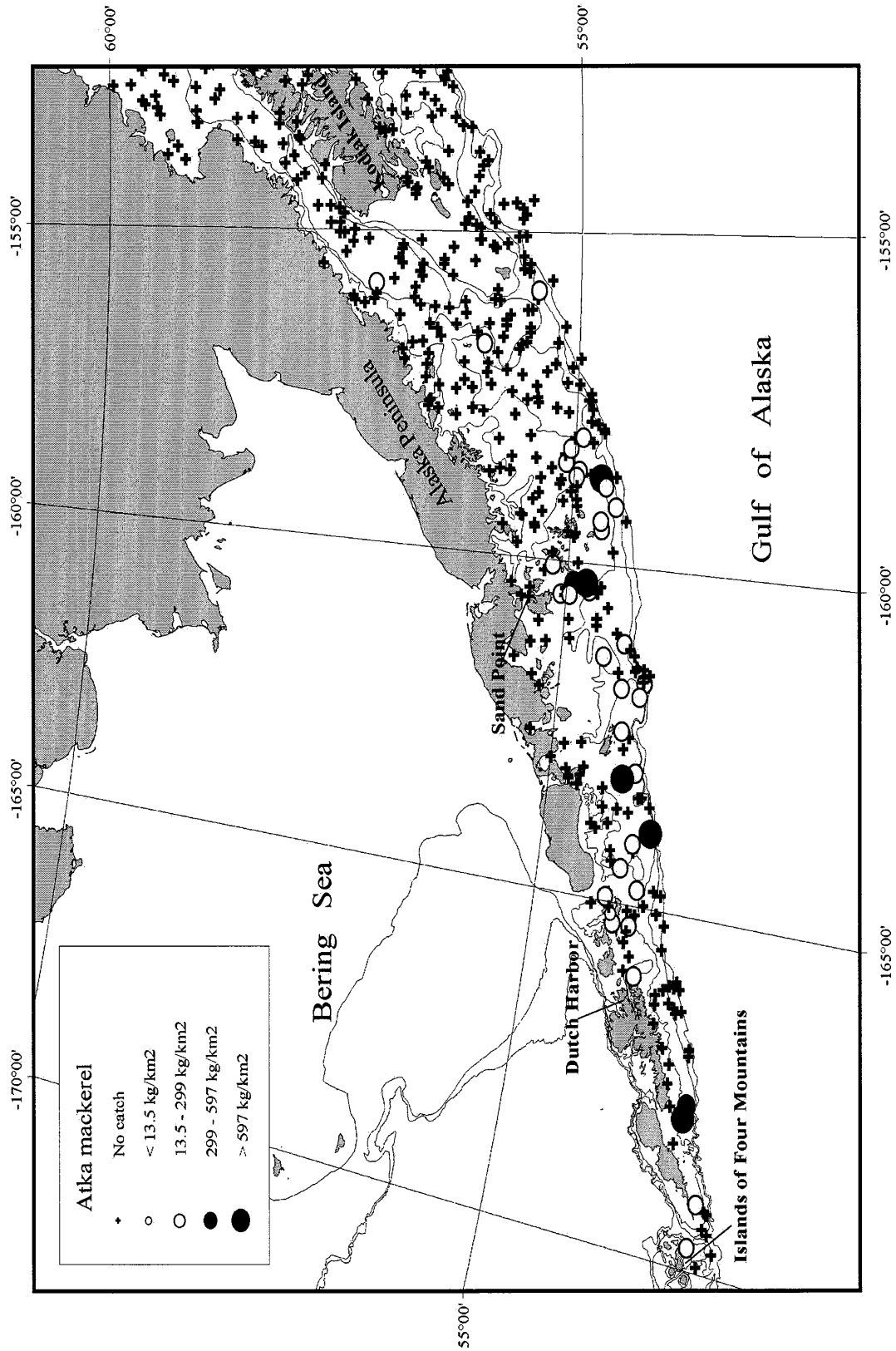


Figure 30.--Distribution and relative abundance of Atka mackerel from the 1999 Gulf of Alaska bottom trawl survey. Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations above mean CPUE, and greater than four standard deviations above mean CPUE. Each symbol is proportional to the sample CPUE.

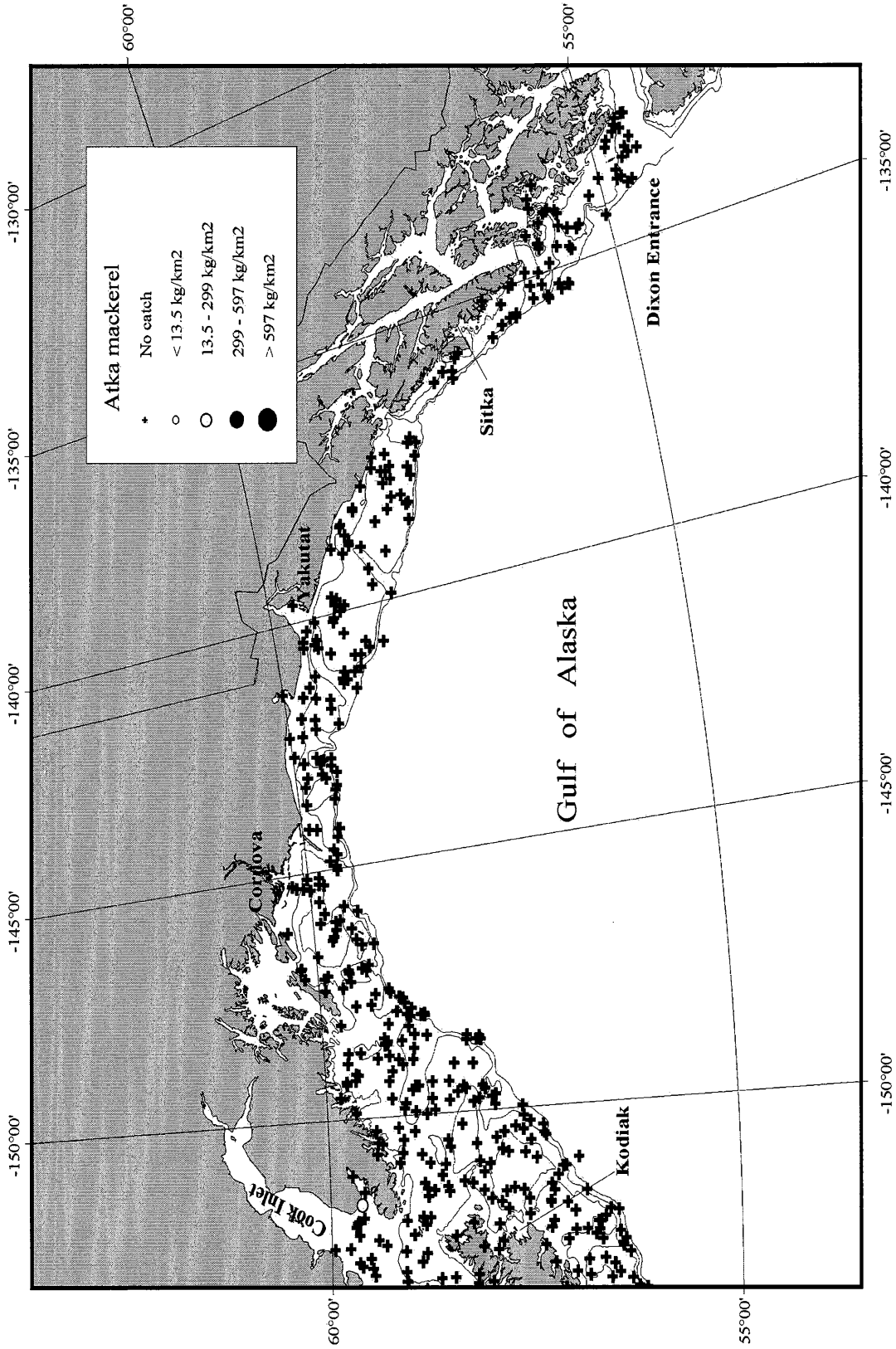


Figure 30.--Continued.

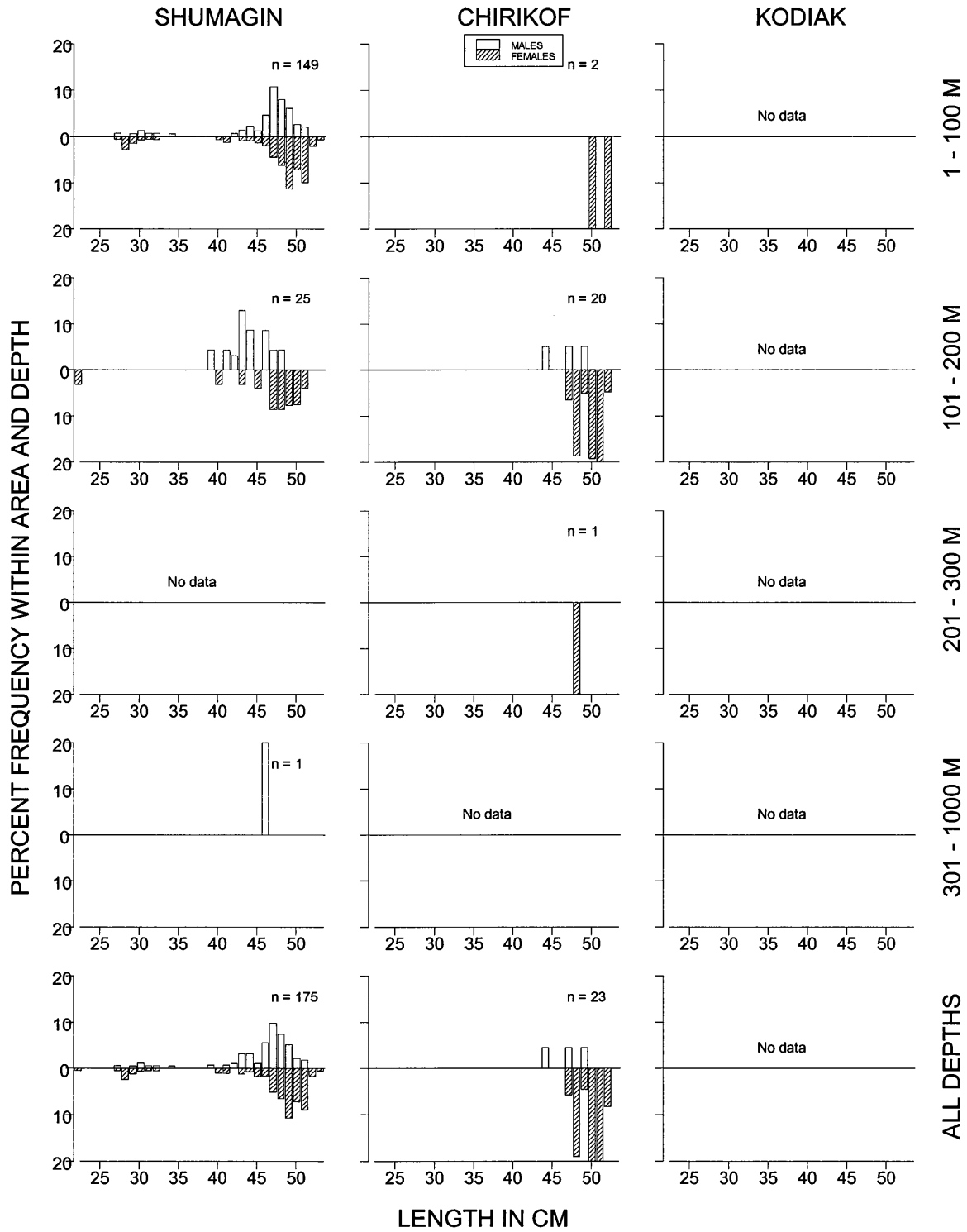


Figure 31.-- Size composition of the estimated Atka mackerel population from the 1999 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

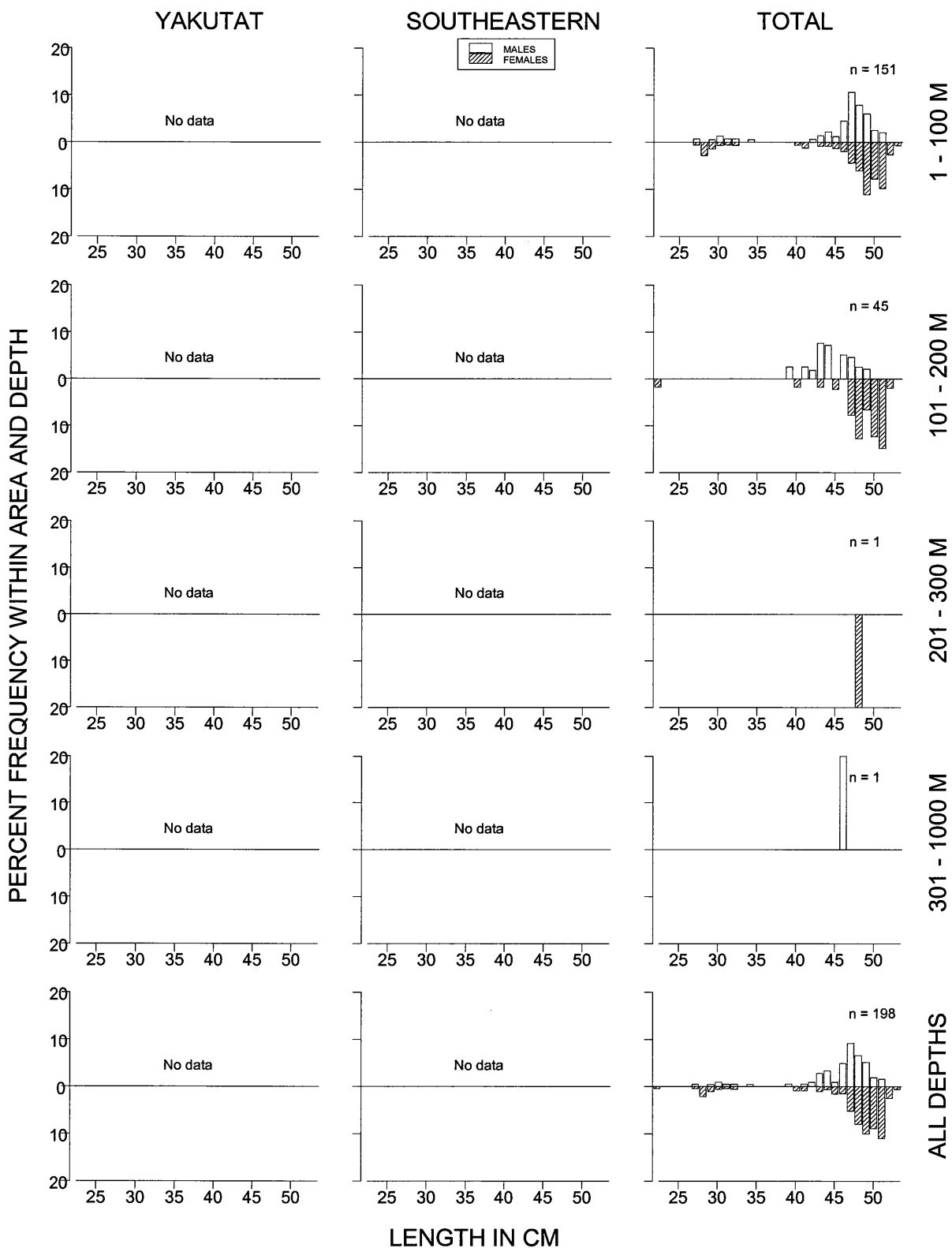


Figure 31.--Continued.

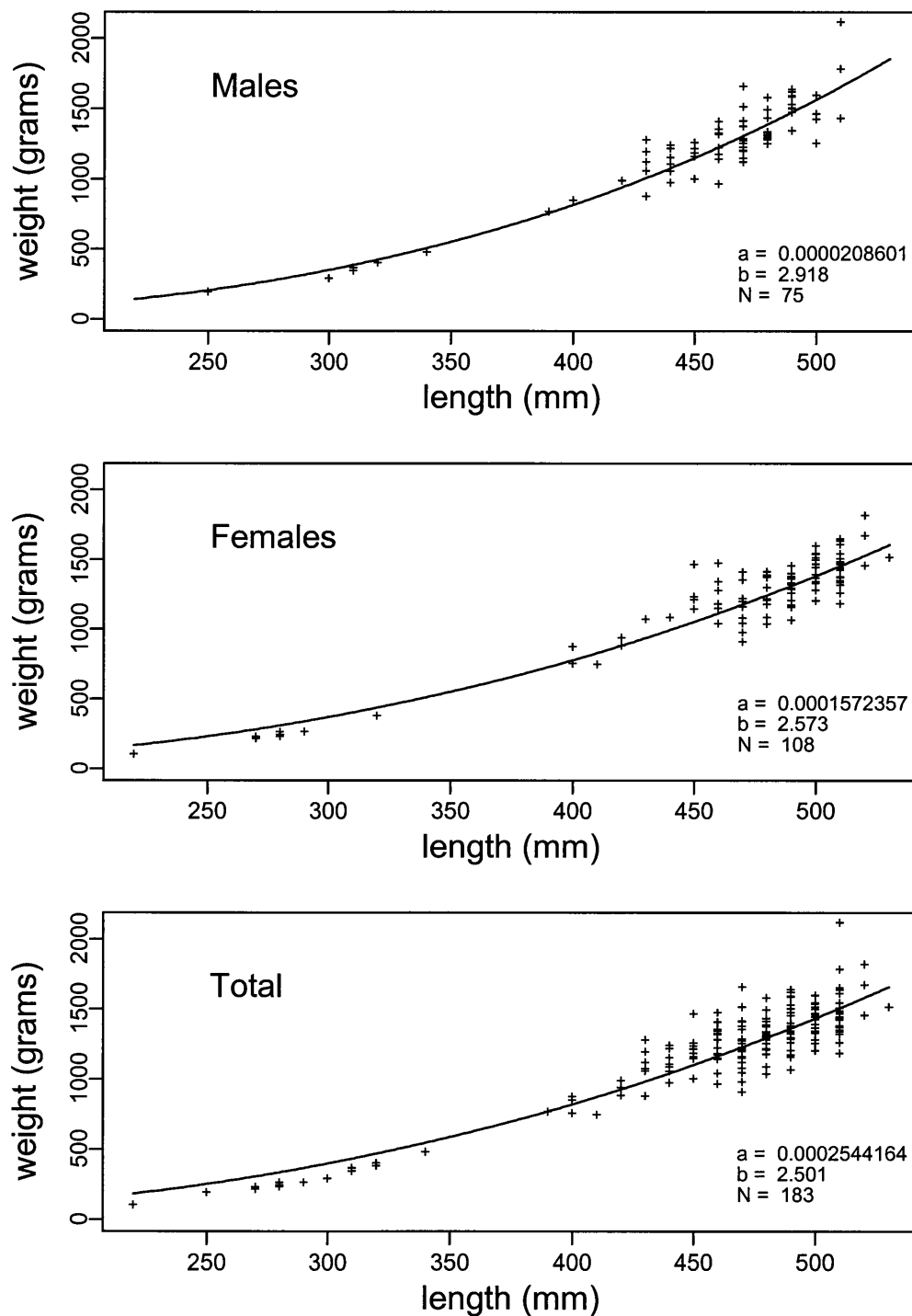


Figure 32.-- Length-weight relationship for Atka mackerel specimens collected during the 1999 Gulf of Alaska bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a \times Length_{(mm)}^b$.

Table 32.-- Catch per unit effort by stratum for Atka mackerel sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls	CPUE (kg/km ²)	Biomass (t)	Lower	Upper
				with catch			C.I. Biomass	C.I. Biomass
Shumagin	1-100	Davidson Bank	29	10	190	2,595	0	6,311
Chirikof	101-200	Chirikof Outer Shelf	11	3	74	371	0	981
Shumagin	101-200	Shumagin Outer Shelf	17	5	69	566	0	1,279
Shumagin	1-100	Shumagin Bank	26	8	61	751	0	1,572
Shumagin	1-100	Fox Islands	19	5	26	213	0	474
Chirikof	101-200	East Shumagin Gully	24	4	14	160	0	347
Shumagin	101-200	Sanak Gully	9	1	12	53	0	175
Chirikof	1-100	Semidi Bank	17	2	8	58	0	143
Shumagin	301-500	Shumagin Slope	12	1	6	14	0	45
Chirikof	201-300	Lower Shelikof Gully	30	1	2	15	0	46
Kodiak	1-100	Lower Cook Inlet	22	1	<1	3	0	10

Sablefish (*Anoplopoma fimbria*)

Sablefish were caught throughout the survey area, primarily at depths greater than 200 m. Sablefish were present in about 94% of the tows over 200 m deep, including all tows greater than 500 m (Fig. 33 and Table 33). Mean CPUEs were generally highest in the Kodiak and Yakutat INPFC areas at depths greater than 300 m (Tables 33 and 34). Fish length and weight increased with depth in all areas to 500 m, and then remained relatively constant between 501 and 1000 m (Fig. 34). The length-weight relationship for sablefish specimens collected during the survey is depicted in Figure 35.

Table 33.-- Number of survey hauls, number of hauls with sablefish, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	7	4	153	0.49	35.0
	101 - 200	31	4	12	181	0.96	47.5
	201 - 300	8	6	304	847	1.29	50.6
	301 - 500	12	12	1,307	3,309	1.56	54.6
	501 - 700	5	5	1,201	2,408	1.95	58.0
	701 - 1000	1	1	3,239	6,275	4.66	64.0
	All depths	147	35	202	13,173	2.25	55.7
Chirikof	1 - 100	59	4	3	67	0.78	43.8
	101 - 200	52	24	135	3,220	1.10	48.9
	201 - 300	35	33	809	9,343	2.24	59.2
	301 - 500	8	8	3,416	5,480	2.48	61.8
	501 - 700	6	6	2,836	5,540	3.32	67.7
	701 - 1000	8	8	865	2,651	2.97	65.0
	All depths	168	83	386	26,300	2.20	58.6
Kodiak	1 - 100	86	15	38	1,465	1.16	46.5
	101 - 200	95	53	578	25,036	1.15	47.3
	201 - 300	36	34	1,432	16,452	2.46	61.2
	301 - 500	14	14	3,245	9,449	3.46	68.2
	501 - 700	5	5	6,866	11,980	3.87	70.7
	701 - 1000	10	10	2,934	10,252	3.72	69.5
	All depths	246	131	735	74,634	1.95	54.7
Yakutat	1 - 100	38	11	26	438	0.45	35.9
	101 - 200	63	47	156	4,580	1.03	45.1
	201 - 300	14	14	1,019	5,267	1.97	56.3
	301 - 500	12	11	3,489	9,168	3.87	70.1
	501 - 700	5	5	7,587	11,147	3.46	68.2
	701 - 1000	3	3	4,620	8,720	3.84	70.1
	All depths	135	91	687	39,319	2.47	58.4
Southeastern	1 - 100	10	5	211	1,378	0.47	36.9
	101 - 200	24	13	215	2,385	0.90	45.0
	201 - 300	16	13	589	2,975	1.89	54.3
	301 - 500	14	13	826	2,573	2.48	60.5
	501 - 700	2	2	2,700	2,790	3.20	67.3
	701 - 1000	2	2	2,130	2,569	2.66	63.7
	All depths	68	48	523	14,671	1.47	49.5
All areas	1 - 100	283	42	27	3,502	0.63	38.9
	101 - 200	265	141	289	35,402	1.11	46.9
	201 - 300	109	100	968	34,884	2.21	58.7
	301 - 500	60	58	2,344	29,979	2.87	63.8
	501 - 700	23	23	4,127	33,864	3.35	67.6
	701 - 1000	24	24	2,629	30,467	3.70	67.6
	All depths	764	388	525	168,097	2.05	55.4

All areas biomass, 95% confidence interval: 140,128 - 196,067 metric tons (t).

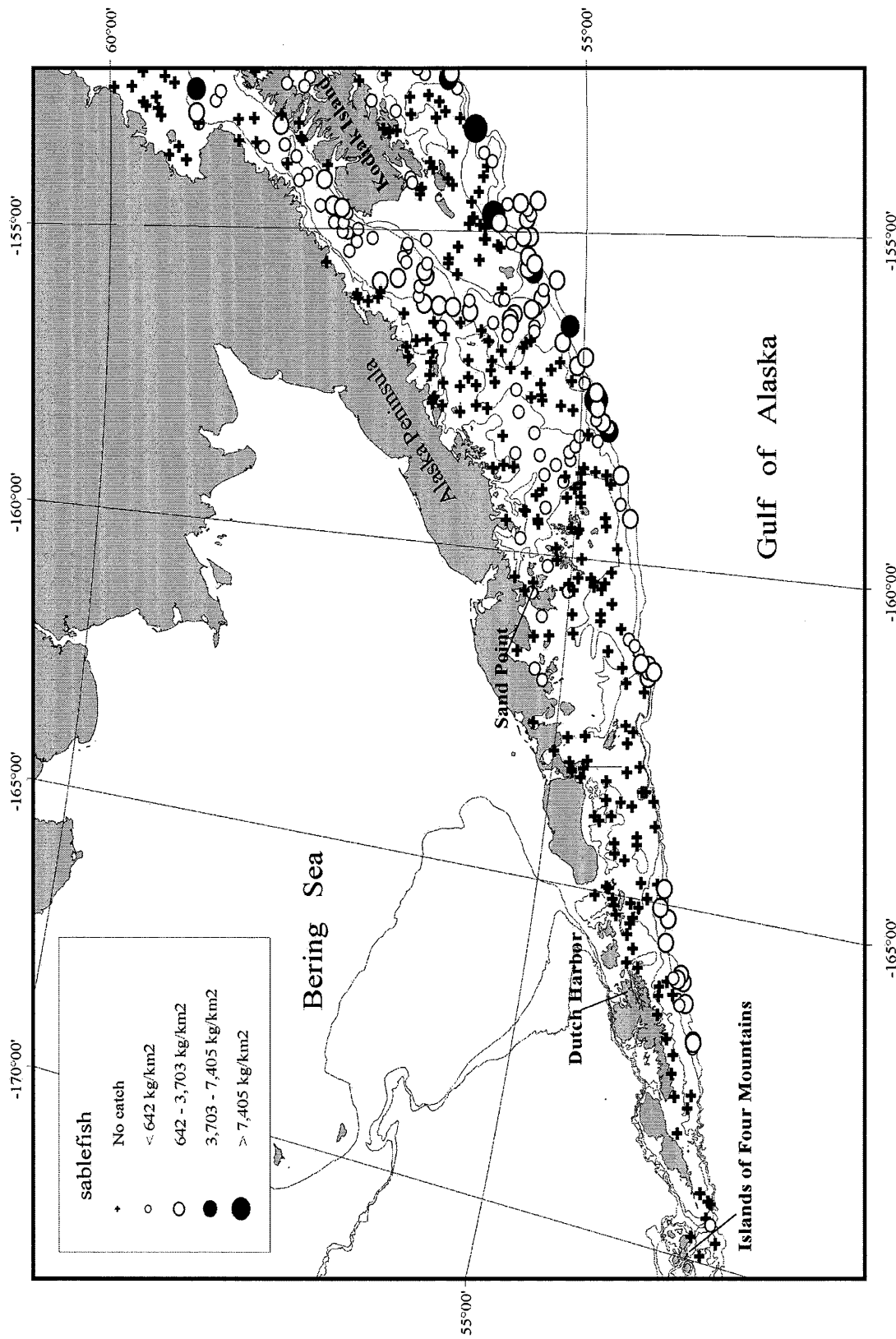


Figure 33. --Distribution and relative abundance of sablefish from the 1999 Gulf of Alaska bottom trawl survey. Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations above mean CPUE, and greater than four standard deviations above mean CPUE. Each symbol is proportional to the sample CPUE.

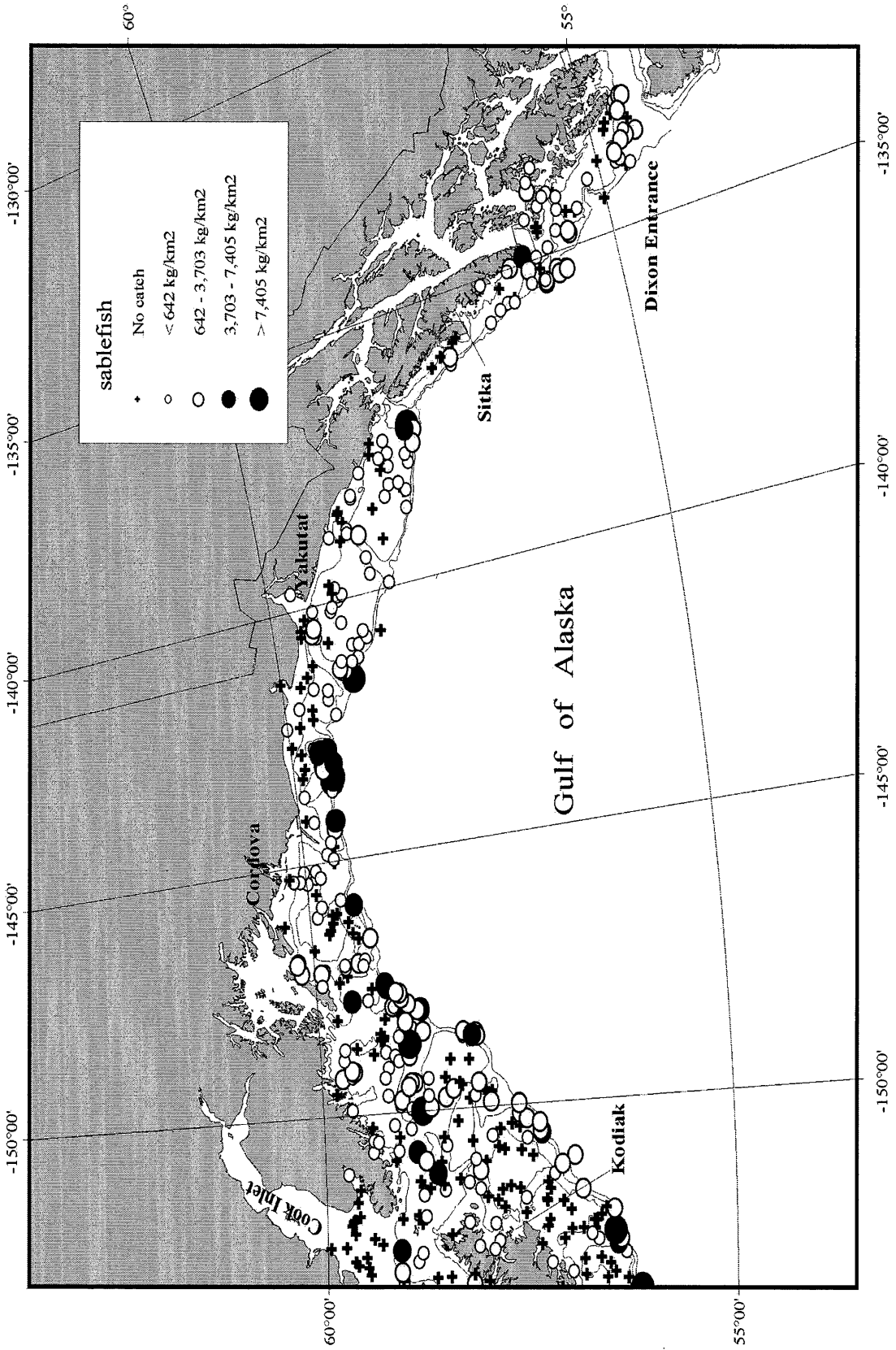


Figure 33.--Continued.

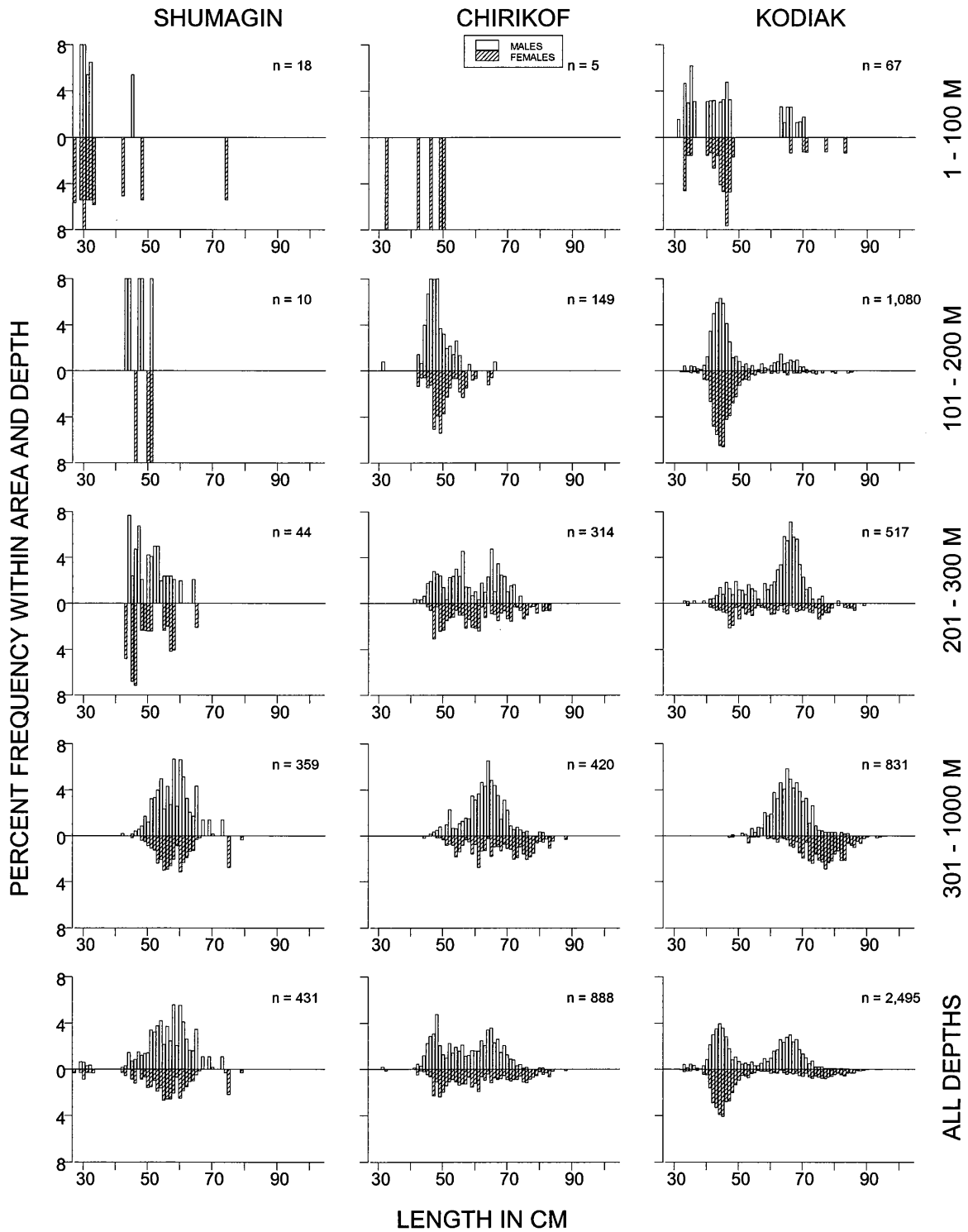


Figure 34.-- Size composition of the estimated sablefish population from the 1999 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

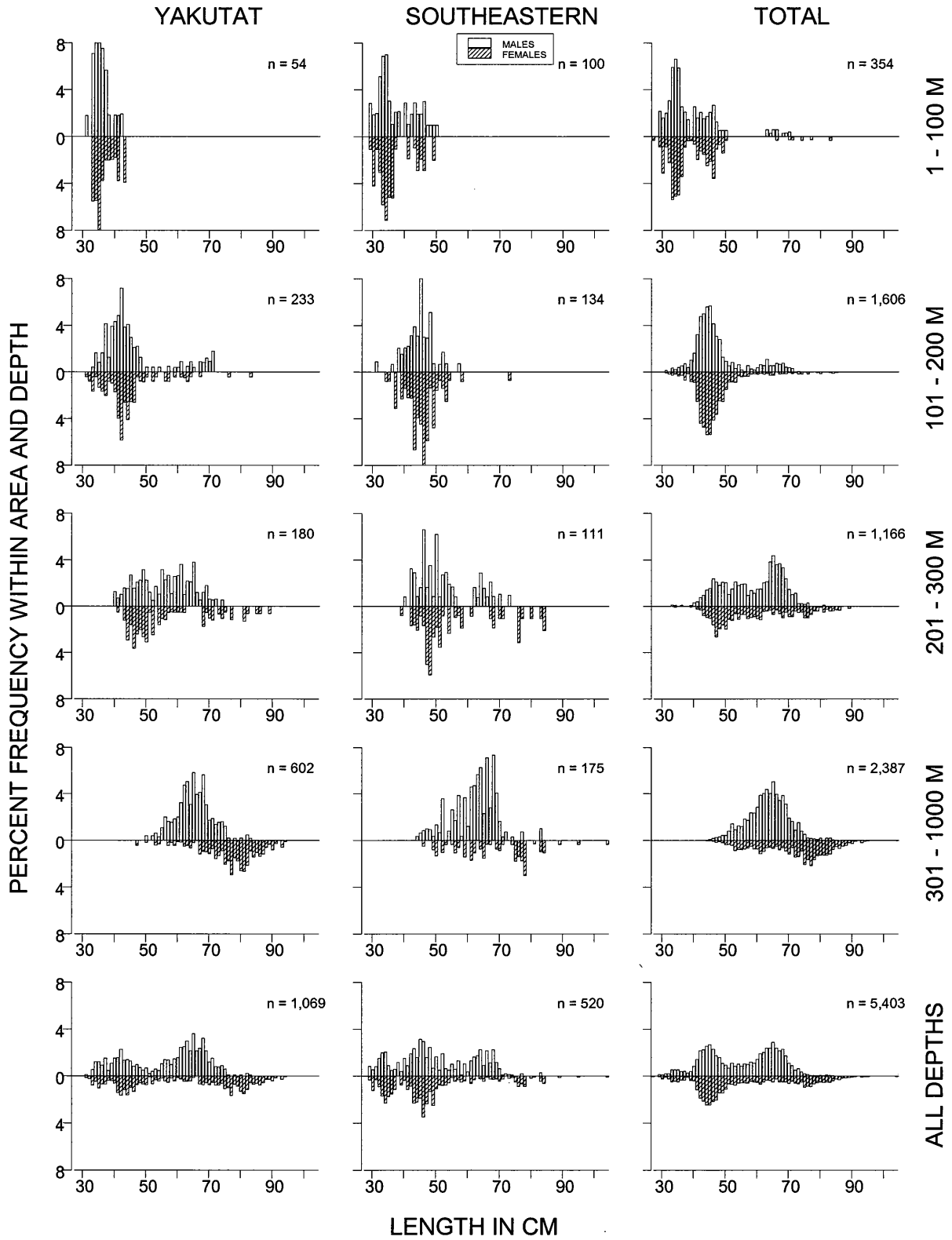


Figure 34.--Continued.

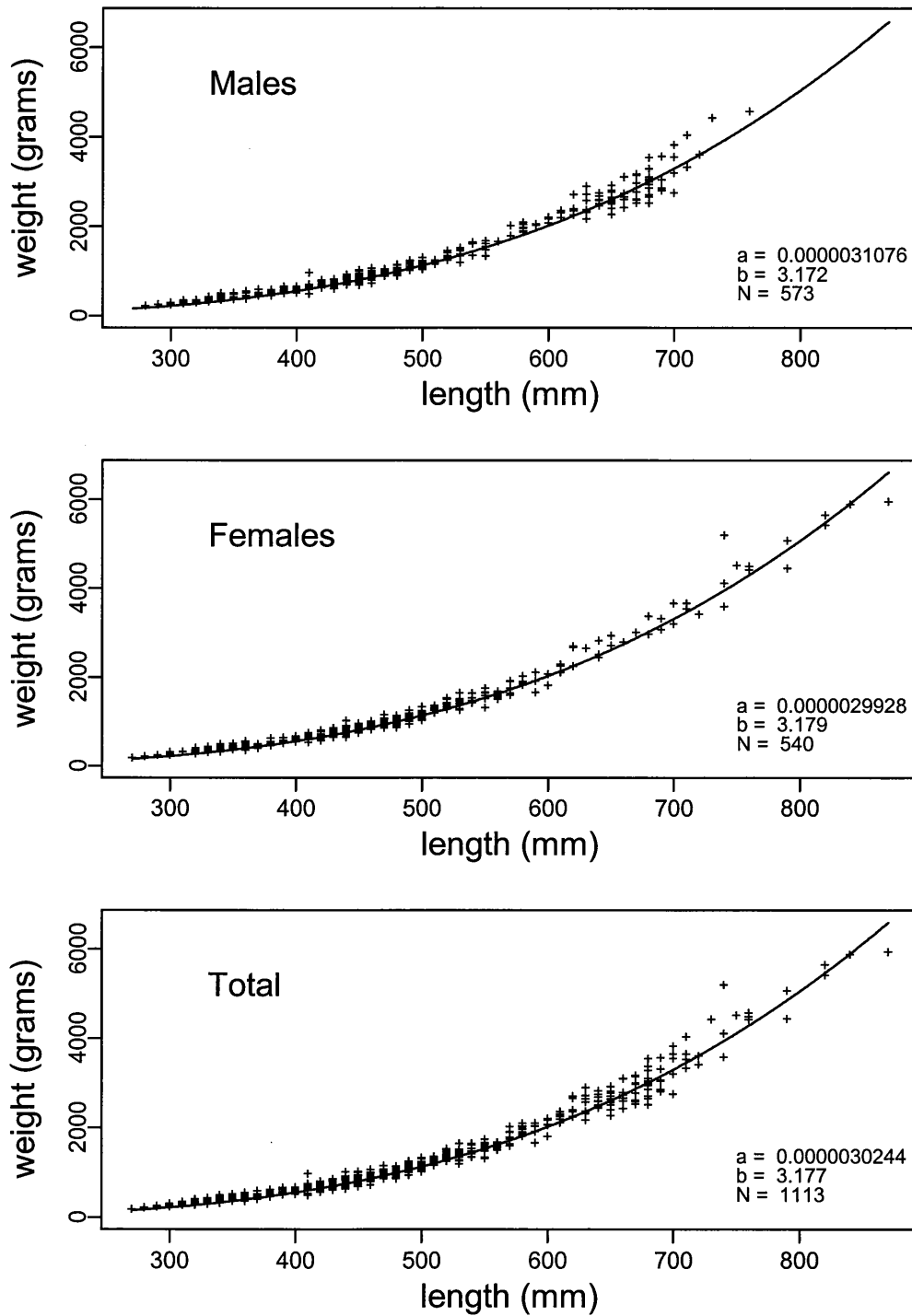


Figure 35.-- Length-weight relationship for sablefish specimens collected during the 1999 Gulf of Alaska bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a \times Length_{(mm)}^b$.

Table 34.-- Catch per unit effort by stratum for sablefish sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Hauls		CPUE (kg/km ²)	Biomass (t)	Lower	Upper
			Number of hauls	with catch			C.I. Biomass	C.I. Biomass
Yakutat	501-700	Yakutat Slope	5	5	7,587	11,147	2,952	19,341
Kodiak	501-700	Kodiak Slope	5	5	6,866	11,980	0	34,954
Yakutat	701-1000	Yakutat Slope	3	3	4,620	8,720	4,717	12,723
Yakutat	301-500	Yakutat Slope	7	6	3,793	5,767	1,369	10,166
Chirikof	301-500	Chirikof Slope	8	8	3,416	5,480	956	10,003
Kodiak	301-500	Kodiak Slope	14	14	3,245	9,449	5,735	13,163
Shumagin	701-1000	Shumagin Slope	1	1	3,239	6,275		
Yakutat	301-500	Yakutat Gullies	5	5	3,072	3,401	0	9,219
Kodiak	701-1000	Kodiak Slope	10	10	2,934	10,252	7,681	12,823
Chirikof	501-700	Chirikof Slope	6	6	2,836	5,540	3,229	7,851
Southeastern	501-700	Southeastern Slope	2	2	2,700	2,790	0	7,610
Chirikof	201-300	Chirikof Slope	5	5	2,175	3,323	0	7,283
Southeastern	701-1000	Southeastern Slope	2	2	2,130	2,569	0	7,337
Kodiak	201-300	Kodiak Slope	5	5	1,957	3,175	0	8,781
Kodiak	201-300	Kenai Gullies	21	20	1,850	12,320	0	26,016
Southeastern	201-300	Baranof-Chichagof Slope	3	3	1,602	1,803	0	7,369
Kodiak	101-200	Portlock Flats	16	10	1,425	10,453	116	20,790
Shumagin	301-500	Shumagin Slope	12	12	1,307	3,309	1,698	4,920
Shumagin	501-700	Shumagin Slope	5	5	1,201	2,408	1,128	3,688
Yakutat	201-300	Yakutat Gullies	9	9	1,088	3,310	277	6,344
Southeastern	301-500	Southeastern Deep Gullies	10	10	972	2,278	840	3,716
Yakutat	201-300	Yakutat Slope	5	5	920	1,957	0	4,042
Chirikof	701-1000	Chirikof Slope	8	8	865	2,651	581	4,720
Kodiak	101-200	Barren Islands	24	11	616	6,767	208	13,327
Chirikof	201-300	Lower Shelikof Gully	30	28	601	6,019	4,005	8,034
Kodiak	101-200	Kenai Flats	26	16	438	5,291	37	10,545
Southeastern	301-500	Southeastern Slope	4	3	382	295	0	841
Southeastern	101-200	Baranof-Chichagof Shelf	10	6	380	1,595	0	3,286
Chirikof	101-200	Chirikof Outer Shelf	11	6	342	1,716	0	3,842
Shumagin	201-300	Shumagin Slope	8	6	304	847	188	1,506
Southeastern	201-300	Prince of Wales Slope/Gullies	13	10	299	1,173	399	1,946
Kodiak	201-300	Upper Shelikof Gully	10	9	298	956	263	1,650
Yakutat	101-200	Middleton Shelf	16	14	279	2,049	652	3,446
Kodiak	101-200	Kodiak Outer Shelf	11	5	251	1,264	0	3,420
Southeastern	1-100	Southeastern Shallows	10	5	211	1,378	31	2,726
Yakutat	101-200	Fairweather Shelf	17	13	183	1,416	328	2,504
Kodiak	1-100	Kenai Peninsula	12	7	174	918	0	1,889
Kodiak	101-200	Albatross Gullies	18	11	159	1,261	470	2,053
Chirikof	101-200	Shelikof Edge	17	7	148	1,147	48	2,245
Southeastern	101-200	Prince of Wales Shelf	14	7	115	790	0	1,646
Yakutat	101-200	Yakutat Flats	19	15	99	892	407	1,377
Kodiak	1-100	Albatross Shallows	13	6	67	385	50	720
Yakutat	101-200	Yakataga Shelf	11	5	42	223	0	490
Yakutat	1-100	Middleton Shallows	15	3	33	224	0	509
Chirikof	101-200	East Shumagin Gully	24	11	32	358	123	592
Shumagin	101-200	West Shumagin Gully	5	1	22	51	0	192
Yakutat	1-100	Yakutat Shallows	23	8	22	214	68	360
Shumagin	1-100	Lower Alaska Peninsula	16	4	20	139	0	395
Kodiak	1-100	Lower Cook Inlet	22	2	16	162	0	487
Shumagin	101-200	Shumagin Outer Shelf	17	3	16	130	0	320
Chirikof	1-100	Chirikof Bank	24	3	5	50	0	107
Chirikof	1-100	Semidi Bank	17	1	2	18	0	56
Shumagin	1-100	Shumagin Bank	26	3	1	14	0	31

Giant grenadier (*Albatrossia pectoralis*)

Giant grenadier were distributed throughout the GOA on the continental slope at depths greater than 300 m (Fig. 36). Giant grenadier were estimated to be the fifth most abundant fish species in the survey area and their abundance ranked in the top five species in every INPFC area except the Southeastern (Table 2). Giant grenadier were caught in every tow at depths greater than 500 m (Table 35). Mean CPUEs for giant grenadier were extremely high in these strata (Table 36). Ranking the mean CPUEs for all fish species by INPFC area and depth revealed that nine of highest ten for the survey were giant grenadier. Mean fish size generally decreased with depth as the smaller males made up a larger fraction of the total population at deeper depths (Fig. 37). However, females were estimated to comprise over 78% of the total survey area population. The length-weight relationship for giant grenadier collected during the survey is depicted in Figure 38. The lengths represented in Figures 37 and 38 are from the tip of the snout to the insertion of the first anal ray.

Table 35.-- Number of survey hauls, number of hauls with giant grenadier, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	0	---	---	---	---
	101 - 200	31	0	---	---	---	---
	201 - 300	8	4	1,031	2,874	4.12	31.1
	301 - 500	12	12	14,982	37,922	3.71	29.7
	501 - 700	5	5	16,708	33,509	3.19	27.4
	701 - 1000	1	1	17,637	34,168	4.89	25.9
	All depths	147	22	1,663	108,472	3.82	27.9
Chirikof	1 - 100	59	0	---	---	---	---
	101 - 200	52	0	---	---	---	---
	201 - 300	35	3	557	6,434	3.74	29.9
	301 - 500	8	8	12,575	20,170	3.50	29.0
	501 - 700	6	6	21,738	42,459	1.48	18.4
	701 - 1000	8	8	6,876	21,078	2.66	26.6
	All depths	168	25	1,325	90,141	2.04	21.7
Kodiak	1 - 100	86	0	---	---	---	---
	101 - 200	95	0	---	---	---	---
	201 - 300	36	0	---	---	---	---
	301 - 500	14	13	15,654	45,581	3.12	28.2
	501 - 700	5	5	28,584	49,874	2.65	26.3
	701 - 1000	10	10	15,699	54,852	2.35	25.0
	All depths	246	28	1,481	150,307	2.65	26.3
Yakutat	1 - 100	38	0	---	---	---	---
	101 - 200	63	0	---	---	---	---
	201 - 300	14	0	---	---	---	---
	301 - 500	12	5	4,093	10,756	2.96	26.8
	501 - 700	5	5	10,951	16,089	2.03	24.3
	701 - 1000	3	3	4,031	7,608	1.66	22.8
	All depths	135	13	602	34,453	2.14	24.4
Southeastern	1 - 100	10	0	---	---	---	---
	101 - 200	24	0	---	---	---	---
	201 - 300	16	0	---	---	---	---
	301 - 500	14	1	70	217	4.75	31.7
	501 - 700	2	2	1,040	1,074	1.17	19.4
	701 - 1000	2	2	1,351	1,629	1.15	19.9
	All depths	68	5	104	2,921	1.22	19.9
All areas	1 - 100	283	0	---	---	---	---
	101 - 200	265	0	---	---	---	---
	201 - 300	109	7	258	9,308	3.85	30.3
	301 - 500	60	39	8,963	114,646	3.35	28.6
	501 - 700	23	23	17,426	143,006	2.14	22.8
	701 - 1000	24	24	10,296	119,335	2.69	25.0
	All depths	764	93	1,207	386,294	2.61	24.9

All areas biomass, 95% confidence interval: 310,609 - 461,978 metric tons (t).

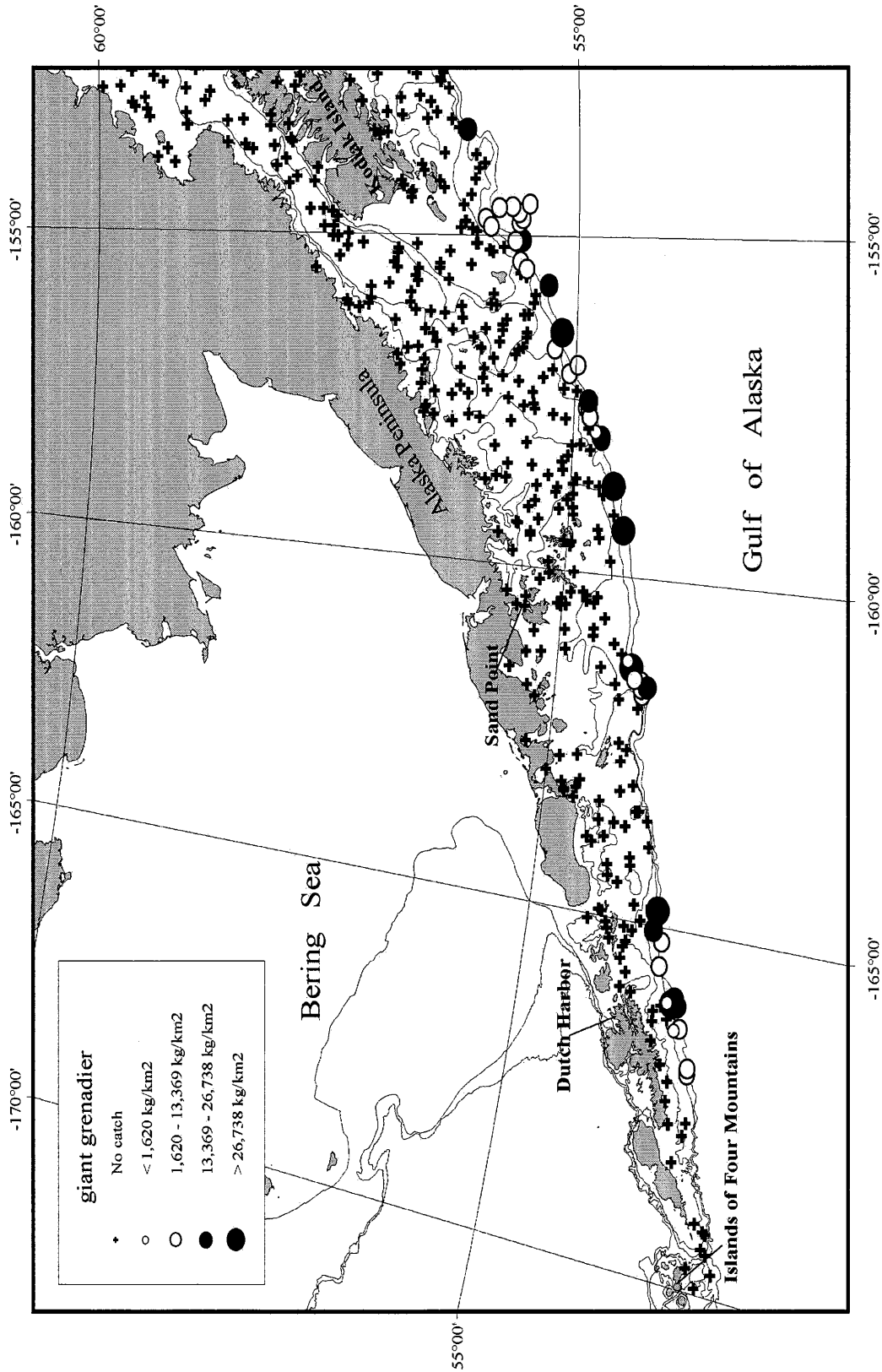


Figure 36.--Distribution and relative abundance of giant grenadier from the 1999 Gulf of Alaska bottom trawl survey. Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations above mean CPUE, and greater than four standard deviations above mean CPUE. Each symbol is proportional to the sample CPUE.

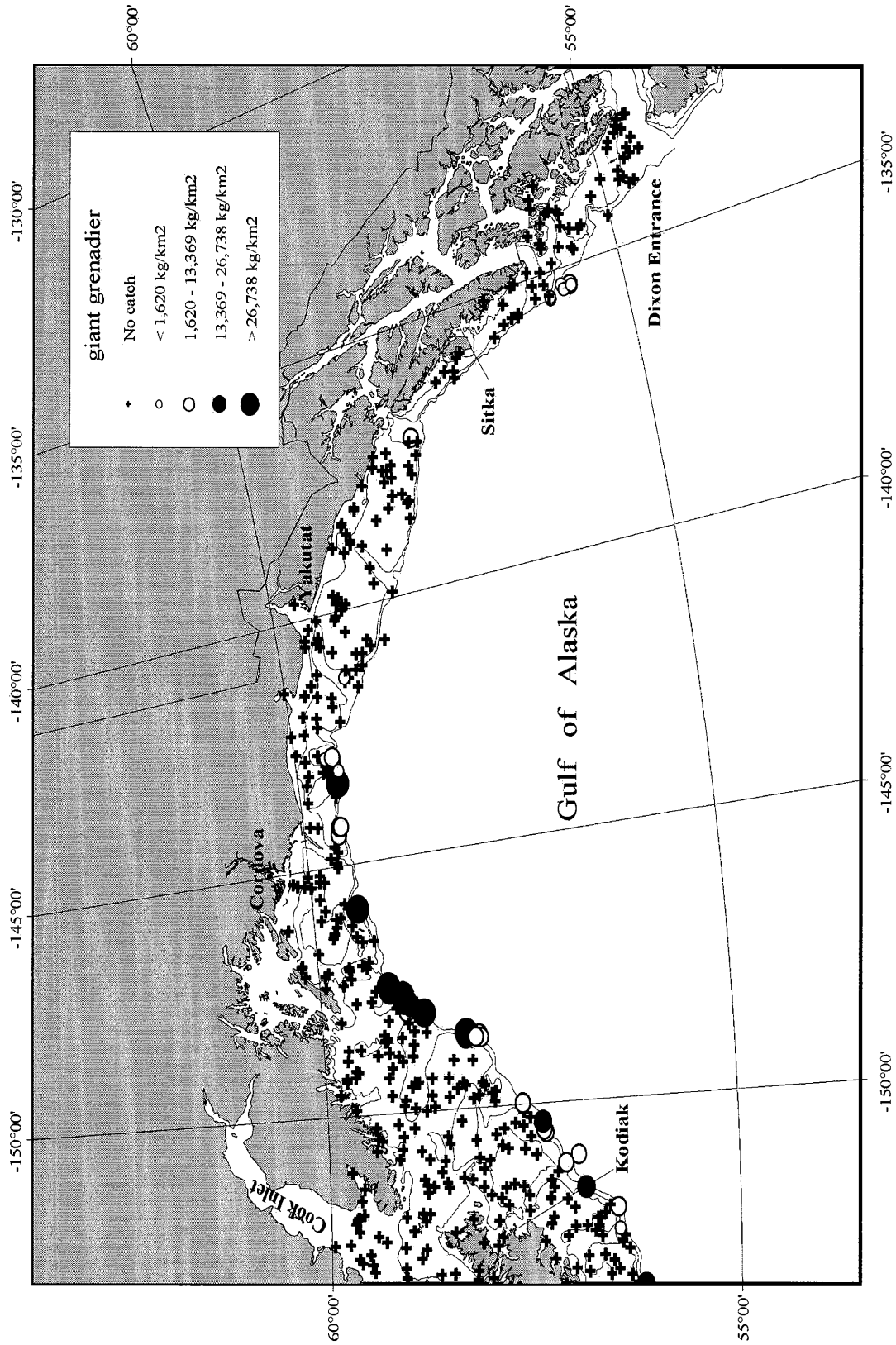


Figure 36.---Continued.

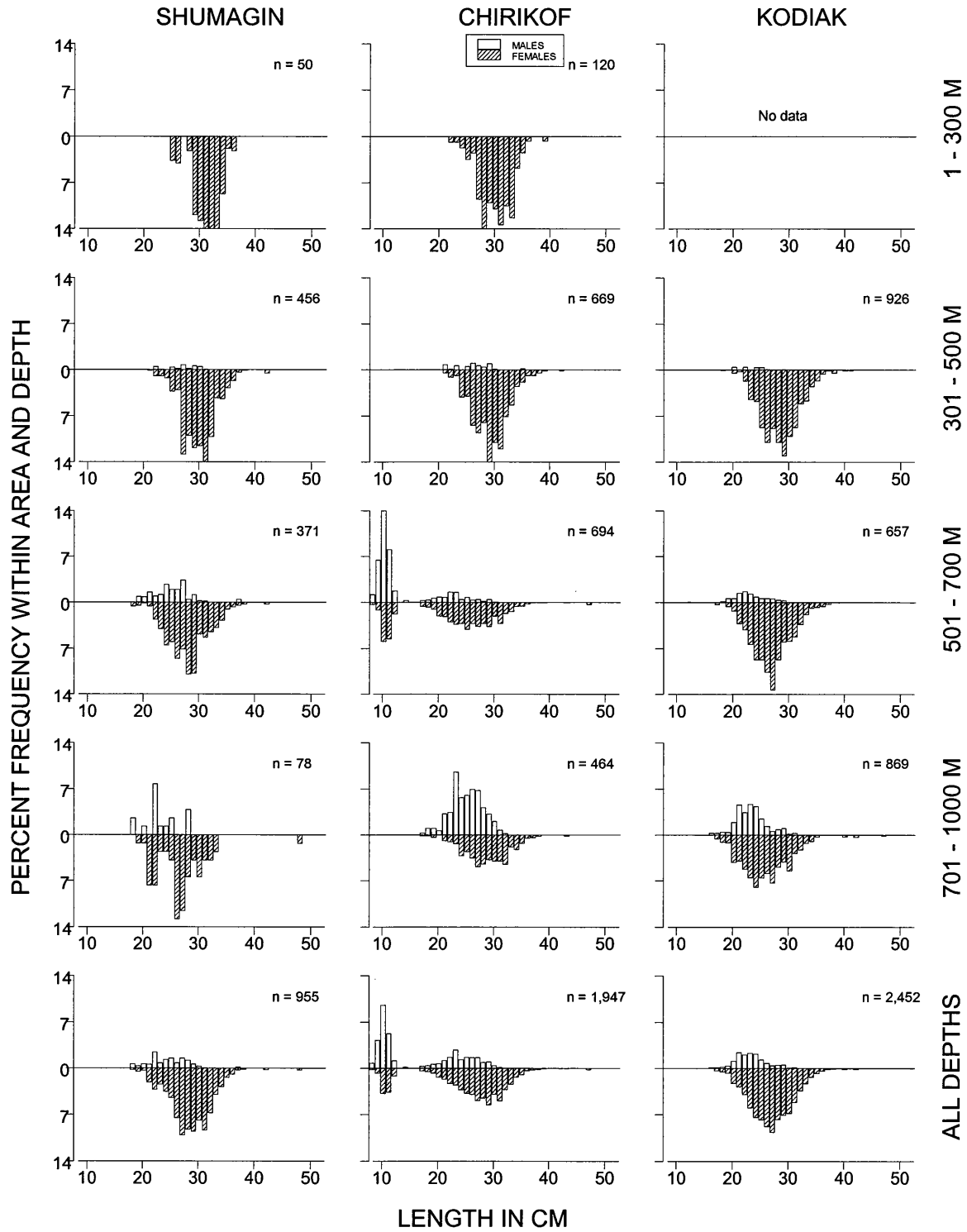


Figure 37.-- Size composition of the estimated giant grenadier population from the 1999 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

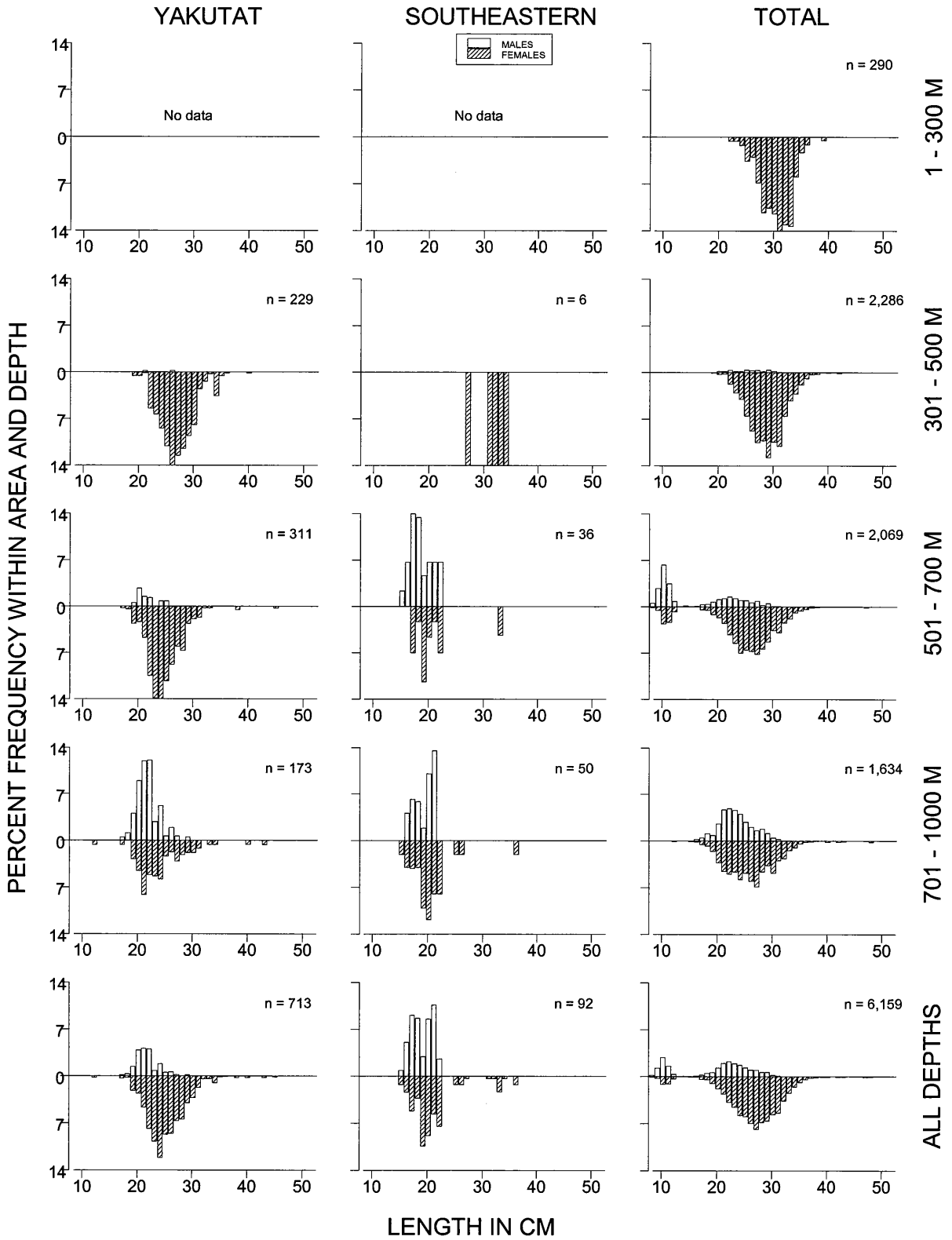


Figure 37.--Continued.

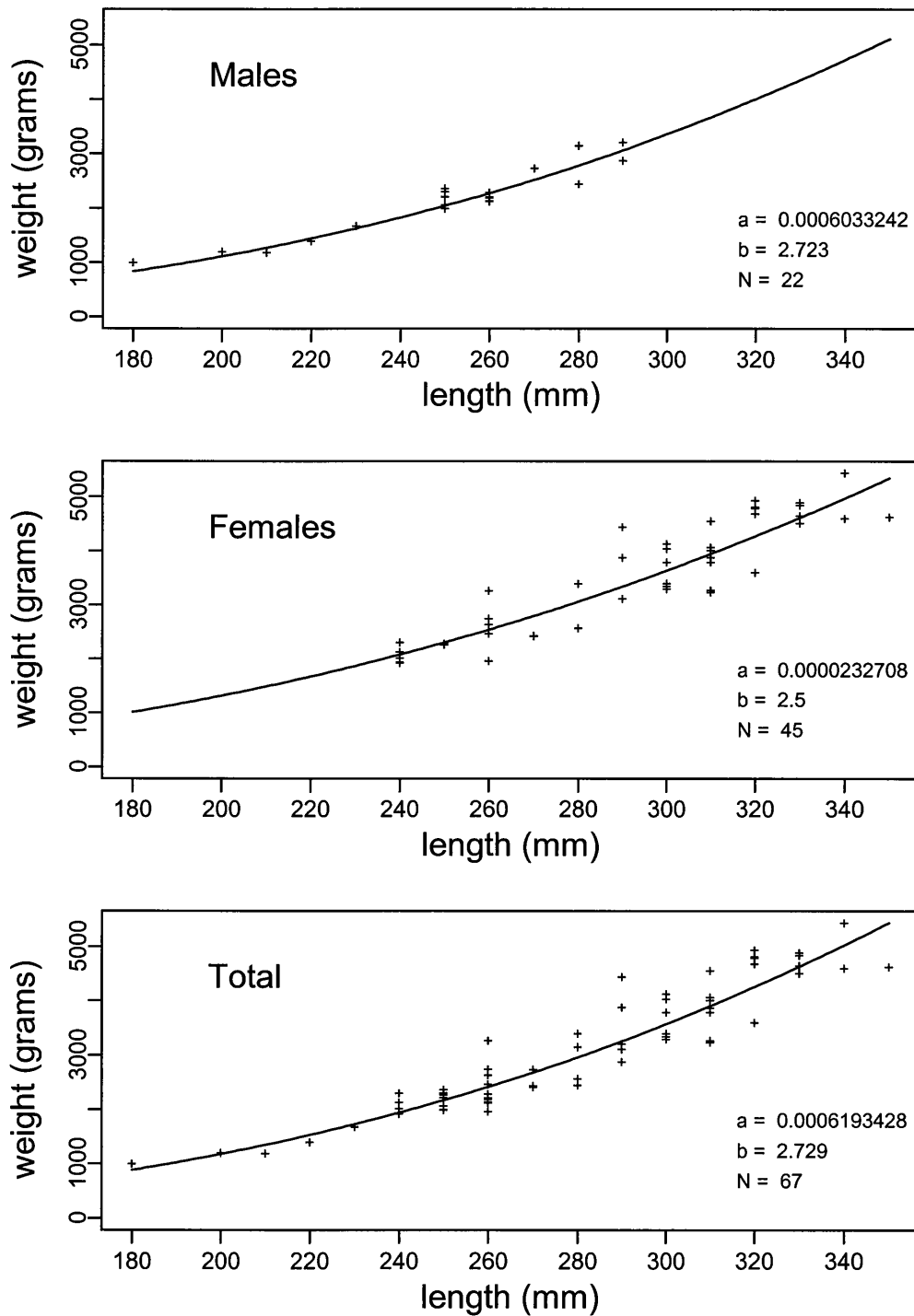


Figure 38.-- Length-weight relationship for giant grenadier collected during the 1999 Gulf of Alaska bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a \times Length_{(mm)}^b$.

Table 36.-- Catch per unit effort by stratum for giant grenadier sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Hauls		CPUE (kg/km ²)	Biomass (t)	Lower	Upper
			Number of hauls	with catch			C.I. Biomass	C.I. Biomass
Kodiak	501-700	Kodiak Slope	5	5	28,584	49,874	13,341	86,407
Chirikof	501-700	Chirikof Slope	6	6	21,738	42,459	0	87,070
Shumagin	701-1000	Shumagin Slope	1	1	17,637	34,168		
Shumagin	501-700	Shumagin Slope	5	5	16,708	33,509	3,018	63,999
Kodiak	701-1000	Kodiak Slope	10	10	15,699	54,852	19,635	90,069
Kodiak	301-500	Kodiak Slope	14	13	15,654	45,581	13,919	77,243
Shumagin	301-500	Shumagin Slope	12	12	14,982	37,922	12,783	63,060
Chirikof	301-500	Chirikof Slope	8	8	12,575	20,170	5,115	35,226
Yakutat	501-700	Yakutat Slope	5	5	10,951	16,089	0	35,755
Chirikof	701-1000	Chirikof Slope	8	8	6,876	21,078	7,935	34,222
Yakutat	301-500	Yakutat Slope	7	3	6,468	9,835	0	30,872
Chirikof	201-300	Chirikof Slope	5	3	4,210	6,434	0	16,874
Yakutat	701-1000	Yakutat Slope	3	3	4,031	7,608	0	18,375
Southeastern	701-1000	Southeastern Slope	2	2	1,351	1,629	0	4,595
Southeastern	501-700	Southeastern Slope	2	2	1,040	1,074	0	2,309
Shumagin	201-300	Shumagin Slope	8	4	1,031	2,874	0	6,971
Yakutat	301-500	Yakutat Gullies	5	2	832	921	0	3,406
Southeastern	301-500	Southeastern Slope	4	1	281	217	0	908

Pacific ocean perch (*Sebastes alutus*)

Pacific ocean perch (POP) was by far the most abundant and widely distributed rockfish species encountered in the survey and was estimated to be the second most abundant groundfish species in the survey area (Table 2). The estimated biomass of POP was three times that of the next most abundant rockfish species, northern rockfish. A single tow in the Chirikof Outer Shelf stratum (Table 37) accounted for over a half of the entire biomass estimated for the survey area. Another tow in the Portlock Flats stratum was responsible for about 10% of the total estimate (Fig. 39 and Table 38). Over 76% of the survey area biomass was estimated to be in three strata comprising a little over 6% of the survey area. (Table 38). Fish less than 30 cm FL were relatively common in water less than 100 m, while larger fish predominated in deeper water (Fig. 40). The length-weight relationship for POP specimens collected during the survey is depicted in Figure 41.

Table 37.-- Number of survey hauls, number of hauls with Pacific ocean perch, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	17	34	1,411	0.35	28.0
	101 - 200	31	15	524	7,692	0.30	26.5
	201 - 300	8	8	9,960	27,769	0.62	35.4
	301 - 500	12	11	518	1,312	0.64	35.3
	501 - 700	5	1	6	13	0.74	37.0
	701 - 1000	1	0	---	---	---	---
	All depths		147	52	586	38,196	0.50
Chirikof	1 - 100	59	9	7	170	0.10	17.9
	101 - 200	52	25	16,444	392,176	0.63	36.3
	201 - 300	35	13	851	9,824	0.66	36.8
	301 - 500	8	3	20	33	0.52	33.3
	501 - 700	6	1	47	91	0.64	36.6
	701 - 1000	8	0	---	---	---	---
	All depths		168	51	5,911	402,293	0.63
Kodiak	1 - 100	86	8	3	121	0.18	21.3
	101 - 200	95	50	4,667	202,245	0.68	36.2
	201 - 300	36	22	608	6,983	0.69	36.5
	301 - 500	14	7	86	251	0.66	36.1
	501 - 700	5	1	19	33	0.67	36.0
	701 - 1000	10	2	12	42	0.63	35.4
	All depths		246	90	2,066	209,675	0.68
Yakutat	1 - 100	38	3	2	36	0.23	24.0
	101 - 200	63	37	426	12,529	0.17	23.1
	201 - 300	14	13	3,254	16,824	0.62	35.8
	301 - 500	12	10	1,248	3,280	0.73	37.2
	501 - 700	5	1	44	64	0.81	36.2
	701 - 1000	3	0	---	---	---	---
	All depths		135	64	572	32,733	0.31
Southeastern	1 - 100	10	0	---	---	---	---
	101 - 200	24	14	689	7,633	0.31	27.2
	201 - 300	16	16	4,789	24,193	0.53	32.8
	301 - 500	14	11	4,017	12,521	0.76	38.1
	501 - 700	2	0	---	---	---	---
	701 - 1000	2	1	17	20	0.74	37.0
	All depths		68	42	1,582	44,367	0.51
All areas	1 - 100	283	37	13	1,737	0.27	24.6
	101 - 200	265	141	5,087	622,275	0.60	34.9
	201 - 300	109	72	2,374	85,593	0.60	34.9
	301 - 500	60	42	1,360	17,397	0.74	37.6
	501 - 700	23	4	24	200	0.70	36.4
	701 - 1000	24	3	5	62	0.66	35.9
	All depths		764	299	2,273	727,263	0.60

All areas biomass, 95% confidence interval: 0 - 1,566,566 metric tons (t).

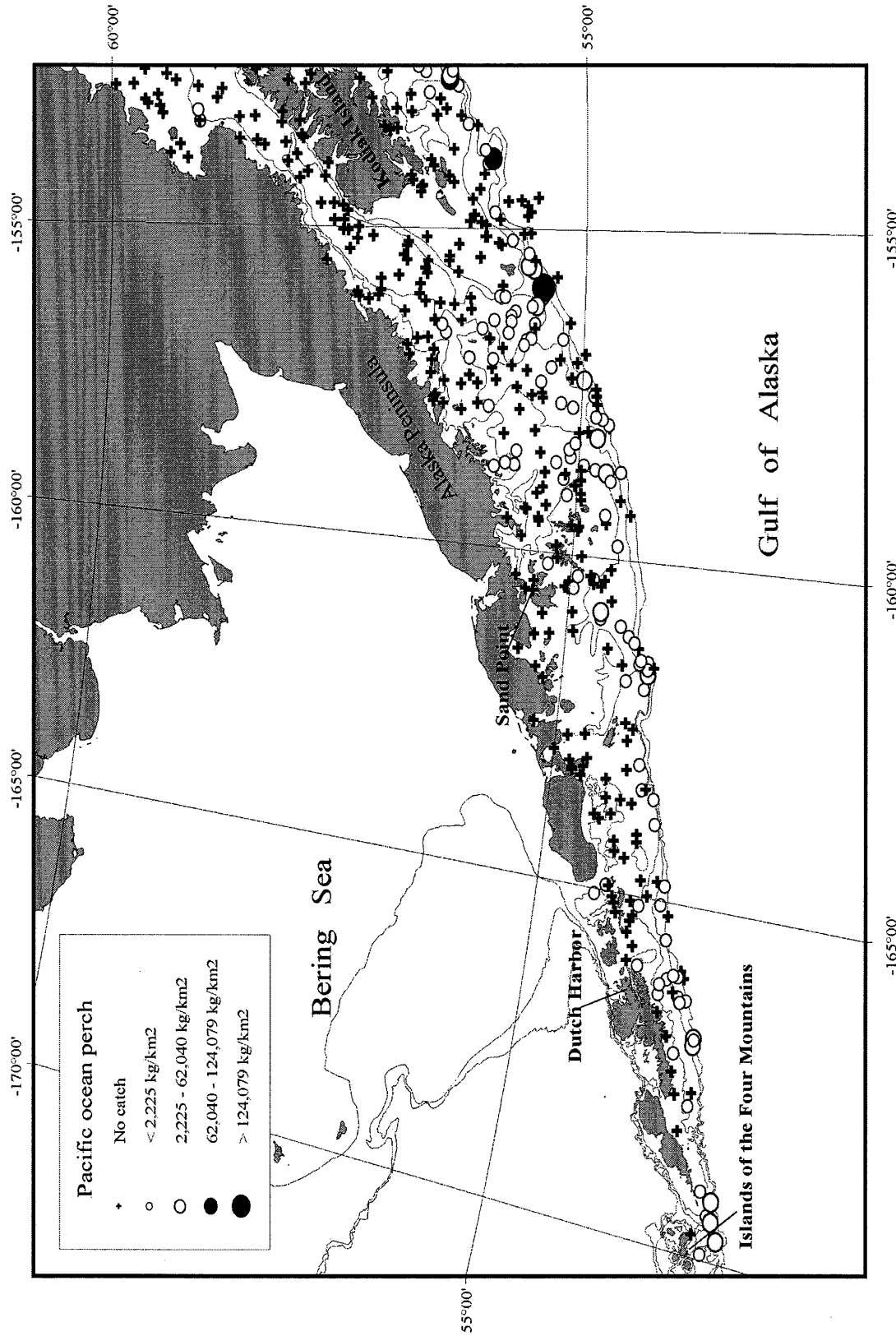


Figure 39.--Distribution and relative abundance of Pacific ocean perch from the 1999 Gulf of Alaska bottom trawl survey. Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations above mean CPUE, and greater than four standard deviations above mean CPUE. Each symbol is proportional to the sample CPUE.

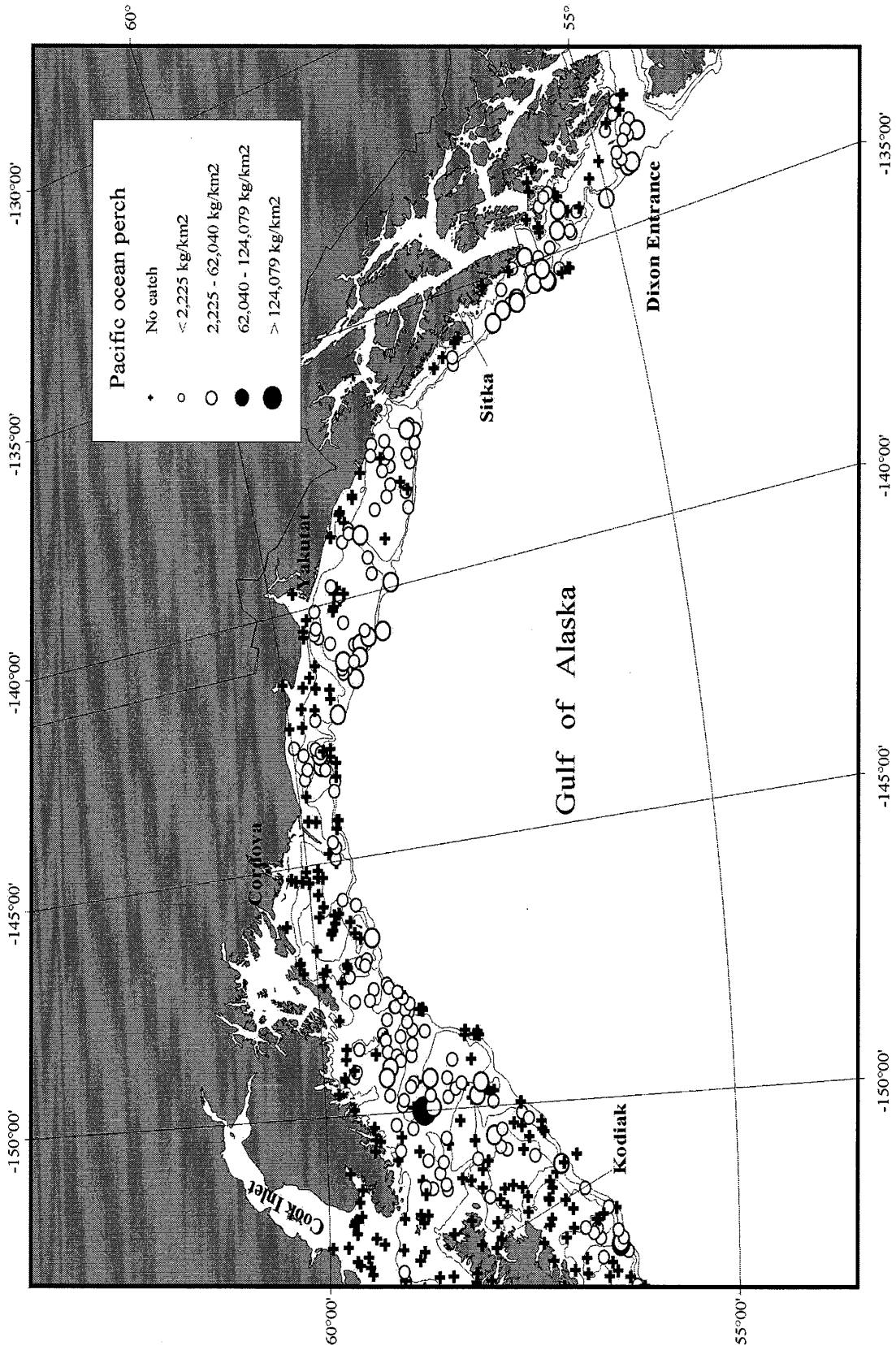


Figure 39.---Continued.

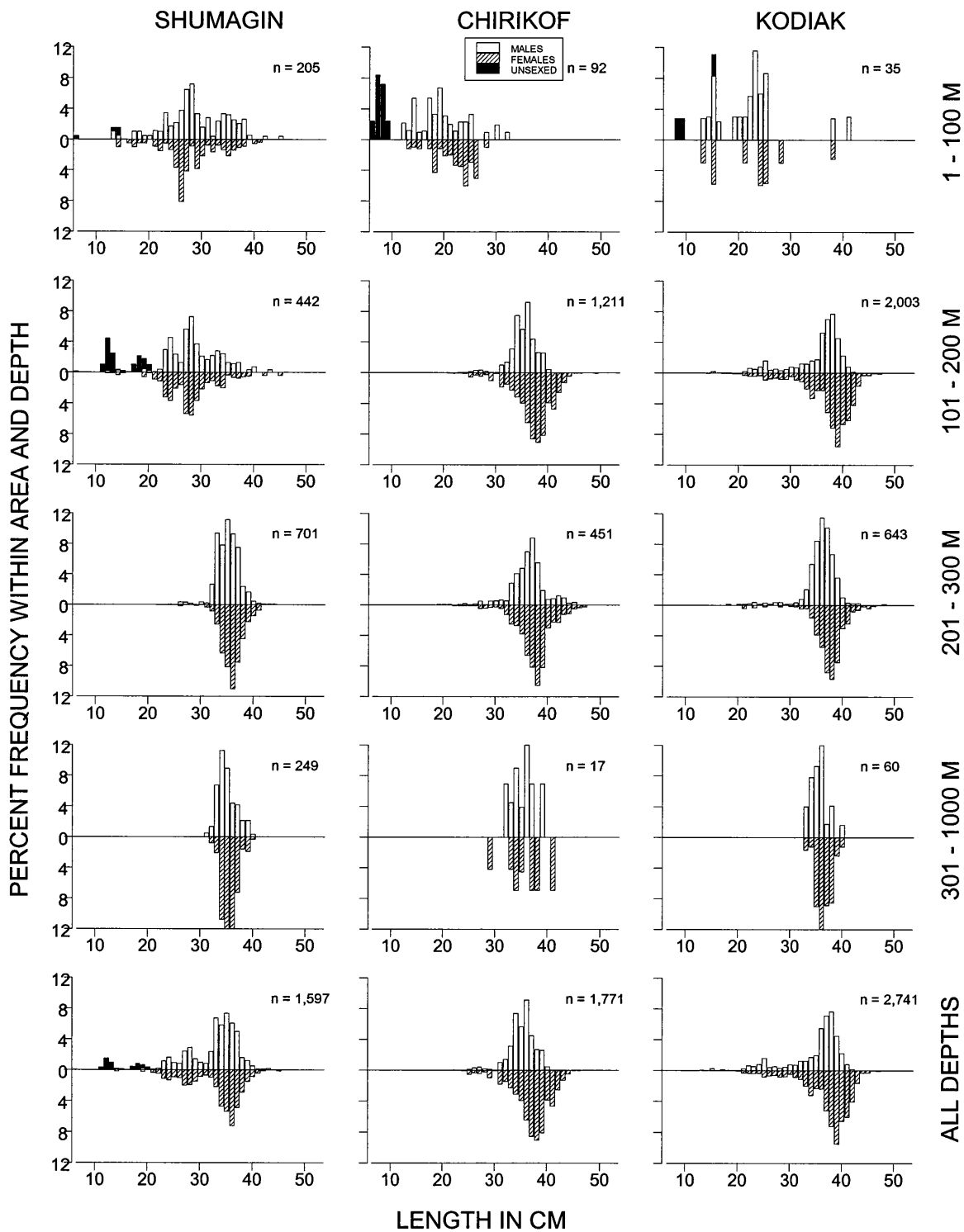


Figure 40.-- Size composition of the estimated Pacific ocean perch population from the 1999 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

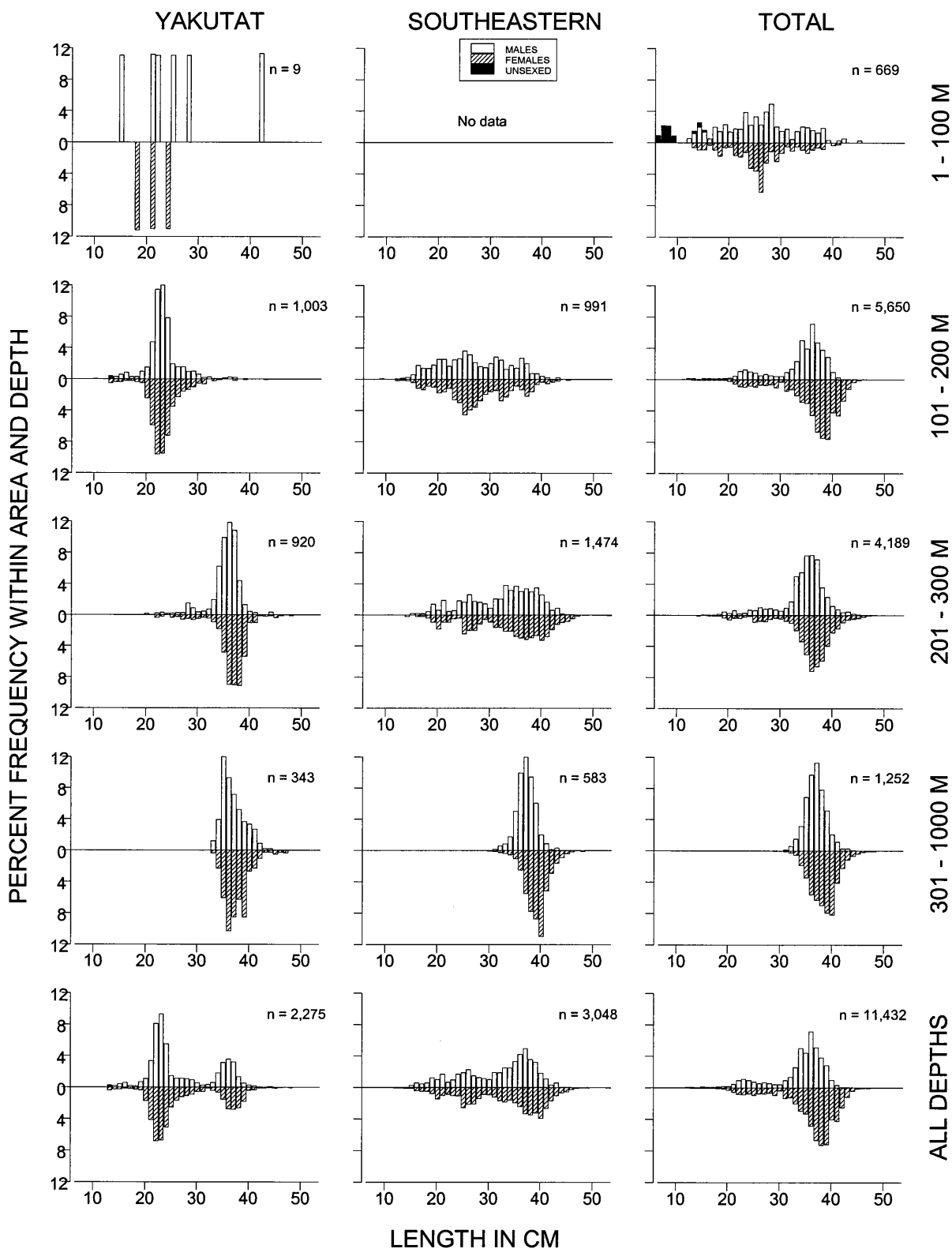


Figure 40.--Continued.

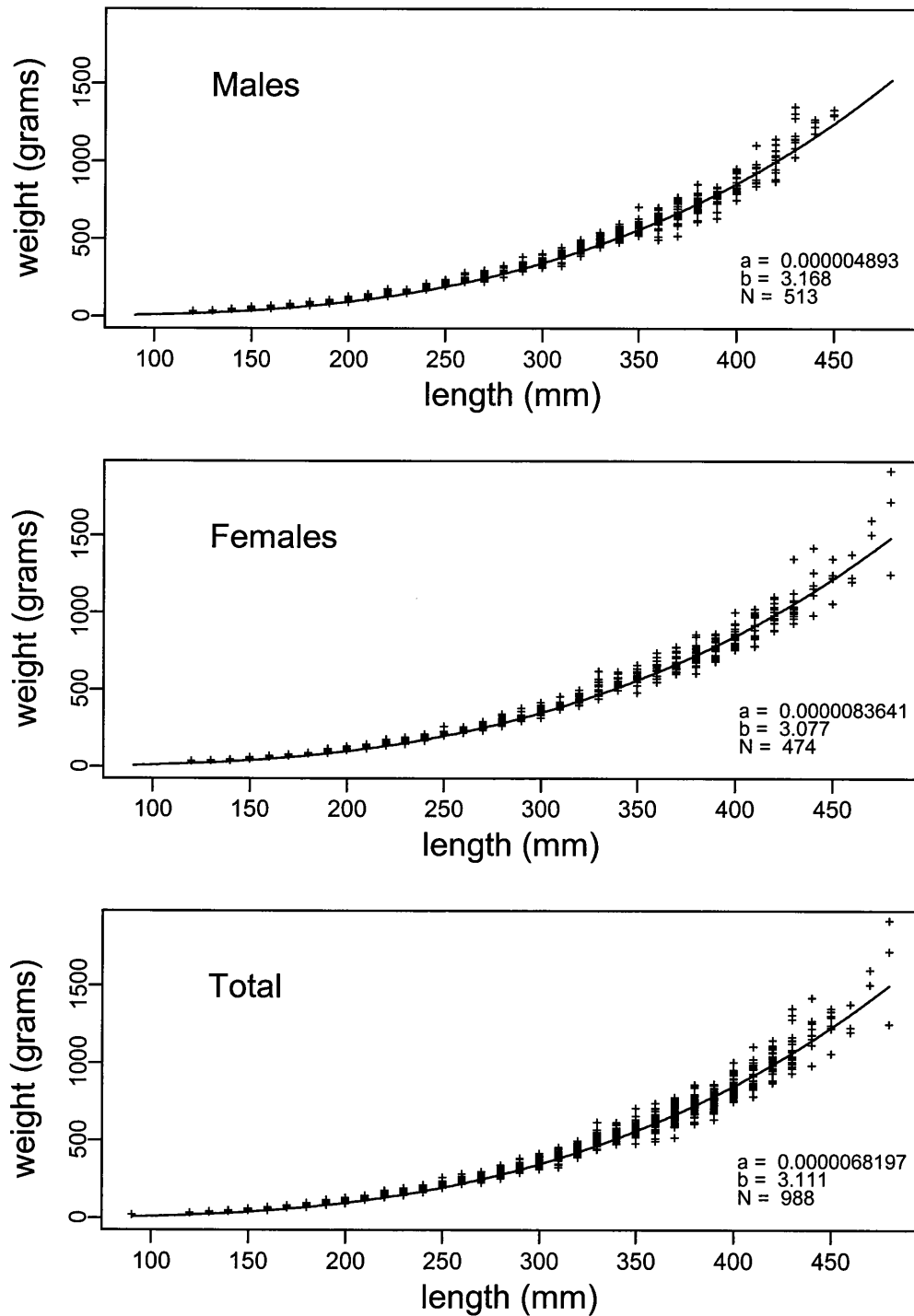


Figure 41.-- Length-weight relationship for Pacific ocean perch specimens collected during the 1999 Gulf of Alaska bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a \times Length_{(mm)}^b$.

Table 38.-- Catch per unit effort by stratum for Pacific ocean perch sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Hauls		CPUE (kg/km ²)	Biomass (t)	Lower	Upper
			Number of hauls	with catch			C.I. Biomass	C.I. Biomass
Chirikof	101-200	Chirikof Outer Shelf	11	8	77,842	390,044	0	1,230,175
Kodiak	101-200	Kodiak Outer Shelf	11	8	15,123	76,003	0	188,995
Kodiak	101-200	Portlock Flats	16	12	12,315	90,348	0	245,100
Shumagin	201-300	Shumagin Slope	8	8	9,960	27,769	0	62,065
Yakutat	201-300	Yakutat Slope	5	5	6,768	14,397	0	30,812
Chirikof	201-300	Chirikof Slope	5	5	5,604	8,565	0	28,580
Southeastern	201-300	Prince of Wales Slope/Gullies	13	13	4,988	19,588	4,721	34,454
Southeastern	301-500	Southeastern Deep Gullies	10	7	4,168	9,771	0	30,135
Southeastern	201-300	Baranof-Chichagof Slope	3	3	4,093	4,606	1,867	7,345
Kodiak	101-200	Albatross Gullies	18	8	3,878	30,685	0	74,661
Southeastern	301-500	Southeastern Slope	4	4	3,560	2,751	0	7,055
Yakutat	301-500	Yakutat Slope	7	5	2,073	3,153	0	6,829
Kodiak	201-300	Kodiak Slope	5	5	1,668	2,706	0	5,703
Southeastern	101-200	Baranof-Chichagof Shelf	10	7	1,268	5,321	0	11,135
Shumagin	101-200	Sanak Gully	9	3	1,185	5,029	0	16,616
Yakutat	201-300	Yakutat Gullies	9	8	798	2,427	159	4,695
Yakutat	101-200	Yakutat Flats	19	13	765	6,908	0	17,868
Kodiak	201-300	Kenai Gullies	21	17	642	4,277	0	10,014
Shumagin	301-500	Shumagin Slope	12	11	518	1,312	0	2,797
Yakutat	101-200	Fairweather Shelf	17	14	441	3,411	0	7,327
Yakutat	101-200	Yakataga Shelf	11	6	415	2,191	0	6,816
Kodiak	101-200	Kenai Flats	26	15	391	4,725	551	8,898
Southeastern	101-200	Prince of Wales Shelf	14	7	336	2,312	0	4,632
Shumagin	101-200	Shumagin Outer Shelf	17	12	327	2,663	0	5,592
Chirikof	101-200	Shelikof Edge	17	8	243	1,880	44	3,715
Chirikof	201-300	Lower Shelikof Gully	30	8	126	1,259	0	2,854
Yakutat	301-500	Yakutat Gullies	5	5	115	128	16	239
Kodiak	301-500	Kodiak Slope	14	7	86	251	37	465
Shumagin	1-100	Davidson Bank	29	6	78	1,070	0	2,451
Chirikof	501-700	Chirikof Slope	6	1	47	91	0	325
Kodiak	101-200	Barren Islands	24	7	44	484	0	1,027
Yakutat	501-700	Yakutat Slope	5	1	44	64	0	241
Shumagin	1-100	Fox Islands	19	5	30	250	0	740
Chirikof	101-200	East Shumagin Gully	24	9	23	253	0	598
Chirikof	301-500	Chirikof Slope	8	3	20	33	0	82
Kodiak	501-700	Kodiak Slope	5	1	19	33	0	123
Southeastern	701-1000	Southeastern Slope	2	1	17	20	0	275
Kodiak	701-1000	Kodiak Slope	10	2	12	42	0	112
Chirikof	1-100	Upper Alaska Peninsula	18	3	11	89	0	218
Chirikof	1-100	Semidi Bank	17	6	11	81	0	187
Shumagin	1-100	Shumagin Bank	26	6	7	91	0	192
Shumagin	501-700	Shumagin Slope	5	1	6	13	0	47
Kodiak	1-100	Albatross Banks	34	5	5	78	0	199
Kodiak	1-100	Kenai Peninsula	12	2	5	24	0	60
Yakutat	1-100	Yakutat Shallows	23	3	4	36	0	82
Yakutat	101-200	Middleton Shelf	16	4	3	19	0	44
Kodiak	1-100	Lower Cook Inlet	22	1	2	19	0	57

Northern rockfish (*Sebastes polyspinus*)

Northern rockfish were estimated to be the second most abundant rockfish in the survey area. Northern rockfish were found primarily in the western and central GOA and no northern rockfish were captured east of Yakutat Bay (Fig. 42). Mean CPUEs were highest in the Kodiak area between 101 and 200 m where a single tow in the Kodiak Outer Shelf stratum accounted for over 60% of the total estimated biomass in the survey area (Tables 39 and 40). Small northern rockfish (< 30 cm FL) were found almost exclusively in waters less than 100 m deep, while large northern rockfish were found throughout their depth range (Fig. 43). The length-weight relationship for northern rockfish specimens collected during the survey is depicted in Figure 44.

Table 39.-- Number of survey hauls, number of hauls with northern rockfish, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	15	750	30,955	0.97	39.4
	101 - 200	31	12	974	14,300	0.92	37.8
	201 - 300	8	5	68	190	0.64	34.8
	301 - 500	12	1	5	12	0.64	35.0
	501 - 700	5	0	---	---	---	---
	701 - 1000	1	0	---	---	---	---
	All depths		147	33	697	45,457	0.95
Chirikof	1 - 100	59	7	21	550	0.42	27.7
	101 - 200	52	17	1,208	28,821	0.88	38.3
	201 - 300	35	8	50	575	0.64	35.0
	301 - 500	8	0	---	---	---	---
	501 - 700	6	0	---	---	---	---
	701 - 1000	8	0	---	---	---	---
	All depths		168	32	440	29,946	0.86
Kodiak	1 - 100	86	15	25	977	0.26	24.7
	101 - 200	95	29	3,816	165,334	0.76	37.8
	201 - 300	36	5	31	354	0.58	34.3
	301 - 500	14	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	10	0	---	---	---	---
	All depths		246	49	1,642	166,665	0.75
Yakutat	1 - 100	38	1	2	25	0.64	35.0
	101 - 200	63	2	1	36	0.58	34.2
	201 - 300	14	2	11	57	0.61	35.0
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	3	0	---	---	---	---
	All depths		135	5	2	118	0.61
Southeastern	1 - 100	10	0	---	---	---	---
	101 - 200	24	0	---	---	---	---
	201 - 300	16	0	---	---	---	---
	301 - 500	14	0	---	---	---	---
	501 - 700	2	0	---	---	---	---
	701 - 1000	2	0	---	---	---	---
	All depths		68	0	---	---	---
All areas	1 - 100	283	38	252	32,508	0.88	37.5
	101 - 200	265	60	1,704	208,491	0.79	37.8
	201 - 300	109	20	33	1,176	0.62	34.7
	301 - 500	60	1	1	12	0.64	35.0
	501 - 700	23	0	---	---	---	---
	701 - 1000	24	0	---	---	---	---
	All depths		764	119	757	242,187	0.80

All areas biomass, 95% confidence interval: 0 - 562,738 metric tons (t).

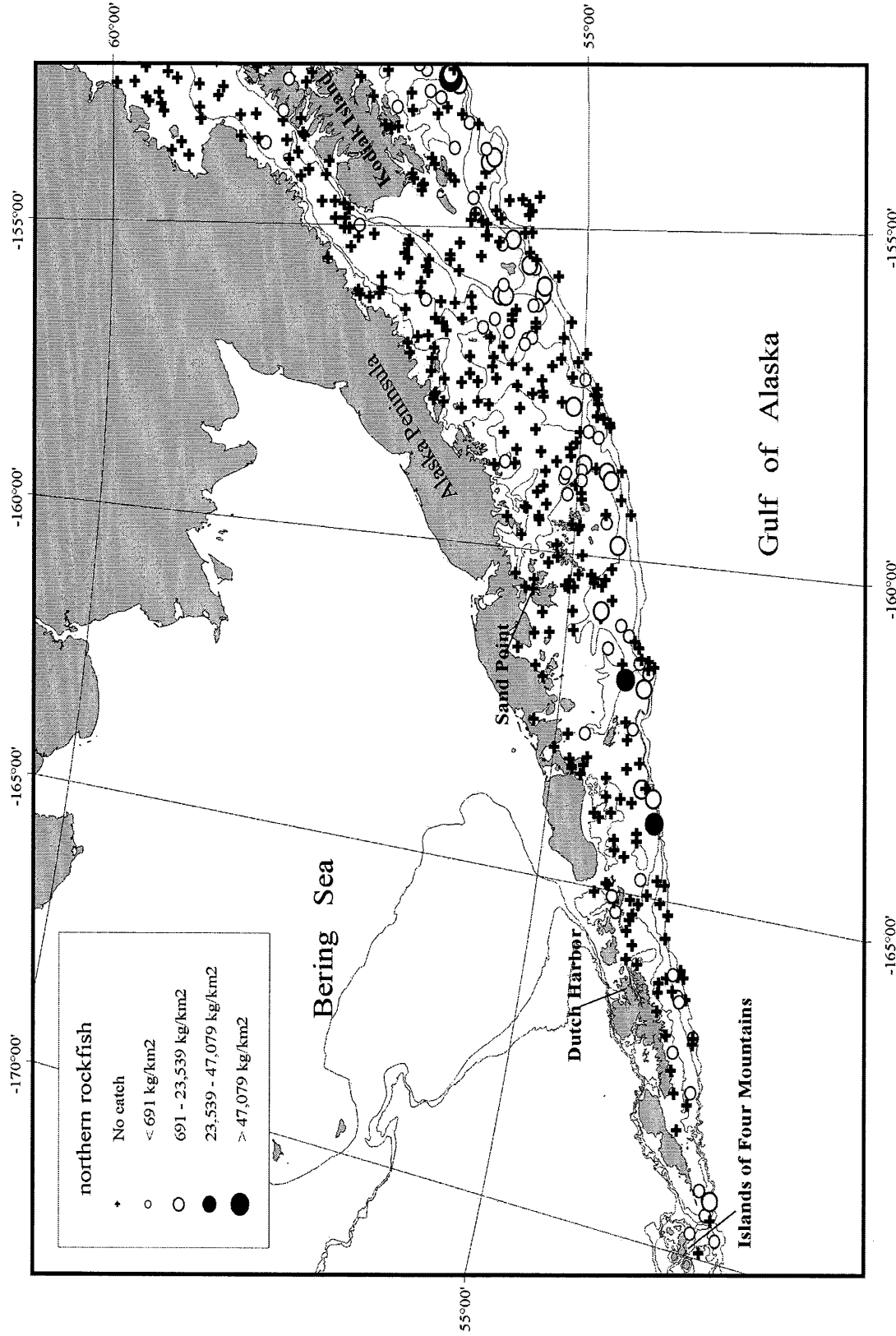


Figure 42. --Distribution and relative abundance of northern rockfish from the 1999 Gulf of Alaska bottom trawl survey. Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations above mean CPUE, and greater than four standard deviations above mean CPUE. Each symbol is proportional to the sample CPUE.

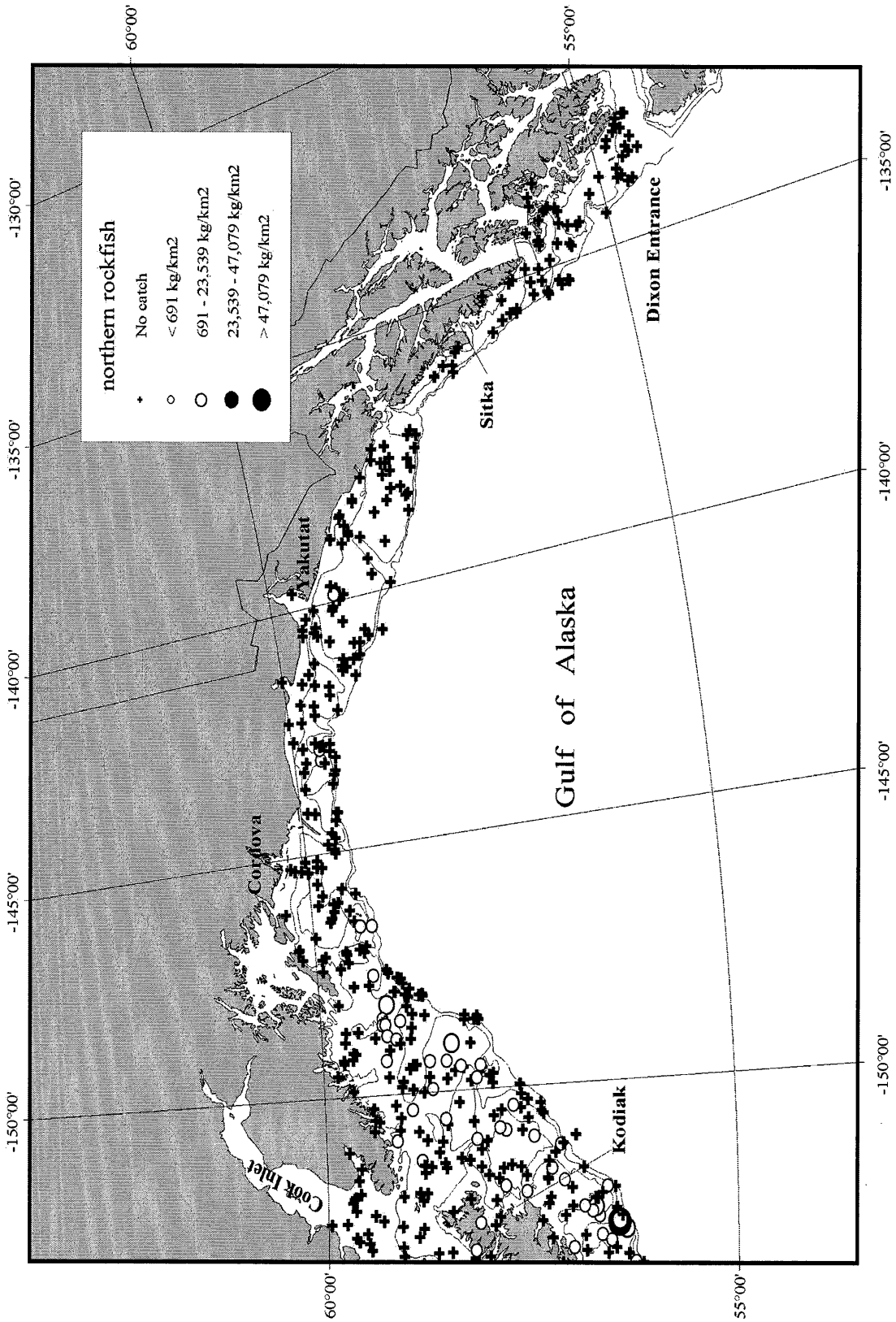


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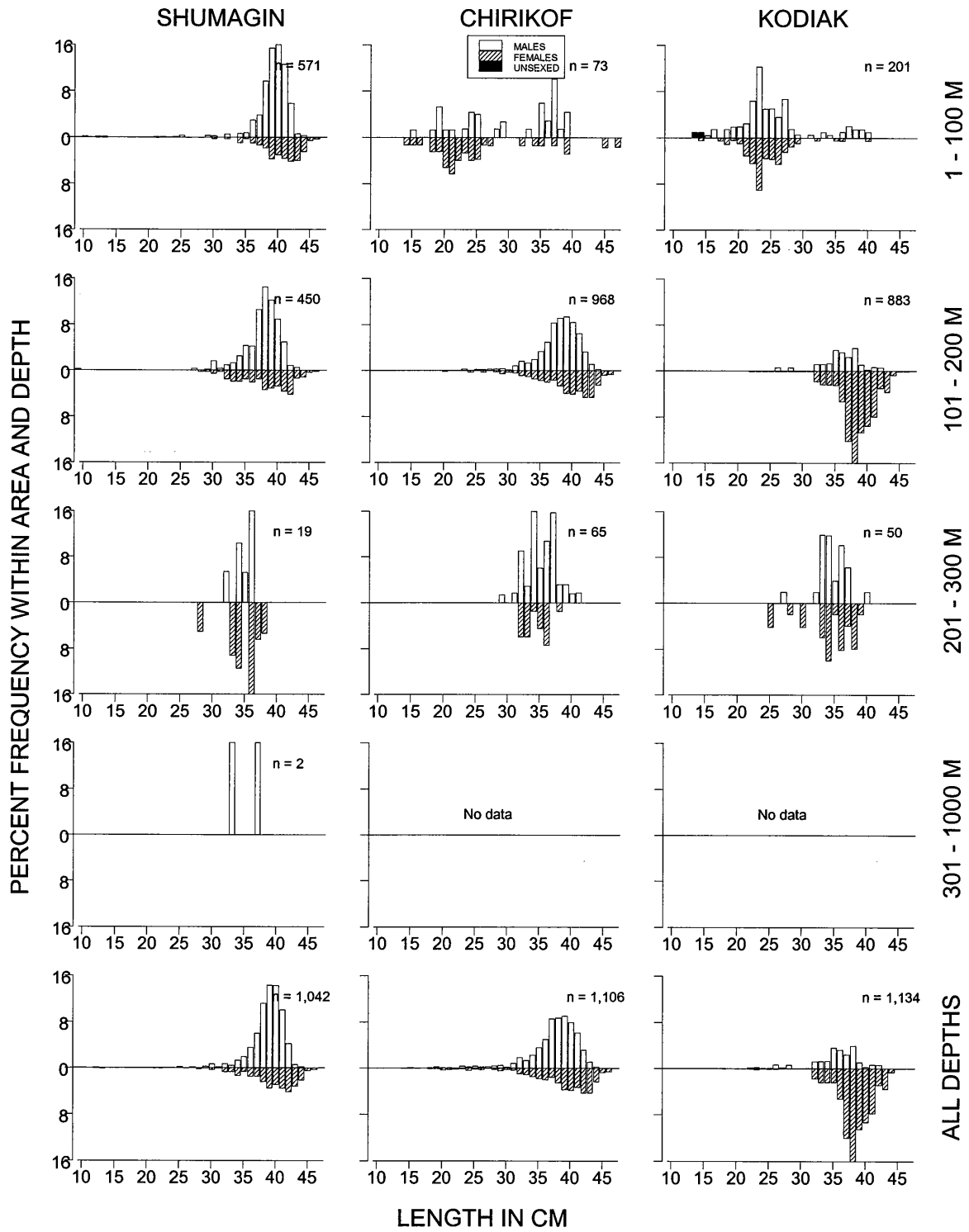


Figure 43.-- Size composition of the estimated northern rockfish population from the 1999 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

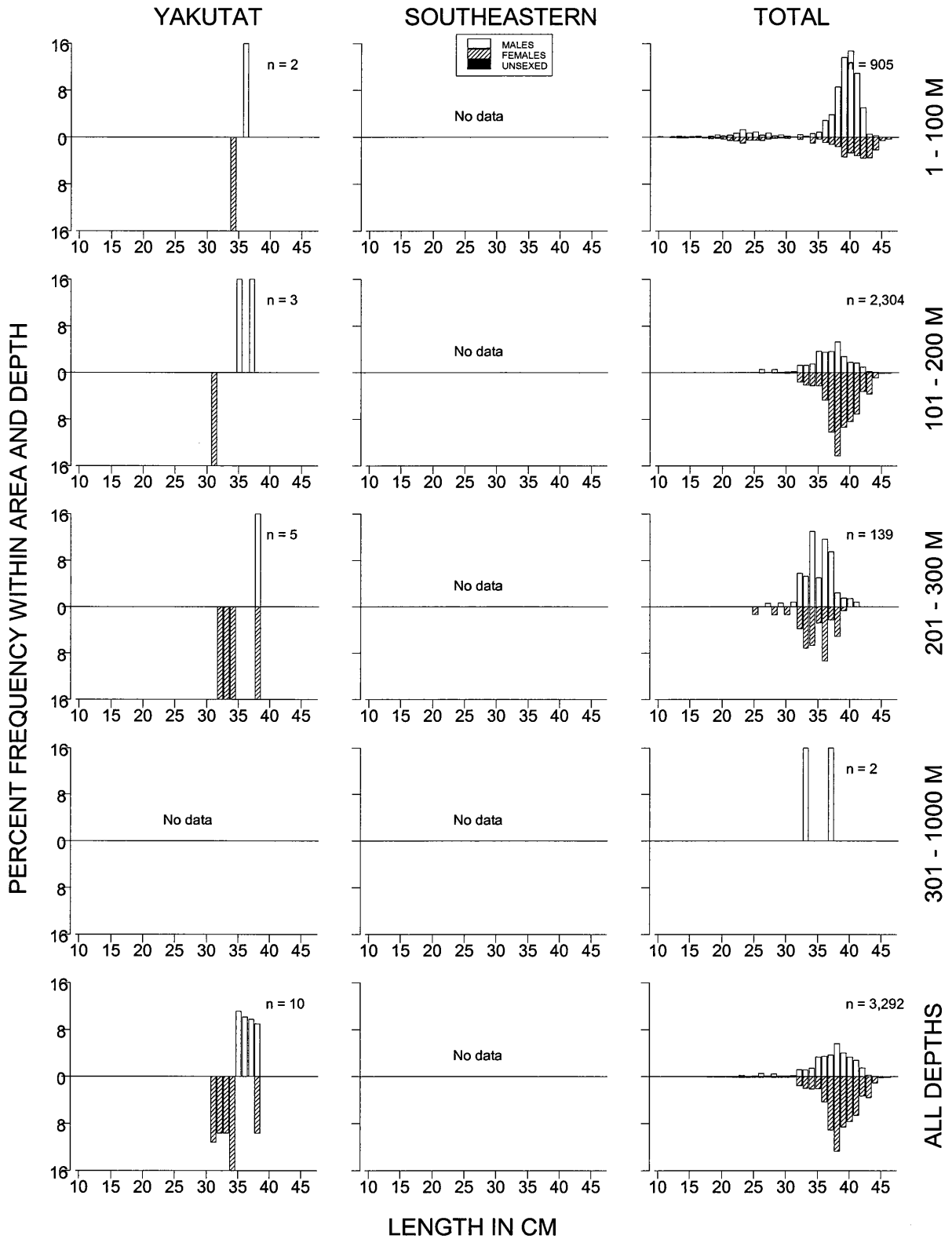


Figure 43.--Continued.

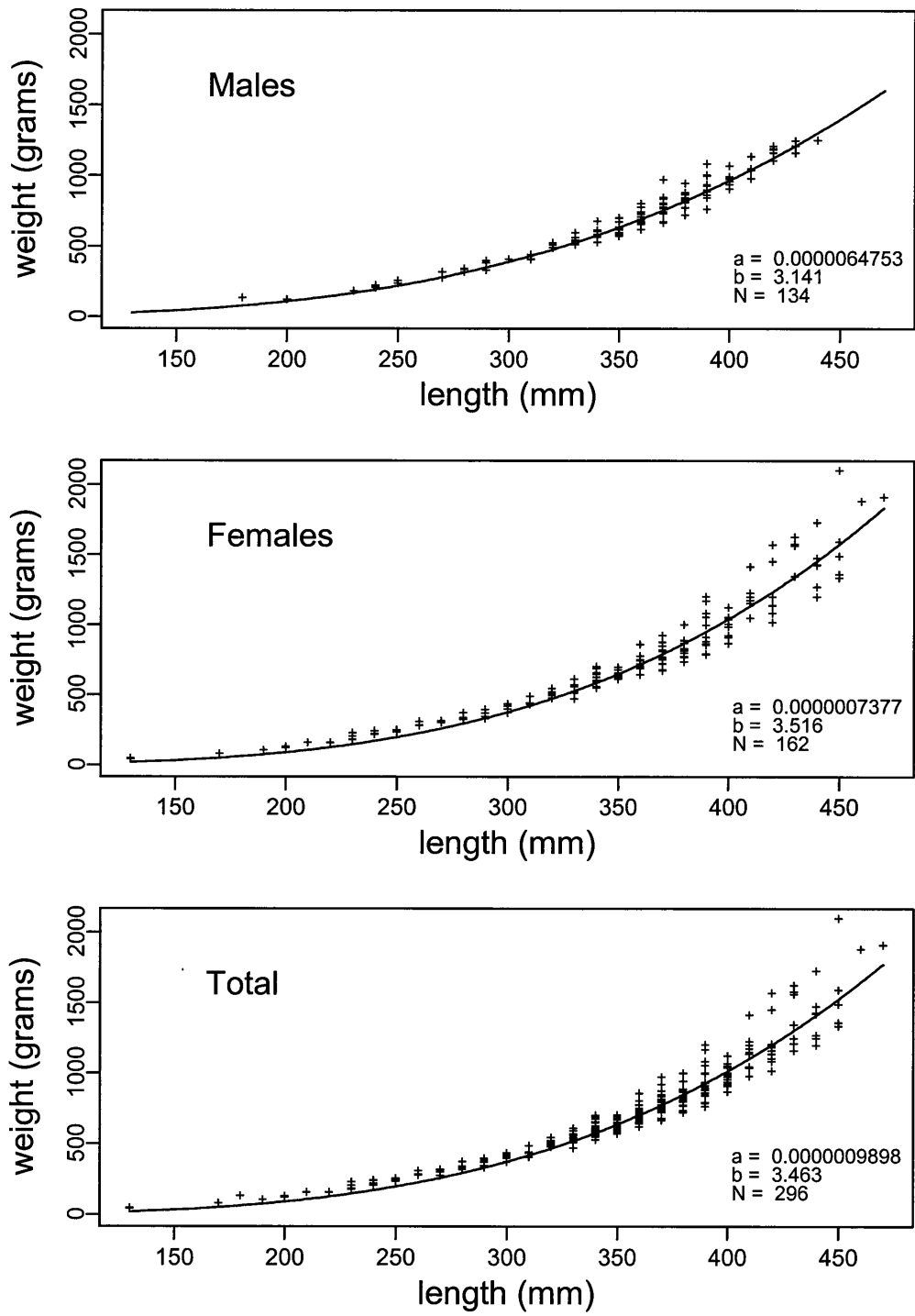


Figure 44.-- Length-weight relationship for northern rockfish specimens collected during the 1999 Gulf of Alaska bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a \times Length_{(mm)}^b$.

Table 40.-- Catch per unit effort by stratum for northern rockfish sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Lower	Upper
							C.I. Biomass	C.I. Biomass
Kodiak	101-200	Kodiak Outer Shelf	11	6	32,324	162,452	0	486,031
Chirikof	101-200	Chirikof Outer Shelf	11	7	3,335	16,713	0	36,979
Shumagin	1-100	Davidson Bank	29	7	2,255	30,851	0	69,072
Shumagin	101-200	Shumagin Outer Shelf	17	10	1,424	11,611	0	25,690
Chirikof	101-200	Shelikof Edge	17	6	792	6,127	0	17,606
Shumagin	101-200	Sanak Gully	9	2	633	2,689	0	8,843
Chirikof	101-200	East Shumagin Gully	24	4	539	5,981	0	18,225
Chirikof	201-300	Chirikof Slope	5	2	329	503	0	1,477
Kodiak	201-300	Kodiak Slope	5	3	201	326	0	940
Kodiak	101-200	Albatross Gullies	18	6	134	1,059	0	2,818
Kodiak	101-200	Portlock Flats	16	7	97	709	0	1,906
Kodiak	101-200	Kenai Flats	26	8	91	1,102	0	2,426
Shumagin	201-300	Shumagin Slope	8	5	68	190	35	346
Chirikof	1-100	Semidi Bank	17	2	57	419	0	1,204
Kodiak	1-100	Albatross Banks	34	11	47	728	0	1,475
Kodiak	1-100	Albatross Shallows	13	2	42	242	0	685
Yakutat	201-300	Yakutat Slope	5	2	27	57	0	171
Chirikof	1-100	Upper Alaska Peninsula	18	1	10	76	0	237
Chirikof	201-300	Lower Shelikof Gully	30	6	7	72	10	134
Shumagin	1-100	Shumagin Bank	26	4	5	63	0	140
Chirikof	1-100	Chirikof Bank	24	4	5	54	0	125
Shumagin	1-100	Fox Islands	19	4	5	41	0	102
Shumagin	301-500	Shumagin Slope	12	1	5	12	0	38
Yakutat	101-200	Yakataga Shelf	11	1	4	23	0	73
Kodiak	201-300	Kenai Gullies	21	2	4	27	0	68
Yakutat	1-100	Middleton Shallows	15	1	4	25	0	80
Kodiak	1-100	Northern Kodiak Shallows	5	1	3	7	0	25
Yakutat	101-200	Yakutat Flats	19	1	2	14	0	43
Kodiak	101-200	Barren Islands	24	2	1	12	0	29
Kodiak	1-100	Kenai Peninsula	12	1	<1	1	0	3

Rougheye rockfish (*Sebastes aleutianus*)

Rougheye rockfish were found throughout the survey area primarily on the upper continental slope and in the deeper gullies (Fig. 45). Mean CPUEs were highest between 301 and 500 m as rougheye rockfish were caught in over 93% of the tows successfully completed in these depths (Table 41). About 55% of the survey area biomass was estimated to be in this depth range, approximately 4% of the total survey area (Fig. 42). Fish size generally increased with depth (Fig. 46). The length mode for fish captured between 201 and 300 m was around 21 cm FL, while the mode for fish captured between 301 and 500 m was about 45 cm FL. The length-weight relationship for rougheye rockfish specimens collected during the survey is depicted in Figure 47.

Table 41.-- Number of survey hauls, number of hauls with rougheye rockfish, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	0	---	---	---	---
	101 - 200	31	3	8	120	0.69	33.6
	201 - 300	8	6	87	241	1.09	40.4
	301 - 500	12	11	2,277	5,764	1.37	44.2
	501 - 700	5	1	15	30	1.98	48.0
	701 - 1000	1	0	---	---	---	---
	All depths	147	21	94	6,156	1.34	43.7
Chirikof	1 - 100	59	1	1	34	0.69	34.0
	101 - 200	52	13	24	567	0.75	32.4
	201 - 300	35	19	117	1,348	1.10	39.6
	301 - 500	8	7	935	1,500	1.33	43.9
	501 - 700	6	0	---	---	---	---
	701 - 1000	8	0	---	---	---	---
	All depths	168	40	51	3,449	1.09	39.3
Kodiak	1 - 100	86	13	52	2,003	0.79	35.3
	101 - 200	95	29	131	5,673	0.42	27.1
	201 - 300	36	30	356	4,087	0.82	35.9
	301 - 500	14	12	1,913	5,570	1.26	42.7
	501 - 700	5	0	---	---	---	---
	701 - 1000	10	0	---	---	---	---
	All depths	246	84	171	17,333	0.68	32.3
Yakutat	1 - 100	38	2	1	16	0.08	16.1
	101 - 200	63	34	45	1,319	0.30	24.5
	201 - 300	14	12	306	1,582	0.56	31.7
	301 - 500	12	12	2,121	5,573	0.89	36.1
	501 - 700	5	2	42	62	1.58	45.6
	701 - 1000	3	0	---	---	---	---
	All depths	135	62	150	8,552	0.62	31.2
Southeastern	1 - 100	10	2	45	295	0.52	32.1
	101 - 200	24	2	2	26	0.29	25.2
	201 - 300	16	6	60	302	0.46	28.2
	301 - 500	14	14	1,056	3,290	0.97	37.5
	501 - 700	2	2	211	218	1.74	48.1
	701 - 1000	2	0	---	---	---	---
	All depths	68	26	147	4,131	0.86	35.7
All areas	1 - 100	283	18	18	2,347	0.70	33.5
	101 - 200	265	81	63	7,704	0.40	26.8
	201 - 300	109	73	210	7,560	0.76	34.7
	301 - 500	60	56	1,696	21,698	1.12	40.1
	501 - 700	23	5	38	310	1.73	47.5
	701 - 1000	24	0	---	---	---	---
	All depths	764	233	124	39,620	0.76	33.8

All areas biomass, 95% confidence interval: 28,034 - 51,205 metric tons (t).

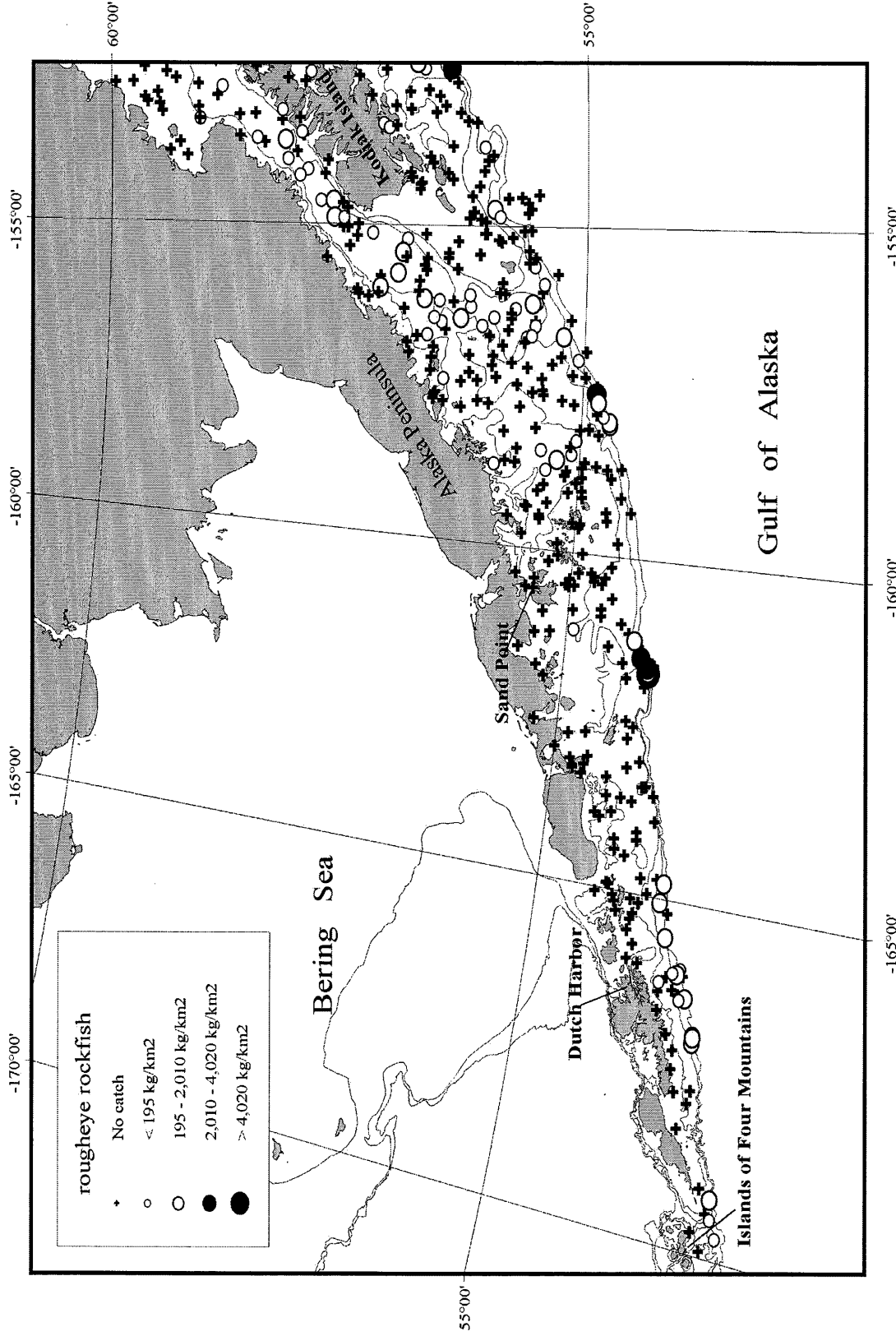


Figure 45.—Distribution and relative abundance of rougheye rockfish from the 1999 Gulf of Alaska bottom trawl survey. Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations above mean CPUE, and greater than four standard deviations above mean CPUE. Each symbol is proportional to the sample CPUE.

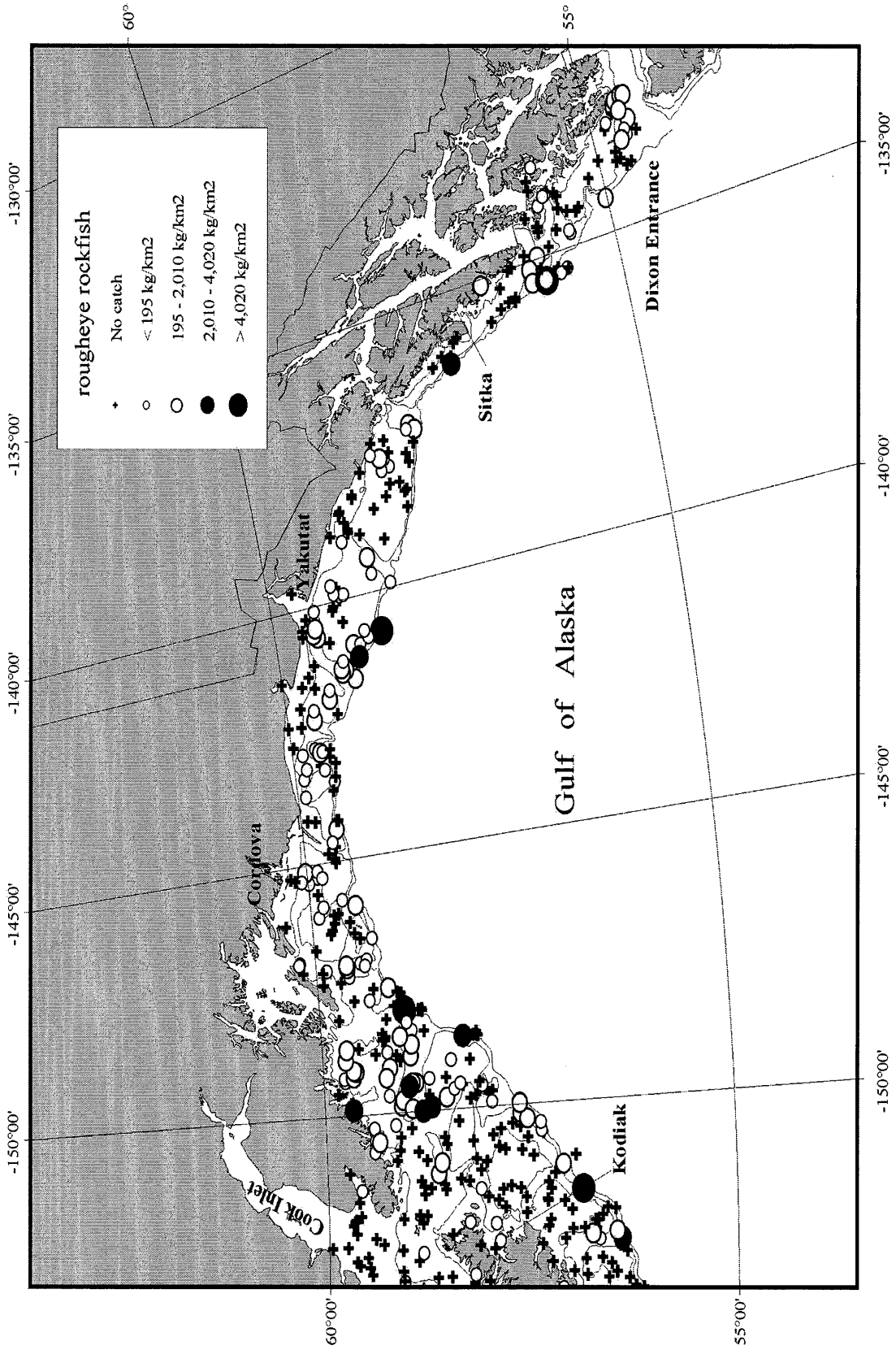


Figure 45.--Continued.

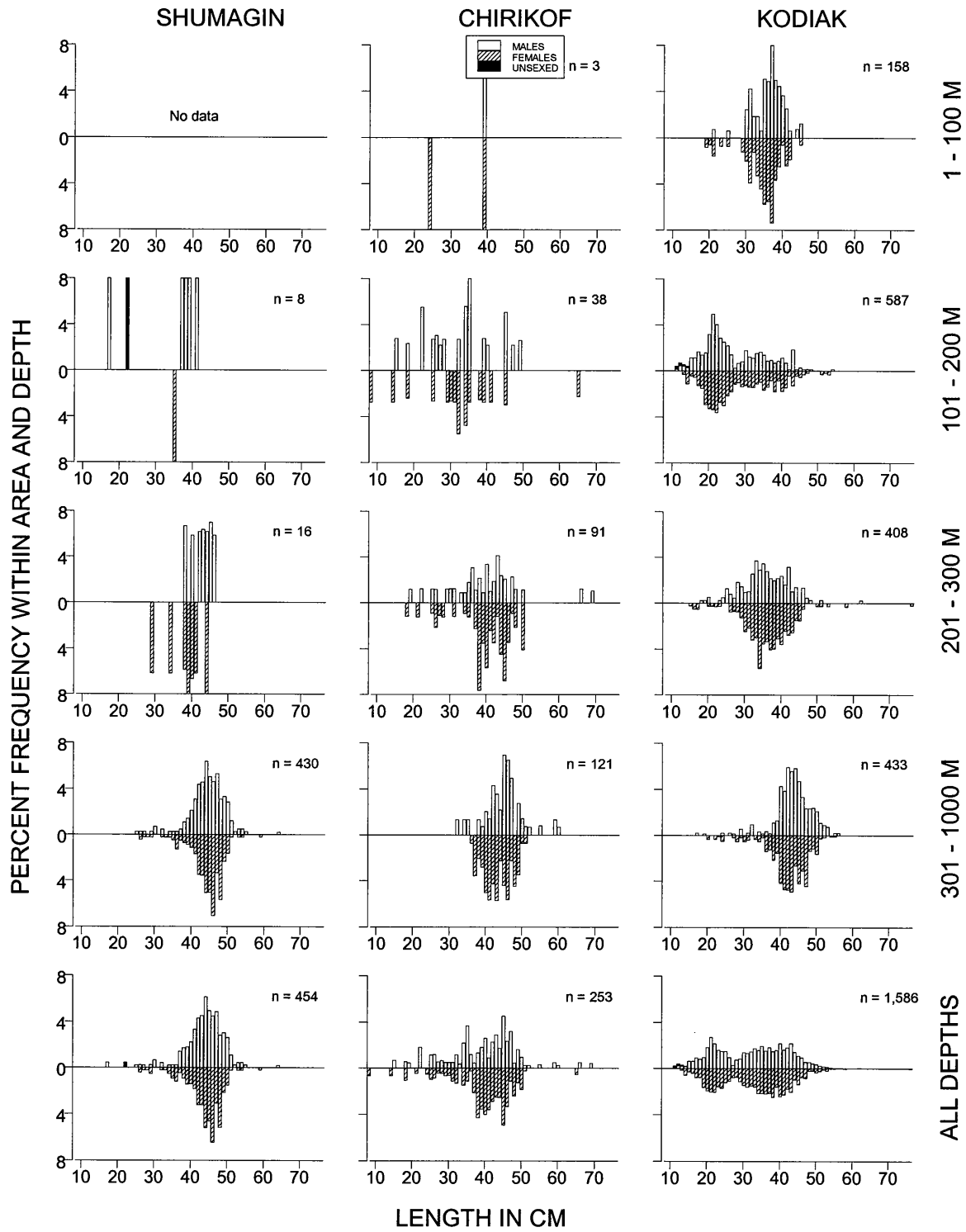


Figure 46.-- Size composition of the estimated roughey rockfish population from the 1999 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

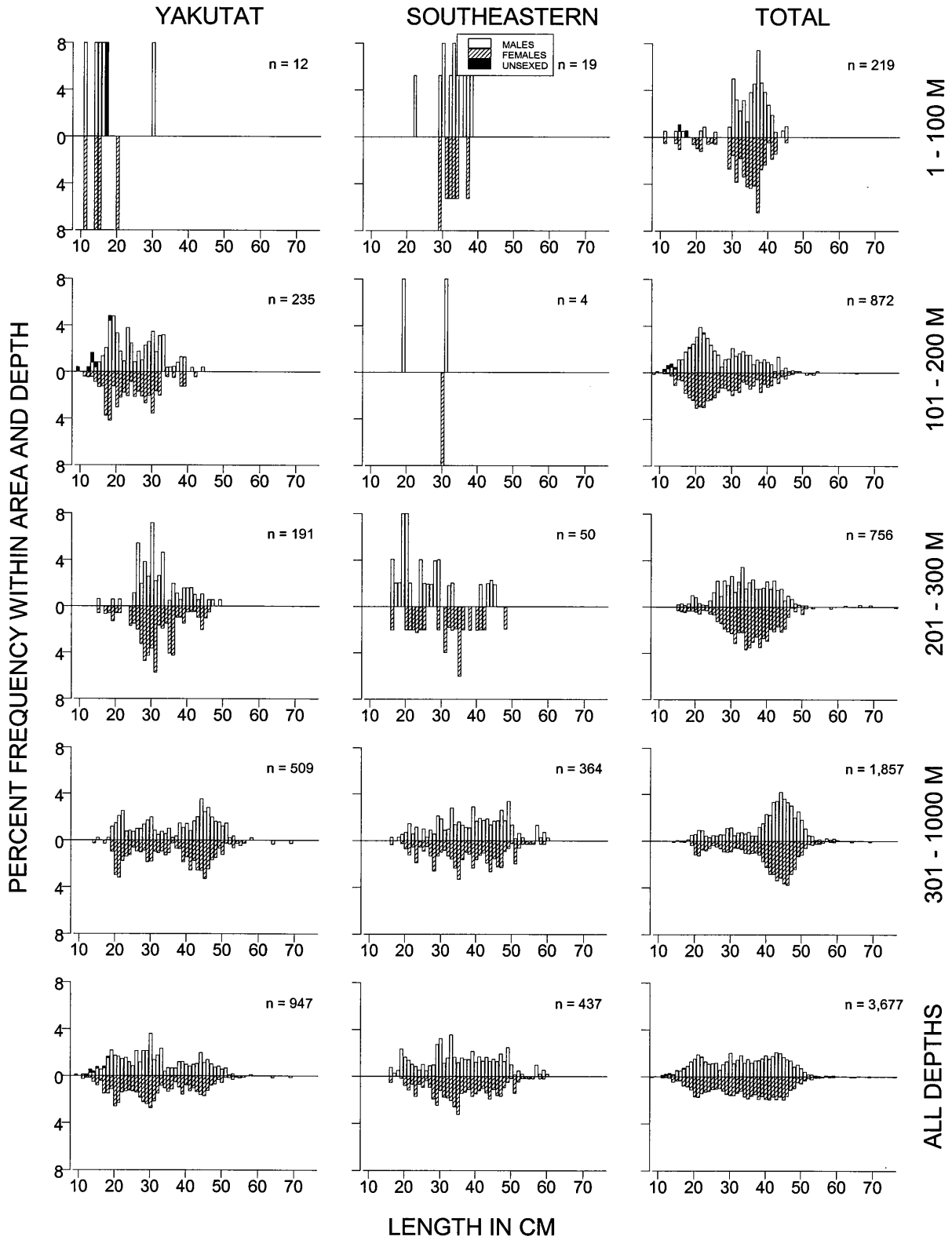


Figure 46.--Continued.

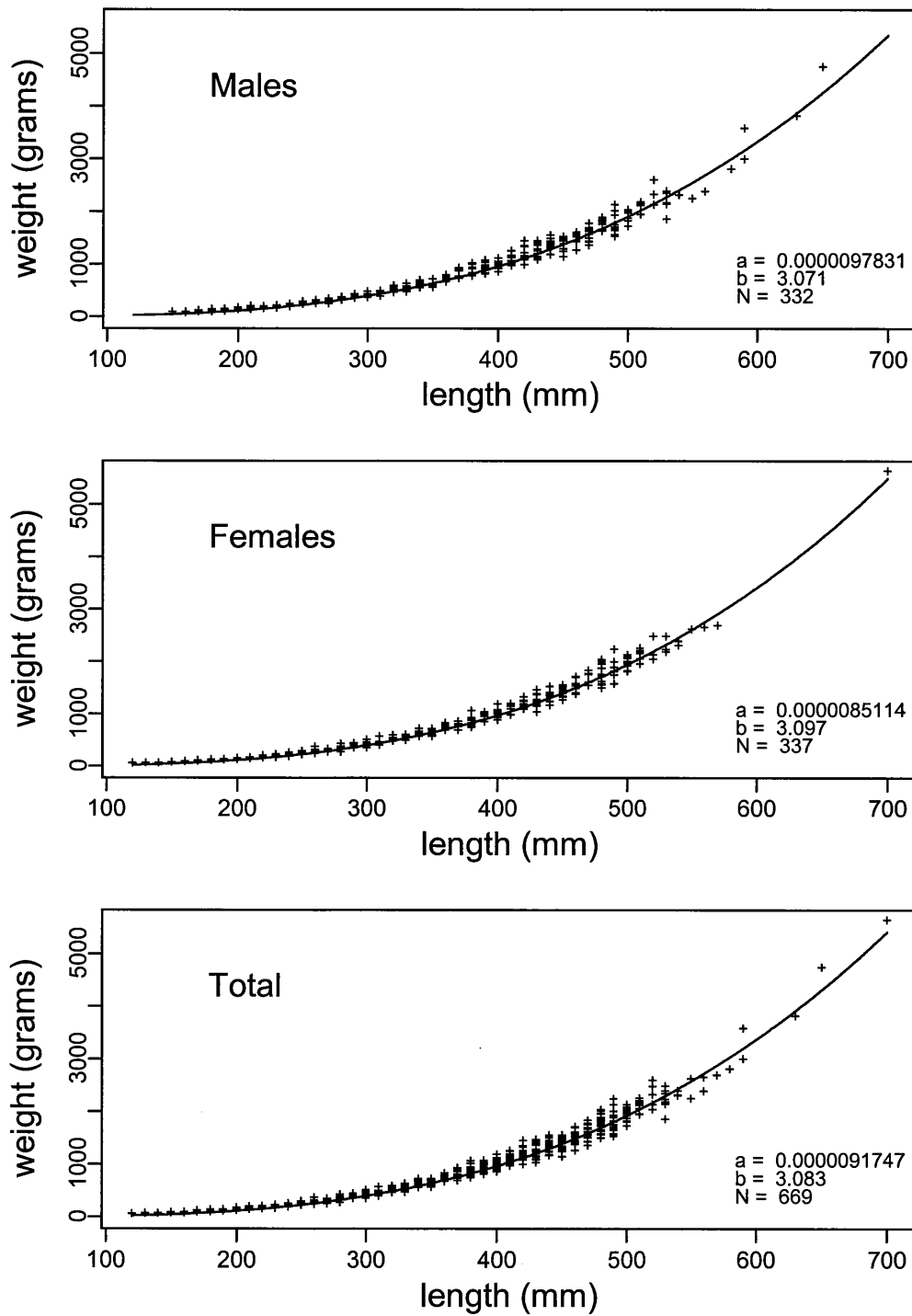


Figure 47.-- Length-weight relationship for roughey rockfish specimens collected during the 1999 Gulf of Alaska bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a \times Length_{(mm)}^b$.

Table 42.-- Catch per unit effort by stratum for rougheye rockfish sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Hauls		CPUE (kg/km ²)	Biomass (t)	Lower	Upper
			Number of hauls	with catch			C.I. Biomass	C.I. Biomass
Yakutat	301-500	Yakutat Slope	7	7	3,299	5,016	0	12,461
Southeastern	301-500	Southeastern Slope	4	4	2,470	1,909	0	4,293
Shumagin	301-500	Shumagin Slope	12	11	2,277	5,764	0	12,702
Kodiak	301-500	Kodiak Slope	14	12	1,913	5,570	282	10,859
Chirikof	301-500	Chirikof Slope	8	7	935	1,500	413	2,588
Southeastern	301-500	Southeastern Deep Gullies	10	10	589	1,382	548	2,216
Yakutat	301-500	Yakutat Gullies	5	5	503	557	245	869
Kodiak	201-300	Kenai Gullies	21	19	489	3,257	1,144	5,370
Yakutat	201-300	Yakutat Gullies	9	8	448	1,363	6	2,720
Kodiak	1-100	Kenai Peninsula	12	5	351	1,848	0	5,464
Kodiak	101-200	Portlock Flats	16	7	297	2,181	0	4,995
Chirikof	201-300	Chirikof Slope	5	4	277	423	0	1,155
Southeastern	501-700	Southeastern Slope	2	2	211	218	0	855
Kodiak	101-200	Kenai Flats	26	13	204	2,461	586	4,337
Kodiak	201-300	Upper Shelikof Gully	10	7	174	557	0	1,263
Kodiak	201-300	Kodiak Slope	5	4	168	273	0	717
Yakutat	201-300	Yakutat Slope	5	4	103	219	19	418
Chirikof	201-300	Lower Shelikof Gully	30	15	92	925	420	1,431
Yakutat	101-200	Yakataga Shelf	11	7	89	468	16	920
Shumagin	201-300	Shumagin Slope	8	6	87	241	41	442
Southeastern	201-300	Prince of Wales Slope/Gullies	13	6	77	302	16	589
Kodiak	101-200	Barren Islands	24	5	74	807	0	1,847
Yakutat	101-200	Middleton Shelf	16	12	45	331	52	611
Southeastern	1-100	Southeastern Shallows	10	2	45	295	0	949
Yakutat	501-700	Yakutat Slope	5	2	42	62	0	169
Yakutat	101-200	Yakutat Flats	19	11	36	321	69	573
Chirikof	101-200	Shelikof Edge	17	6	31	240	0	545
Kodiak	101-200	Albatross Gullies	18	4	28	223	0	529
Chirikof	101-200	East Shumagin Gully	24	6	27	297	0	680
Yakutat	101-200	Fairweather Shelf	17	4	26	199	0	434
Kodiak	1-100	Northern Kodiak Shallows	5	2	21	45	0	124
Kodiak	1-100	Albatross Shallows	13	4	16	94	0	194
Shumagin	501-700	Shumagin Slope	5	1	15	30	0	114
Shumagin	101-200	Shumagin Outer Shelf	17	2	13	104	0	314
Chirikof	101-200	Chirikof Outer Shelf	11	1	6	30	0	96
Chirikof	1-100	Upper Alaska Peninsula	18	1	4	34	0	105
Shumagin	101-200	Sanak Gully	9	1	4	16	0	54
Southeastern	101-200	Prince of Wales Shelf	14	2	4	26	0	71
Kodiak	1-100	Lower Cook Inlet	22	2	2	16	0	46
Yakutat	1-100	Yakutat Shallows	23	1	2	16	0	48
Yakutat	1-100	Middleton Shallows	15	1	<1	0	0	1

Light dusky rockfish (*Sebastes sp.cf. ciliatus*)

Light dusky rockfish were found throughout the GOA at depths less than 300 m (Fig. 48). The highest mean CPUEs were noted between 101 and 200 m, particularly in the Kodiak and Chirikof INPFC areas (Table 43). Approximately 94% of the total survey biomass was estimated to be found in this depth range, including a single tow in the Portlock Flats stratum that accounted for over 35% of the total survey biomass estimate (Table 44). Fish less than 30 cm FL were generally restricted to water less than 100 m deep (Fig. 49). The length-weight relationship for light dusky rockfish specimens collected during the survey is depicted in Figure 50.

Table 43.-- Number of survey hauls, number of hauls with light dusky rockfish, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	9	39	1,605	1.18	40.2
	101 - 200	31	6	52	760	0.97	38.6
	201 - 300	8	3	62	173	1.30	42.9
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	1	0	---	---	---	---
	All depths		147	18	39	2,538	1.12
Chirikof	1 - 100	59	4	10	269	1.11	38.8
	101 - 200	52	17	358	8,539	1.23	41.4
	201 - 300	35	7	23	260	1.41	43.9
	301 - 500	8	0	---	---	---	---
	501 - 700	6	0	---	---	---	---
	701 - 1000	8	0	---	---	---	---
	All depths		168	28	133	9,068	1.23
Kodiak	1 - 100	86	2	5	201	0.81	33.6
	101 - 200	95	20	771	33,418	1.61	45.1
	201 - 300	36	5	10	110	1.39	43.2
	301 - 500	14	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	10	0	---	---	---	---
	All depths		246	27	332	33,729	1.60
Yakutat	1 - 100	38	0	---	---	---	---
	101 - 200	63	8	65	1,909	1.60	45.5
	201 - 300	14	4	36	188	1.50	44.9
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	3	0	---	---	---	---
	All depths		135	12	37	2,097	1.59
Southeastern	1 - 100	10	0	---	---	---	---
	101 - 200	24	2	186	2,067	1.50	45.4
	201 - 300	16	2	8	41	1.54	45.0
	301 - 500	14	0	---	---	---	---
	501 - 700	2	0	---	---	---	---
	701 - 1000	2	0	---	---	---	---
	All depths		68	4	75	2,108	1.50
All areas	1 - 100	283	15	16	2,075	1.12	39.1
	101 - 200	265	53	382	46,693	1.50	44.1
	201 - 300	109	21	21	772	1.41	43.9
	301 - 500	60	0	---	---	---	---
	501 - 700	23	0	---	---	---	---
	701 - 1000	24	0	---	---	---	---
	All depths		764	89	155	49,540	1.48

All areas biomass, 95% confidence interval: 9,733 - 89,346 metric tons (t).

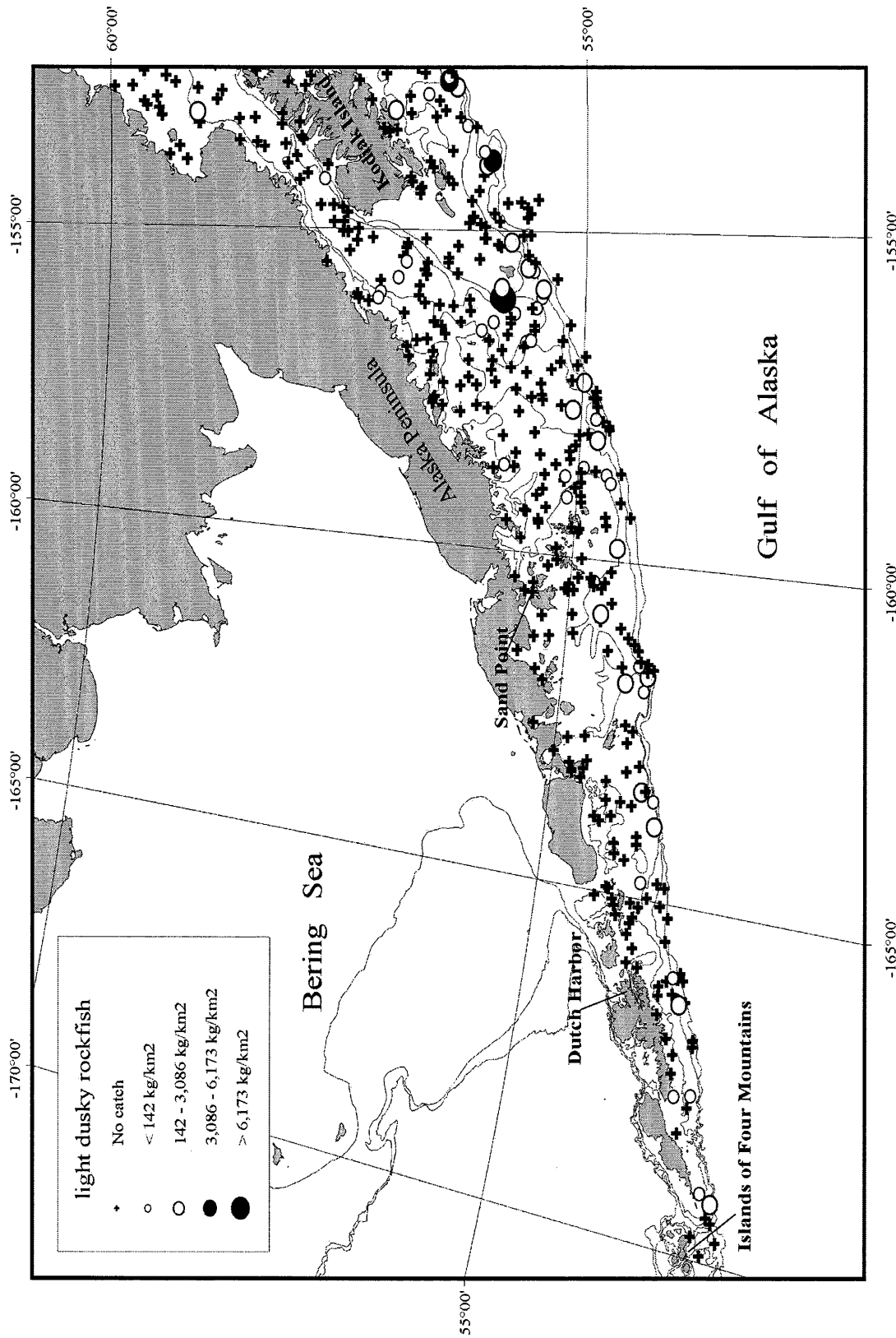


Figure 48.—Distribution and relative abundance of light dusky rockfish from the 1999 Gulf of Alaska bottom trawl survey. Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations above mean CPUE, and greater than four standard deviations above mean CPUE. Each symbol is proportional to the sample CPUE.

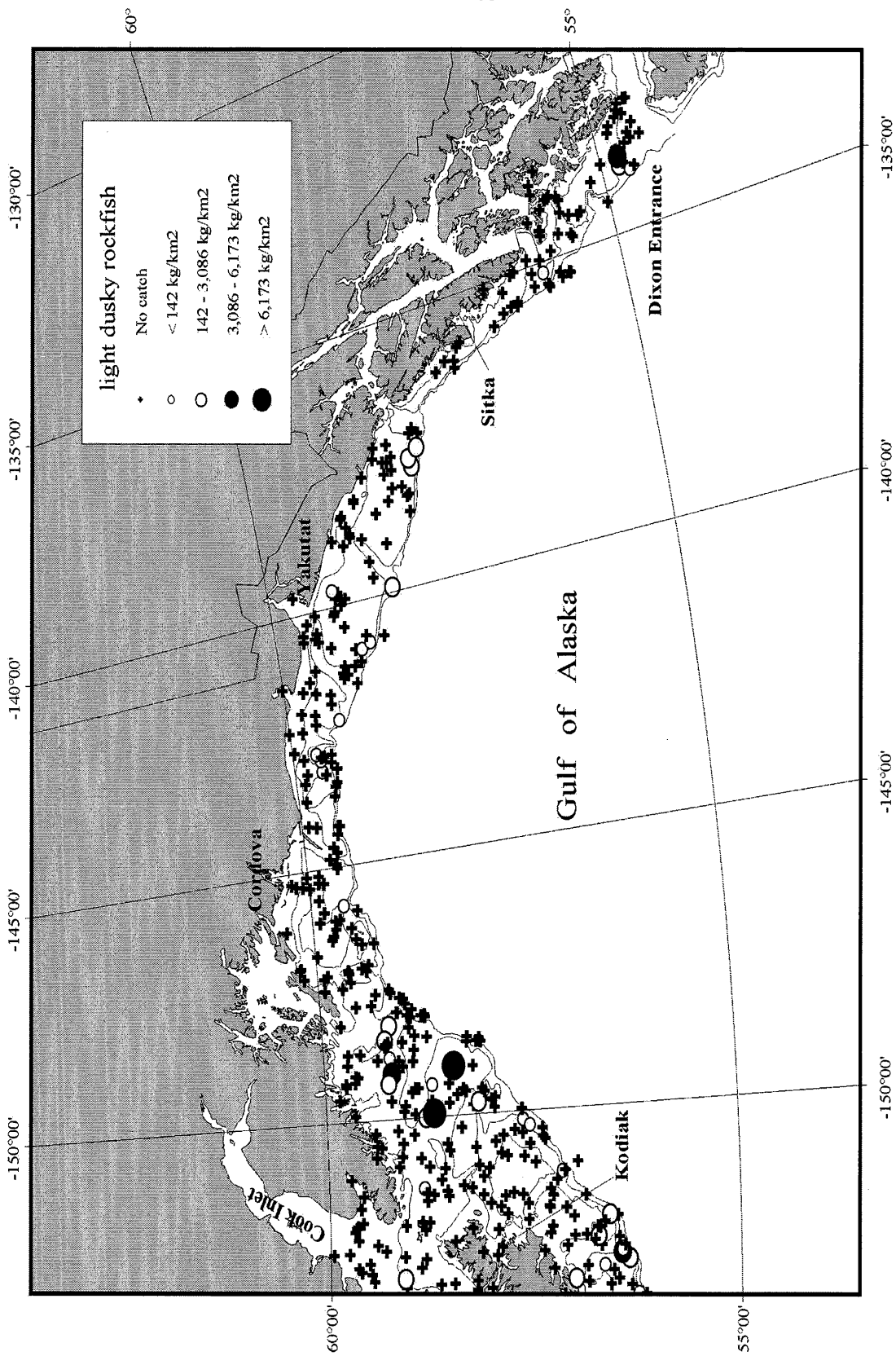


Figure 48.--Continued.

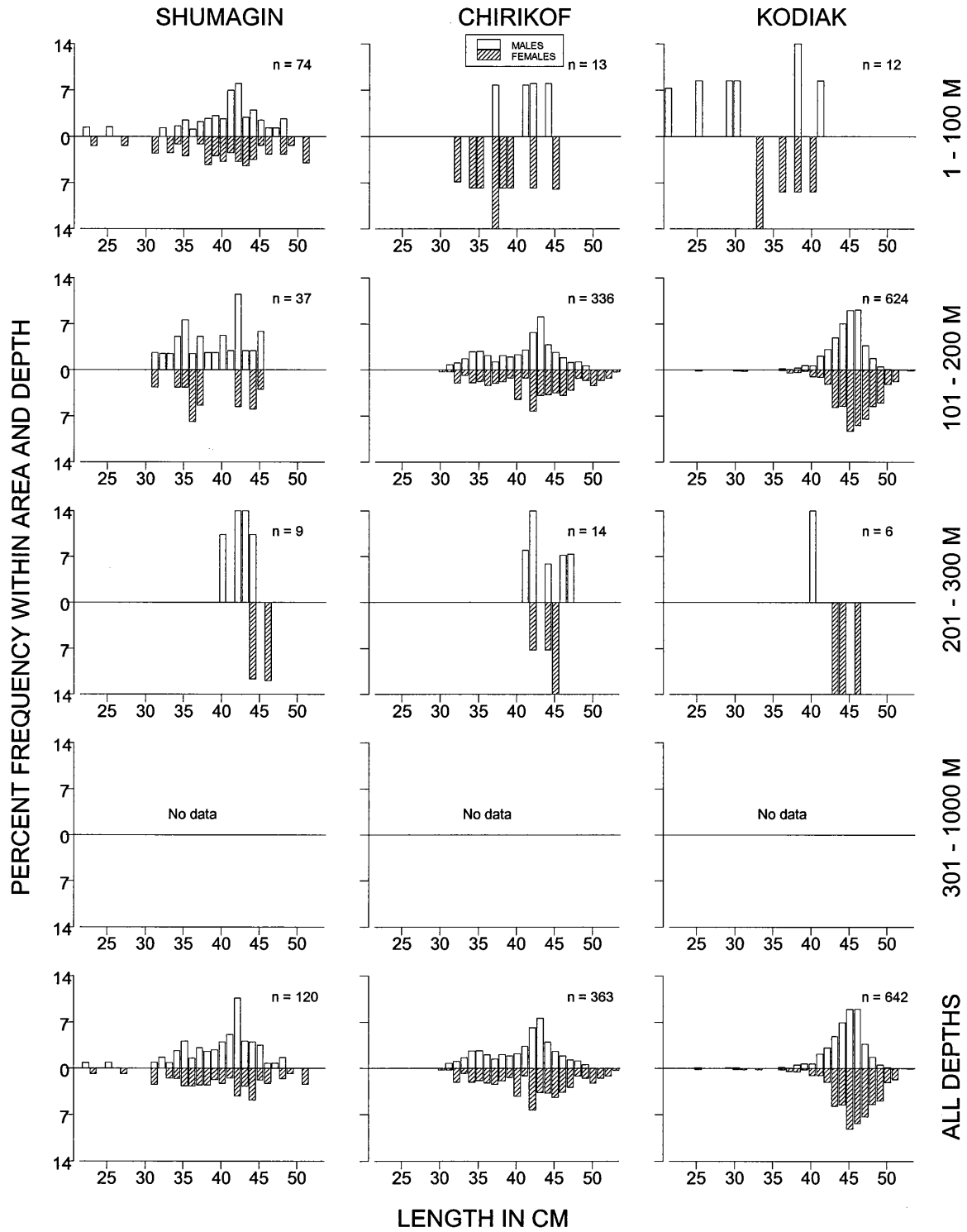


Figure 49.-- Size composition of the estimated light dusky rockfish population from the 1999 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

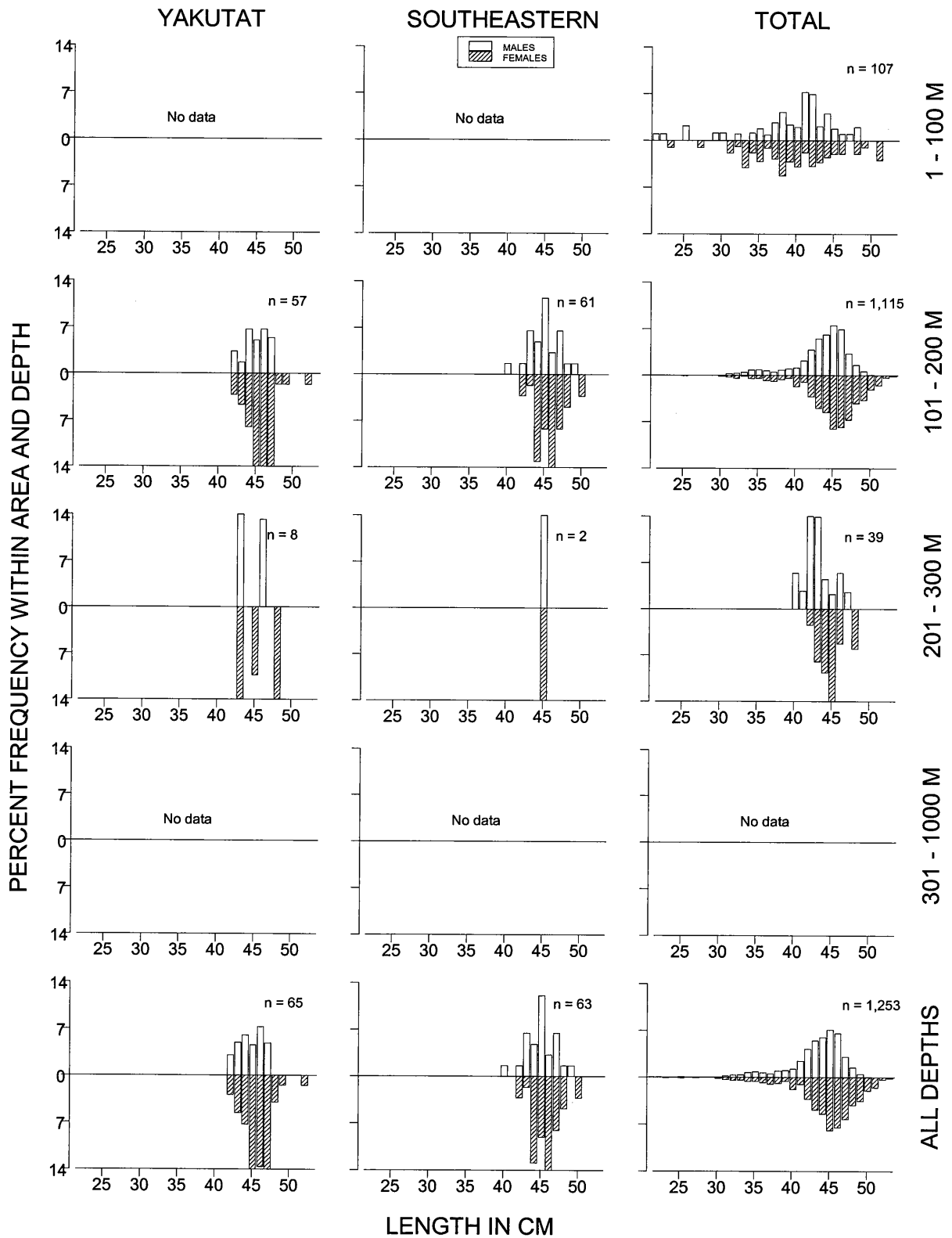


Figure 49.--Continued.

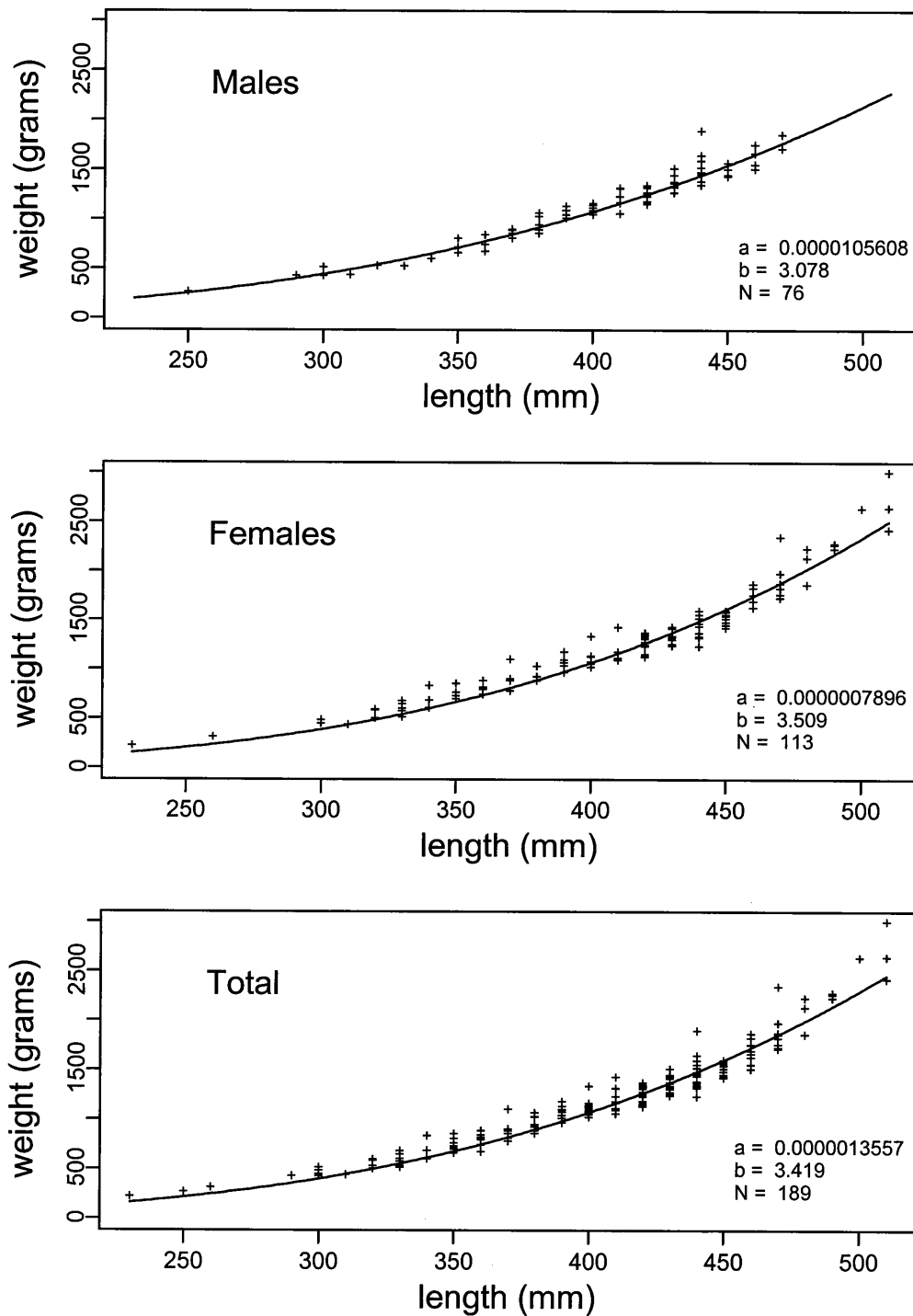


Figure 50.-- Length-weight relationship for light dusky rockfish specimens collected during the 1999 Gulf of Alaska bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a \times Length_{(mm)}^b$.

Table 44.-- Catch per unit effort by stratum for light dusky rockfish sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Hauls		CPUE (kg/km ²)	Biomass (t)	Lower	Upper
			Number of hauls	with catch			C.I. Biomass	C.I. Biomass
Kodiak	101-200	Portlock Flats	16	4	3,073	22,544	0	60,488
Kodiak	101-200	Kodiak Outer Shelf	11	6	1,280	6,432	448	12,416
Chirikof	101-200	Shelikof Edge	17	7	938	7,254	0	18,736
Kodiak	101-200	Kenai Flats	26	5	304	3,675	0	9,084
Southeastern	101-200	Prince of Wales Shelf	14	2	300	2,067	0	6,309
Chirikof	101-200	Chirikof Outer Shelf	11	8	246	1,231	0	2,622
Yakutat	101-200	Fairweather Shelf	17	3	218	1,686	0	4,626
Shumagin	1-100	Davidson Bank	29	5	116	1,584	0	3,833
Chirikof	201-300	Chirikof Slope	5	2	99	151	0	500
Yakutat	201-300	Yakutat Slope	5	3	71	151	0	423
Kodiak	101-200	Albatross Gullies	18	2	71	561	0	1,557
Kodiak	201-300	Kodiak Slope	5	5	68	110	59	161
Shumagin	101-200	Sanak Gully	9	1	62	263	0	870
Shumagin	201-300	Shumagin Slope	8	3	62	173	0	397
Shumagin	101-200	Shumagin Outer Shelf	17	5	61	497	0	1,075
Kodiak	1-100	Albatross Shallows	13	1	34	198	0	628
Chirikof	1-100	Semidi Bank	17	1	23	168	0	524
Kodiak	101-200	Barren Islands	24	3	19	207	0	540
Yakutat	101-200	Yakutat Flats	19	3	15	136	0	299
Yakutat	101-200	Yakataga Shelf	11	1	12	65	0	209
Yakutat	201-300	Yakutat Gullies	9	1	12	37	0	122
Chirikof	201-300	Lower Shelikof Gully	30	5	11	109	3	216
Southeastern	201-300	Prince of Wales Slope/Gullies	13	2	10	41	0	100
Chirikof	1-100	Chirikof Bank	24	1	7	79	0	242
Chirikof	101-200	East Shumagin Gully	24	2	5	54	0	138
Yakutat	101-200	Middleton Shelf	16	1	3	22	0	68
Chirikof	1-100	Upper Alaska Peninsula	18	2	3	22	0	56
Shumagin	1-100	Fox Islands	19	2	1	8	0	20
Shumagin	1-100	Shumagin Bank	26	2	1	13	0	32
Kodiak	1-100	Albatross Banks	34	1	<1	3	0	9

Dark dusky rockfish (*Sebastes ciliatus*)

Dark dusky rockfish were rarely caught over the course of the survey (Table 45). A single tow in the Davidson Bank stratum accounted for over 90% of the total estimated biomass for dark dusky rockfish in the survey area (Fig. 51 and Table 46) and this was the only stratum of the survey with more than one tow with dark dusky rockfish (Table 46). The length information is dominated by the length measurements from this tow as well (Fig. 52). The length-weight relationship for dark dusky rockfish specimens collected during the survey is depicted in Figure 53.

Table 45.-- Number of survey hauls, number of hauls with dark dusky rockfish, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	2	51	2,104	1.22	40.5
	101 - 200	31	1	2	27	1.31	44.0
	201 - 300	8	0	---	---	---	---
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	1	0	---	---	---	---
	All depths		147	3	33	2,131	1.22
Chirikof	1 - 100	59	0	---	---	---	---
	101 - 200	52	1	1	31	0.67	33.5
	201 - 300	35	0	---	---	---	---
	301 - 500	8	0	---	---	---	---
	501 - 700	6	0	---	---	---	---
	701 - 1000	8	0	---	---	---	---
	All depths		168	1	<1	31	0.67
Kodiak	1 - 100	86	0	---	---	---	---
	101 - 200	95	1	1	49	1.40	---
	201 - 300	36	0	---	---	---	---
	301 - 500	14	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	10	0	---	---	---	---
	All depths		246	1	<1	49	1.40
Yakutat	1 - 100	38	0	---	---	---	---
	101 - 200	63	0	---	---	---	---
	201 - 300	14	0	---	---	---	---
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	3	0	---	---	---	---
	All depths		135	0	---	---	---
Southeastern	1 - 100	10	0	---	---	---	---
	101 - 200	24	0	---	---	---	---
	201 - 300	16	0	---	---	---	---
	301 - 500	14	0	---	---	---	---
	501 - 700	2	0	---	---	---	---
	701 - 1000	2	0	---	---	---	---
	All depths		68	0	---	---	---
All areas	1 - 100	283	2	16	2,104	1.22	40.5
	101 - 200	265	3	1	107	1.05	36.7
	201 - 300	109	0	---	---	---	---
	301 - 500	60	0	---	---	---	---
	501 - 700	23	0	---	---	---	---
	701 - 1000	24	0	---	---	---	---
	All depths		764	5	7	2,211	1.21

All areas biomass, 95% confidence interval: 0 - 6,304 metric tons (t).

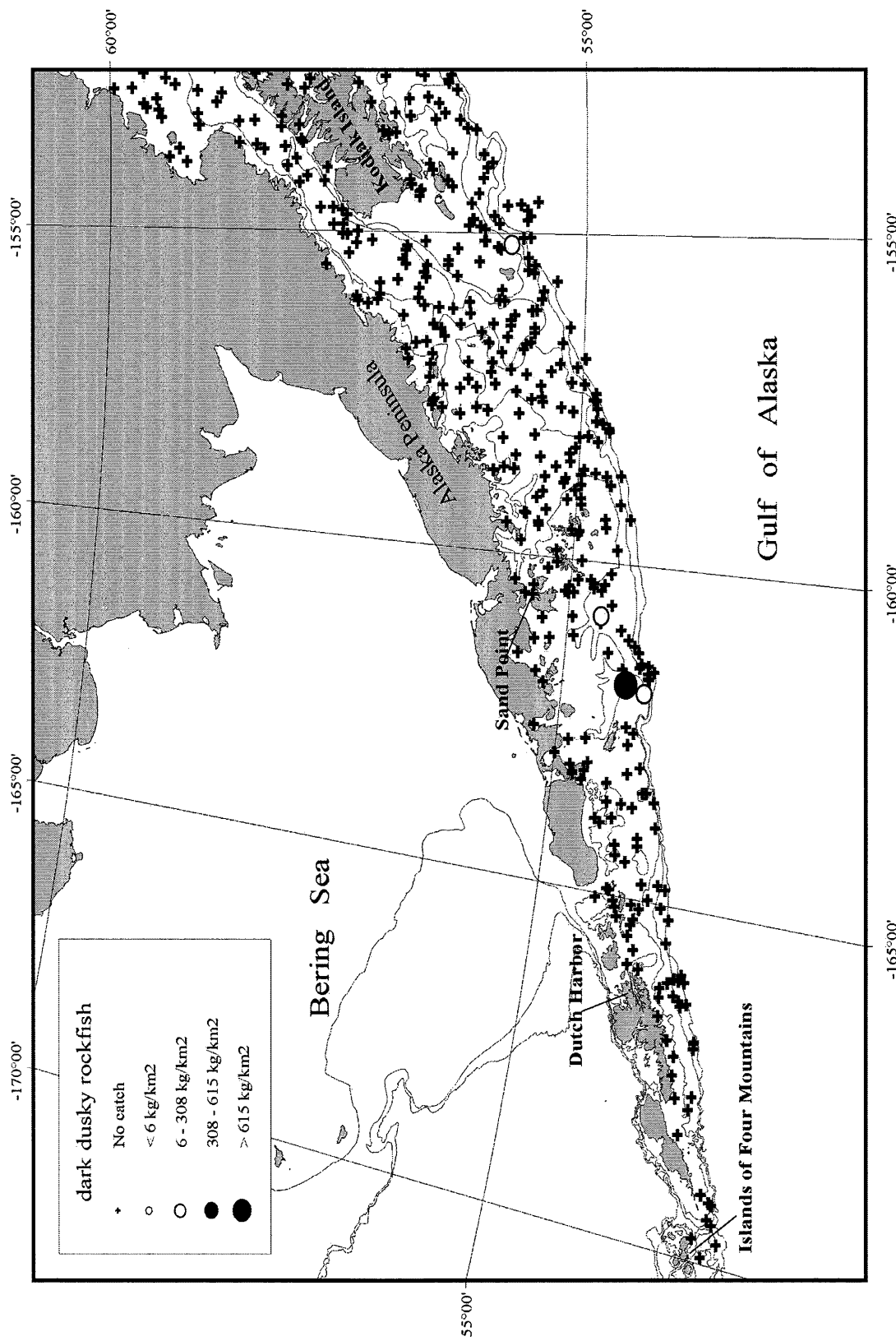


Figure 51.—Distribution and relative abundance of dark dusky rockfish from the 1999 Gulf of Alaska bottom trawl survey. Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations above mean CPUE, and greater than four standard deviations above mean CPUE. Each symbol is proportional to the sample CPUE.

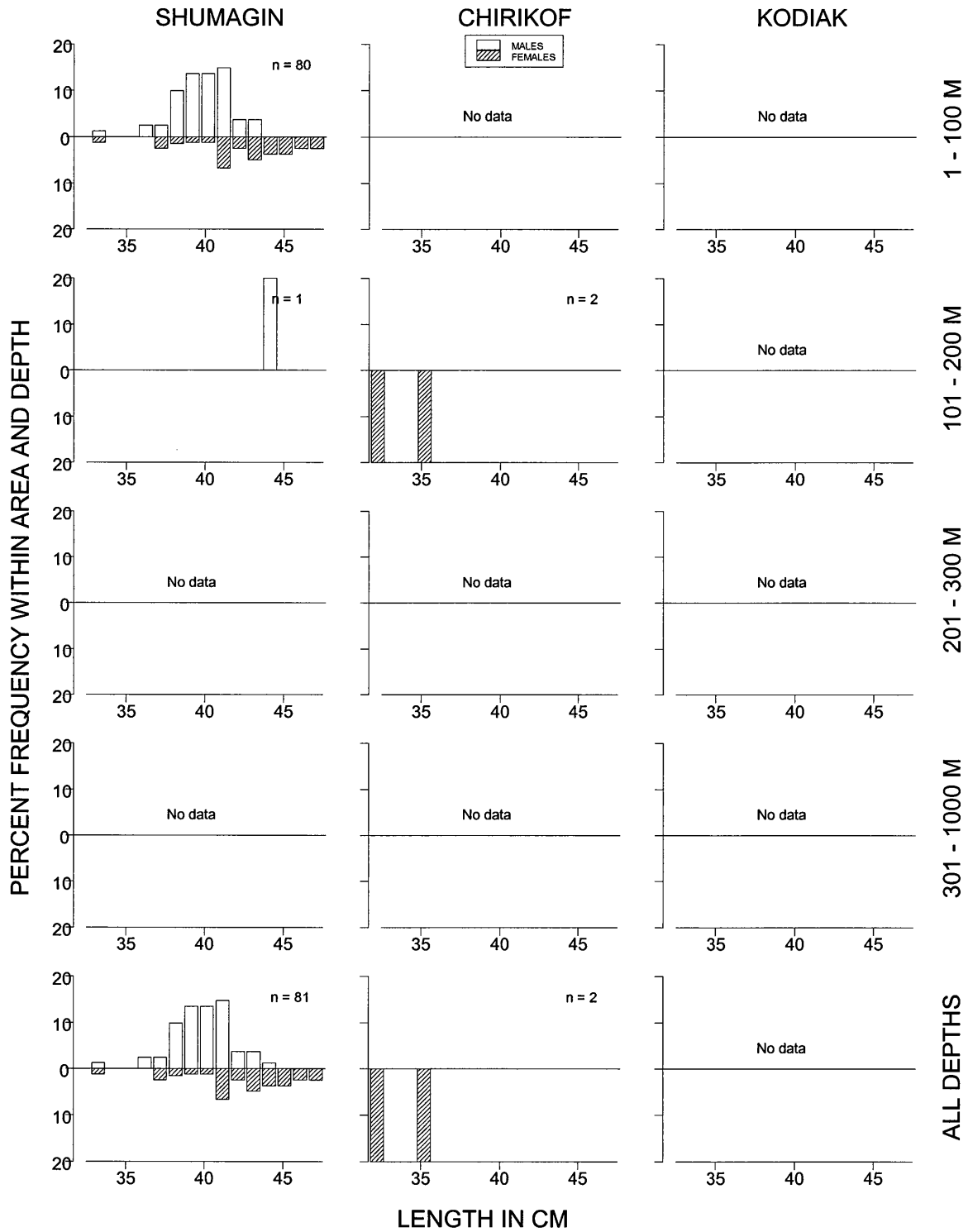


Figure 52.-- Size composition of the estimated dark dusky rockfish population from the 1999 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

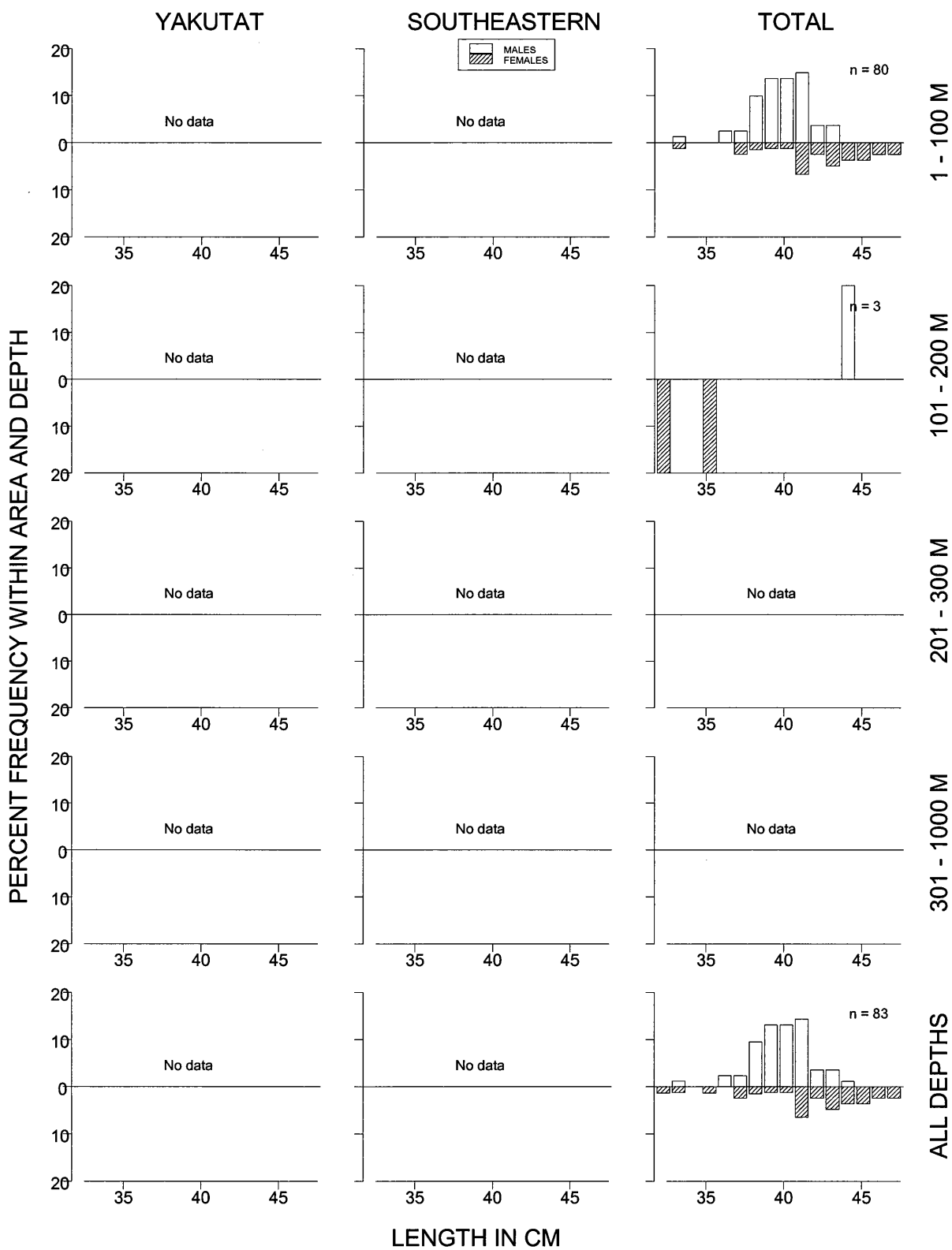


Figure 52.--Continued.

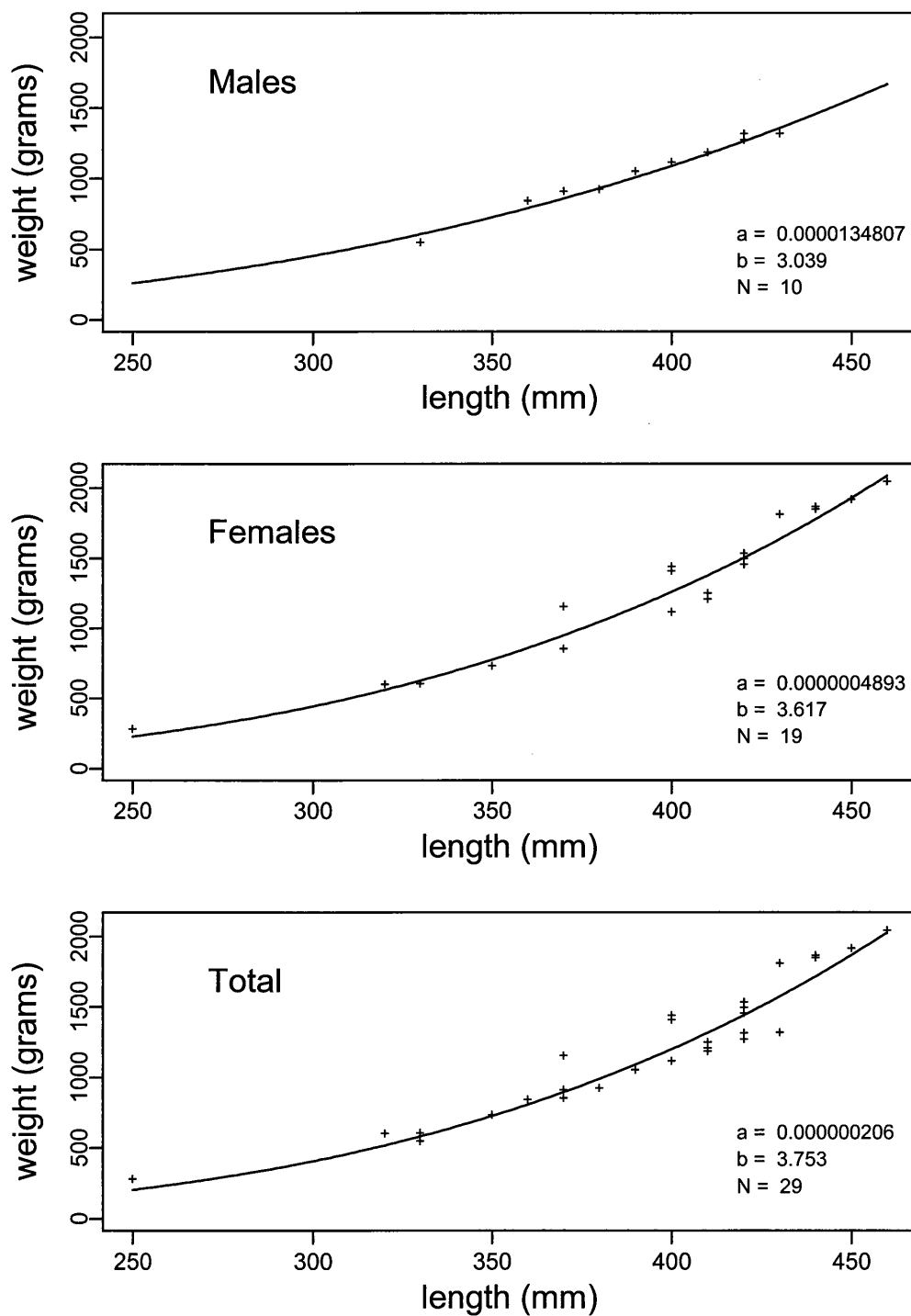


Figure 53.-- Length-weight relationship for dark dusky rockfish specimens collected during the 1999 Gulf of Alaska bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a \times Length_{(mm)}^b$.

Table 46.-- Catch per unit effort by stratum for dark dusky rockfish sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Lower	Upper
							C.I. Biomass	C.I. Biomass
Shumagin	1-100	Davidson Bank	29	2	154	2,104	0	6,201
Shumagin	101-200	Sanak Gully	9	1	6	27	0	89
Chirikof	101-200	Chirikof Outer Shelf	11	1	6	31	0	101
Kodiak	101-200	Kenai Flats	26	1	4	49	0	150

Sharpchin rockfish (*Sebastes zacentrus*)

Sharpchin rockfish were rarely captured west of Kodiak Island and were not recorded in the Shumagin INPFC area (Fig. 54). Sharpchin rockfish were captured most consistently in the Southeastern INPFC area where they were seen in over 38% of all tows compared with about 4% of the tows in the rest of the survey area (Table 47). The highest mean CPUE was noted in the Yakutat Slope stratum between 201 and 300 m where one tow accounted for over 65% of the total survey estimate for sharpchin rockfish (Table 48). Overall, the size composition of female sharpchin rockfish was larger than that of the males throughout the survey area (Fig. 55). The length-weight relationship for sharpchin rockfish specimens collected during the survey is depicted in Figure 56.

Table 47.-- Number of survey hauls, number of hauls with sharpchin rockfish, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	0	---	---	---	---
	101 - 200	31	0	---	---	---	---
	201 - 300	8	0	---	---	---	---
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	1	0	---	---	---	---
	All depths		147	0	---	---	---
Chirikof	1 - 100	59	0	---	---	---	---
	101 - 200	52	1	1	15	0.45	30.5
	201 - 300	35	0	---	---	---	---
	301 - 500	8	0	---	---	---	---
	501 - 700	6	0	---	---	---	---
	701 - 1000	8	0	---	---	---	---
	All depths		168	1	<1	15	0.45
Kodiak	1 - 100	86	0	---	---	---	---
	101 - 200	95	16	66	2,841	0.32	27.7
	201 - 300	36	0	---	---	---	---
	301 - 500	14	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	10	0	---	---	---	---
	All depths		246	16	28	2,841	0.32
Yakutat	1 - 100	38	0	---	---	---	---
	101 - 200	63	9	49	1,434	0.16	22.1
	201 - 300	14	2	2,648	13,691	0.33	28.7
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	3	0	---	---	---	---
	All depths		135	11	264	15,125	0.30
Southeastern	1 - 100	10	0	---	---	---	---
	101 - 200	24	12	228	2,523	0.28	26.0
	201 - 300	16	12	60	305	0.19	23.5
	301 - 500	14	2	10	31	0.29	27.4
	501 - 700	2	0	---	---	---	---
	701 - 1000	2	0	---	---	---	---
	All depths		68	26	102	2,860	0.27
All areas	1 - 100	283	0	---	---	---	---
	101 - 200	265	38	56	6,813	0.26	25.3
	201 - 300	109	14	388	13,996	0.33	28.5
	301 - 500	60	2	2	31	0.29	27.4
	501 - 700	23	0	---	---	---	---
	701 - 1000	24	0	---	---	---	---
	All depths		764	54	65	20,841	0.30

All areas biomass, 95% confidence interval: 0 - 54,401 metric tons (t).

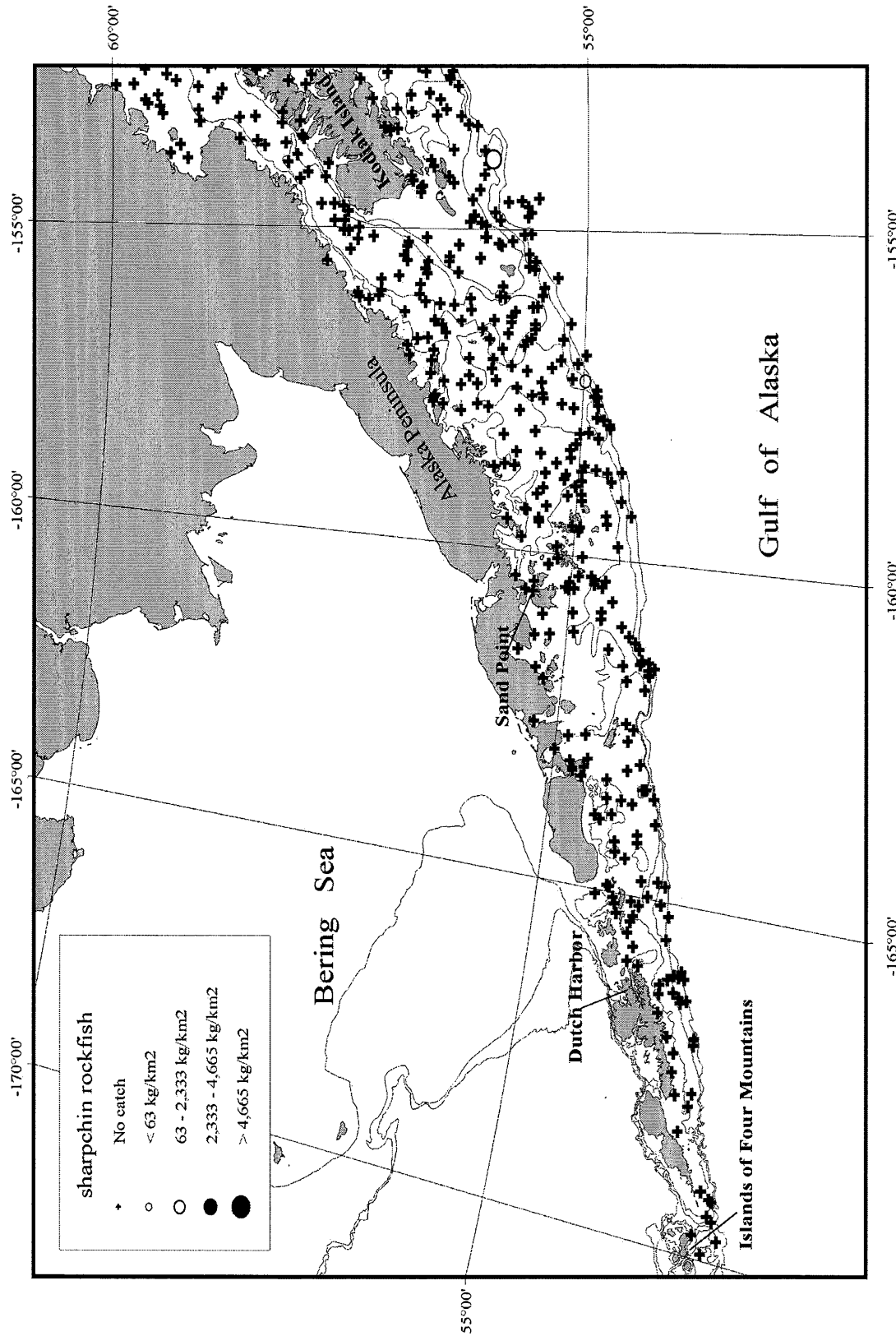


Figure 54.--Distribution and relative abundance of sharpchin rockfish from the 1999 Gulf of Alaska bottom trawl survey. Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations above mean CPUE, and greater than four standard deviations above mean CPUE. Each symbol is proportional to the sample CPUE.

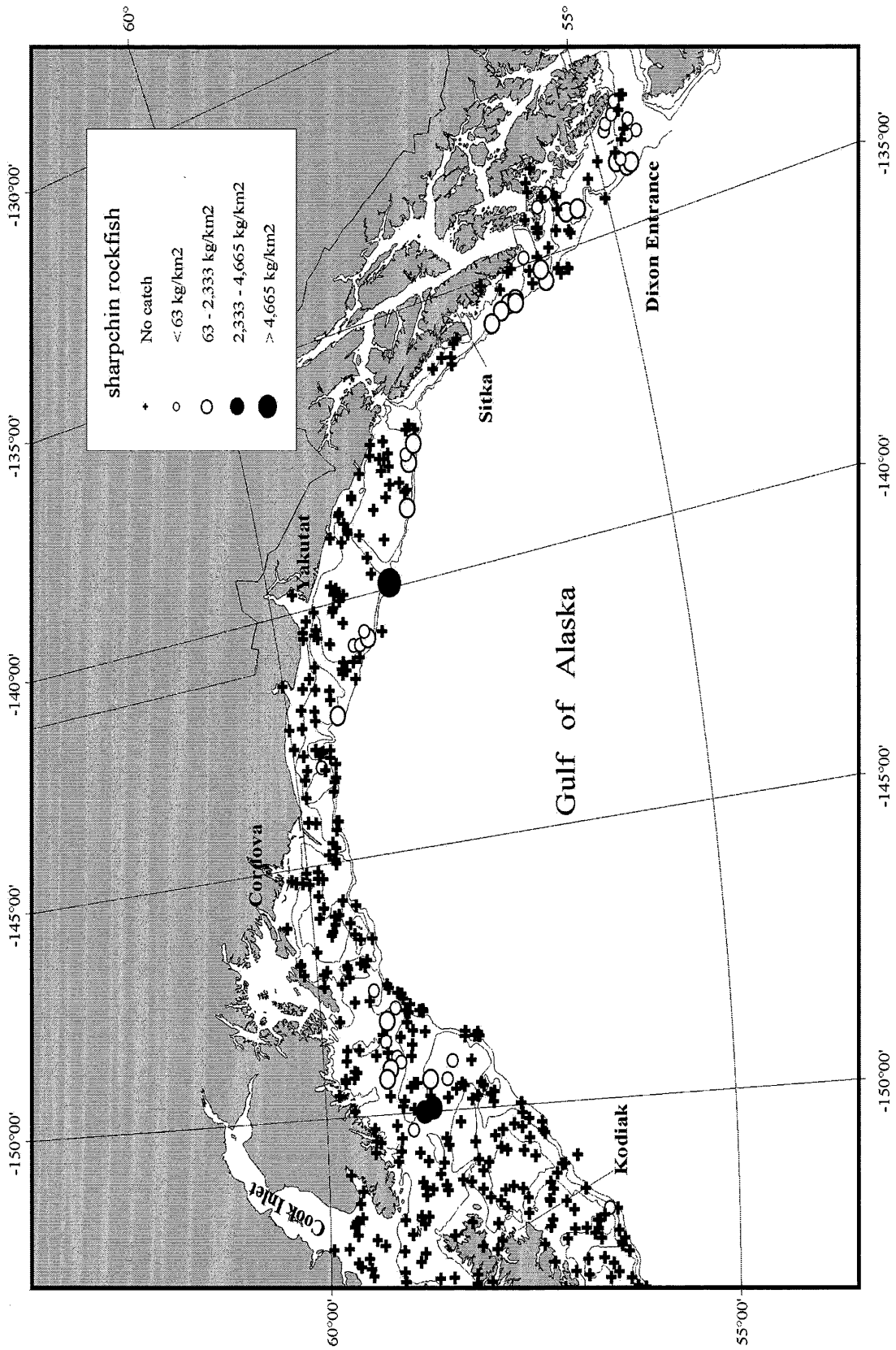


Figure 54.--Continued.

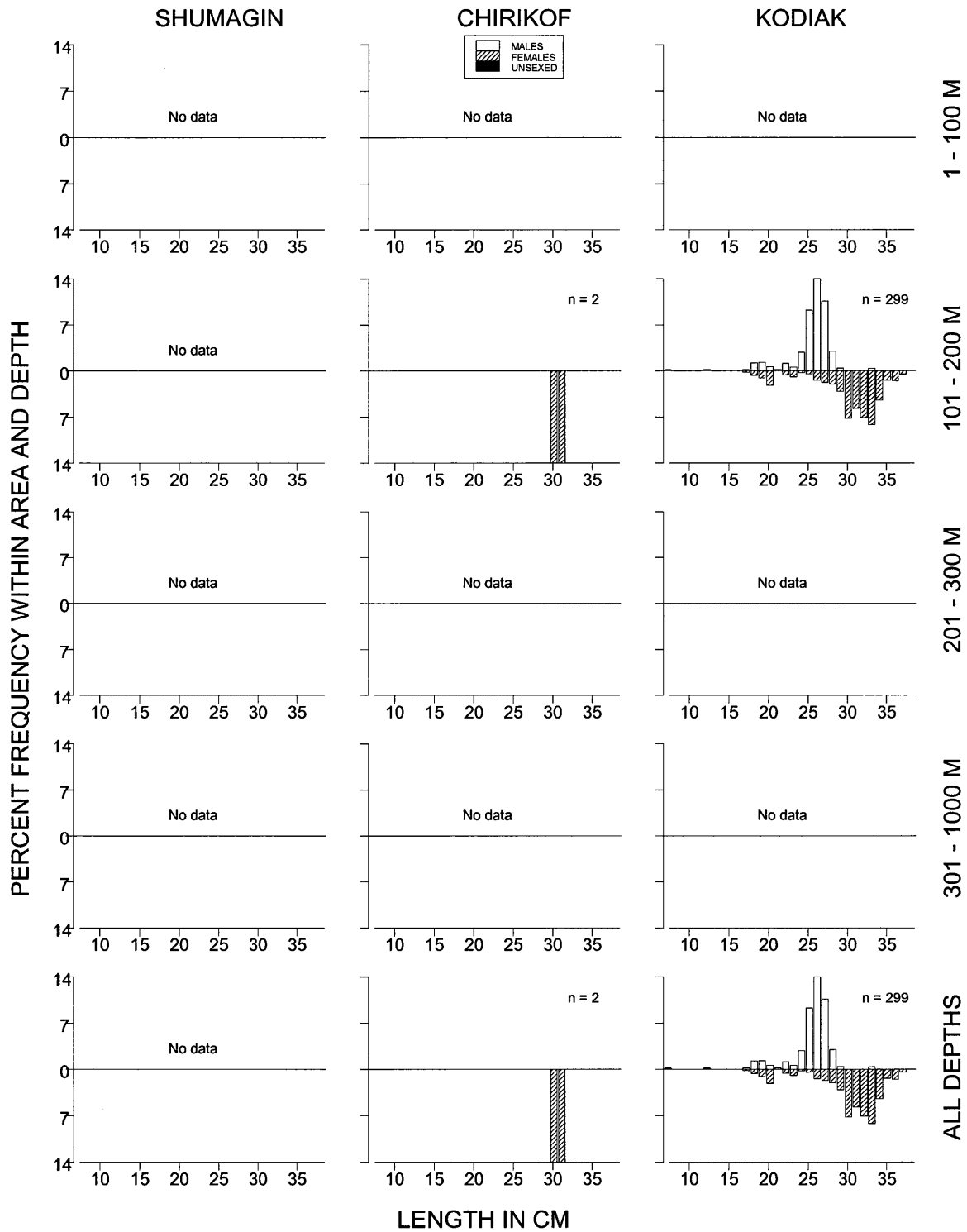


Figure 55.-- Size composition of the estimated sharpchin rockfish population from the 1999 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

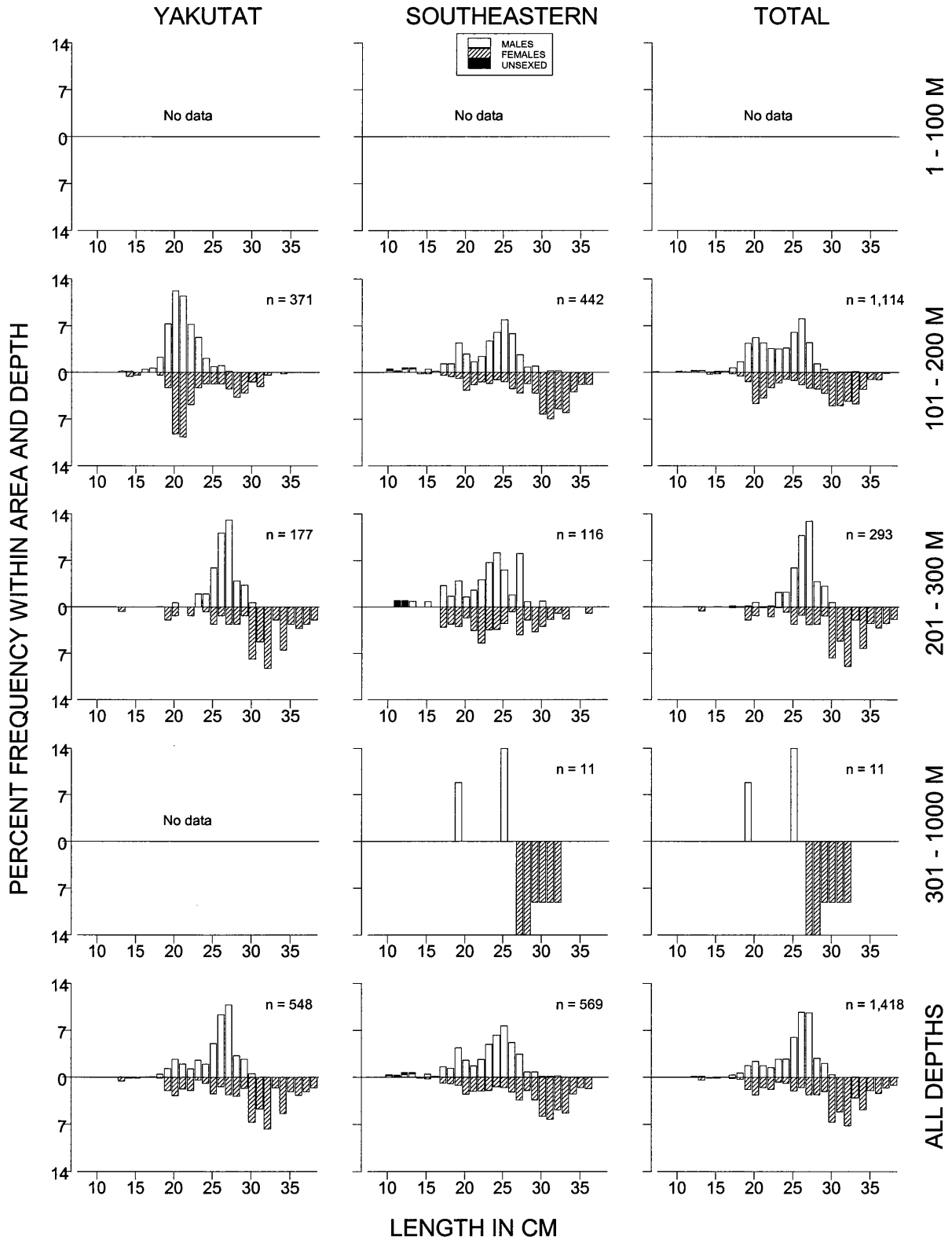


Figure 55.--Continued.

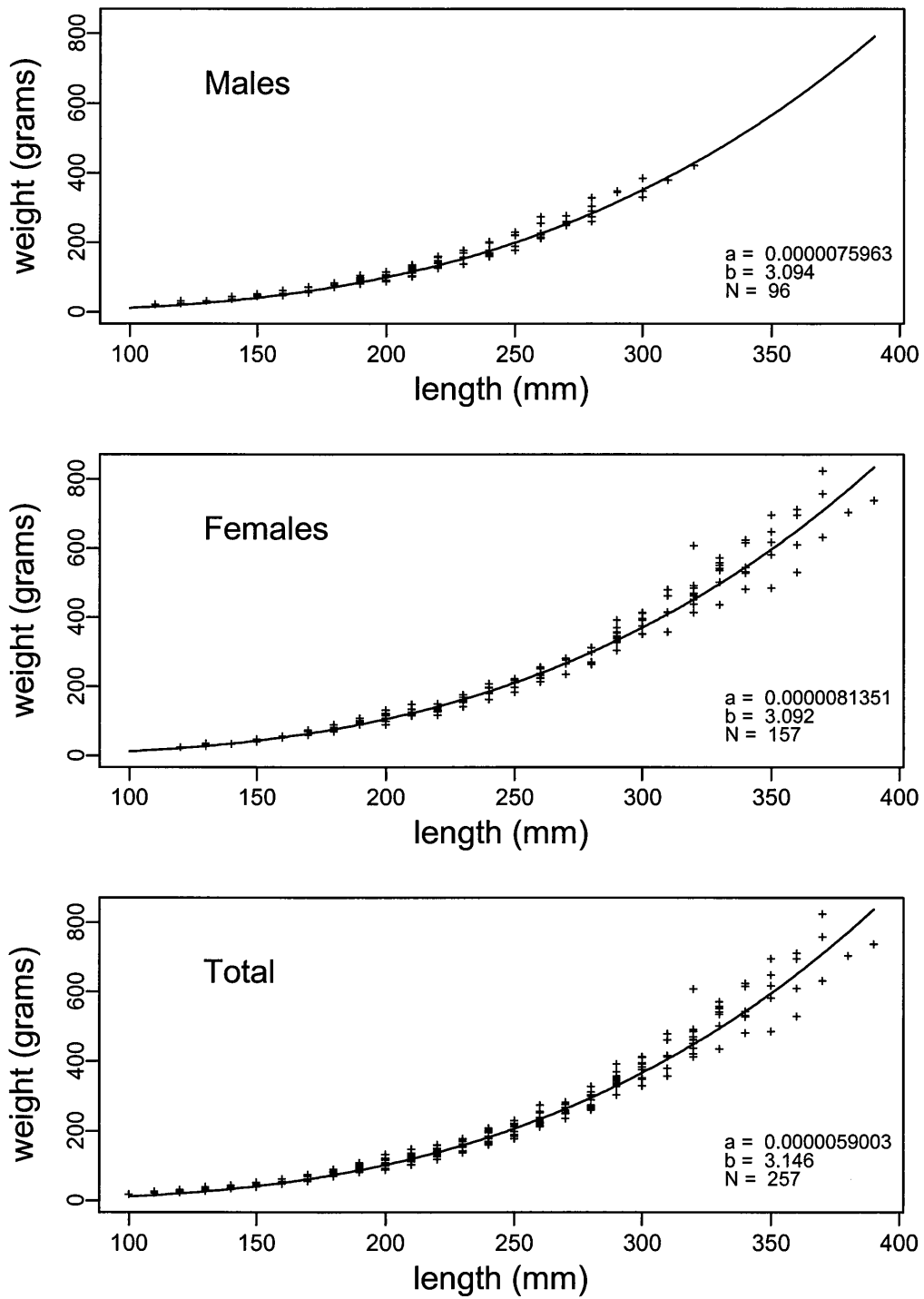


Figure 56.-- Length-weight relationship for sharpchin rockfish specimens collected during the 1999 Gulf of Alaska bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a \times Length_{(mm)}^b$.

Table 48.-- Catch per unit effort by stratum for sharpchin rockfish sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Lower	Upper
							C.I. Biomass	C.I. Biomass
Yakutat	201-300	Yakutat Slope	5	2	6,436	13,691	0	51,279
Southeastern	101-200	Baranof-Chichagof Shelf	10	3	357	1,498	0	3,422
Kodiak	101-200	Portlock Flats	16	6	340	2,492	0	5,986
Southeastern	101-200	Prince of Wales Shelf	14	9	149	1,025	0	2,709
Southeastern	201-300	Baranof-Chichagof Slope	3	3	145	163	0	649
Yakutat	101-200	Fairweather Shelf	17	4	95	730	0	1,880
Yakutat	101-200	Yakutat Flats	19	4	75	677	0	1,988
Southeastern	301-500	Southeastern Slope	4	1	40	31	0	128
Southeastern	201-300	Prince of Wales Slope/Gullies	13	9	36	142	0	288
Kodiak	101-200	Kenai Flats	26	7	25	299	0	635
Kodiak	101-200	Kodiak Outer Shelf	11	3	10	51	0	149
Yakutat	101-200	Yakataga Shelf	11	1	5	27	0	87
Chirikof	101-200	Chirikof Outer Shelf	11	1	3	15	0	48
Southeastern	301-500	Southeastern Deep Gullies	10	1	<1	1	0	3

Shortraker rockfish (*Sebastes borealis*)

Shortraker rockfish were consistently caught in tows between 301 and 500 m throughout the survey area (Fig. 57). In this depth range, shortraker rockfish were caught in about 87% of the tows, including all tows on the continental slope in this depth range except one. The highest mean CPUEs were also found on the slope, particularly in the Yakutat INPFC area (Table 50). In other depths of the survey area, shortraker rockfish were captured in just over 2% of the tows (Table 49). Mean fish size generally increased from west to east (Fig. 58). The length-weight relationship for shortraker rockfish specimens collected during the survey is depicted in Figure 59.

Table 49.-- Number of survey hauls, number of hauls with shortraker rockfish, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	0	---	---	---	---
	101 - 200	31	0	---	---	---	---
	201 - 300	8	1	59	165	4.03	62.3
	301 - 500	12	11	798	2,019	2.61	50.5
	501 - 700	5	1	12	24	1.39	44.0
	701 - 1000	1	0	---	---	---	---
	All depths		147	13	34	2,208	2.65
Chirikof	1 - 100	59	0	---	---	---	---
	101 - 200	52	0	---	---	---	---
	201 - 300	35	2	29	337	2.19	50.3
	301 - 500	8	8	2,222	3,563	2.49	51.5
	501 - 700	6	1	16	31	2.45	55.0
	701 - 1000	8	0	---	---	---	---
	All depths		168	11	58	3,931	2.46
Kodiak	1 - 100	86	0	---	---	---	---
	101 - 200	95	0	---	---	---	---
	201 - 300	36	2	33	378	4.88	65.3
	301 - 500	14	12	2,728	7,942	3.28	56.5
	501 - 700	5	2	80	139	3.67	59.9
	701 - 1000	10	0	---	---	---	---
	All depths		246	16	83	8,459	3.33
Yakutat	1 - 100	38	0	---	---	---	---
	101 - 200	63	1	4	108	5.30	67.0
	201 - 300	14	5	332	1,718	4.34	63.2
	301 - 500	12	11	2,963	7,787	4.15	60.2
	501 - 700	5	2	119	175	4.56	65.9
	701 - 1000	3	0	---	---	---	---
	All depths		135	19	171	9,788	4.20
Southeastern	1 - 100	10	0	---	---	---	---
	101 - 200	24	0	---	---	---	---
	201 - 300	16	0	---	---	---	---
	301 - 500	14	10	1,233	3,845	6.66	71.2
	501 - 700	2	0	---	---	---	---
	701 - 1000	2	0	---	---	---	---
	All depths		68	10	137	3,845	6.66
All areas	1 - 100	283	0	---	---	---	---
	101 - 200	265	1	1	108	5.30	67.0
	201 - 300	109	10	72	2,598	3.89	60.4
	301 - 500	60	52	1,967	25,156	3.55	57.0
	501 - 700	23	6	45	369	3.48	59.0
	701 - 1000	24	0	---	---	---	---
	All depths		764	69	88	28,231	3.58

All areas biomass, 95% confidence interval: 16,798 - 39,664 metric tons (t).

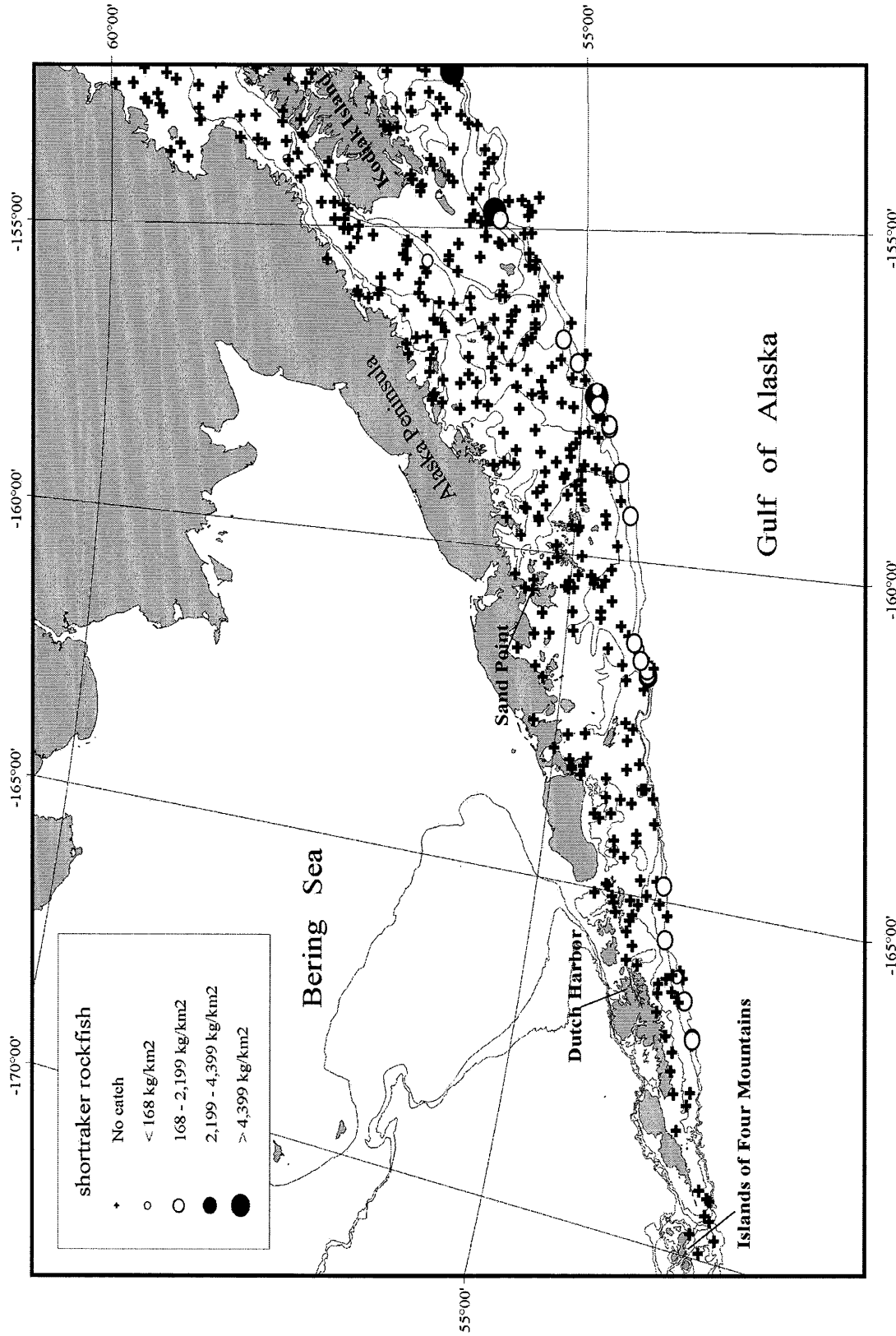


Figure 57.--Distribution and relative abundance of shortraker rockfish from the 1999 Gulf of Alaska bottom trawl survey. Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations above mean CPUE, and greater than four standard deviations above mean CPUE. Each symbol is proportional to the sample CPUE.

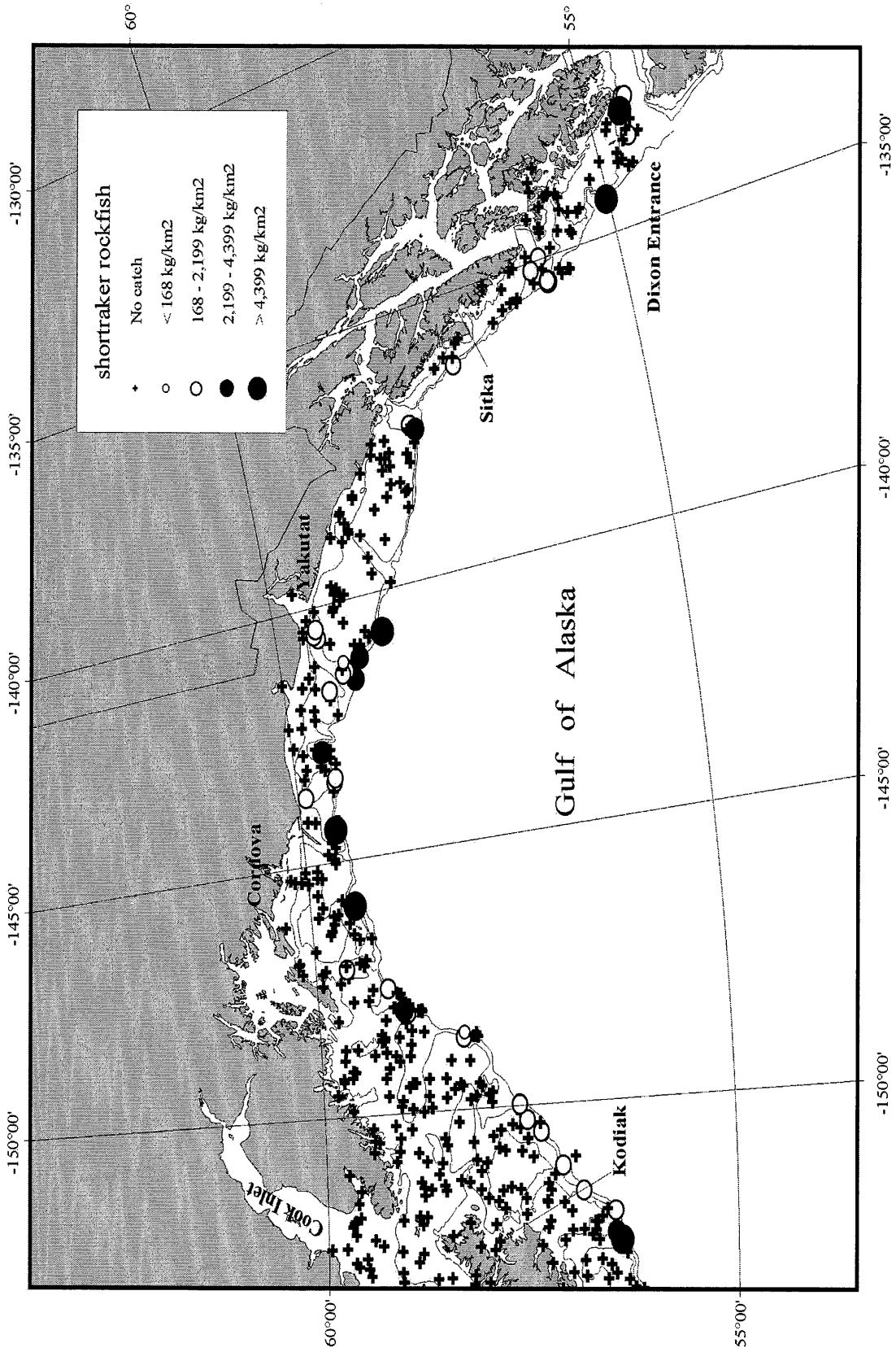


Figure 57.--Continued.

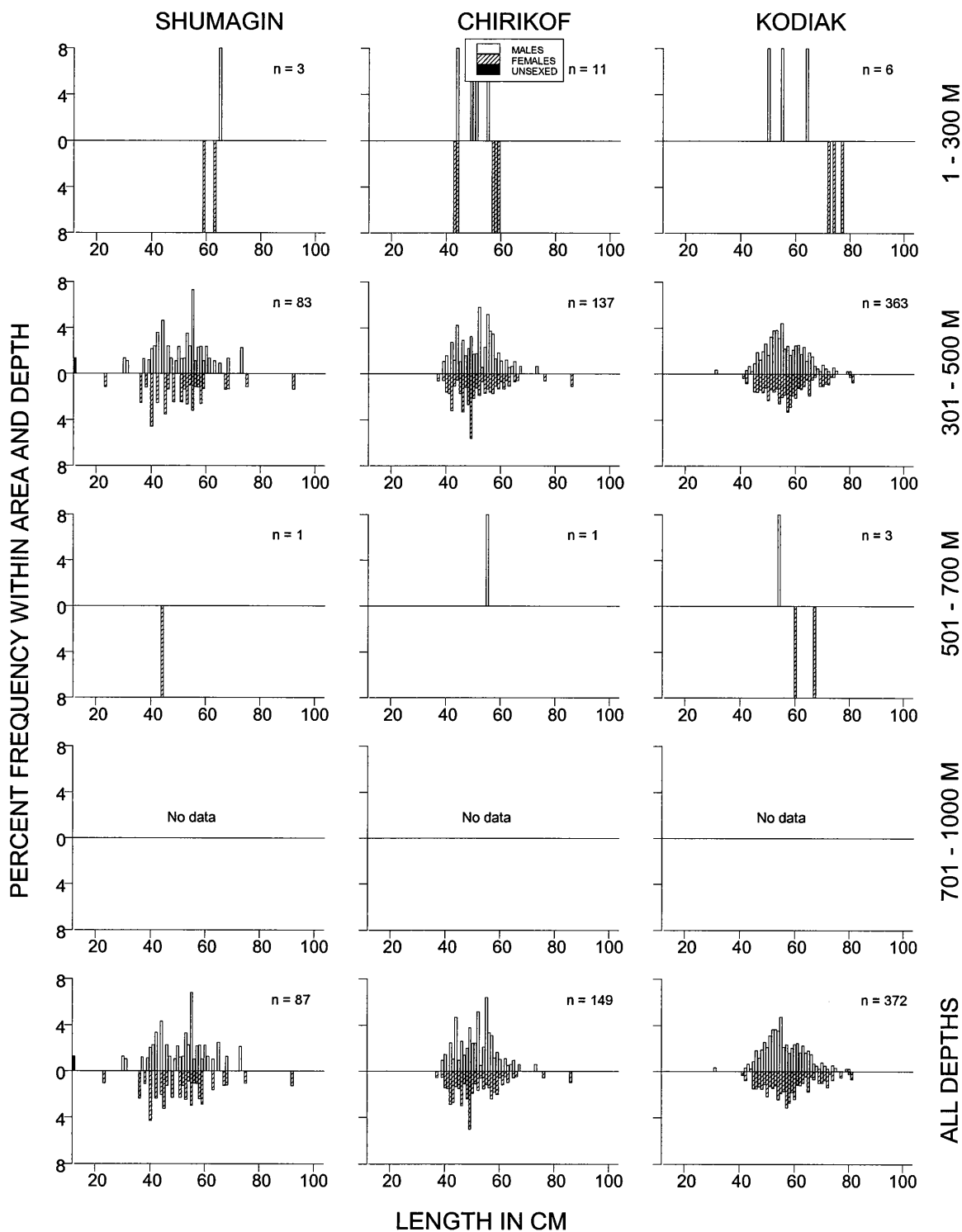


Figure 58.-- Size composition of the estimated shorttraker rockfish population from the 1999 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

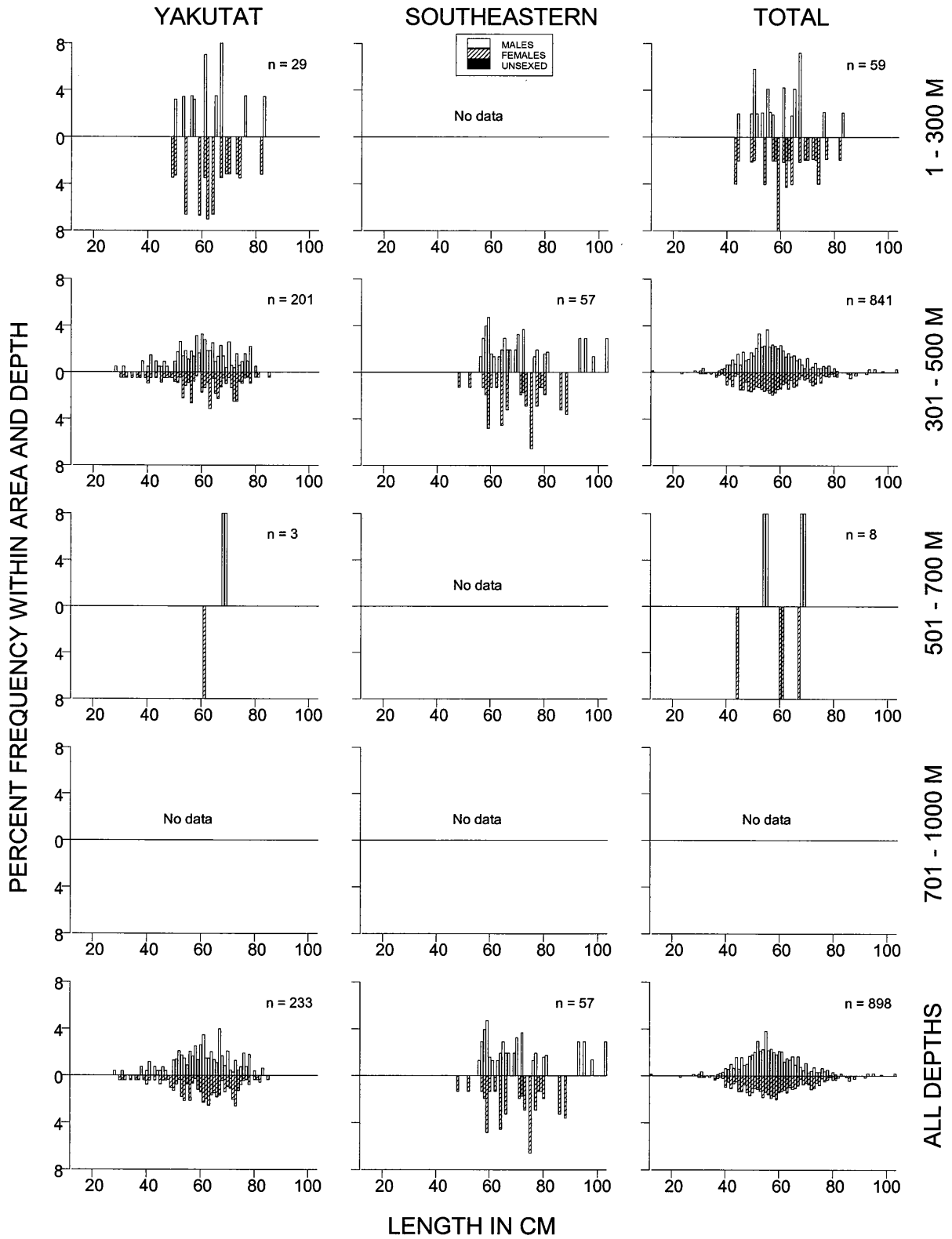


Figure 58.--Continued.

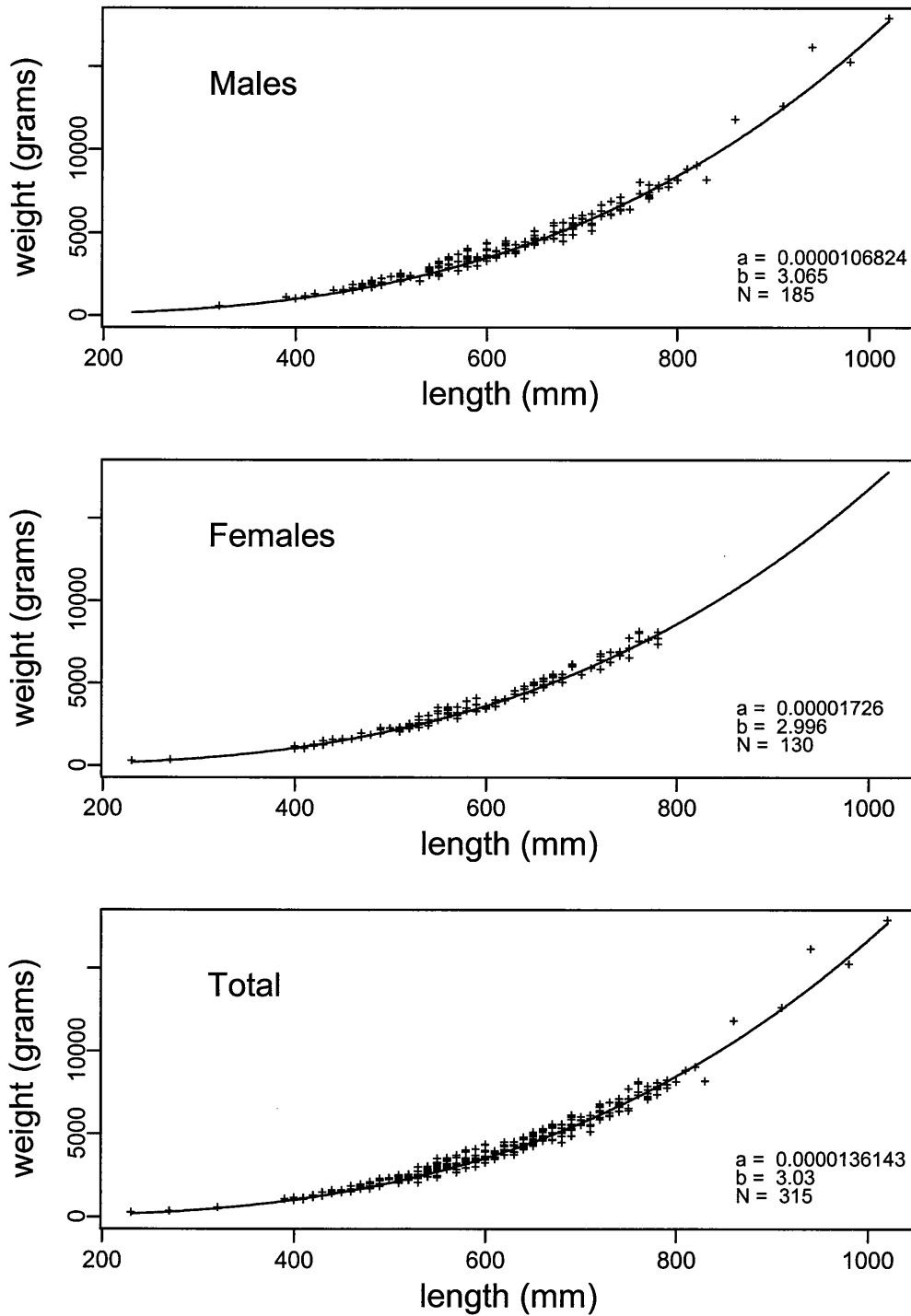


Figure 59.-- Length-weight relationship for shorttraker rockfish specimens collected during the 1999 Gulf of Alaska bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a \times Length_{(mm)}^b$.

Table 50.-- Catch per unit effort by stratum for shorttraker rockfish sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Hauls		CPUE (kg/km ²)	Biomass (t)	Lower	Upper
			Number of hauls	with catch			C.I. Biomass	C.I. Biomass
Yakutat	301-500	Yakutat Slope	7	7	4,122	6,268	3,909	8,627
Kodiak	301-500	Kodiak Slope	14	12	2,728	7,942	0	18,424
Southeastern	301-500	Southeastern Slope	4	4	2,639	2,039	0	4,267
Chirikof	301-500	Chirikof Slope	8	8	2,222	3,563	94	7,032
Yakutat	301-500	Yakutat Gullies	5	4	1,372	1,519	23	3,014
Shumagin	301-500	Shumagin Slope	12	11	798	2,019	208	3,831
Southeastern	301-500	Southeastern Deep Gullies	10	6	770	1,806	0	4,474
Yakutat	201-300	Yakutat Gullies	9	5	565	1,718	0	3,572
Kodiak	201-300	Kodiak Slope	5	1	200	324	0	1,225
Chirikof	201-300	Chirikof Slope	5	1	196	300	0	1,133
Yakutat	501-700	Yakutat Slope	5	2	119	175	0	496
Kodiak	501-700	Kodiak Slope	5	2	80	139	0	413
Shumagin	201-300	Shumagin Slope	8	1	59	165	0	557
Yakutat	101-200	Yakataga Shelf	11	1	20	108	0	347
Chirikof	501-700	Chirikof Slope	6	1	16	31	0	111
Shumagin	501-700	Shumagin Slope	5	1	12	24	0	89
Kodiak	201-300	Kenai Gullies	21	1	8	53	0	165
Chirikof	201-300	Lower Shelikof Gully	30	1	4	37	0	112

Shortspine thornyhead (*Sebastolobus alascanus*)

Shortspine thornyhead were found throughout the survey area at all depths, including all tows greater than 300 m (Table 51). Mean CPUEs were generally highest along the continental slope and deeper gullies between 301 and 700 m (Fig. 60: Table 52). Catch sizes were generally much less variable than other rockfish species as evidenced by the relatively narrow confidence intervals for individual strata and the overall survey abundance estimate (Tables 51 and 52). Population length distributions were similar in all areas, with both males and females exhibiting length modes between 24 and 30 cm FL (Fig. 61). The length-weight relationship for shortspine thornyhead specimen collected during the survey is depicted in Figure 62.

Table 51.-- Number of survey hauls, number of hauls with shortspine thornyhead, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	1	<1	4	0.18	---
	101 - 200	31	4	3	37	0.30	29.0
	201 - 300	8	6	806	2,248	0.24	26.3
	301 - 500	12	12	1,872	4,739	0.23	25.4
	501 - 700	5	5	2,687	5,389	0.30	28.6
	701 - 1000	1	1	866	1,679	0.50	32.1
	All depths	147	29	216	14,097	0.27	27.1
Chirikof	1 - 100	59	0	---	---	---	---
	101 - 200	52	3	5	118	0.16	25.2
	201 - 300	35	9	253	2,922	0.29	27.5
	301 - 500	8	8	3,358	5,386	0.35	29.1
	501 - 700	6	6	2,085	4,073	0.33	28.1
	701 - 1000	8	8	434	1,331	0.59	34.3
	All depths	168	34	203	13,830	0.34	28.6
Kodiak	1 - 100	86	1	<1	2	0.10	21.0
	101 - 200	95	10	13	572	0.30	26.9
	201 - 300	36	25	669	7,683	0.25	26.3
	301 - 500	14	14	2,147	6,252	0.23	24.9
	501 - 700	5	5	1,520	2,652	0.19	22.3
	701 - 1000	10	10	458	1,599	0.36	29.8
	All depths	246	65	185	18,759	0.24	25.3
Yakutat	1 - 100	38	4	7	111	0.30	27.9
	101 - 200	63	26	96	2,816	0.21	24.4
	201 - 300	14	14	1,178	6,088	0.21	24.8
	301 - 500	12	12	1,708	4,487	0.19	23.5
	501 - 700	5	5	1,105	1,624	0.25	26.4
	701 - 1000	3	3	910	1,717	0.34	29.3
	All depths	135	64	294	16,844	0.22	24.8
Southeastern	1 - 100	10	0	---	---	---	---
	101 - 200	24	10	81	903	0.15	22.2
	201 - 300	16	16	886	4,477	0.18	23.2
	301 - 500	14	14	2,248	7,008	0.20	24.1
	501 - 700	2	2	1,194	1,234	0.35	28.9
	701 - 1000	2	2	170	205	0.44	32.2
	All depths	68	44	493	13,825	0.20	23.9
All areas	1 - 100	283	6	1	116	0.29	27.6
	101 - 200	265	53	36	4,446	0.20	24.1
	201 - 300	109	70	650	23,418	0.23	25.3
	301 - 500	60	60	2,179	27,872	0.23	25.0
	501 - 700	23	23	1,824	14,972	0.27	26.6
	701 - 1000	24	24	563	6,531	0.42	30.9
	All depths	764	236	242	77,355	0.24	25.6

All areas biomass, 95% confidence interval: 69,362 - 85,348 metric tons (t).

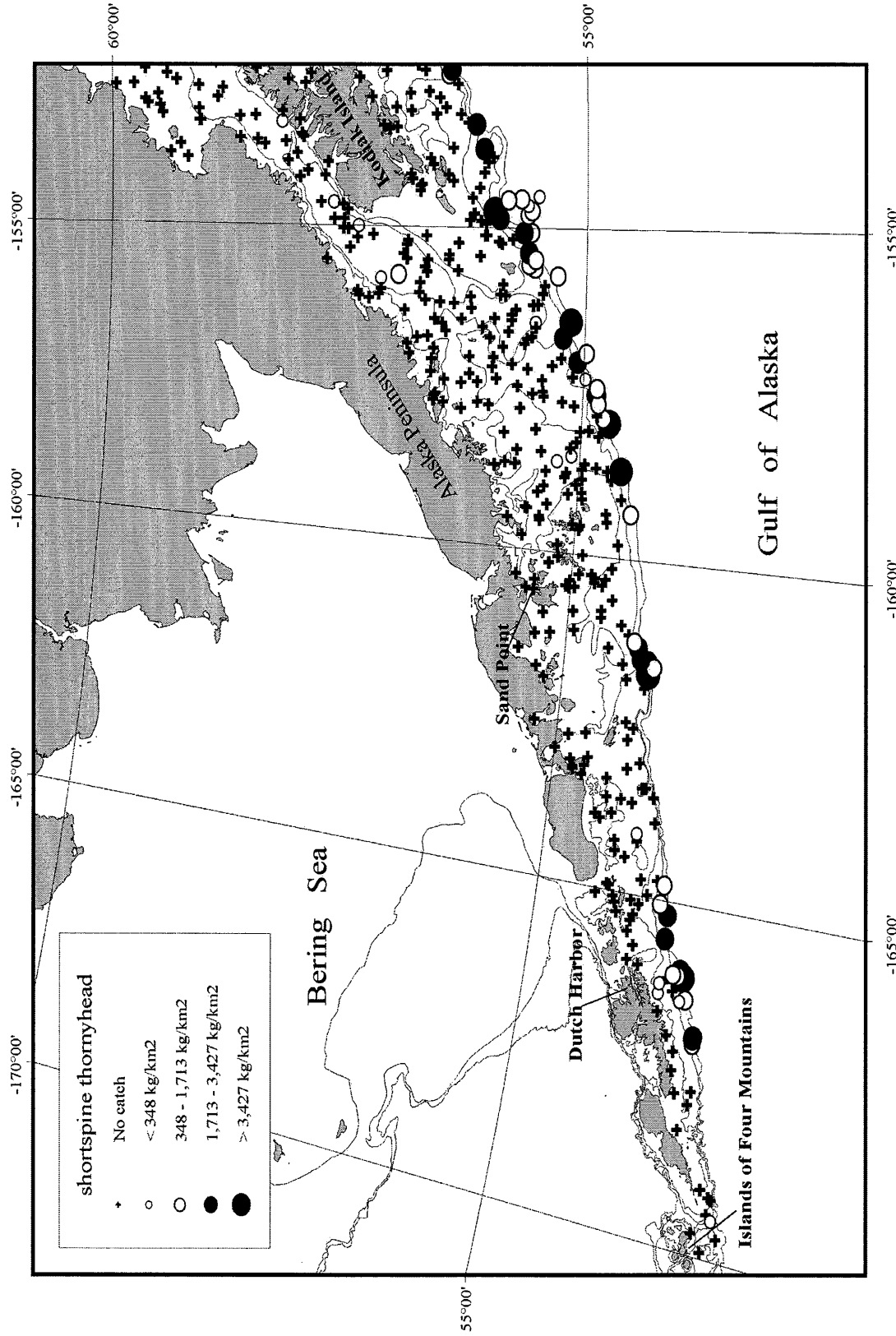


Figure 60.--Distribution and relative abundance of shortspine thornyhead from the 1999 Gulf of Alaska bottom trawl survey. Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations above mean CPUE, and greater than four standard deviations above mean CPUE. Each symbol is proportional to the sample CPUE.

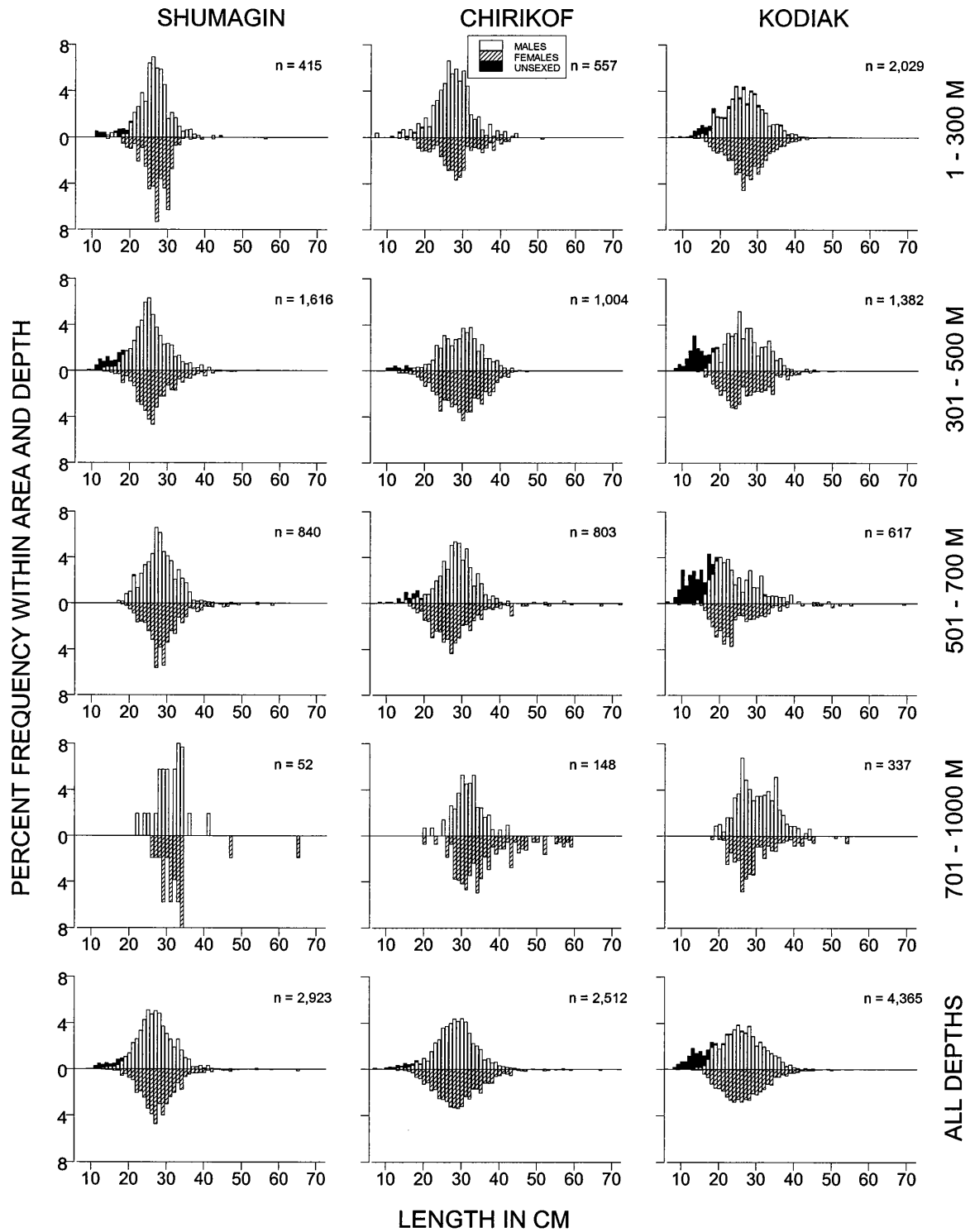


Figure 61.-- Size composition of the estimated shortspine thornyhead population from the 1999 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

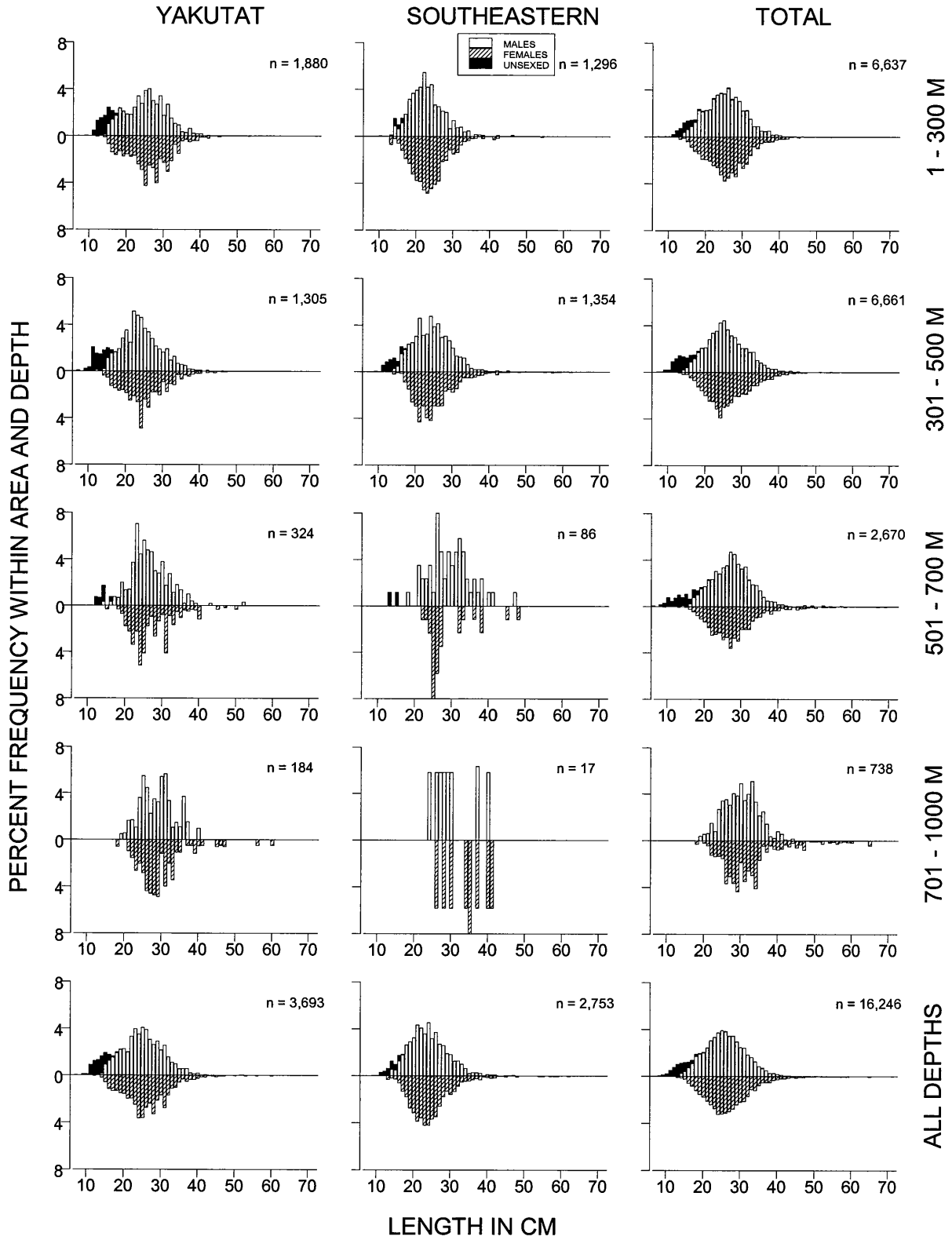


Figure 61.--Continued.

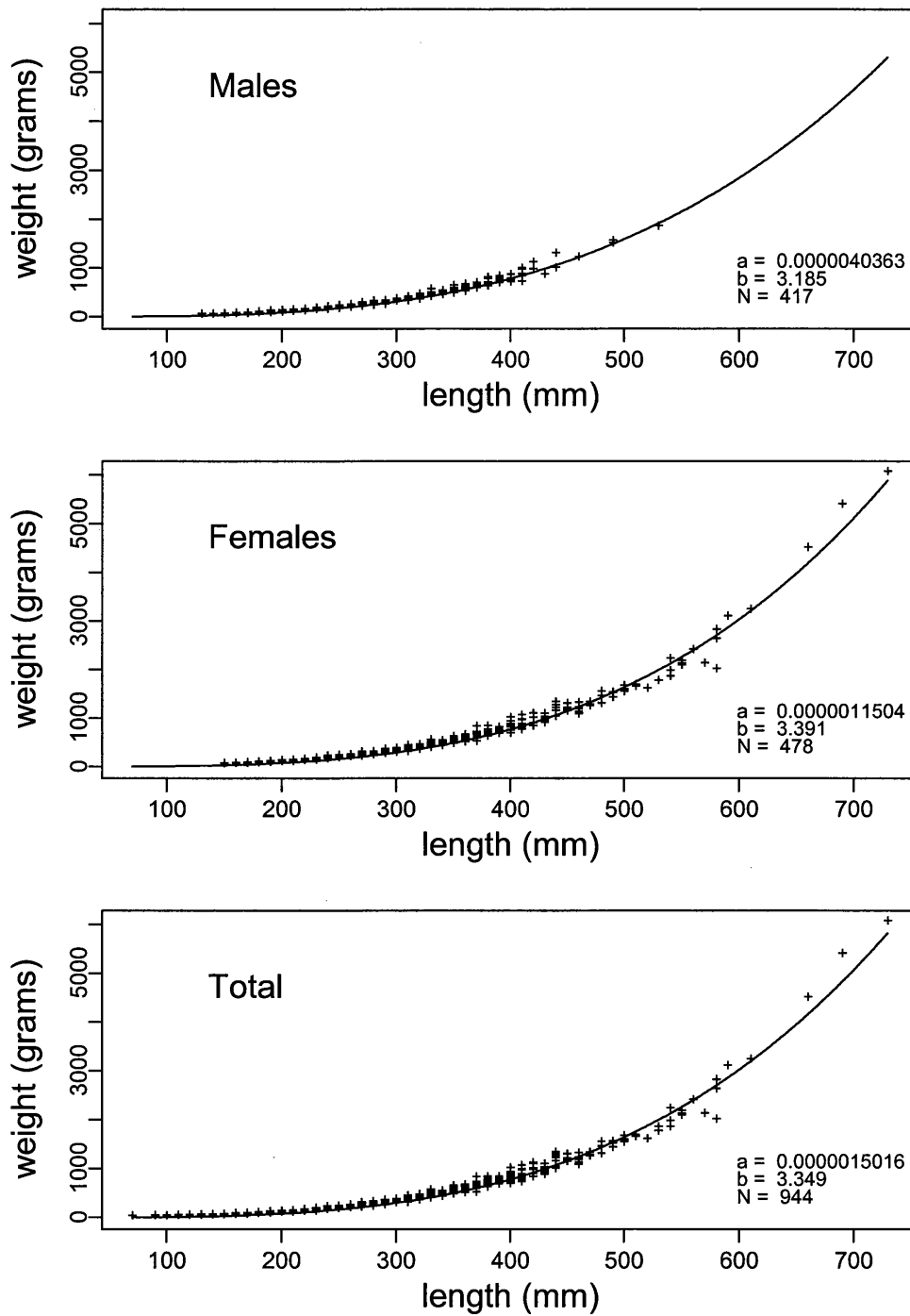


Figure 62.-- Length-weight relationship for shortspine thornyhead specimens collected during the 1999 Gulf of Alaska bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a \times Length_{(mm)}^b$.

Table 52.-- Catch per unit effort by stratum for shortspine thornyhead sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Lower	Upper
							C.I. Biomass	C.I. Biomass
Chirikof	301-500	Chirikof Slope	8	8	3,358	5,386	2,736	8,036
Southeastern	301-500	Southeastern Slope	4	4	3,316	2,562	478	4,647
Shumagin	501-700	Shumagin Slope	5	5	2,687	5,389	3,107	7,671
Kodiak	301-500	Kodiak Slope	14	14	2,147	6,252	4,288	8,216
Yakutat	301-500	Yakutat Slope	7	7	2,089	3,177	1,949	4,405
Chirikof	501-700	Chirikof Slope	6	6	2,085	4,073	1,855	6,290
Southeastern	301-500	Southeastern Deep Gullies	10	10	1,896	4,445	2,061	6,830
Shumagin	301-500	Shumagin Slope	12	12	1,872	4,739	2,866	6,613
Chirikof	201-300	Chirikof Slope	5	5	1,725	2,636	710	4,562
Kodiak	201-300	Kodiak Slope	5	5	1,674	2,717	524	4,909
Kodiak	501-700	Kodiak Slope	5	5	1,520	2,652	1,570	3,735
Southeastern	201-300	Baranof-Chichagof Slope	3	3	1,362	1,533	0	4,784
Yakutat	201-300	Yakutat Gullies	9	9	1,218	3,707	555	6,859
Southeastern	501-700	Southeastern Slope	2	2	1,194	1,234	0	10,190
Yakutat	301-500	Yakutat Gullies	5	5	1,183	1,310	615	2,006
Yakutat	201-300	Yakutat Slope	5	5	1,119	2,381	165	4,598
Yakutat	501-700	Yakutat Slope	5	5	1,105	1,624	625	2,624
Yakutat	701-1000	Yakutat Slope	3	3	910	1,717	0	4,505
Shumagin	701-1000	Shumagin Slope	1	1	866	1,679		
Shumagin	201-300	Shumagin Slope	8	6	806	2,248	0	5,533
Southeastern	201-300	Prince of Wales Slope/Gullies	13	13	750	2,944	855	5,034
Kodiak	201-300	Kenai Gullies	21	19	730	4,864	3,383	6,344
Kodiak	701-1000	Kodiak Slope	10	10	458	1,599	859	2,339
Chirikof	701-1000	Chirikof Slope	8	8	434	1,331	609	2,053
Yakutat	101-200	Yakataga Shelf	11	9	252	1,331	0	3,066
Southeastern	101-200	Baranof-Chichagof Shelf	10	6	179	751	0	1,771
Southeastern	701-1000	Southeastern Slope	2	2	170	205	0	1,885
Yakutat	101-200	Middleton Shelf	16	7	96	706	21	1,390
Yakutat	101-200	Yakutat Flats	19	6	58	526	0	1,384
Kodiak	101-200	Kenai Flats	26	8	36	439	0	891
Yakutat	101-200	Fairweather Shelf	17	4	33	254	0	598
Kodiak	201-300	Upper Shelikof Gully	10	1	32	102	0	334
Chirikof	201-300	Lower Shelikof Gully	30	4	29	286	0	817
Southeastern	101-200	Prince of Wales Shelf	14	4	22	152	0	345
Kodiak	101-200	Portlock Flats	16	1	15	109	0	342
Chirikof	101-200	Chirikof Outer Shelf	11	1	12	61	0	197
Yakutat	1-100	Yakutat Shallows	23	3	11	105	0	229
Chirikof	101-200	East Shumagin Gully	24	2	5	57	0	172
Shumagin	101-200	Shumagin Outer Shelf	17	4	5	37	0	77
Kodiak	101-200	Barren Islands	24	1	2	24	0	74
Yakutat	1-100	Middleton Shallows	15	1	1	5	0	17
Shumagin	1-100	Davidson Bank	29	1	<1	4	0	12
Kodiak	1-100	Kenai Peninsula	12	1	<1	2	0	6

Other Rockfish

Redstripe rockfish (*Sebastes proriger*)

Redstripe rockfish were rare outside of the Southeastern INPFC area and were not captured in the Shumagin INPFC area (Table 53). Approximately 98% of the total survey area biomass was estimated to be in the Southeastern INPFC area. Two tows in the Prince of Wales Slope and Gullies stratum accounted for about 68% of the total estimate (Table 54). This area makes up just over 1% of the entire survey area. Mean fish size generally increased with depth.

Silvergray rockfish (*Sebastes brevispinus*)

Silvergray rockfish were captured only east of Kodiak Island, and CPUEs were generally low outside of the Southeastern INPFC area where they were estimated to be the fourth most abundant groundfish species (Tables 2 and 55). The highest mean CPUEs were noted in the shelf, slope and gullies off Prince of Wales Island (Table 56). Silvergray rockfish were captured in over 81% of the tows in the Southeastern INPFC area between 201 and 300 m. Mean fish size generally increased with depth.

Harlequin rockfish (*Sebastes variegatus*)

Harlequin rockfish were caught infrequently and in modest numbers throughout the survey area between 101 and 300 m, although the mean CPUEs were highest in the Kodiak

INPFC area (Tables 57 and 58). In the Kodiak INPFC area, three tows in two strata combined to account for about two-thirds of the total survey area biomass estimate (Table 58). Mean fish size generally increased with depth.

Redbanded rockfish (*Sebastes babcocki*)

Redbanded rockfish were caught infrequently and in low numbers west of Prince William Sound (Table 59). They were found in the greatest abundance in the Southeastern INPFC area where they were captured in nearly 60% of the tows between 101 and 500 m (Table 59). Approximately 75% of the total biomass was estimated to be found in the shelf, slope and gully strata near Prince of Wales Island (Table 60).

Yellowmouth rockfish (*Sebastes reedi*)

Yellowmouth rockfish were captured in only three tows in three different strata over the course of the survey (Table 61). The highest CPUE of these three tows occurred in the Prince of Wales Slope and Gullies stratum (Table 62) and this tow accounted for over 99% of the total survey area biomass estimate.

Yelloweye rockfish (*Sebastes ruberrimus*)

Yelloweye rockfish CPUEs were caught infrequently and in low numbers throughout the survey and were not caught in the Shumagin INPFC area (Table 63). Yelloweye rockfish

were captured most frequently and in the highest numbers in the Kodiak INPFC area between 101 and 200 m, although the Prince of Wales shelf stratum had the highest mean CPUE of the survey (Tables 63 and 64).

Rosethorn rockfish (*Sebastes helvomaculatus*)

Rosethorn rockfish were captured only in the Yakutat and Southeastern INPFC areas (Table 65) and CPUEs in these areas were generally quite low. The highest mean CPUE was noted in the Yakutat Slope stratum between 201 and 300 m, although the estimated biomass was higher in other strata (Table 66) due to the small area of this stratum.

Table 53.-- Number of survey hauls, number of hauls with redstripe rockfish, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	0	---	---	---	---
	101 - 200	31	0	---	---	---	---
	201 - 300	8	0	---	---	---	---
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	1	0	---	---	---	---
	All depths		147	0	---	---	---
Chirikof	1 - 100	59	0	---	---	---	---
	101 - 200	52	0	---	---	---	---
	201 - 300	35	1	1	8	0.60	---
	301 - 500	8	0	---	---	---	---
	501 - 700	6	0	---	---	---	---
	701 - 1000	8	0	---	---	---	---
	All depths		168	1	<1	8	0.60
Kodiak	1 - 100	86	1	<1	14	0.38	---
	101 - 200	95	3	3	117	0.83	---
	201 - 300	36	0	---	---	---	---
	301 - 500	14	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	10	0	---	---	---	---
	All depths		246	4	1	131	0.74
Yakutat	1 - 100	38	0	---	---	---	---
	101 - 200	63	1	1	15	0.67	---
	201 - 300	14	1	5	25	0.76	---
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	3	0	---	---	---	---
	All depths		135	2	1	40	0.73
Southeastern	1 - 100	10	1	2	11	0.06	---
	101 - 200	24	7	219	2,424	0.63	---
	201 - 300	16	3	1,111	5,613	0.67	---
	301 - 500	14	0	---	---	---	---
	501 - 700	2	0	---	---	---	---
	701 - 1000	2	0	---	---	---	---
	All depths		68	11	287	8,047	0.65
All areas	1 - 100	283	2	<1	25	0.11	---
	101 - 200	265	11	21	2,555	0.64	---
	201 - 300	109	5	157	5,646	0.67	---
	301 - 500	60	0	---	---	---	---
	501 - 700	23	0	---	---	---	---
	701 - 1000	24	0	---	---	---	---
	All depths		764	18	26	8,226	0.65

All areas biomass, 95% confidence interval: 0 - 16,618 metric tons (t).

Table 54.-- Catch per unit effort by stratum for redstripe rockfish sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/km²)	Biomass (t)	Lower C.I. Biomass	Upper C.I. Biomass
Southeastern	201-300	Prince of Wales Slope/Gullies	13	2	1,428	5,607	0	13,916
Southeastern	101-200	Prince of Wales Shelf	14	4	324	2,230	0	5,134
Southeastern	101-200	Baranof-Chichagof Shelf	10	3	46	194	0	490
Yakutat	201-300	Yakutat Slope	5	1	12	25	0	95
Kodiak	101-200	Portlock Flats	16	1	12	86	0	268
Chirikof	201-300	Chirikof Slope	5	1	5	8	0	31
Southeastern	201-300	Baranof-Chichagof Slope	3	1	5	6	0	30
Kodiak	101-200	Kodiak Outer Shelf	11	1	3	15	0	50
Yakutat	101-200	Yakataga Shelf	11	1	3	15	0	47
Kodiak	1-100	Kenai Peninsula	12	1	3	14	0	45
Southeastern	1-100	Southeastern Shallows	10	1	2	11	0	36
Kodiak	101-200	Kenai Flats	26	1	1	16	0	49

Table 55.-- Number of survey hauls, number of hauls with silvergrey rockfish, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	0	---	---	---	---
	101 - 200	31	0	---	---	---	---
	201 - 300	8	0	---	---	---	---
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	1	0	---	---	---	---
	All depths		147	0	---	---	---
Chirikof	1 - 100	59	0	---	---	---	---
	101 - 200	52	0	---	---	---	---
	201 - 300	35	0	---	---	---	---
	301 - 500	8	0	---	---	---	---
	501 - 700	6	0	---	---	---	---
	701 - 1000	8	0	---	---	---	---
	All depths		168	0	---	---	---
Kodiak	1 - 100	86	0	---	---	---	---
	101 - 200	95	1	155	6,730	1.62	48.1
	201 - 300	36	1	1	15	1.18	45.0
	301 - 500	14	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	10	0	---	---	---	---
	All depths		246	2	66	6,745	1.61
Yakutat	1 - 100	38	3	2	36	0.50	32.8
	101 - 200	63	13	186	5,478	1.75	50.0
	201 - 300	14	2	182	943	1.92	52.1
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	3	0	---	---	---	---
	All depths		135	18	113	6,456	1.75
Southeastern	1 - 100	10	3	16	107	1.25	45.8
	101 - 200	24	13	1,773	19,655	1.69	49.6
	201 - 300	16	13	913	4,614	1.88	52.3
	301 - 500	14	3	20	64	1.64	50.3
	501 - 700	2	0	---	---	---	---
	701 - 1000	2	0	---	---	---	---
	All depths		68	32	872	24,440	1.72
All areas	1 - 100	283	6	1	143	0.91	39.9
	101 - 200	265	27	260	31,862	1.68	49.3
	201 - 300	109	16	155	5,572	1.89	52.2
	301 - 500	60	3	5	64	1.64	50.3
	501 - 700	23	0	---	---	---	---
	701 - 1000	24	0	---	---	---	---
	All depths		764	52	118	37,641	1.70

All areas biomass, 95% confidence interval: 12,371 - 62,911 metric tons (t).

Table 56.-- Catch per unit effort by stratum for silvergrey rockfish sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Lower C.I. Biomass	Upper C.I. Biomass
Southeastern	101-200	Prince of Wales Shelf	14	9	2,790	19,214	0	39,205
Southeastern	201-300	Prince of Wales Slope/Gullies	13	12	1,167	4,581	0	11,692
Kodiak	101-200	Portlock Flats	16	1	917	6,730	0	21,071
Yakutat	101-200	Fairweather Shelf	17	5	606	4,679	0	11,530
Yakutat	201-300	Yakutat Slope	5	1	412	876	0	3,308
Yakutat	101-200	Yakataga Shelf	11	4	117	617	0	1,796
Southeastern	101-200	Baranof-Chichagof Shelf	10	4	105	440	0	882
Southeastern	201-300	Baranof-Chichagof Slope	3	1	30	33	0	176
Southeastern	301-500	Southeastern Deep Gullies	10	3	27	64	0	151
Yakutat	201-300	Yakutat Gullies	9	1	22	67	0	221
Yakutat	101-200	Yakutat Flats	19	4	20	182	0	375
Southeastern	1-100	Southeastern Shallows	10	3	16	107	0	241
Kodiak	201-300	Kodiak Slope	5	1	9	15	0	58
Yakutat	1-100	Yakutat Shallows	23	3	4	36	0	86

Table 57.-- Number of survey hauls, number of hauls with harlequin rockfish, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	0	---	---	---	---
	101 - 200	31	0	---	---	---	---
	201 - 300	8	1	3	7	0.54	34.0
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	1	0	---	---	---	---
	All depths		147	1	<1	7	0.54
Chirikof	1 - 100	59	0	---	---	---	---
	101 - 200	52	1	1	27	0.24	28.8
	201 - 300	35	1	12	139	0.40	31.6
	301 - 500	8	0	---	---	---	---
	501 - 700	6	0	---	---	---	---
	701 - 1000	8	0	---	---	---	---
	All depths		168	2	2	167	0.36
Kodiak	1 - 100	86	1	<1	3	0.15	21.0
	101 - 200	95	16	194	8,393	0.26	26.0
	201 - 300	36	0	---	---	---	---
	301 - 500	14	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	10	0	---	---	---	---
	All depths		246	17	83	8,396	0.26
Yakutat	1 - 100	38	0	---	---	---	---
	101 - 200	63	4	20	580	0.20	23.9
	201 - 300	14	1	90	465	0.22	25.3
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	3	0	---	---	---	---
	All depths		135	5	18	1,046	0.21
Southeastern	1 - 100	10	0	---	---	---	---
	101 - 200	24	6	23	254	0.16	22.7
	201 - 300	16	4	1	7	0.14	20.5
	301 - 500	14	0	---	---	---	---
	501 - 700	2	0	---	---	---	---
	701 - 1000	2	0	---	---	---	---
	All depths		68	10	9	261	0.16
All areas	1 - 100	283	1	<1	3	0.15	21.0
	101 - 200	265	27	76	9,255	0.25	25.7
	201 - 300	109	7	17	619	0.25	26.2
	301 - 500	60	0	---	---	---	---
	501 - 700	23	0	---	---	---	---
	701 - 1000	24	0	---	---	---	---
	All depths		764	35	31	9,877	0.25

All areas biomass, 95% confidence interval: 1,313 - 18,440 metric tons (t).

Table 58.-- Catch per unit effort by stratum for harlequin rockfish sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Lower	Upper
							C.I. Biomass	C.I. Biomass
Kodiak	101-200	Portlock Flats	16	4	436	3,198	0	7,538
Kodiak	101-200	Kenai Flats	26	5	329	3,970	0	11,199
Yakutat	201-300	Yakutat Slope	5	1	219	465	0	1,757
Kodiak	101-200	Kodiak Outer Shelf	11	5	217	1,089	0	2,715
Chirikof	201-300	Chirikof Slope	5	1	91	139	0	527
Yakutat	101-200	Fairweather Shelf	17	4	75	580	0	1,775
Southeastern	101-200	Prince of Wales Shelf	14	3	26	182	0	492
Kodiak	101-200	Albatross Gullies	18	2	17	136	0	412
Southeastern	101-200	Baranof-Chichagof Shelf	10	3	17	72	0	176
Chirikof	101-200	Chirikof Outer Shelf	11	1	5	27	0	88
Shumagin	201-300	Shumagin Slope	8	1	3	7	0	25
Southeastern	201-300	Prince of Wales Slope/Gullies	13	4	2	7	0	14
Kodiak	1-100	Kenai Peninsula	12	1	1	3	0	9

Table 59.-- Number of survey hauls, number of hauls with redbanded rockfish, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	0	---	---	---	---
	101 - 200	31	0	---	---	---	---
	201 - 300	8	1	38	107	1.56	43.6
	301 - 500	12	1	5	12	1.17	39.0
	501 - 700	5	0	---	---	---	---
	701 - 1000	1	0	---	---	---	---
	All depths		147	2	2	118	1.51
Chirikof	1 - 100	59	0	---	---	---	---
	101 - 200	52	1	1	20	0.98	37.0
	201 - 300	35	1	2	23	1.70	45.0
	301 - 500	8	1	1	2	0.26	26.0
	501 - 700	6	0	---	---	---	---
	701 - 1000	8	0	---	---	---	---
	All depths		168	3	1	45	1.08
Kodiak	1 - 100	86	0	---	---	---	---
	101 - 200	95	5	5	198	0.87	34.1
	201 - 300	36	6	14	161	0.90	35.2
	301 - 500	14	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	10	0	---	---	---	---
	All depths		246	11	4	358	0.88
Yakutat	1 - 100	38	0	---	---	---	---
	101 - 200	63	12	33	959	0.96	32.9
	201 - 300	14	10	40	206	0.49	28.6
	301 - 500	12	5	68	179	0.91	35.7
	501 - 700	5	0	---	---	---	---
	701 - 1000	3	0	---	---	---	---
	All depths		135	27	23	1,344	0.83
Southeastern	1 - 100	10	0	---	---	---	---
	101 - 200	24	11	580	6,433	1.54	43.1
	201 - 300	16	12	401	2,025	1.12	37.4
	301 - 500	14	9	198	618	1.06	37.7
	501 - 700	2	0	---	---	---	---
	701 - 1000	2	0	---	---	---	---
	All depths		68	32	324	9,076	1.38
All areas	1 - 100	283	0	---	---	---	---
	101 - 200	265	29	62	7,609	1.41	40.9
	201 - 300	109	30	70	2,521	1.01	36.0
	301 - 500	60	16	63	811	1.02	37.1
	501 - 700	23	0	---	---	---	---
	701 - 1000	24	0	---	---	---	---
	All depths		764	75	34	10,941	1.26

All areas biomass, 95% confidence interval: 1,313 - 18,440 metric tons (t).

Table 60.-- Catch per unit effort by stratum for redbanded rockfish sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Lower	Upper
							C.I. Biomass	C.I. Biomass
Southeastern	101-200	Prince of Wales Shelf	14	7	915	6,305	0	15,513
Southeastern	201-300	Prince of Wales Slope/Gullies	13	9	494	1,940	0	4,850
Southeastern	301-500	Southeastern Deep Gullies	10	6	250	585	0	1,215
Yakutat	101-200	Fairweather Shelf	17	5	89	687	0	1,431
Yakutat	301-500	Yakutat Gullies	5	1	77	85	0	322
Southeastern	201-300	Baranof-Chichagof Slope	3	3	75	85	0	389
Yakutat	301-500	Yakutat Slope	7	4	62	94	0	197
Kodiak	201-300	Kodiak Slope	5	3	50	81	0	176
Southeastern	301-500	Southeastern Slope	4	3	43	33	0	91
Yakutat	201-300	Yakutat Slope	5	4	41	86	0	219
Yakutat	201-300	Yakutat Gullies	9	6	39	119	36	203
Shumagin	201-300	Shumagin Slope	8	1	38	107	0	359
Southeastern	101-200	Baranof-Chichagof Shelf	10	4	31	128	0	287
Yakutat	101-200	Yakutat Flats	19	6	30	271	0	727
Kodiak	101-200	Portlock Flats	16	3	20	144	0	329
Chirikof	201-300	Chirikof Slope	5	1	15	23	0	86
Kodiak	201-300	Kenai Gullies	21	3	12	80	0	204
Shumagin	301-500	Shumagin Slope	12	1	5	12	0	38
Kodiak	101-200	Albatross Gullies	18	1	3	22	0	68
Kodiak	101-200	Barren Islands	24	1	3	31	0	96
Chirikof	101-200	Shelikof Edge	17	1	3	20	0	61
Chirikof	301-500	Chirikof Slope	8	1	1	2	0	7
Yakutat	101-200	Yakataga Shelf	11	1	<1	1	0	3

Table 61.-- Number of survey hauls, number of hauls with yellowmouth rockfish, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	0	---	---	---	---
	101 - 200	31	0	---	---	---	---
	201 - 300	8	0	---	---	---	---
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	1	0	---	---	---	---
	All depths		147	0	---	---	---
Chirikof	1 - 100	59	0	---	---	---	---
	101 - 200	52	0	---	---	---	---
	201 - 300	35	0	---	---	---	---
	301 - 500	8	0	---	---	---	---
	501 - 700	6	0	---	---	---	---
	701 - 1000	8	0	---	---	---	---
	All depths		168	0	---	---	---
Kodiak	1 - 100	86	0	---	---	---	---
	101 - 200	95	0	---	---	---	---
	201 - 300	36	0	---	---	---	---
	301 - 500	14	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	10	0	---	---	---	---
	All depths		246	0	---	---	---
Yakutat	1 - 100	38	0	---	---	---	---
	101 - 200	63	0	---	---	---	---
	201 - 300	14	1	3	18	1.08	40.0
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	3	0	---	---	---	---
	All depths		135	1	<1	18	1.08
Southeastern	1 - 100	10	0	---	---	---	---
	101 - 200	24	0	---	---	---	---
	201 - 300	16	1	1,095	5,531	1.52	45.2
	301 - 500	14	1	7	21	0.95	39.5
	501 - 700	2	0	---	---	---	---
	701 - 1000	2	0	---	---	---	---
	All depths		68	2	198	5,552	1.51
All areas	1 - 100	283	0	---	---	---	---
	101 - 200	265	0	---	---	---	---
	201 - 300	109	2	154	5,549	1.51	45.2
	301 - 500	60	1	2	21	0.95	39.5
	501 - 700	23	0	---	---	---	---
	701 - 1000	24	0	---	---	---	---
	All depths		764	3	17	5,570	1.51

All areas biomass, 95% confidence interval: 0 - 17,516 metric tons (t).

Table 62.-- Catch per unit effort by stratum for yellowmouth rockfish sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/km²)	Biomass (t)	Lower C.I. Biomass	Upper C.I. Biomass
Southeastern	201-300	Prince of Wales Slope/Gullies	13	1	1,408	5,531	0	17,582
Southeastern	301-500	Southeastern Slope	4	1	27	21	0	89
Yakutat	201-300	Yakutat Slope	5	1	8	18	0	68

Table 63.-- Number of survey hauls, number of hauls with yelloweye rockfish, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	0	---	---	---	---
	101 - 200	31	0	---	---	---	---
	201 - 300	8	0	---	---	---	---
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	1	0	---	---	---	---
	All depths		147	0	---	---	---
Chirikof	1 - 100	59	0	---	---	---	---
	101 - 200	52	1	1	29	1.47	44.0
	201 - 300	35	0	---	---	---	---
	301 - 500	8	0	---	---	---	---
	501 - 700	6	0	---	---	---	---
	701 - 1000	8	0	---	---	---	---
	All depths		168	1	<1	29	1.47
Kodiak	1 - 100	86	1	2	80	4.40	61.0
	101 - 200	95	13	50	2,172	3.14	53.4
	201 - 300	36	0	---	---	---	---
	301 - 500	14	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	10	0	---	---	---	---
	All depths		246	14	22	2,252	3.17
Yakutat	1 - 100	38	1	8	128	1.00	37.3
	101 - 200	63	1	4	112	6.20	70.0
	201 - 300	14	0	---	---	---	---
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	3	0	---	---	---	---
	All depths		135	2	4	240	1.63
Southeastern	1 - 100	10	0	---	---	---	---
	101 - 200	24	4	74	822	3.56	56.4
	201 - 300	16	0	---	---	---	---
	301 - 500	14	0	---	---	---	---
	501 - 700	2	0	---	---	---	---
	701 - 1000	2	0	---	---	---	---
	All depths		68	4	29	822	3.56
All areas	1 - 100	283	2	2	208	1.42	40.2
	101 - 200	265	19	26	3,135	3.26	54.2
	201 - 300	109	0	---	---	---	---
	301 - 500	60	0	---	---	---	---
	501 - 700	23	0	---	---	---	---
	701 - 1000	24	0	---	---	---	---
	All depths		764	21	10	3,344	3.02

All areas biomass, 95% confidence interval: 889 - 5,799 metric tons (t).

Table 64.-- Catch per unit effort by stratum for yelloweye rockfish sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls		Biomass (t)	Lower	Upper
				with catch	CPUE (kg/km ²)		C.I. Biomass	C.I. Biomass
Southeastern	101-200	Prince of Wales Shelf	14	3	102	703	0	1,923
Kodiak	101-200	Kenai Flats	26	5	98	1,177	0	3,169
Kodiak	101-200	Kodiak Outer Shelf	11	2	71	354	0	980
Kodiak	101-200	Portlock Flats	16	3	31	225	0	555
Southeastern	101-200	Baranof-Chichagof Shelf	10	1	29	119	0	390
Kodiak	101-200	Albatross Gullies	18	1	26	203	0	631
Kodiak	101-200	Barren Islands	24	2	19	212	0	557
Kodiak	1-100	Kenai Peninsula	12	1	15	80	0	256
Yakutat	101-200	Fairweather Shelf	17	1	15	112	0	349
Yakutat	1-100	Yakutat Shallows	23	1	13	128	0	395
Chirikof	101-200	Chirikof Outer Shelf	11	1	6	29	0	93

Table 65.-- Number of survey hauls, number of hauls with rosethorn rockfish, mean CPUE, biomass, mean weight and mean length based on the 1999 Gulf of Alaska triennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC 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	90	0	---	---	---	---
	101 - 200	31	0	---	---	---	---
	201 - 300	8	0	---	---	---	---
	301 - 500	12	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	1	0	---	---	---	---
	All depths		147	0	---	---	---
Chirikof	1 - 100	59	0	---	---	---	---
	101 - 200	52	0	---	---	---	---
	201 - 300	35	0	---	---	---	---
	301 - 500	8	0	---	---	---	---
	501 - 700	6	0	---	---	---	---
	701 - 1000	8	0	---	---	---	---
	All depths		168	0	---	---	---
Kodiak	1 - 100	86	0	---	---	---	---
	101 - 200	95	0	---	---	---	---
	201 - 300	36	0	---	---	---	---
	301 - 500	14	0	---	---	---	---
	501 - 700	5	0	---	---	---	---
	701 - 1000	10	0	---	---	---	---
	All depths		246	0	---	---	---
Yakutat	1 - 100	38	0	---	---	---	---
	101 - 200	63	5	19	553	0.25	24.4
	201 - 300	14	2	58	297	0.32	27.3
	301 - 500	12	1	8	21	0.46	30.7
	501 - 700	5	0	---	---	---	---
	701 - 1000	3	0	---	---	---	---
	All depths		135	8	15	871	0.27
Southeastern	1 - 100	10	0	---	---	---	---
	101 - 200	24	6	42	468	0.23	24.9
	201 - 300	16	6	29	145	0.17	22.3
	301 - 500	14	3	25	78	0.24	25.3
	501 - 700	2	0	---	---	---	---
	701 - 1000	2	0	---	---	---	---
	All depths		68	15	25	691	0.22
All areas	1 - 100	283	0	---	---	---	---
	101 - 200	265	11	8	1,021	0.24	24.6
	201 - 300	109	8	12	443	0.25	24.9
	301 - 500	60	4	8	99	0.26	26.0
	501 - 700	23	0	---	---	---	---
	701 - 1000	24	0	---	---	---	---
	All depths		764	23	5	1,562	0.24

All areas biomass, 95% confidence interval: 477 - 2,648 metric tons (t).

Table 66.-- Catch per unit effort by stratum for rosethorn rockfish sorted by descending CPUE for the 1999 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/km ²)	Biomass (t)	Lower	Upper
							C.I. Biomass	C.I. Biomass
Yakutat	201-300	Yakutat Slope	5	2	140	297	0	1,120
Southeastern	301-500	Southeastern Slope	4	2	88	68	0	261
Southeastern	101-200	Prince of Wales Shelf	14	4	66	452	0	969
Yakutat	101-200	Yakutat Flats	19	3	60	541	0	1,286
Southeastern	201-300	Prince of Wales Slope/Gullies	13	5	35	138	0	326
Yakutat	301-500	Yakutat Slope	7	1	14	21	0	72
Southeastern	201-300	Baranof-Chichagof Slope	3	1	7	8	0	41
Southeastern	301-500	Southeastern Deep Gullies	10	1	4	10	0	33
Southeastern	101-200	Baranof-Chichagof Shelf	10	2	4	16	0	40
Yakutat	101-200	Fairweather Shelf	17	2	2	12	0	33

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APPENDIX A

Gear Specifications and Diagrams

Figure A-1 is a schematic diagram of the Poly-Nor'eastern bottom trawl and roller gear used during the 1996 Gulf of Alaska triennial bottom trawl survey.

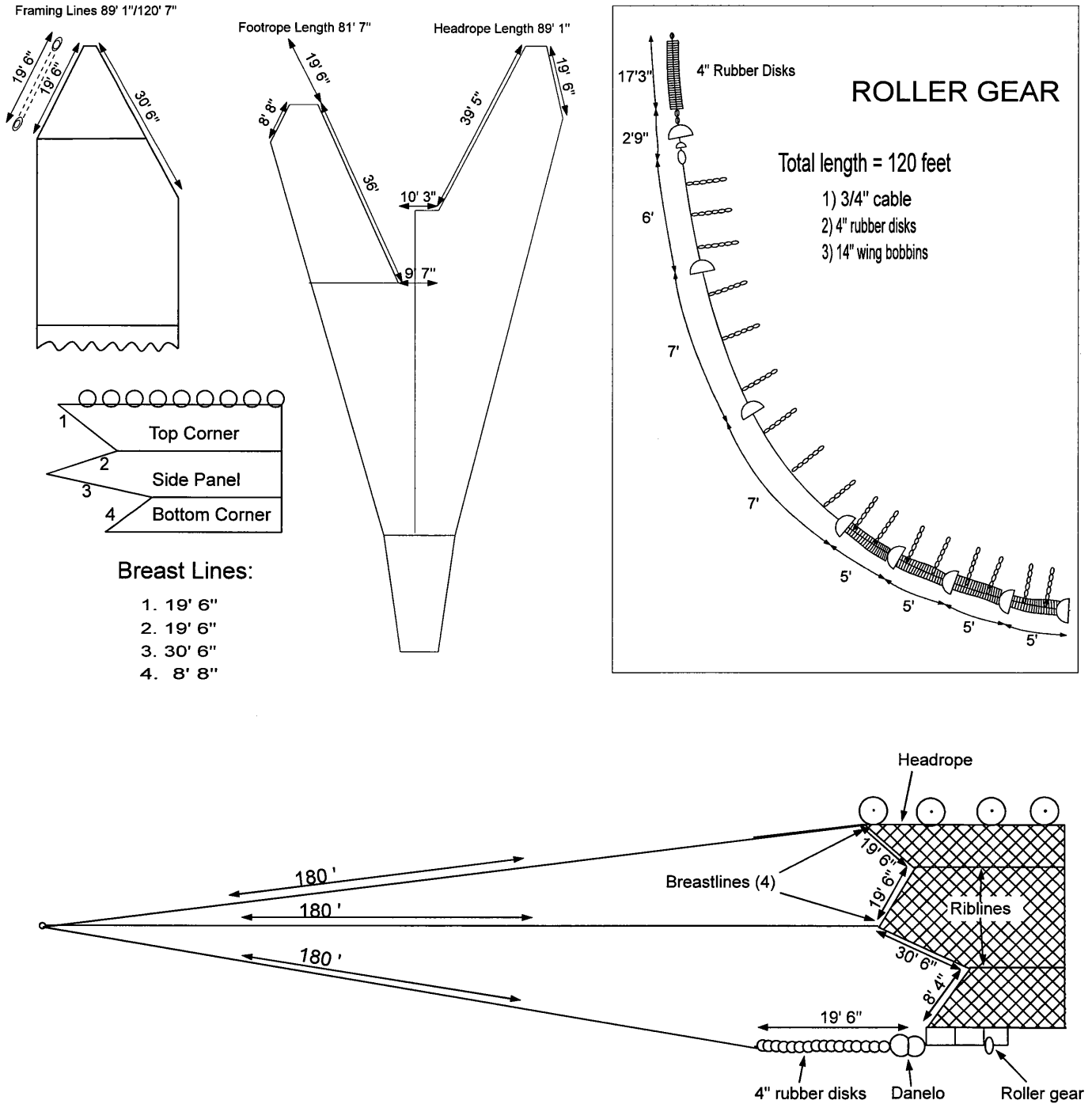


Figure A-1.--Schematic diagram of the 90-105 polyethylene Nor'eastern bottom trawl, roller gear and accessory gear used during the 1999 Gulf of Alaska triennial bottom trawl survey.

APPENDIX B

Strata Specifications and Locations

Appendix table B-1 presents the survey strata definitions for the 1999 Gulf of Alaska triennial bottom trawl survey including depth range, stratum name, and the area in square nautical miles and square kilometers. Appendix Table B-2 presents the summary strata code definitions. Appendix Figures B-1 through B-5 are charts showing the locations and extent of the strata as defined.

Appendix Table B-1.--Survey strata used for the 1999 Gulf of Alaska triennial survey including depth, stratum code, name and area in square nautical miles (nmi²) and square kilometers (km²).

Depth Range (m)	Stratum Code	Stratum Name	Area (nmi²)	Area (km²)	
1 - 100	10	Fox Islands	2,389	8,193	
	11	Davidson Bank	3,989	13,683	
	12	Lower Alaska Peninsula	2,005	6,876	
	13	Shumagin Bank	3,615	12,399	
	20	Upper Alaska Peninsula	2,315	7,941	
	21	Semidi Bank	2,129	7,302	
	22	Chirikof Bank	3,147	10,793	
	30	Albatross Shallows	1,681	5,766	
	31	Albatross Banks	4,491	15,404	
	32	Lower Cook Inlet	2,883	9,887	
	33	Kenai Peninsula	1,534	5,260	
	35	Northern Kodiak Shallows	641	2,200	
	40	Yakutat Shallows	2,900	9,948	
	41	Middleton Shallows	1,958	6,715	
	50	Southeastern Shallows	1,909	6,547	
		991	subtotal	37,585	128,915
	101 - 200	110	Sanak Gully	1,238	4,247
111		Shumagin Outer Shelf	2,377	8,152	
112		West Shumagin Gully	664	2,278	
120		East Shumagin Gully	3,238	11,105	
121		Shelikof Edge	2,255	7,735	
122		Chirikof Outer Shelf	1,461	5,011	
130		Albatross Gullies	2,307	7,912	
131		Portlock Flats	2,139	7,337	
132		Barren Islands	3,202	10,981	
133		Kenai Flats	3,521	12,078	
134		Kodiak Outer Shelf	1,465	5,026	
140		Middleton Shelf	2,142	7,346	
141		Yakataga Shelf	1,538	5,277	
142		Yakutat Flats	2,633	9,032	
143		Fairweather Shelf	2,253	7,728	
150		Baranof-Chichagof Shelf	1,224	4,197	
151		Prince of Wales Shelf	2,008	6,888	
	992	subtotal	35,666	122,331	

Appendix Table B-1.--Continued

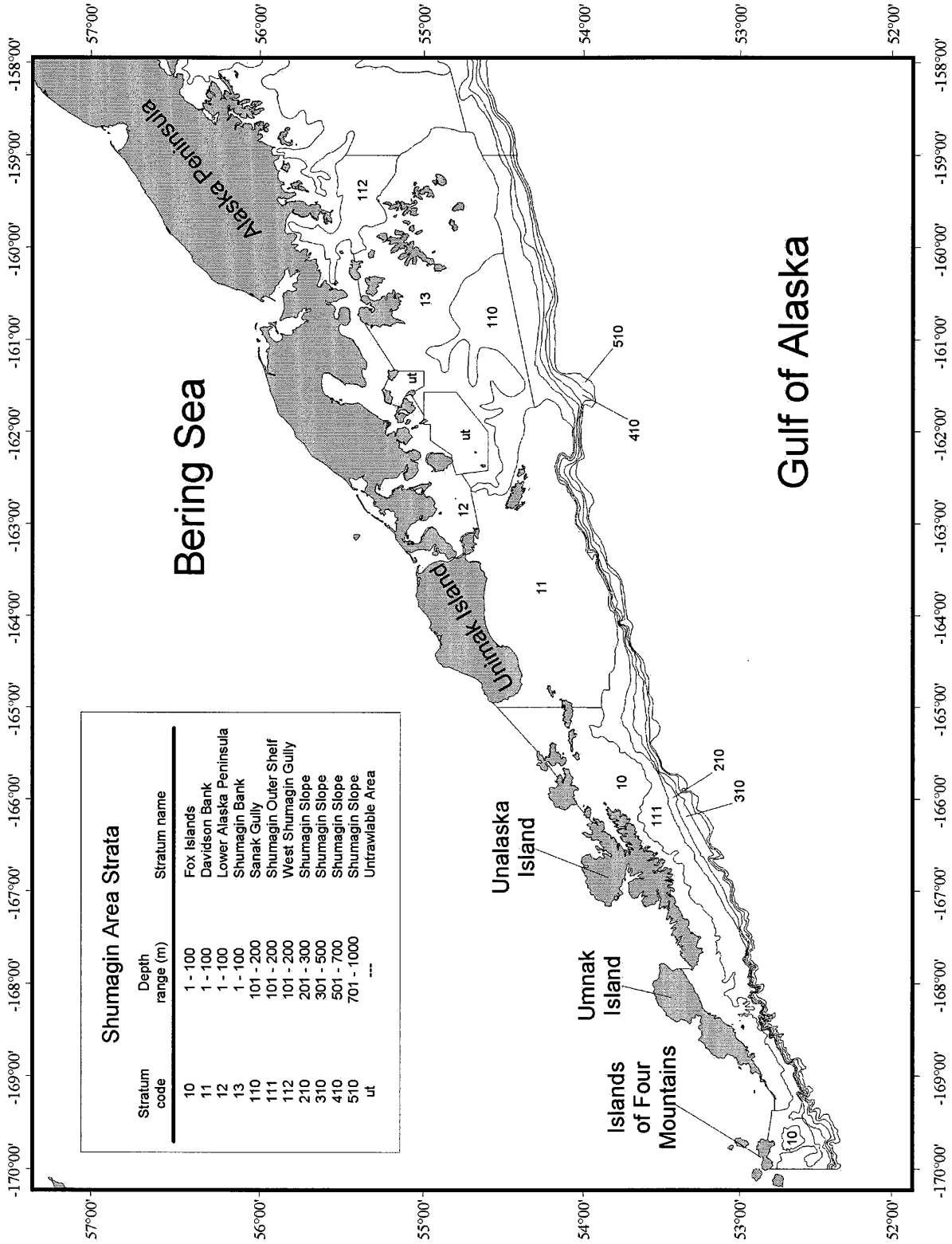
Depth Range (m)	Stratum Code	Stratum Name	Area (nmi ²)	Area (km ²)
201 - 300	210	Shumagin Slope	813	2,788
	220	Lower Shelikof Gully	2,921	10,018
	221	Chirikof Slope	446	1,528
	230	Kenai Gullies	1,942	6,660
	231	Kodiak Slope	473	1,623
	232	Upper Shelikof Gully	935	3,208
	240	Yakutat Gullies	887	3,043
	241	Yakutat Slope	620	2,127
	250	Baranof-Chichagof Slope	328	1,125
	251	Prince of Wales Slope/Gullies	1,145	3,927
		993	subtotal	10,510
301 - 500	310	Shumagin Slope	738	2,531
	320	Chirikof Slope	468	1,604
	330	Kodiak Slope	849	2,912
	340	Yakutat Gullies	323	1,107
	341	Yakutat Slope	443	1,521
	350	Southeastern Deep Gullies	684	2,344
	351	Southeastern Slope	225	773
		994	subtotal	3,730
501 - 700	410	Shumagin Slope	585	2,006
	420	Chirikof Slope	569	1,953
	430	Kodiak Slope	509	1,745
	440	Yakutat Slope	428	1,469
	450	Southeastern Slope	301	1,034
		995	subtotal	2,393
701 - 1000	510	Shumagin Slope	565	1,937
	520	Chirikof Slope	894	3,066
	530	Kodiak Slope	1,019	3,494
	540	Yakutat Slope	550	1,888
	550	Southeastern Slope	352	1,206
		996	subtotal	3,379
1 - 1000	999	GRAND TOTAL	93,262	319,884

Appendix Table B-2.-- Summary codes used for the 1999 Gulf of Alaska triennial bottom trawl survey including depth range, International North Pacific Fisheries Commission statistical areas and square area, and strata included in the summary area.

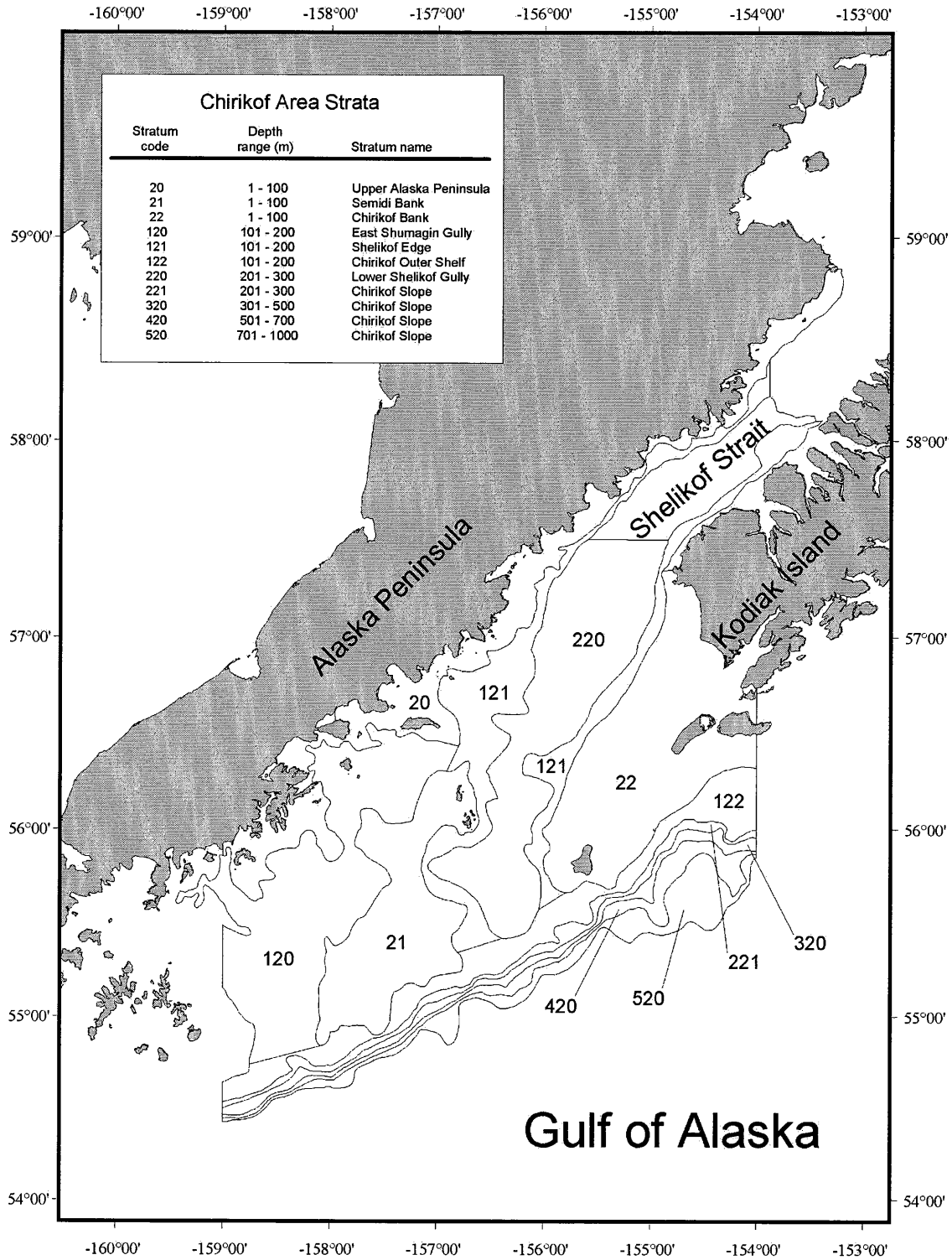
Summary Code Number	Depth Range (m)	INPFC area	Area (nmi²)	Area (km²)	Strata included
911	1 - 100	Shumagin	11,998	41,151	10 -13
912	101 - 200		4,279	14,678	110 - 112
913	201 - 300		813	2,788	210
914	301 - 500		738	2,531	310
915	501 - 700		585	2,006	410
916	701 - 1000		565	1,937	510
919	1 -1000			18,977	65,091
921	1 - 100	Chirikof	7,591	26,036	20-22
922	101 - 200		6,954	23,851	120-122
923	201 - 300		3,366	11,547	230, 231
924	301 - 500		468	1,604	320
925	501 - 700		569	1,953	420
926	701 - 1000		894	3,066	520
929	1 -1000			19,842	68,057
931	1 - 100	Kodiak	11,230	38,518	30 - 33, 35
932	101 - 200		12,634	43,334	130 - 134
933	201 - 300		3,350	11,491	230 - 232
934	301 - 500		849	2,912	330
935	501 - 700		509	1,745	430
936	701 - 1000		1,019	3,494	530
939	1 -1000			29,591	101,494

Appendix Table B-2.-- Continued.

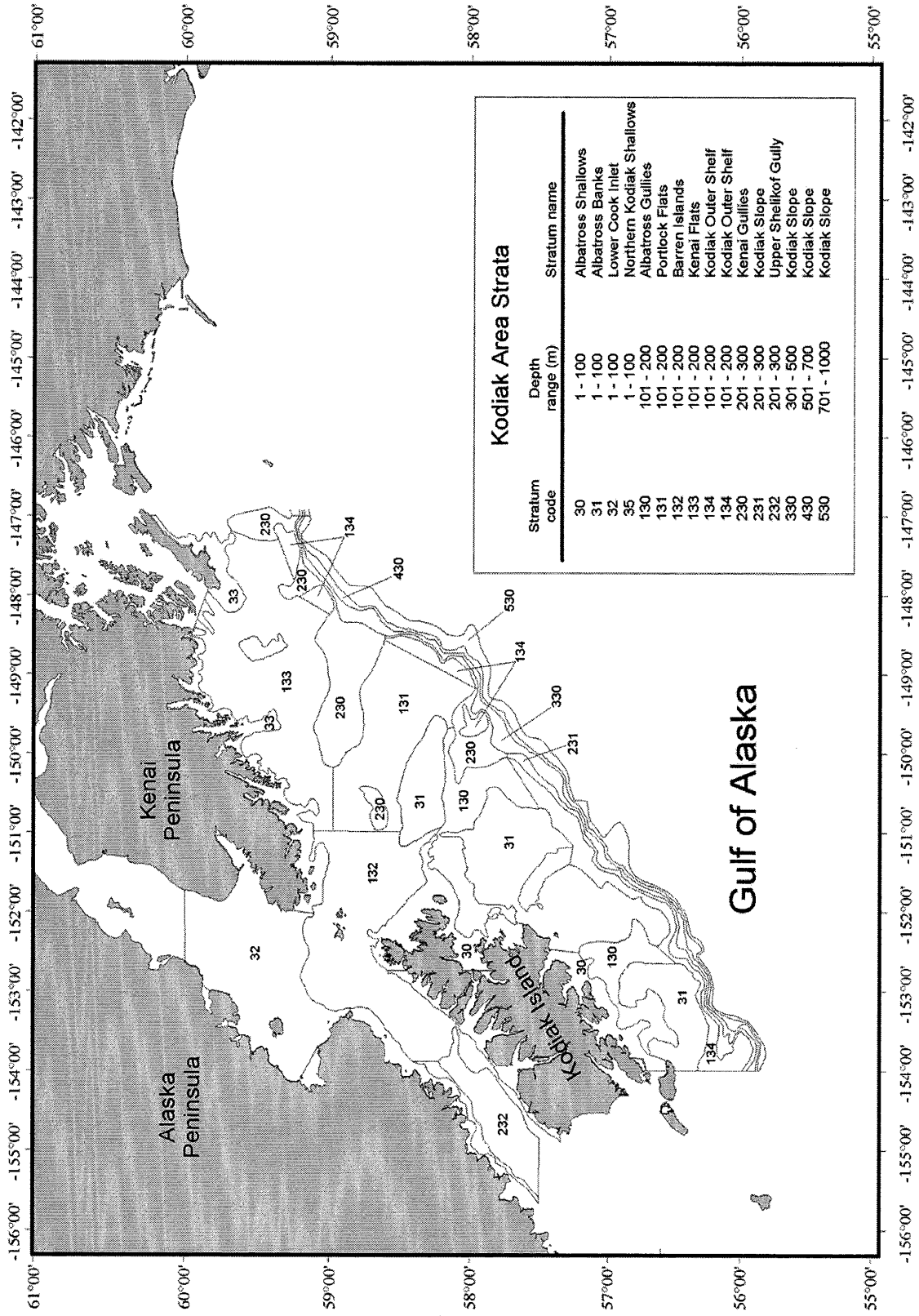
Summary Code Number	Depth Range (m)	INPFC area	Area (nmi²)	Area (km²)	Strata included
941	1 - 100	Yakutat	4,858	16,663	40, 41
942	101 - 200		8,567	29,383	140 - 143
943	201 - 300		1,507	5,170	240, 241
944	301 - 500		766	2,628	340, 341
945	501 - 700		428	1,469	440
946	701 - 1000		550	1,888	540
949	1 -1000		16,677	57,201	
951	1 - 100	Southeastern	1,909	6,547	50
952	101 - 200		3,232	11,085	150, 151
953	201 - 300		1,473	5,053	250, 251
954	301 - 500		909	3,117	350, 351
955	501 - 700		301	1,034	450
956	701 - 1000		352	1,206	550
959	1 -1000		8,175	28,041	
999	1 - 1000	All Areas	93,262	319,884	



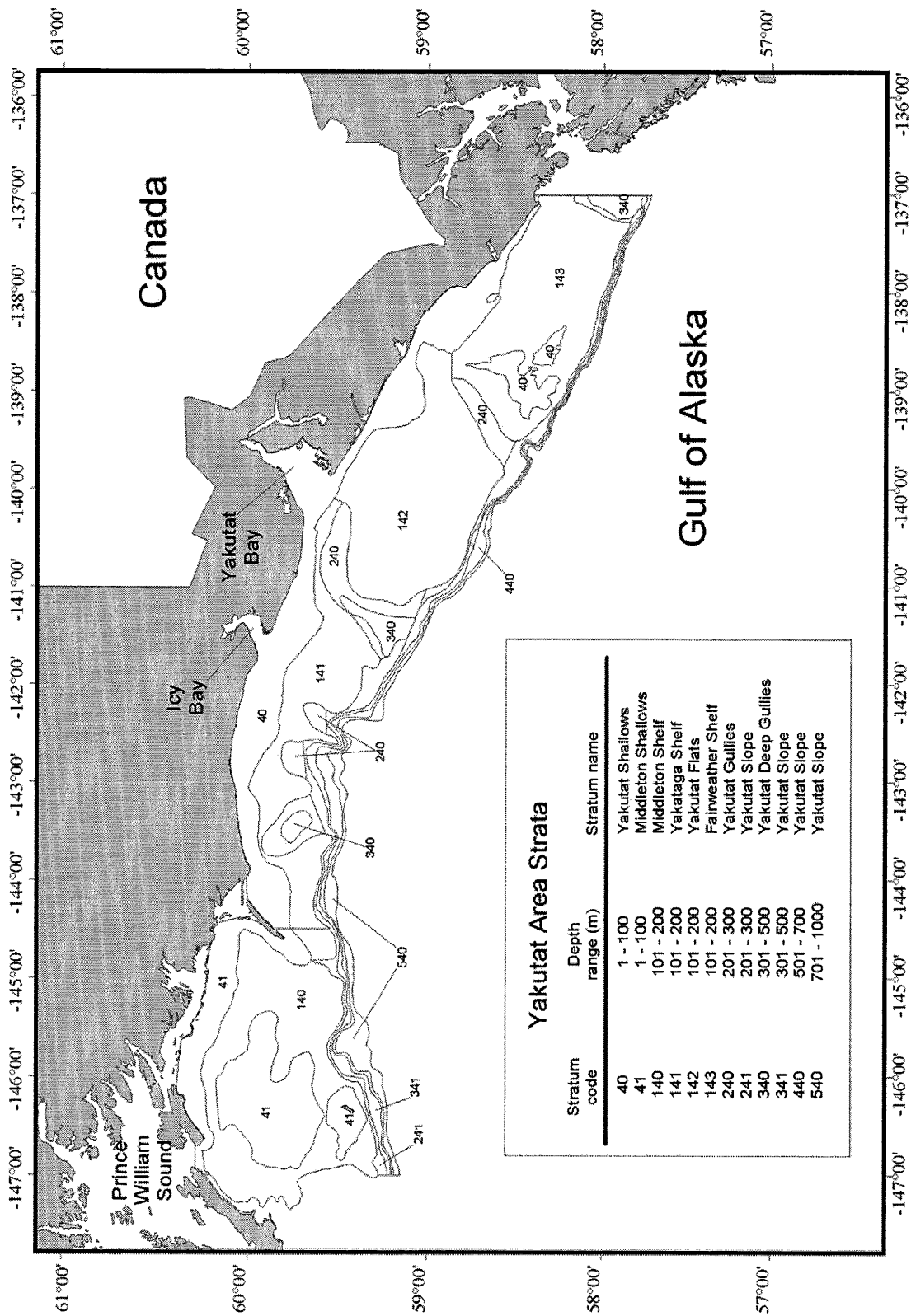
Appendix Figure B-1.-Survey strata in the Shumagin INPFC statistical area used for the 1999 Gulf of Alaska bottom trawl survey.



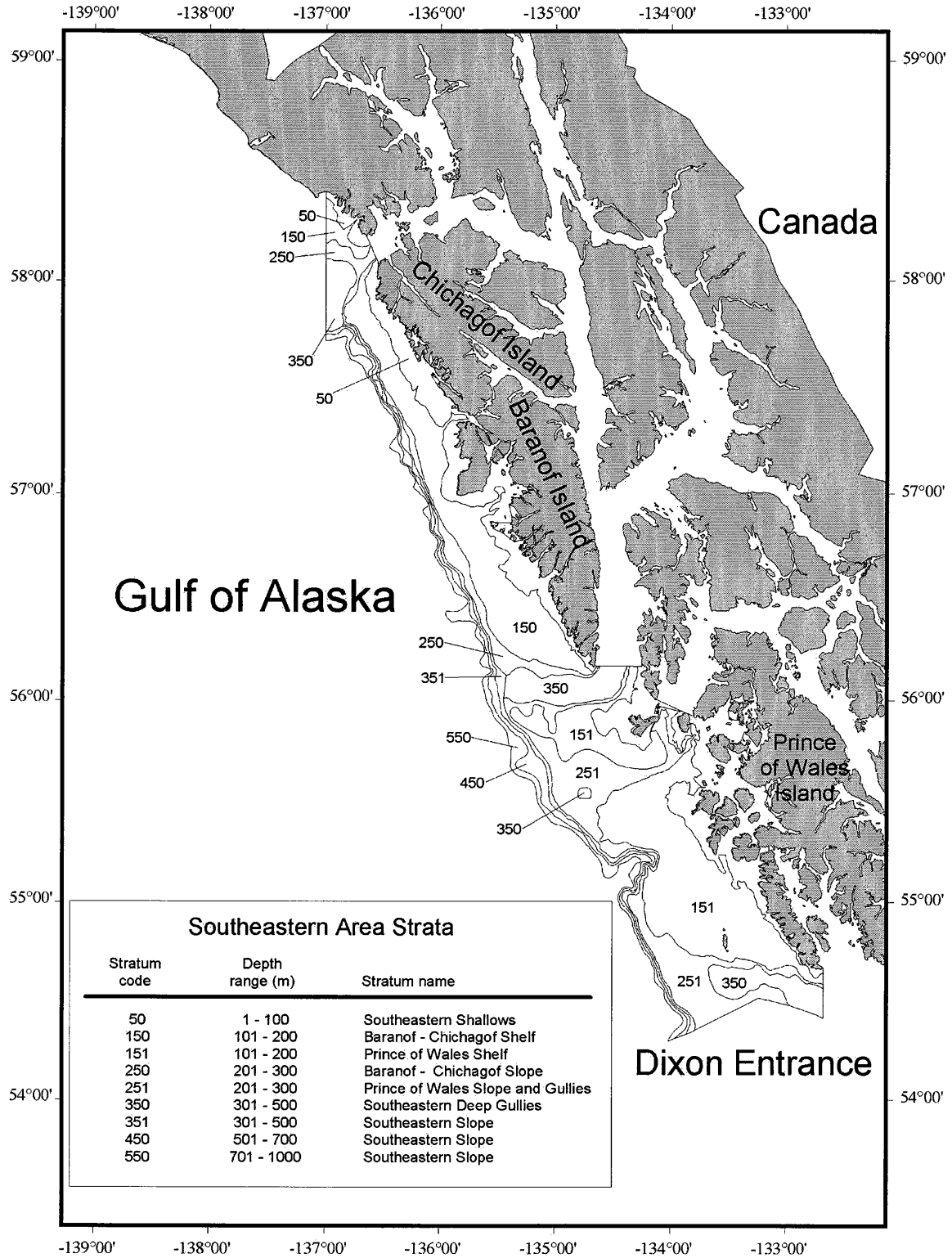
Appendix Figure B-2.-- Survey strata in the Chirikof INPFC statistical area used for the 1999 Gulf of Alaska bottom trawl survey.



Appendix Figure B-3.--Survey strata in the Kodiak INPFC statistical area used for the 1999 Gulf of Alaska bottom trawl survey.



Appendix Figure B-4.--Survey strata in the Yakutat INPFC statistical area used for the 1999 Gulf of Alaska bottom trawl survey.



Appendix Figure B-5.-- Survey strata in the Southeastern INPFC statistical area used for the 1999 Gulf of Alaska bottom trawl survey.

APPENDIX C

Fish Species Encountered

Appendix Tables C-1 and C-2 list fish and invertebrate taxa encountered and identified during the 1999 Gulf of Alaska triennial bottom trawl survey. Most common and scientific names are from Robins et al. (1991). Order of listings and common names used are for convenience and do not imply adherence to a particular phylogenetic system.

Appendix Table C-1.--Fish species encountered during the 1999 Gulf of Alaska bottom trawl

Family	Species Name	Common Name
Chimaeridae	<i>Hydrolagus colliei</i>	spotted ratfish
Hexanchidae	<i>Hexanchus griseus</i>	sixgill shark
Squalidae	<i>Somniosus pacificus</i>	Pacific sleeper shark
	<i>Squalus acanthias</i>	spiny dogfish
Rajidae	<i>Bathyraja aleutica</i>	Aleutian skate
	<i>Bathyraja interrupta</i>	Bering skate
	<i>Bathyraja lindbergi</i>	commander skate
	<i>Bathyraja maculata</i>	whiteblotched skate
	<i>Bathyraja parmifera</i>	Alaska skate
	<i>Bathyraja taranetzi</i>	mud skate
	<i>Bathyraja trachura</i>	black skate
	<i>Raja binoculata</i>	big skate
	<i>Raja rhina</i>	longnose skate
Nemichthyidae	<i>Avocettina infans</i>	blackline snipe eel
Clupeidae	<i>Clupea pallasii</i>	Pacific herring
Argentinidae	<i>Argentina sialis</i>	Pacific argentine
Bathylagidae	<i>Bathylagus milleri</i>	robust blacksmelt
	<i>Leuroglossus schmidti</i>	northern smoothtongue
	<i>Leuroglossus stilbius</i>	California smoothtongue
Opisthoproctidae	<i>Macropinna microstoma</i>	barreleye
Searsiidae	<i>Sagamichthys abei</i>	shining tubeshoulder
Osmeridae	<i>Hypomesus pretiosus</i>	surf smelt
	<i>Mallotus villosus</i>	capelin
	<i>Spirinchus starksi</i>	night smelt
	<i>Thaleichthys pacificus</i>	eulachon
Salmonidae	<i>Oncorhynchus gorbuscha</i>	pink salmon
	<i>Oncorhynchus keta</i>	chum salmon
	<i>Oncorhynchus kisutch</i>	coho salmon
	<i>Oncorhynchus nerka</i>	sockeye salmon
	<i>Oncorhynchus tshawytscha</i>	chinook salmon
Melanostomiidae	<i>Tactostoma macropus</i>	longfin dragonfish
Chauliodontidae	<i>Chauliodus macouni</i>	Pacific viperfish

Family	Species Name	Common Name
Scopelarchidae	<i>Benthalbella dentata</i>	northern pearleye
Notosudidae	<i>Scopelosaurus harryi</i>	scaly paperbone
Myctophidae	<i>Diaphus theta</i>	California headlightfish
	<i>Lampanyctus</i> sp.	
	<i>Protomyctophum thompsoni</i>	northern flashlightfish
	<i>Stenobranchius leucopsarus</i>	northern lampfish
	<i>Stenobranchius nannochir</i>	garnet lampfish
Macrouridae	<i>Albatrossia pectoralis</i>	giant grenadier
	<i>Coryphaenoides acrolepis</i>	Pacific grenadier
	<i>Coryphaenoides cinereus</i>	popeye grenadier
Moridae	<i>Antimora microlepis</i>	Pacific flatnose
Merluccidae	<i>Merluccius productus</i>	Pacific hake
Gadidae	<i>Eleginus gracilis</i>	saffron cod
	<i>Gadus macrocephalus</i>	Pacific cod
	<i>Microgadus proximus</i>	Pacific tomcod
	<i>Theragra chalcogramma</i>	walleye pollock
	<i>Cololabis saira</i>	Pacific saury
Oneirodidae	<i>Oneirodes acanthias</i>	spiny dreamer
	<i>Oneirodes bulbosus</i>	hairy-lure dreamer
Melamphaeidae	<i>Melamphaes lugubris</i>	highsnout bigscale
	<i>Poromitra crassiceps</i>	crested bigscale
Scorpaenidae	<i>Sebastes aleutianus</i>	rougeye rockfish
	<i>Sebastes alutus</i>	Pacific ocean perch
	<i>Sebastes babcocki</i>	redbanded rockfish
	<i>Sebastes borealis</i>	shortraker rockfish
	<i>Sebastes brevispinis</i>	silvergray rockfish
	<i>Sebastes ciliatus</i>	dark dusky rockfish
	<i>Sebastes crameri</i>	darkblotched rockfish
	<i>Sebastes diploproa</i>	splitnose rockfish
	<i>Sebastes elongatus</i>	greenstriped rockfish
	<i>Sebastes entomelas</i>	widow rockfish
	<i>Sebastes flavidus</i>	yellowtail rockfish
<i>Sebastes helvomaculatus</i>	rosethorn rockfish	

Family	Species Name	Common Name
	<i>Sebastes maliger</i>	quillback rockfish
	<i>Sebastes melanops</i>	black rockfish
	<i>Sebastes pinniger</i>	canary rockfish
	<i>Sebastes polyspinis</i>	northern rockfish
	<i>Sebastes proriger</i>	redstripe rockfish
	<i>Sebastes reedi</i>	yellowmouth rockfish
	<i>Sebastes ruberrimus</i>	yelloweye rockfish
	<i>Sebastes</i> sp. cf. <i>ciliatus</i>	light dusky rockfish
	<i>Sebastes variegatus</i>	harlequin rockfish
	<i>Sebastes wilsoni</i>	pygmy rockfish
	<i>Sebastes zacentrus</i>	sharpchin rockfish
	<i>Sebastolobus alascanus</i>	shortspine thornyhead
	<i>Sebastolobus altivelis</i>	longspine thornyhead
Anoplopomatidae	<i>Anoplopoma fimbria</i>	sablefish
Hexagrammidae	<i>Hexagrammos decagrammus</i>	kelp greenling
	<i>Hexagrammos lagocephalus</i>	rock greenling
	<i>Hexagrammos octogrammus</i>	masked greenling
	<i>Hexagrammos stelleri</i>	whitespotted greenling
	<i>Ophiodon elongatus</i>	lingcod
	<i>Pleurogrammus monopterygius</i>	Atka mackerel
Cottidae	<i>Artediellus pacificus</i>	Pacific hookear sculpin
	<i>Dasycottus setiger</i>	spinyhead sculpin
	<i>Enophrys diceraus</i>	antlered sculpin
	<i>Eurymen gyrinus</i>	smoothcheek sculpin
	<i>Gymnocanthus galeatus</i>	armorhead sculpin
	<i>Hemilepidotus hemilepidotus</i>	red Irish lord
	<i>Hemilepidotus jordani</i>	yellow Irish lord
	<i>Hemilepidotus papilio</i>	butterfly sculpin
	<i>Hemilepidotus zapus</i>	longfin Irish lord
	<i>Hemitripterus bolini</i>	bigmouth sculpin
	<i>Icelinus borealis</i>	northern sculpin
	<i>Icelinus burchami</i>	dusky sculpin
	<i>Icelinus filamentosus</i>	threadfin sculpin

Family	Species Name	Common Name
	<i>Icelus spatula</i>	spatulate sculpin
	<i>Icelus spiniger</i>	thorny sculpin
	<i>Icelus uncinalis</i>	uncinate sculpin
	<i>Leptocottus armatus</i>	Pacific staghorn sculpin
	<i>Malacocottus kincaidi</i>	blackfin sculpin
	<i>Malacocottus zonurus</i>	darkfin sculpin
	<i>Myoxocephalus jaok</i>	plain sculpin
	<i>Myoxocephalus polyacanthocephalus</i>	great sculpin
	<i>Myoxocephalus quadricornis</i>	fourhorn sculpin
	<i>Paricelinus hopliticus</i>	thornback sculpin
	<i>Psychrolutes paradoxus</i>	tadpole sculpin
	<i>Rhamphocottus richardsoni</i>	grunt sculpin
	<i>Triglops forficata</i>	scissortail sculpin
	<i>Triglops macellus</i>	roughspine sculpin
	<i>Triglops pingeli</i>	ribbed sculpin
	<i>Triglops szepticus</i>	spectacled sculpin
Agonidae	<i>Bathyagonus nigripinnis</i>	blackfin poacher
	<i>Bathyagonus pentacanthus</i>	bigeye poacher
	<i>Hypsagonus quadricornis</i>	fourhorn poacher
	<i>Podothecus acipenserinus</i>	sturgeon poacher
	<i>Sarritor frenatus</i>	sawback poacher
	<i>Sarritor leptorhynchus</i>	longnose poacher
Cyclopteridae	<i>Aptocyclus ventricosus</i>	smooth lumpsucker
	<i>Careproctus colletti</i>	Alaska snailfish
	<i>Careproctus cypselurus</i>	blackfin snailfish
	<i>Careproctus gilberti</i>	smalldisk snailfish
	<i>Careproctus melanurus</i>	blacktail snailfish
	<i>Careproctus phasma</i>	monster snailfish
	<i>Careproctus rastrinus</i>	salmon snailfish
	<i>Crystallichthys cyclospilus</i>	blotched snailfish
	<i>Cyclopteropsis phrynoides</i>	toad lumpsucker
	<i>Elassodiscus caudatus</i>	humpback snailfish
	<i>Eumicrotremus derjugini</i>	leatherfin lumpsucker

Family	Species Name	Common Name
	<i>Eumicrotremus orbis</i>	Pacific spiny lumpsucker
	<i>Paraliparis dactylosus</i>	red snailfish
	<i>Rhinoliparis attenuatus</i>	slim snailfish
	<i>Rhinoliparis barbulifer</i>	
Bathymasteridae	<i>Bathymaster leurolepis</i>	smallmouth ronquil
	<i>Bathymaster signatus</i>	searcher
	<i>Ronquilus jordani</i>	northern ronquil
Zoarcidae	<i>Bothrocara brunneum</i>	twoline eelpout
	<i>Bothrocara pusillum</i>	Alaska eelpout
	<i>Embryx crotalinus</i>	snakehead eelpout
	<i>Lycodes brevipes</i>	shortfin eelpout
	<i>Lycodes concolor</i>	ebony eelpout
	<i>Lycodes diapterus</i>	black eelpout
	<i>Lycodes pacificus</i>	blackbelly eelpout
	<i>Lycodes palearis</i>	wattled eelpout
	<i>Lycodes polaris</i>	Canadian eelpout
Stichaeidae	<i>Bryozoichthys lysimus</i>	nutcracker prickleback
	<i>Bryozoichthys marjorius</i>	pearly prickleback
	<i>Lumpenella longirostris</i>	longsnout prickleback
	<i>Lumpenus fabricii</i>	slender eelblenny
	<i>Lumpenus sagitta</i>	snake prickleback
	<i>Poroclinus rothrocki</i>	whitebarred prickleback
	<i>Stichaeus punctatus</i>	Arctic shanny
Cryptacanthodidae	<i>Cryptacanthodes giganteus</i>	giant wrymouth
	<i>Lyconectes aleutensis</i>	dwarf wrymouth
Anarhichadidae	<i>Anarhichas orientalis</i>	Bering wolffish
	<i>Anarrhichthys ocellatus</i>	wolf-eel
Zaproridae	<i>Zaprora silenus</i>	prowfish
Trichodontidae	<i>Trichodon trichodon</i>	Pacific sandfish
Ammodytidae	<i>Ammodytes hexapterus</i>	Pacific sand lance
Bothidae	<i>Citharichthys sordidus</i>	Pacific sanddab
Pleuronectidae	<i>Atheresthes evermanni</i>	Kamchatka flounder
	<i>Atheresthes stomias</i>	arrowtooth flounder

Family	Species Name	Common Name
	<i>Embassichthys bathybius</i>	deepsea sole
	<i>Eopsetta jordani</i>	petrale sole
	<i>Glyptocephalus zachirus</i>	rex sole
	<i>Hippoglossoides elassodon</i>	flathead sole
	<i>Hippoglossus stenolepis</i>	Pacific halibut
	<i>Isopsetta isolepis</i>	butter sole
	<i>Lepidopsetta bilineata</i>	southern rock sole
	<i>Lepidopsetta polyxystra</i>	northern rock sole
	<i>Limanda aspera</i>	yellowfin sole
	<i>Lyopsetta exilis</i>	slender sole
	<i>Microstomus pacificus</i>	Dover sole
	<i>Parophrys vetulus</i>	english sole
	<i>Platichthys stellatus</i>	starry flounder
	<i>Pleuronectes quadrituberculatus</i>	Alaska plaice
	<i>Psettichthys melanostictus</i>	sand sole

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Appendix Table C2 .--Invertebrate species encountered during the 1999 Gulf of Alaska bottom trawl survey.

Phylum	Species/Taxon Name	Common Name
Porifera	<i>Aphrocallistes vastus</i>	clay pipe sponge
	<i>Halichondria</i> cf. <i>sitiens</i>	yellow green papillate sponge
	<i>Halichondria panicea</i>	barrel sponge
	<i>Halichondria sitiens</i>	black papillate sponge
	<i>Leucandra heathi</i>	spiny vase sponge
	<i>Leucosolenia blanca</i>	yellow leafy sponge
	<i>Mycale bellabellensis</i>	lampshade sponge
	<i>Mycale loveni</i>	tree sponge
	<i>Myxilla incrustans</i>	scallop sponge
	<i>Neoesperiopsis rigida</i>	soft finger sponge
	<i>Suberites ficus</i>	hermit sponge
Cnidaria	<i>stone sponge</i>	
	<i>Actinauge verrillii</i>	reticulate anemone
	Antipatheria	black coral
	<i>Chrysaora melanaster</i>	
	<i>Cribrinopsis fernaldi</i>	chevron-tentacled anemone
	<i>Crypthelia trophostega</i>	
	<i>Cyanea capillata</i>	lion's mane
	<i>Cyclohelia lancellata</i>	
	<i>Euplexaura marki</i>	
	<i>Fanellia compressa</i>	
	<i>Halipteris</i> sp.	
	<i>Halipteris californica</i>	
	<i>Liponema brevicorne</i>	tentacle-shedding anemone
	<i>Metridium giganteum</i>	gigantic anemone
	<i>Metridium senile</i>	clonal plumose anemone
	<i>Paractinostola faeculenta</i>	rough purple sea anemone
	<i>Periphylla periphylla</i>	
<i>Phacellophora camtchatica</i>		
<i>Primnoa willeyi</i>	red tree coral	
<i>Ptilosarcus gurneyi</i>	orange sea pen	

Phylum	Species/Taxon Name	Common Name
	<i>Stomphia didemon</i>	cowardly anemone
	<i>Urticina</i> sp.	
	<i>Urticina crassicornis</i>	mottled anemone
Annelida	<i>Aphrodita negligens</i>	
	<i>Carcinobdella cyclostomum</i>	striped sea leech
	<i>Cheilonereis cyclurus</i>	
	<i>Eunoe depressa</i>	depressed scale worm
	<i>Eunoe nodosa</i>	giant scale worm
Arthropoda	<i>Acantholithodes hispidus</i>	fuzzy crab
	<i>Argis dentata</i>	Arctic argid
	<i>Argis lar</i>	kuro argid
	<i>Balanus evermanni</i>	giant barnacle
	<i>Cancer magister</i>	Dungeness crab
	<i>Cancer oregonensis</i>	Oregon rock crab
	<i>Cancer productus</i>	red rock crab
	<i>Chionoecetes angulatus</i>	triangle Tanner crab
	<i>Chionoecetes bairdi</i>	Tanner crab
	<i>Chionoecetes hybrid</i>	Tanner crab
	<i>Chionoecetes opilio</i>	snow crab
	<i>Chionoecetes tanneri</i>	grooved Tanner crab
	<i>Chorilia longipes</i>	Longhorned decorator crab
	<i>Crangon communis</i>	twospine crangon
	<i>Crangon dalli</i>	ridged crangon
	<i>Crangon septemspinosa</i>	sevenspine bay shrimp
	<i>Cryptolithodes typica</i>	
	<i>Elassochirus cavimanus</i>	purple hermit
	<i>Elassochirus gilli</i>	Pacific red hermit
	<i>Elassochirus tenuimanus</i>	widehand hermit crab
	<i>Eualus barbatus</i>	barbed eualid
	<i>Eualus macrophthalmus</i>	bigeye eualid
	<i>Eualus suckleyi</i>	shortscale eualid
	<i>Gnathophausia gigas</i>	
	<i>Gnathophausia ingens</i>	

Phylum	Species/Taxon Name	Common Name
	<i>Hapalogaster mertensii</i>	
	<i>Hyas coarctatus</i>	circumboreal toad crab
	<i>Hyas lyratus</i>	Pacific lyre crab
	<i>Labidochirus splendescens</i>	splendid hermit
	<i>Lebbeus groenlandicus</i>	spiny lebbeid
	<i>Lithodes aequispina</i>	golden king crab
	<i>Lithodes couesi</i>	scarlet king crab
	<i>Lopholithodes foraminatus</i>	box crab
	<i>Munida quadrispina</i>	pinchbug
	<i>Notostomus japonicus</i>	spinyridge shrimp
	<i>Oregonia gracilis</i>	graceful decorator crab
	<i>Pagurus aleuticus</i>	Aleutian hermit
	<i>Pagurus brandti</i>	sponge hermit
	<i>Pagurus capillatus</i>	hairy hermit crab
	<i>Pagurus confragosus</i>	knobbyhand hermit
	<i>Pagurus dalli</i>	whiteknee hermit
	<i>Pagurus kennerlyi</i>	bluespine hermit
	<i>Pagurus ochotensis</i>	Alaskan hermit
	<i>Pagurus rathbuni</i>	longfinger hermit
	<i>Pagurus tanneri</i>	longhand hermit
	<i>Pagurus trigonocheirus</i>	fuzzy hermit crab
	<i>Pandalopsis dispar</i>	sidestripe shrimp
	<i>Pandalus borealis</i>	northern shrimp
	<i>Pandalus goniurus</i>	humpy shrimp
	<i>Pandalus hypsinotus</i>	coonstripe shrimp
	<i>Pandalus jordani</i>	ocean shrimp
	<i>Pandalus platyceros</i>	spot shrimp
	<i>Pandalus tridens</i>	yellowleg pandalid
	<i>Paralithodes brevipes</i>	brown king crab
	<i>Paralithodes californiensis</i>	California king crab
	<i>Paralithodes camtschaticus</i>	red king crab
	<i>Pasiphaea pacifica</i>	Pacific glass shrimp
	<i>Pasiphaea tarda</i>	crimson pasiphaeid

Phylum	Species/Taxon Name	Common Name
Mollusca	<i>Placetrion wosnessenskii</i>	scaled crab
	<i>Pugettia gracilis</i>	graceful kelp crab
	<i>Rhinolithodes wosnessenskii</i>	rhinoceros crab
	<i>Sclerocrangon boreas</i>	sculptured shrimp
	<i>Telmessus cheiragonus</i>	helmet crab
	<i>Amicula vestita</i>	
	<i>Anisodoris nobilis</i>	Pacific sea lemon
	Aplacophora	Solengaster unidentified
	<i>Archidoris odhneri</i>	white night doris
	<i>Arctomelon stearnsii</i>	Alaska volute
	<i>Bathybembix bairdii</i>	
	<i>Bathybuccinum clarki</i>	Roger's buccinid
	<i>Bathybuccinum ovulum</i>	
	<i>Beringius kennicottii</i>	
	<i>Beringius undatus</i>	
	<i>Berryteuthis magister</i>	magistrate armhook squid
	<i>Boreotrophon stuarti</i>	winged trophon
	<i>Buccinum ciliatum</i>	
	<i>Buccinum eugrammatum</i>	lirate whelk
	<i>Buccinum glaciale</i>	glacial whelk
	<i>Buccinum oedematum</i>	swollen whelk
	<i>Buccinum picturatum</i>	
	<i>Buccinum plectrum</i>	sinuous whelk
	<i>Buccinum scalariforme</i>	ladder whelk
	<i>Bulbus fragilis</i>	fragile moonsnail
	<i>Chlamys hericia</i>	
	<i>Chlamys rubida</i>	reddish scallop
	<i>Cidarina cidaris</i>	
	<i>Clinocardium ciliatum</i>	hairy cockle
	<i>Clinocardium nuttallii</i>	Nuttall cockle
<i>Colus georgianus</i>		
<i>Colus herendeenii</i>	thin-ribbed whelk	
<i>Cryptochiton stelleri</i>	giant Pacific	

Phylum	Species/Taxon Name	Common Name
	<i>Fusitriton oregonensis</i>	Oregon triton
	<i>Hiatella arctica</i>	Arctic hiatella
	<i>Histioteuthis hoylei</i>	
	<i>Lepidozona abyssicola</i>	
	<i>Lepidozona trifida</i>	
	<i>Limopsis vaginata</i>	
	<i>Loligo opalescens</i>	California market squid
	<i>Modiolus modiolus</i>	northern horse mussel
	<i>Moroteuthis robusta</i>	robust clubhook squid
	<i>Musculus discors</i>	discordant mussel
	<i>Musculus niger</i>	black mussel
	<i>Mya pseudoarenaria</i>	false softshell
	<i>Natica aleutica</i>	Aleutian moon snail
	<i>Natica russa</i>	rusty moon snail
	<i>Neptunea amianta</i>	
	<i>Neptunea lyrata</i>	lyre whelk
	<i>Neptunea middendorffii</i>	
	<i>Neptunea pribiloffensis</i>	Pribilof whelk
	<i>Neptunea ventricosa</i>	fat whelk
	<i>Nucella lamellosa</i>	frilled dogwinkle
	<i>Nuculana fossa</i>	trenched nut clam
	<i>Octopus dofleini</i>	giant octopus
	<i>Octopus leioderma</i>	smoothskin octopus
	<i>Onychoteuthis borealijaponicus</i>	boreal clubhook squid
	<i>Opisthoteuthis californiana</i>	flapjack devilfish
	<i>Patinopecten caurinus</i>	weathervane scallop
	<i>Placiphorella pacifica</i>	
	<i>Plicifusus griseus</i>	gray whelk
	<i>Pododesmus macroschisma</i>	Alaska false jingle
	<i>Polinices lewisi</i>	
	<i>Polinices pallidus</i>	pale moon snail
	<i>Rossia pacifica</i>	eastern Pacific bobtail
	<i>Serripes groenlandicus</i>	Greenland cockle

Phylum	Species/Taxon Name	Common Name
	<i>Siliqua alta</i>	Alaska razor
	<i>Taningia danae</i>	rhomboid squid
	<i>Tegula pulligo</i>	
	<i>Tochuina tetraquetra</i>	giant orange tochui
	<i>Tritonia diomedea</i>	rosy tritonia
	<i>Vampyroteuthis infernalis</i>	vampire squid
	<i>Volutopsius castaneus</i>	volute whelk
	<i>Volutopsius fragilis</i>	fragile whelk
	<i>Volutopsius harpa</i>	left-hand whelk
	<i>Volutopsius middendorffii</i>	tulip whelk
	<i>Yoldia scissurata</i>	crisscrossed yoldia
	<i>Yoldia thraciaeformis</i>	broad yoldia
Bryozoa	<i>Eucratea loricata</i>	feathery bryozoan
	<i>Flustra serrulata</i>	leafy bryozoan
	<i>Myriozoum subgracile</i>	
	<i>Rhamphostomella costata</i>	ribbed bryozoan
Brachiopoda	<i>Laqueus californianus</i>	California lamp shell
	<i>Terebratalia transversa</i>	common brachiopod
	<i>Terebratulina unguicula</i>	shakeshead brachiopod
Echinodermata	<i>Allocentrotus fragilis</i>	orange-pink sea urchin
	<i>Amphiophiura ponderosa</i>	
	<i>Asterias amurensis</i>	purple-orange sea star
	<i>Asteronyx loveni</i>	serpent sea star
	<i>Brisaster latifrons</i>	heart urchin
	<i>Brisingella exilis</i>	
	<i>Ceramaster arcticus</i>	Arctic bat sea star
	<i>Ceramaster patagonicus</i>	orange bat sea star
	<i>Crossaster borealis</i>	grooved sea star
	<i>Crossaster papposus</i>	rose sea star
	<i>Ctenodiscus crispatus</i>	common mud star
	<i>Cucumaria fallax</i>	sea football
	<i>Cucumaria japonica</i>	
	<i>Dermasterias imbricata</i>	leather sea star

Phylum	Species/Taxon Name	Common Name
	<i>Diplopteraster multipes</i>	pincushion sea star
	<i>Dipsacaster borealis</i>	northern sea star
	<i>Echinarachnius parma</i>	Parma sand dollar
	<i>Evasterias echinosoma</i>	giant sea star
	<i>Evasterias troschelii</i>	mottled sea star
	<i>Florometra acririma</i>	
	<i>Florometra asperima</i>	
	<i>Florometra serratissima</i>	featherstar crinoid
	<i>Gephyreaster swifti</i>	Swift's sea star
	<i>Gorgonocephalus eucnemis</i>	basketstar
	<i>Henricia aspera</i>	
	<i>Henricia asthenactis</i>	
	<i>Henricia clarki</i>	
	<i>Henricia leviuscula</i>	blood sea star
	<i>Henricia longispina</i>	
	<i>Henricia sanguinolenta</i>	sanguine sea star
	<i>Henricia tumida</i>	tumid sea star
	<i>Heterozonias alternatus</i>	
	<i>Hippasteria californica</i>	
	<i>Hippasteria heathi</i>	
	<i>Hippasteria spinosa</i>	spiny red sea star
	<i>Leptasterias camtschatica</i>	
	<i>Leptasterias coei</i>	
	<i>Leptasterias hylodes</i>	Aleutian sea star
	<i>Leptychaster arcticus</i>	North Pacific sea star
	<i>Lethasterias nanimensis</i>	blackspined sea star
	<i>Lophaster furcilliger</i>	crested sea star
	<i>Luidia foliolata</i>	
	<i>Luidiaster dawsoni</i>	fragile sea star
	<i>Mediaster aequalis</i>	vermilion sea star
	<i>Molpadia intermedia</i>	sweet sea potato
	<i>Myoxoderma platyacanthum</i>	
	<i>Myoxoderma sacculatum</i>	

Phylum	Species/Taxon Name	Common Name
	<i>Nearchaster pedicellaris</i>	
	<i>Ophiopholis aculeata</i>	ubiquitous brittle star
	<i>Ophiopholis longispina</i>	
	<i>Ophiura sarsi</i>	notched brittlestar
	<i>Orthasterias koehleri</i>	redbanded sea star
	<i>Pannychia moseleyi</i>	
	<i>Parastichopus californicus</i>	
	<i>Parastichopus leucothele</i>	
	<i>Pedicellaster magister</i>	majestic sea star
	<i>Pentamera lissoplaca</i>	crescent sea cucumber
	<i>Poraniopsis inflata</i>	thorny sea star
	<i>Pseudarchaster parelii</i>	scarlet sea star
	<i>Pseudostichopus mollis</i>	sandy sea cucumber
	<i>Psolus fabricii</i>	brownscaled sea cucumber
	<i>Psolus squamatus</i>	
	<i>Pteraster jordani</i>	
	<i>Pteraster militaris</i>	
	<i>Pteraster obscurus</i>	obscure sea star
	<i>Pteraster pulvillus</i>	
	<i>Pteraster temnochiton</i>	cushion sea star
	<i>Pteraster tessellatus</i>	
	<i>Pycnopodia helianthoides</i>	sunflower sea star
	<i>Rathbunaster californicus</i>	
	<i>Solaster dawsoni</i>	morning sun sea star
	<i>Solaster endeca</i>	northern sun sea star
	<i>Solaster paxillatus</i>	evening sun sea star
	<i>Solaster stimpsoni</i>	sun sea star
	<i>Strongylocentrotus droebachiensis</i>	green sea urchin
	<i>Strongylocentrotus franciscanus</i>	red sea urchin
	<i>Strongylocentrotus pallidus</i>	white sea urchin
	<i>Strongylocentrotus polyacanthus</i>	
	<i>Strongylocentrotus purpuratus</i>	purple sea urchin
	<i>Stylasterias forreri</i>	

Phylum	Species/Taxon Name	Common Name
Chordata	<i>Ascidia paratropa</i>	glassy tunicate
	<i>Halocynthia aurantium</i>	sea peach
	<i>Halocynthia hispidus</i>	hairy tunicate
	<i>Molgula griffithsii</i>	sea grape
	<i>Molgula retortiformis</i>	sea clod
	<i>Styela rustica</i>	sea potato
Platyhelminthes	Acoelida	acoel turbellarian

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